



REVISED AGENDA

SPC ON COMMUNITY AND PROTECTIVE SERVICES RE: FLUORIDE

October 29, 2019, 9:30 AM
IN THE COUNCIL CHAMBER
Members

Councillor D. Colley-Urquhart, Chair
Councillor G-C. Carra, Vice-Chair
Councillor S. Chu
Councillor J. Gondek
Councillor R. Jones
Councillor J. Magliocca
Councillor E. Woolley
Mayor N. Nenshi, Ex-Officio

1. CALL TO ORDER
2. OPENING REMARKS
3. CONFIRMATION OF AGENDA
4. CONFIRMATION OF MINUTES
 - 4.1 Minutes of the SPC on CPS, 2019 October 09
5. CONSENT AGENDA
 - 5.1 DEFERRALS AND PROCEDURAL REQUESTS
None
 - 5.2 BRIEFINGS
None
6. POSTPONED REPORTS
(including related/supplemental reports)
 - 6.1 *Response to Water Fluoridation in The City of Calgary, CPS2019-0965*
See 6.1.1 for REVISED attachment 2

REVISED MATERIALS

6.1.1 *REVISED-Attach2-Letter 40a-CPS2019-0965*

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES
None

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS
None

8.2 NOTICE(S) OF MOTION
None

9. URGENT BUSINESS

10. CONFIDENTIAL ITEMS

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES
None

10.2 URGENT BUSINESS

11. ADJOURNMENT
Members of Council may participate remotely, if required.



MINUTES

SPC ON COMMUNITY AND PROTECTIVE SERVICES

**October 9, 2019, 9:30 AM
IN THE COUNCIL CHAMBER**

PRESENT: Councillor D. Colley-Urquhart, Chair
Councillor G-C. Carra, Vice-Chair
Councillor S. Chu
Councillor J. Gondek
Councillor J. Magliocca
Councillor E. Woolley
Councillor J. Farkas
Councillor W. Sutherland

ABSENT: Councillor R. Jones (Personal)

ALSO PRESENT: Acting General Manager K. Black
Acting City Clerk L. Gibb
Legislative Advisor J. Palaschuk

1. **CALL TO ORDER**

Councillor Colley-Urquhart called the Meeting to order at 9:33 a.m.

2. **OPENING REMARKS**

Councillor Colley-Urquhart provided opening remarks.

3. **CONFIRMATION OF AGENDA**

Moved by Councillor Carra

That the Agenda for today's meeting be amended by adding a Confidential Item of Urgent Business, 10.2.1 CFD Update - (Verbal Report) CPS2019-1328.

MOTION CARRIED

Moved by Councillor Carra

That the Agenda for the 2019 October 09 Regular Meeting of the Standing Policy Committee on Community and Protective Services be confirmed, **as amended**.

MOTION CARRIED

4. **CONFIRMATION OF MINUTES**

- 4.1 Minutes of the Regular Meeting of the SPC on Community and Protective Services, 2019 September 11

Moved by Councillor Chu

That the Minutes of the 2019 September 11 Regular Meeting of the Standing Policy Committee on Community and Protective Services be confirmed.

MOTION CARRIED

5. CONSENT AGENDA

5.1 DEFERRALS AND PROCEDURAL REQUESTS

None

5.2 BRIEFINGS

None

6. POSTPONED REPORTS

None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

7.1 Business-Friendly Amendments to Business Related Bylaws, CPS2019-1309

Committee, by general consent, requested that the title of Report CPS2019-1309 be renamed to "Business Efficiency Amendments to Related Bylaws."

A Revised Attachment 1 was distributed with respect to Report CPS2019-1309.

Moved by Councillor Sutherland

That the Standing Policy Committee on Community and Protective Services enhance business friendliness by recommending that Council give three readings to the proposed amendments in the Revised Attachment 1, affecting business related bylaws.

MOTION CARRIED

7.2 Amendment to Fire Operations and Fees Bylaw 55M2014, CPS2019-1311

A presentation entitled "Calgary Fire Department: Amendment to Fire Operations and Fees Bylaw 55M2014, CPS2019-1311" was distributed with respect to Report CPS2019-1311.

Councillor Chu rose on a Point of Order to clarify if Members of Committee had received e-mails from Industry regarding this issue.

Moved by Councillor Carra

That the Standing Policy Committee on Community and Protective Services recommends that this item be postponed to November in order to gather more information, received feedback from Industry, and to allow for more public engagement.

ROLL CALL VOTE

For: (3): Councillor Carra, Councillor Magliocca, and Councillor Woolley

Against: (4): Councillor Colley-Urquhart, Councillor Chu, Councillor Gondek, and Councillor Farkas

MOTION DEFEATED

Moved by Councillor Farkas

That the Standing Policy Committee on Community and Protective Services recommends that Council give three readings to the proposed bylaw to amend Bylaw 55M2014, City of Calgary Fire Operations and Fees Bylaw (Attachment 1) to prohibit the sale and use of consumer fireworks.

Against: Councillor Woolley

MOTION CARRIED

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS

None

8.2 NOTICE(S) OF MOTION

None

9. URGENT BUSINESS

None

10. CONFIDENTIAL ITEMS

Moved by Councillor Woolley

That pursuant to Sections 16 (Disclosure harmful to business interests of a third party), 21 (Disclosure harmful to intergovernmental relations), 23 (Local public body confidences), and 24 (Advice from officials) of the *Freedom of Information and Protection of Privacy Act*, the Standing Policy Committee on Community and Protective Services now move into Closed Meeting, in the Council Boardroom at 10:15 a.m., to discuss confidential matters with respect to the following items:

10.1.1. Civic Partners Program Update (Verbal) - CPS2019-1308

10.1.2. Family and Community Support Services (FCSS) Program Update (Verbal) - CPS2019-1307

10.2.1 CFD Update - CPS2019-1328

ROLL CALL VOTE:

For: (7): Councillor Colley-Urquhart, Councillor Carra, Councillor Chu, Councillor Gondek, Councillor Magliocca, Councillor Woolley, and Councillor Farkas

MOTION CARRIED

Committee reconvened at 11:04 a.m. with Councillor Colley-Urquhart in the Chair

Moved by Councillor Carra

That Committee rise without reporting.

MOTION CARRIED

Moved by Councillor Woolley

That pursuant to Sections 16 (Disclosure harmful to business interests of a third party), 21 (Disclosure harmful to intergovernmental relations), 23 (Local public body confidences), and 24 (Advice from officials) of the Freedom of Information and Protection of Privacy Act, the Standing Policy Committee on Community and Protective Services now move into Closed Meeting, in the Council Boardroom at 11:05 a.m., to discuss confidential matters with respect to the following items:

10.1.2. Family and Community Support Services (FCSS) Program Update (Verbal) - CPS2019-1307

10.2.1 CFD Update - CPS2019-1328

MOTION CARRIED

Committee reconvened in Public Meeting at 11:43 a.m. with Councillor Colley-Urquhart in the Chair.

Moved by Councillor Carra

That Committee rise and report

MOTION CARRIED

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

10.1.1 Civic Partners Program Update (Verbal) - CPS2019-1308

A confidential presentation was distributed with respect to Confidential Verbal Report CPS2019-1308.

Administration in attendance during the Closed Meeting discussions with respect to Report CPS2019-1308:

Clerks: L. Gibb and J. Palaschuk. Advice: L. Kerr and K. Black Observer: S. Dongworth, J.L. Martin, and M. Kebede

Moved by Councillor Magliocca

That with respect to Confidential Verbal Report CPS2019-1308, the following be approved:

That the Standing Policy Committee on Community and Protective Services recommend that Council:

1. Receive the verbal report and presentation for the Corporate Record; and
2. Direct that the presentation and verbal discussions remain confidential pursuant to Sections 16 (Disclosure harmful to business interests of a third party), 23 (Local public body confidences), and 24 (Advice from officials), of the Freedom of Information and Protection of Privacy Act, until 2019 December 31.

MOTION CARRIED

10.1.2 Family and Community Support Services (FCSS) Program Update (Verbal) - CPS2019-1307

A confidential presentation was distributed with respect to Confidential Verbal Report CPS2019-1307.

Administration in attendance during the Closed Meeting discussions with respect to Report CPS2019-1307:

Clerks: L. Gibb and J. Palaschuk Advice K. Black, M. Hulsker, and M. Kebede Observer: S. Dongworth, L. Kerr, and J.L. Martin

Moved by Councillor Carra

That with respect to Confidential Verbal Report CPS2019-1307, the following be approved:

That the Standing Policy Committee on Community and Protective Services recommend that Council:

1. Adopt Administration's recommendations as contained in the confidential presentation; and
2. Direct that the presentation, recommendations, and verbal discussions remain confidential pursuant to Sections 21 (Disclosure harmful to intergovernmental relations) and 24 (Advice from officials) of the Freedom of Information and Protection of Privacy Act, until the impact of the provincial budget on the program is known, or no later than 2019 December 31.

Against: Councillor Farkas

MOTION CARRIED

10.2 URGENT BUSINESS

10.2.1 Calgary Fire Department Update (Verbal), CPS2019-1328

A confidential presentation was distributed with respect to Confidential Verbal Report CPS2019-1328.

Administration in attendance during the Closed Meeting discussions with respect to Report CPS2019-1328:

Clerks: L. Gibb, and J. Palaschuk Advice S. Dongworth and K. Black Observer: M. Hulsker, L. Kerr, M. Kebede and J.L. Martin

Moved by Councillor Carra

That with respect to Confidential Verbal Report CPS2019-1328, the following be approved:

That the Standing Policy Committee on Community and Protective Services recommend that Council:

1. Receive the confidential presentation for the Corporate Record; and
2. Direct that the presentation, recommendations, and verbal discussions remain confidential pursuant to Sections 21 (Disclosure harmful to intergovernmental relations) and 24 (Advice from officials) of the Freedom of Information and Protection of Privacy Act, and review by 2019 October 21.

Against: Councillor Farkas

MOTION CARRIED

11. ADJOURNMENT

Moved by Councillor Gondek

That this meeting adjourn at 11:53 a.m.

MOTION CARRIED

The following items have been forwarded to the 2019 October 21 Combined Meeting of Council:

CONFIDENTIAL CONSENT

- Civic Partners Program Update (Verbal) - CPS2019-1308
- Family and Community Support Services (FCSS) Program Update (Verbal) CPS2019-1307
- CFD Update (Confidential Verbal) - CPS2019-1328

ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

- Business Efficiency Amendments to Related Bylaws, CPS2019-1309
- Amendment to Fire Operations and Fees Bylaw 55M2014, CPS2019-1311

The next regular Meeting of the Standing Policy Committee on Community and Protective Services is scheduled to be held on 2019 October 29 at 9:30 a.m.

CONFIRMED BY COMMITTEE ON

CHAIR

ACTING CITY CLERK

UNCONFIRMED

POSTPONED REPORT

Excerpt from the Minutes of the Combined Meeting of Council, held 2019 07 22:

“Response to Water Fluoridation in The City of Calgary – Request for Deferral, CPS2019-0781

Moved by Councillor Colley-Urquhart

Seconded by Councillor Carra

That with respect to Report CPS2019-0781 the following be adopted:

That, pursuant to Section 17(2) of the Procedure Bylaw 35M2017, as amended, Council cancel the Regular Meeting of the Standing Policy Committee on Community and Protective Services, scheduled for 2019 July 24 and that the Response to Water Fluoridation in The City of Calgary – Request for Deferral, CPS2019-0781, be deferred to the call of the Chair of SPC on CPS, before the end of Q4 2019.

Against: Councillor Demong

MOTION CARRIED”

**Community Services Report to
SPC on Community and Protective Services
2019 July 24**

**ISC: UNRESTRICTED
CPS2019-0965**

Response to Water Fluoridation in The City of Calgary

EXECUTIVE SUMMARY

In 2019 February, Council directed that an assessment of evidence related to water fluoridation and other dental health interventions be undertaken through the engagement of the University of Calgary's O'Brien Institute for Public Health (OIPH) and other willing and qualified bodies. This report presents the results of that engagement and research review.

Over the past five months, OIPH has conducted a broad and multifaceted examination of research, including that related to the benefits and risks of water fluoridation, to integrated and/or alternative approaches to oral health, and other dimensions of the issue (e.g., ethical/legal, economic, jurisdictional/intergovernmental).

OIPH has consulted with various individuals who have unique perspectives or knowledge on the issue. A number of O'Brien Institute members provided expertise in areas such as: the physician specialty of public health/preventive medicine; population health; dental and oral health; health law; health economics; public policy and governance; endocrinology; neurology and cognition; and aging and dementia. Additionally, the OIPH team met with external knowledge resources to gain additional perspective on the issues.

ADMINISTRATION RECOMMENDATION:

That the SPC on Community and Protective Services:

1. Receive the presentation with respect to Report CPS2019-0965 for the Corporate Record; and
2. That Council receive this Report for information.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2019 February 25, Council adopted Notice of Motion C2019-0219 requesting that the O'Brien Institute for Public Health undertake a review of the evidence related to water fluoridation and other dental health interventions, and to report and present these findings to SPC on Community and Protective Services no later than June 2019. Additionally, Council directed that other potential willing and qualified bodies be engaged to similarly assess water fluoridation and other programs to improve dental health, and that any party participating in the inquiry be invited to present their findings at the same time.

BACKGROUND

As a result of Council direction in 2011 (UE2011-02), Calgary water treatment plants discontinued the addition of fluoride to the city's water supply. Since that time, Administration transferred a total of \$750,000 on a one-time basis from the Utilities (Water Resources/Water Services) budget to the Alexandra Community Health Centre ("The Alex") and to CUPS to support dental health for children living in poverty in accordance with Council's direction in CPS2012-0446.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

At Council's request, the O'Brien Institute has conducted a broad and multifaceted examination of research, including available studies related to the effectiveness of direct dental interventions,

**Community Services Report to
SPC on Community and Protective Services
2019 July 24**

**ISC: UNRESTRICTED
CPS2019-0965**

Response to Water Fluoridation in The City of Calgary

other jurisdictions' approaches, and the relationship between dental health and other disease vectors.

OIPH has consulted with various individuals with unique perspectives or knowledge on the issue. A number of O'Brien Institute members provided expertise in areas such as: the physician specialty of public health/preventive medicine; population health; dental and oral health; health law; health economics; public policy and governance; endocrinology; neurology and cognition; and aging and dementia. Additionally, Administration and the OIPH team met with external knowledge resources to gain additional perspective on the issues.

The O'Brien Report (*Community Water Fluoridation: A Report for Calgary City Council*) is included as Attachment 1.

Additional correspondence, including a review coordinated by Safe Water Calgary, is included in Attachment 2.

Stakeholder Engagement, Research and Communication

In preparing the report, members of the O'Brien Institute for Public Health research team have held individual interviews with interested Council members, as requested in C2019-0219. These meetings provided an opportunity for Councillors to expand on any comments or questions raised during the 2019 February 25 meeting or to identify additional questions or concerns so that they could be investigated and addressed as part of the review.

OIPH also engaged in conversations with a number of other University of Calgary and external individuals with unique perspectives or knowledge to support addressing the topics, questions, and issues identified by Council.

A full list of names and affiliations of all consulted individuals is provided in Attachment 1 (pp. 5-6).

Within Administration, groups from both Utilities and Environmental Protection (Water Services, Water Resources – Planning) and from within Community Services (Calgary Neighbourhoods) were included to ensure they were aware of the progress of the report and to identify any specific input or questions they might have.

Strategic Alignment

This report considers how water fluoridation and other oral health interventions might contribute to A Healthy and Green City.

Social, Environmental, Economic (External)

Possible social, environmental and economic considerations are discussed within Attachment 1 and would be assessed in detail if Administration were to further explore the feasibility of pursuing specific interventions.

Community Services Report to
SPC on Community and Protective Services
2019 July 24

ISC: UNRESTRICTED
CPS2019-0965

Response to Water Fluoridation in The City of Calgary

Financial Capacity

Current and Future Operating Budget:

There are no impacts as a result of the recommendation contained in this report.

Current and Future Capital Budget:

There are no impacts as a result of the recommendation contained in this report.

Risk Assessment

City of Calgary Organizational Risk

As this review was not initiated in connection with any related capital or other projects, there are no identified City impacts or risks associated with the recommendation contained in this report.

Risks Related to Water Fluoridation

The O'Brien Institute for Public Health's report on Community Water Fluoridation (Attachment 1) provides a summary of the potential risks of both fluoridating and not fluoridating water as determined by their analysis of the available research.

REASON(S) FOR RECOMMENDATION(S):

The O'Brien Institute for Public Health's Community Water Fluoridation: A Report for Calgary City Council provides Council with a review of existing literature related to water fluoridation and other dental health interventions. This report synthesizes and summarizes the research, and provides OIPH's high-level observations of its overriding impressions and findings.

Given the current conversation related to budget reductions, Administration has not recommended any future work towards new services, including conducting feasibility studies or developing implementation plans (either related to water fluoridation or other dental health initiatives).

ATTACHMENT(S)

1. Attachment 1 – Community Water Fluoridation: A Report for Calgary City Council (The O'Brien Institute for Public Health)
2. Attachment 2 – Stakeholder submissions to date



UNIVERSITY OF CALGARY
O'Brien Institute for Public Health

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COMMUNITY WATER FLUORIDATION

A REPORT FOR CALGARY CITY COUNCIL

Prepared for:

City Council
The City of Calgary

July 2019

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INTRODUCTION

PURPOSE

The O'Brien Institute for Public Health is pleased to provide this report to City Council as a scholarly analysis intended to advance collective understanding of the fluoride debate among both City Council members and the Calgary public at large. This report is in specific response to a Notice of Motion from the City Council meeting on February 25, 2019, where Councillors voted to support further study on community water fluoridation and requested the O'Brien Institute for Public Health to provide that information (#C2019-0219). The formal resolution is included as Appendix 1 of this report.

THE O'BRIEN INSTITUTE

The O'Brien Institute for Public Health at the University of Calgary is one of the university's seven health research institutes. With a formal *vision* of '*better health and health care*', and a corresponding *mission* '*to produce knowledge that informs public policy for health*', the O'Brien Institute is committed to excellence in population health and health services research. The Institute has over 500 members, consisting of researchers, health professionals, and policy makers; within this membership, there is representation from a multitude of disciplines including medicine, nursing, epidemiology, statistics, psychology, sociology, economics, social work, kinesiology, and architecture and planning, among others.

The Institute contributes to public policy discourse through the production of reports for health agencies and various levels of government. A notable recent example is the Institute's [Raising Canada](#) report (produced in collaboration with Children First Canada) on the health and well-being of children in Canada. The Institute also convenes public symposia and stakeholder summits focusing on a variety of topics including health system sustainability, guaranteed basic income, cannabis legalization, national food policy, mandatory vaccination of healthcare workers, and the health and social impacts of hosting Olympic Games.

Through such formal reports, events, and consultations, the Institute often assumes an *academic diplomacy* role, brokering dialogue and information exchanges across sectors, disciplines and perspectives. When engaged in such a capacity, the Institute's executive team functions differently than do individual faculty members. Whereas the latter have academic freedom to conduct their independent research and to speak freely and advocate as they wish, the Institute executive, in contrast, will often not take positions on policies (especially if not requested to do so). Rather, the Institute executive works to create settings for public discourse, so that scholarly, policymaker, and civil society perspectives can be heard. In its academic diplomacy capacity, the O'Brien Institute's ultimate goals are to foster respectful dialogue, to contribute dispassionate evidence, and to learn from community – in pursuit of *better health and health care*.

More information is available at www.obrieniph.ucalgary.ca.

REPORT PROCESS

Initiation

- Councillor Colley-Urquhart requests O'Brien Institute guidance and initiates Motion to City Council.
- O'Brien Institute commits time and resources.
- City of Calgary issues directive to O'Brien Institute to provide an informative and unbiased report (without recommendations) regarding potential risks and benefits of community water fluoridation.

Planning

- O'Brien Institute allocates faculty experts and staff to plan and execute consultation, literature review and report writing.
- City of Calgary assigns Ms. Robin Hopkins (Issue Strategist) as active liaison for consultation and report development.
- O'Brien Institute commits to a simultaneous process of a phased literature review interlocking with City Councillor and community interviews.

Execution

- O'Brien Institute begins literature review and interview process with City Councillors to identify key issues.
- O'Brien Institute conducts interviews with fluoridation opponents, external experts, and authors of key studies.
- Interview and literature review summaries are compiled.
- Final report written for presentation on July 24, 2019.

The preceding schematic outlines, in broad terms, the steps taken to produce this report. Expanding slightly on the information presented in that figure:

- Councillor Diane Colley-Urquhart approached the O'Brien Institute's leadership in early February of 2019 to determine if the Institute was willing/able to conduct work on behalf of the City of Calgary – specifically to provide information relating to community water fluoridation.
- Councillor Colley-Urquhart brought forward a Notice of Motion to City Council for discussion/debate on February 25, 2019, proposing that the O'Brien Institute for Public Health be approached to provide the City of Calgary with information regarding potential risks and benefits of community water fluoridation.
- The lengthy discussion during the Council session on February 25th permitted most Councillors to ask questions and/or make comments relating to community water fluoridation. Each articulated comment/question was recorded by the Institute team as a starting point. The full listing of questions arising from the February 25th Council hearing is presented in Appendix 2.
- The Institute team then embarked on a process of contacting the Mayor and all Councillors, as requested by Council, with an invitation to meet in person to discuss community water fluoridation and the report development process. A standardized invitation was sent to each invitee, with follow-up as needed to a total of three invitations. From this process, 11 Councillors participated in meetings; each was provided with a clear statement of meeting objectives, and an overview of questions that would be posed during meetings. Meetings were led by either Dr. Aleem Bharwani (O'Brien Institute Lead – Public Policy) or Dr. William Ghali (O'Brien Institute Scientific Director). Ms. Robin Hopkins from Community Services attended all meetings on behalf of the City.
- The list of review topics and questions for this report was refined through this process of interviewing Councillors. Ensuing sections present the final listing of questions/topics (grouped thematically) that were addressed through this O'Brien Institute work. A high-level summary of the Councillor meetings/discussions is presented in Appendix 3.
- A number of O'Brien Institute members were enlisted as experts asked to provide information to support development of this report. These included experts in: 1) the physician specialty of public health/preventive medicine; 2) population health and health equity; 3) dental and oral health; 4) health law; 5) health economics; 6) public policy and governance; 7) endocrinology focusing on thyroid function; 8) endocrinology focusing on bone disease and health; 9) neurology and cognition; and 10) aging and dementia. The full listing of O'Brien Institute and University of Calgary faculty members who were consulted and/or contributed to the report:
 - **Bharwani, Aleem, MD, MPP, FRCPC**, Director Public Policy and Strategic Partnerships, Clinical Associate Professor, Cumming School of Medicine, University of Calgary
 - **Billington, Emma, MD**, Clinical Assistant Professor, Cumming School of Medicine, University of Calgary

- **Boulet, Fiona, BA, MEd**, Coordinator, *makeCalgary* program, University of Calgary
 - **Cabaj, Jason, MD, MSc, FRCPC**, Medical Officer of Health, Calgary Zone, Alberta Health Services
Provincial Lead Medical Officer of Health, Public Health Surveillance and Infrastructure, Clinical
Assistant Professor, Community Health Sciences, University of Calgary, Program Director, Public
Health & Preventive Medicine, University of Calgary
 - **Day, Jamie, PhD**, Administrative Director, O'Brien Institute for Public Health, University of
Calgary
 - **Elliott, Charlene, PhD**, Professor, Department of Communication, Media and Film, University of
Calgary
 - **Fernandez, Pablo Richard**, Manager, Strategic Communications, O'Brien Institute for Public
Health, University of Calgary
 - **Aravind Ganesh, MD, PhD**, Clinical Research Fellow, Junior Dean, Clinical Teaching Associate, St
John's College, Department of Clinical Neurosciences, University of Oxford, UK
 - **Ghali, William, MD, MPH, FRCPC**, Professor, Faculty of Medicine, Scientific Director, O'Brien
Institute for Public Health, University of Calgary
 - **Hardcastle, Lorian**, Assistant Professor, Faculty of Law and Community Health Sciences,
Cumming School of Medicine, University of Calgary
 - **Hogan, David, MD, FACP, FRCPC**, Professor (Geriatrics), Cumming School of Medicine, University
of Calgary
 - **Hollis, Aidan, PhD**, Professor, Department of Economics, University of Calgary
 - **Leung, Alexander Ah-Chi, MD, MPH, FRCPC**, Assistant Professor, Community Health Sciences,
Department of Medicine, University of Calgary
 - **Lucas, Jack, PhD**, Associate Professor, Department of Political Science, University of Calgary
 - **McLaren, Lindsay, PhD**, CIHR / PHAC / AI-HS Applied Public Health Chair, Associate Professor,
Dept Community Health Sciences and O'Brien Institute for Public Health, University of Calgary,
Senior Editor, Canadian Journal of Public Health, Co-Editor, Critical Public Health
 - **Weijs, Cynthia, RDH PhD**, CIHR and AHS Health System Impact Fellow, Department of
Community Health Sciences. Cumming School of Medicine, University of Calgary
- Some external stakeholders were also consulted in this report development process. These included:
1) **Dr. Robert Dickson**, Founder of Safe Water Calgary - a community group opposed to Community
Water Fluoridation; 2) **Ms. Maria Castro**, Executive Assistant Safe Water Calgary; 3) **Dr. Paul Connett**,
Executive Director of the Fluoride Action Network, a U.S.-based group that is passionately opposed to
Community Water Fluoridation; 4) **Dr. Hardy Limeback**, an Ontario-based dentist, and Emeritus
Professor and former Head of Preventive Dentistry, University of Toronto; 5) **Dr. Morteza Bashash**,
Adjunct Lecturer, Dalla Lana School of Public Health, University of Toronto – and author of recently-
published research exploring the link between fluoride and cognition; 6) **Dr. Christine Till**, Associate
Professor, York University, Toronto, ON – also author of recently-published research exploring
fluoride and cognition; and 7) **Dr. Rafael Figueiredo**, Alberta's Provincial Dental Public Health Officer,
Alberta Health Services. Each of these consultations were led by Dr. William Ghali, +/- other O'Brien

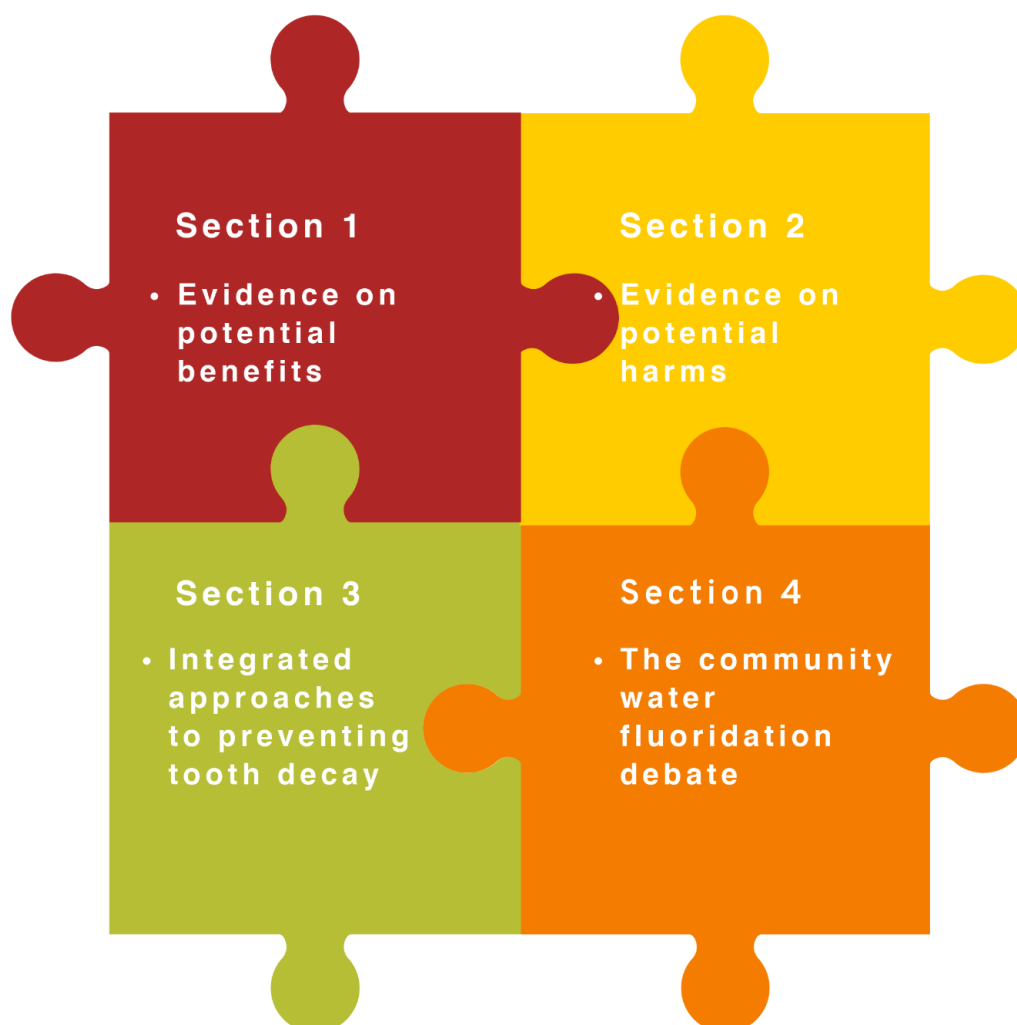
team members present, and also +/- Ms. Hopkins from the City (when scheduling permitted others to participate).

- A relevant backdrop to this O'Brien Institute work is a February 2019 report on community water fluoridation produced by the Canadian Agency for Drugs and Technologies in Health (CADTH). The [CADTH report](#) was a resource for the O'Brien Institute's work, because it highlights some, but not all, of the literature relevant to this Institute report. Also, the report formally presents the findings of an important Canadian health agency. The agency was established in 1989 by federal, provincial, and territorial governments, as an independent, not-for-profit organization with a mandate to conduct comprehensive evidence assessments of new drugs and technologies. In its multitude of reports on various drugs and technologies, CADTH has informed provincial health systems on both the efficacy of various health interventions, and the economic considerations around drug and technology funding decisions. Through its reports, CADTH seeks to inform governments and health systems on important public policy decisions that affect Canadians' health. A summary of the recent CADTH report on community water fluoridation is available online — [CADTH Evidence Highlights](#).
- Submissions of supporting documents and reference materials were welcomed from all sources. These included materials provided by any or all of the above-mentioned individuals, as well as document submissions from external stakeholders who were not interviewed. For the latter, Councillor Colley-Urquhart regularly forwarded materials received by her office (+/- other Councillors' offices) to the O'Brien Institute team for review and consideration.
- This final report was compiled and written by an Institute writing team led by Dr. William Ghali in his capacity as Director of the O'Brien Institute, with support from Dr. Jamie Day (the Institute's Administrative Director), Dr. Aleem Bharwani (the Institute's Public Policy Lead), Ms. Fiona Boulet (Coordinator of the University of Calgary's *makeCalgary* initiative), and the Institute's Communications team.

REPORT ROADMAP

This report is written in a question-answer format and divided into the following thematic sections, which align with questions from Councillors. Sections 1 to 3 provide research evidence summaries on various aspects of community water fluoridation and oral health – with a review of potential benefits of fluoridation (Section 1), potential harms (Section 2), and integrated and/or alternative approaches to preventing tooth decay (Section 3). For each of these three evidence review sections, O’Brien Institute experts contributed knowledge from their respective areas of specialization. Section 4 then discusses several other dimensions of the community water fluoridation issue (and debate), with, in particular, a discussion of economic considerations, the ethical/legal context, intergovernmental jurisdiction considerations, and miscellaneous other topics.

Summary of this report’s FOUR SECTIONS:



HIGH-LEVEL OBSERVATIONS ON THE COMMUNITY WATER FLUORIDATION ISSUE

Before the granular presentation of information in Sections 1 through 4, we consider it important to present some high-level observations at the outset, so that readers are aware of the overriding findings and impressions, before reading the more detailed evidence sections. O'Brien Institute observations:

- The community water fluoridation issue is contentious, with passionate views held by individuals on both sides of what has become a high-decibel public policy debate. Further, ***there is a large amount of advocacy work being done by individuals on both sides of the debate, with use of a variety of communication strategies for that advocacy***, including proactive social media campaigns, the staging of community events, targeted communications to City Councillors and other decision-makers.
- As mentioned in the earlier Report Process section, the Institute team actively sought out meetings with anti-fluoride stakeholders, while also having meetings with proponents of community water fluoridation. Our various discussions with individuals on both sides of this fractious issue highlight that ***both sides bring knowledge and thoughtful perspectives***.
- Importantly, all stakeholders (proponents, opponents, and any who may be in the middle without a strongly formed opinion) appear to be looking at the same general body of evidence, and ***overall there is agreement on a number of core findings***. Namely, most seem to acknowledge that:
 - community water fluoridation reduces the number of cavities at a population level;
 - community water fluoridation increases the prevalence of dental fluorosis;
 - there is a mixed (and therefore somewhat confusing) literature around the potential harms associated with ingested fluoride; and
 - within that harm literature, there are very recent studies (and notably some methodologically strong studies published in late 2018 and 2019) on potential detrimental cognitive effects.
- However, the proponents and opponents then differ considerably in how they approach the above findings, specifically in relation to:
 - ***how they convey their evaluations (critique) of the quality of the respective research studies*** relating to each of the evidence points above; and
 - ***how heavily they weight the negative health impacts*** associated with each of the relevant conditions (e.g., the extent of suffering associated with dental cavities vs. the extent of psychological distress associated with varying degrees of dental fluorosis).
- Further, both sides seem to selectively highlight the parts of the evidence that best support either pro- or anti-fluoride positions. Reflecting this, reactions to the recent CADTH report are similarly polarized – either strong endorsement of the report, or criticism on multiple levels.

• ***There are several areas of uncertainty that must be highlighted***, because these will continue to be points of discussion and debate in scientific circles. Municipal and health decision-makers (like Calgary's City Councillors) will also continue to be confronted by these points of uncertainty, because they will be highlighted in overtures from proponents and opponents alike. Areas of uncertainty:

- Many of the studies on benefits of fluoride for reducing dental cavities were based on fluoridation levels of 1.0ppm or greater. There is comparatively less information on the extent to which community water fluoridation is effective at the current lower North American community fluoridation standard fluoride concentration of 0.7ppm.
- Dental fluorosis, when present, is usually mild. However, there is some inconsistency in the reported prevalence of moderate and/or severe dental fluorosis in Canada – with reported rates varying from less than 1% in research using the Canadian Health Measures Survey to over 14% in some population-based research done in Ontario.
- New evidence has emerged on potential cognitive effects of fluoride, arising from fluoride ingestion by pregnant women +/- fluoride intake from water consumed by infants. Recent National Institutes of Health funding decisions in the U.S., and corresponding new research funding decisions in Australia highlight that funding agencies and leading researchers in these two peer countries acknowledge the need to actively study/invest in understanding any potential cognitive effects.
- ***There is a need to consider both individual and population perspectives*** when quantifying and discussing health impacts. Risk differences, both positive and negative, can be communicated by stakeholders with a focus on only describing the impact of health interventions on individuals (e.g., “a small reduction of only 1 to 2 cavities over a person's lifetime” or “a tiny 1% increase in fluorosis”), but these differences also must also be considered through a population impact lens, where even very small differences in a health measure can add up to significant benefit/harm when projected over an entire population of over 1 million Calgarians, or over 35 million Canadians. Public health decision-making must consider both of these perspectives on the positive and negative sides of the ledger.
- In our preceding mentions of proponents and opponents of fluoride, we have been non-explicit in our characterization of the many health agencies – provincial, national, and international – that must contemplate and make recommendations on water fluoridation. And to do so, they have a mandate (and significant ongoing challenge) of getting their positions right in the face of continuously evolving evidence. Health agencies have endorsed community water fluoridation since its introduction in the 1940s, and they have reviewed evidence iteratively over several decades as a basis for those endorsements. The O'Brien Institute team has learned that the areas of uncertainty just described are being actively reviewed by health agencies (including Alberta Health Services, which is carefully tracking and reviewing emerging cognition studies), and time will tell whether new evidence leads to a change in the official agency positions. In this regard, we note also that this decision-making accountability for health agencies is not confined to fluoride, but that it also applies to countless other issues, such as immunization policy, various environmental matters, and drug approval decisions, among others.

A final point to make in this high-level overview of the O'Brien Institute's work and overall impressions is that ***we have found the completion of this report to be a very challenging exercise.*** We have encountered a high level of passion among those who actively advocate for or against fluoride from firmly-held "yes" vs. "no" positions. Yet, there is also a nuanced middle ground that must be considered, where risks and benefits must be carefully weighted, while also fully understanding and acknowledging that there are still very definitely areas of persisting uncertainty, as just discussed. More knowledge is needed in a few key areas (the cognitive domain in particular), and from our expert interviews regarding new research that is happening around the world, more research evidence will emerge as time passes.

The City of Calgary Notice of Motion very explicitly tasks the O'Brien Institute with providing information, *but not recommendations*, for City decision-makers to consider. This report therefore stops short of ending with a simplistic "yes" or "no" recommendation for community water fluoridation. Our overall report findings suggest that such a simplistic response is not appropriate in any case. We hope that the bottom-line information just outlined is more enlightening than it is confusing.

SECTION 1: POTENTIAL BENEFITS OF COMMUNITY WATER FLUORIDATION

❖ *Are community water fluoridation programs beneficial for reducing tooth decay (cavities) in children?*

As with other areas of science, to answer questions like this it is useful to rely on systematic reviews, which involve identifying and synthesizing individual studies in a comprehensive and reproducible manner, and then evaluating their methodological quality. Such reviews also need to assess studies for relevance (for example, some studies consider fluoride at very high levels, which is not necessarily relevant to community water fluoridation, where controlled levels of fluoride are added to drinking water).

For this particular topic, the recent [CADTH Report \(Sub-Report on Dental Caries and Other Health Outcomes\)](#) is a useful resource, as it summarizes a large and rather consistent body of literature showing that community water fluoridation is associated with a lower rate of dental cavities, especially in children. Further, this appears to be true for both deciduous teeth (i.e., baby teeth) and the new permanent teeth of older children. Some details on this evidence:

Benefits of water fluoridation - children



44% relative reduction in baby teeth affected by dental decay and cavities.

37% relative reduction in children's permanent teeth affected by cavities.



50% lower rates of hospital admissions for surgical treatment of tooth decay.

- A series of systematic reviews examining variable numbers of primary studies finds that children in communities with fluoridated water had on average 1.8 fewer baby teeth affected by dental decay and cavities. Stated in relative terms, this equates to a 44% relative reduction in the number of baby teeth affected by dental decay and cavities.
 - For permanent teeth in children, the corresponding findings are that there were 1.2 fewer permanent teeth with tooth decay in children living in communities with water fluoridation. This represents a 37% relative reduction in children's permanent teeth affected by cavities.
 - A smaller number of studies go beyond simple counts of affected teeth, to examine more significant outcomes such as numbers of teeth lost entirely, or the need for hospital admission to treat severe tooth decay. A total of five studies show lower rates of tooth loss in children and adolescents in communities with fluoridated water, and one study from the U.K. reports lower rates of hospital admission for surgical treatment of tooth decay (approximately 50% lower in relative terms).
- Our review of this evidence on dental cavities also identifies some caveats and limitations of the available evidence. These include:
- Acknowledging that many of the studies are from early in fluoridation's history (prior to 1970).

- Noting that a large proportion of the studies done to date were from jurisdictions with water fluoride concentrations of 1.0ppm or greater, which is higher than the current Canadian standard of 0.7ppm for community water fluoridation.
- Recognizing that there is limited primary evidence from Canadian contexts (— this is one of the factors that motivated Dr. Lindsay McLaren’s Calgary-Edmonton study, which is discussed below).

Community water fluoridation is a public policy employed variably across provinces in Canada, and variably around the world, and decisions on its use are highly political and variable. In this context, the assignment of communities to receive fluoride (vs. not) is not controlled by researchers. As a result, the studies done to date are not randomized controlled trials. While some critics call for randomized controlled trials (RCTs) to be conducted to determine a true effect on cavities, such studies to determine *community-based effects* (i.e., the ultimate question in such research) are plain and simply not feasible. Researchers would need to identify a number of communities willing to be randomized as entire jurisdictions to have community water fluoridation vs. not – something that is clearly neither feasible nor practical. (Note: Simply randomizing some individuals to receive fluoridated vs. non-fluoridated water would not represent a study of *population-based* community water fluoridation.)

As a result, existing research studies on community water fluoridation (and many other population health interventions outside of fluoride) are observational in nature. These involve observing whole communities, either the same community over time, or comparing two or more communities, and carefully considering the various factors other than fluoridation that contribute to tooth decay for the populations and settings being studied. Such studies of course need to be interpreted with caution, with careful consideration of potential confounding factors like socioeconomic status, educational level, and prevailing health behaviours of the communities being studied.

❖ ***Do community water fluoridation programs also reduce dental cavities in adults?***

Again, drawing most heavily from the [CADTH Report \(Sub-Report on Dental Caries and Other Health Outcomes\)](#) we find evidence that community water fluoridation is also beneficial to adult populations. The extent of research evidence is somewhat less than for children, but studies of adults still show benefit:

- Systematic reviews suggest a 35% relative reduction in the number of teeth affected by decay and cavities.
- Different approaches have been used to estimate the corresponding absolute reductions in numbers of teeth affected by decay and cavities. It has been projected that the above-mentioned relative reduction corresponds to an average of 1 to 2 fewer cavities per person, experienced over 40 years (— the range of this estimate relates to varying assumptions made for these projections).

- Individual and population perspectives need to be considered in interpreting the above numbers. A relative small difference in individuals can amount to very significant overall morbidity in an entire population.

There is interest in determining whether community water fluoridation helps prevent tooth decay in the vulnerable elderly, either living in the community or in long-term care. Evidence for this sub-group is very limited, but new local data will emerge, as a team based at the University of Calgary has Canadian Institutes of Health Research funding to explore potential dental benefits in the elderly.

Importantly, we reiterate that this review suggests that the benefit of community water fluoridation for tooth decay and cavities is not confined to children.

❖ ***What are the effects of removing a community water fluoridation program?***

- Cessation of community water fluoridation is a relatively recent phenomenon in the life course of fluoridation. Because of that, there are fewer studies available; this is problematic because for communities that are revisiting their fluoridation status, there is limited information on which to base their decision. This is in part what prompted the Calgary-Edmonton study led by Dr. Lindsay McLaren.
- Prior to the publication of that Calgary-Edmonton study, McLaren & Singhal published [a systematic review of all fluoride cessation studies](#) conducted internationally. The systematic review revealed:
 - 15 studied instances of fluoride cessation (from 15 cities/regions in 13 countries).
 - Among these, nine of the studies are of moderate-to-high methodological quality.
 - Among the higher quality studies, five found an increase in dental cavities after cessation, whereas three did not. Among the latter, alternative dental care programs were initiated upon cessation of water fluoridation, and it is possible that these mitigated the impact of cessation.
- The highly publicized [Calgary-Edmonton fluoride cessation comparison study by McLaren](#) and colleagues was published in May 2017. It is clearly of relevance to Calgarians and Calgary City Council, given that the data are local. Its findings include:

Benefits of water fluoridation - adults



35% relative reduction in the number of teeth affected by decay and cavities.

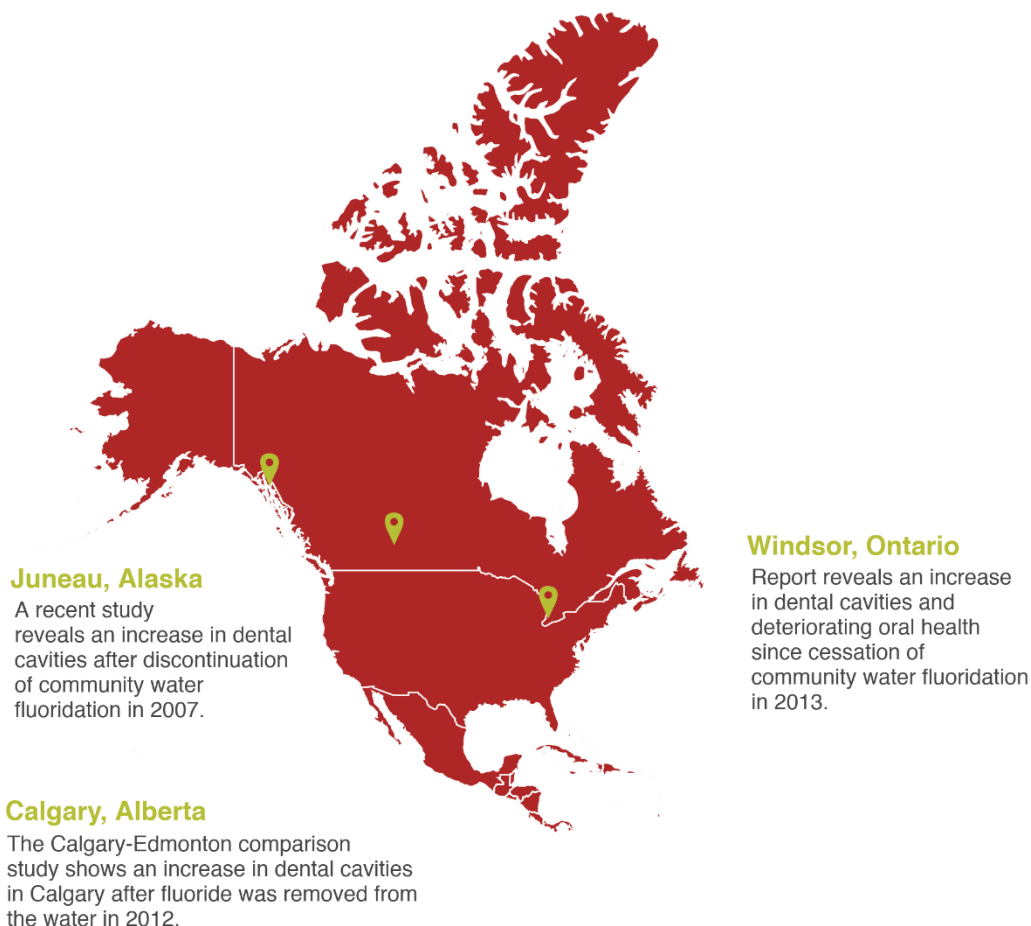
Projected reduction of an average of just over **1** cavity per person, over a **40** year time span.



The benefit of community water fluoridation for tooth decay and cavities is not confined to children.

- Evidence of an increase in dental cavities in *both* Calgary and Edmonton – an indication of deteriorating oral health in Alberta as a whole.
- The magnitude of increase in number of cavities was greater in Calgary than in Edmonton, and this was despite the fact that there was evidence of better dental treatment activities in Calgary.

Community water fluoridation cessation



- An increase in oral health disparities across socioeconomic groupings (described in more detail in the next section).
- Since the systematic review and Calgary-Edmonton studies just described above, we are aware of two other North American studies on cessation of water fluoridation:
 - A recent [report from Windsor, Ontario](#) has revealed an increase in dental cavities and deteriorating oral health since cessation of community water fluoridation in 2013.
 - An even more [recent study from Juneau, Alaska](#) similarly reveals an increase in dental cavities after discontinuation of community water fluoridation in 2007. This included increases in both

the number of cavity-related procedures in children, and the overall costs incurred by individuals and the population as a whole. Of note, costs incurred for dental care were more than doubled for some subgroups of the population.

- As noted earlier, community water fluoridation is a public policy that is not controlled by researchers. Therefore, research studies like the ones summarized in this section are inherently challenging and messy because a population-based phenomenon is being studied. Research of this type involves observing whole communities, either the same community over time, or comparing two or more communities, and carefully considering the various factors, other than fluoridation, that contribute to tooth decay for the populations and settings being studied.

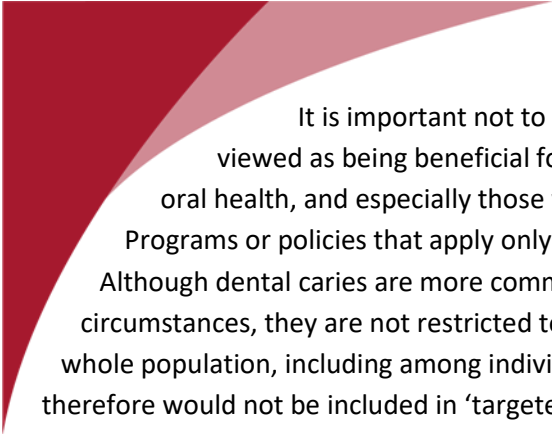
We end this section by highlighting that the McLaren study of Calgary and Edmonton is not standing alone with its findings of increased dental cavities after fluoride cessation. It stands alongside a number of other studies showing the same thing, both prior to and after the Calgary-Edmonton study. This is hardly surprising, as these cessation study findings are entirely in keeping with the studies on dental benefits reviewed in preceding sections (-- indeed, it would have been quite surprising for cessation studies to show anything different.)

❖ ***Does community water fluoridation contribute to reducing socioeconomic inequities in dental health?***

The best research we have indicates that fluoridation reduces socio-economic inequities in dental health among children. This is noted in both the international health literature, and in Calgary-based research:

- The [CADTH Report \(Sub-Report on Dental Caries and Other Health Outcomes\)](#) summarizes literature for both children (15 studies) and adults (one study) revealing a decrease in oral health inequities across socioeconomic strata.
- In Calgary, the recent McLaren study of fluoride cessation has permitted a [sub-study evaluating inequity in dental health in Calgary](#). Importantly, this local work reveals that cessation of community water fluoridation in 2012 was associated with an increase in health disparities (i.e., differences in numbers of cavities for advantaged vs. disadvantaged children) across socioeconomic groupings defined by dental insurance status and level of household material deprivation.

Because a community water fluoridation program is population-wide in nature, it impacts the population as a whole and requires no special effort from community members. Fluoridation is beneficial for health equity, because it benefits everyone, but especially those who have limited resources to access oral hygiene and dental care. Evidence shows that socioeconomically disadvantaged community members have the least access to formal dental care due to cost and access challenges. This is very applicable to Calgary (and Alberta), where dental care is recognized as being particularly costly.



It is important not to confuse 'equity' with 'poverty'. Fluoridation has historically been viewed as being beneficial for health equity because it has potential to benefit everyone for oral health, and especially those who have limited resources for oral hygiene and dental care. Programs or policies that apply only to people living with low-income circumstances are incomplete. Although dental caries are more common in individuals and families with lower socioeconomic circumstances, they are not restricted to those population groups. Dental caries are distributed across the whole population, including among individuals and families who are relatively advantaged, and who therefore would not be included in 'targeted' policies such as the programs that were briefly funded by the City of Calgary in inner-city health clinics upon cessation of community water fluoridation.

We must emphasize in closing that community water fluoridation is not, in and of itself, a fundamental solution to oral health inequities, or health inequities beyond oral health. Health is determined by many factors, and societies need to develop integrated approaches to reducing health disparities of all types across socioeconomic strata, as these relate to income, education, social support, location of residence, housing, and countless other factors. A later discussion in Section 3 below discusses integrated approaches to oral health.

SECTION 2: POTENTIAL HARMS OF COMMUNITY WATER FLUORIDATION

The [CADTH Report \(Sub-Report on Dental Caries and Other Health Outcomes\)](#) presents information on the associations between community water fluoridation and 22 different non-dental health conditions. In addition, the report presents findings in relation to the prevalence of dental fluorosis in communities with water fluoridation. For 16 of the 22 non-dental conditions, the bottom-line CADTH finding is simply to report that there is insufficient evidence to indicate risk from water fluoridation for the particular condition(s) in question.

Below, we summarize evidence on potential harms relating to: 1) dental fluorosis; 2) cognition; 3) thyroid disease; and 4) bone health. The CADTH report was a partial resource for these sections of the O'Brien Institute report, as some additional literature and interviews with key informants were needed to obtain additional information.

❖ ***Does community water fluoridation increase the prevalence of dental fluorosis?***

Dental fluorosis is a condition that arises from disruption of enamel formation by fluoride. The condition is broadly considered to be cosmetic, though it is not necessarily of negligible importance to individuals who have moderate-to-severe cases. Fluorosis can vary in severity from very mild forms (with subtle white spots on the teeth) to severe forms (with significant brownish discoloration of teeth).

The prevalence of dental fluorosis has been studied extensively, and existing evidence appears to be well-described in the CADTH Report, where the bottom-line conclusion is that community water fluoridation increases the prevalence of dental fluorosis. Highlights of this evidence:

- Two comprehensive systematic reviews of dental fluorosis are highlighted, one of which is a Cochrane Systematic Review presenting comprehensive data on dental fluorosis, for which 135 studies were reviewed.
- The Cochrane review reports a prevalence of 'any fluorosis' of 40%, linked to water fluoridation concentrations of 0.7ppm. If only aesthetically-concerning fluorosis is considered (i.e., fluorosis rated to be moderate or severe in a standardized fluorosis rating system), the prevalence is lower at about 12%.

Harms of water fluoridation

Consistent evidence
that fluoride
causes fluorosis.



Active research still
needed on effect of
fluoride on cognition.

Consistent evidence
shows no adverse effects
on bones.



Possible minor effects on
thyroid function.

- Higher fluoride concentrations (as high as 5.0ppm) in older community water fluoridation studies (and/or studies where the fluoride content of groundwater is very high) reveal higher prevalence of dental fluorosis.

There is some inconsistency across Canadian studies surrounding the prevalence of dental fluorosis. The [Canadian Health Measures Survey 2007-2009 Oral Health Component](#) reports a prevalence of less than 1% for more severe forms of fluorosis. This differs from some Ontario studies that report a rate of over 14% (e.g., [Leake and colleagues, studying fluorosis in Toronto](#)). The alignment of the prevalence from that latter study with the Cochrane review's reported prevalence of 12% for community water fluoridation at the Canadian level of 0.7ppm certainly lends some credibility to that higher prevalence estimate.

Through our stakeholder interviews, we also note variable descriptions of the relative importance of dental fluorosis as a health condition – i.e., varying from its description as an 'entirely negligible' condition by some, to its being described as a 'devastating condition' that affects mental health. We reserve judgement on which of these descriptions is more valid, suspecting that the degree of distress is likely to vary from one person to the next, partially affected by the severity of one's fluorosis.

❖ ***Does ingested fluoride affect cognition?***

This is an important section of our report, because it highlights an area where the evidence is evolving quite rapidly. Recognizing this, we present descriptions of new studies from the past eight months that were not covered in the recent CADTH report published in February of 2019. These are presented alongside some older studies on fluoride and cognition.

- During fetal life and early infancy, the blood-brain barrier only partially prevents entry of chemicals into the brain and the developing brain is known to be sensitive to injury from toxic chemicals.
- Several Chinese studies reported lower IQ among children exposed to fluoride in drinking water at average concentrations of 2.5-4.1ppm (several times higher than recommended fluoridation levels); these were published in journals specifically interested in fluoride (— namely, the journal *Fluoride*).
- [A meta-analysis of 27 studies](#) led by a team at Harvard University, summarizing primary studies mostly done in China and Iran, reported an association between high fluoride exposure (upper limit of exposure up to 11.5mg/L) and lower IQ scores. The relevance of this study to the context of North American water fluoridation has rightly been questioned on the basis that the levels of fluoride exposure were generally higher than those seen in fluoridated Canadian water systems. Furthermore, the primary studies reviewed were generally either cross-sectional studies or ecological studies – i.e., weaker study designs for inferring causation. However, it should still be noted that the systematic review itself was very well done in reviewing an existing body of primary literature, and it certainly appears to have contributed to convincing national peer reviewed agencies like the National Institutes of Health in the U.S. to fund major studies (expensive studies) exploring the link between fluoride ingestion and cognition.
- A later [prospective study of a birth cohort in Dunedin, New Zealand](#) found no association between fluoride exposure and IQ measurements performed repeatedly during childhood and at age 38. The cohort study design of this study, published in 2015, is stronger than prior study designs. However, there were also some important limitations to this study, including the fact that there were only a small number of control subjects (one-tenth the number of subjects exposed to fluoridated water), and as a

result, a lack of statistical power to make definitive conclusions. Also, various forms of oral fluoride supplements were in use in New Zealand in the 1970s, and it is likely that controls received fluoride from non-water sources – a factor that could bias the study toward finding no association.

- Inconsistent results were found in a [cross-sectional population-based study of Canadian children](#) aged 3-12 years that examined the association between different measures of fluoride exposure (urinary fluoride, adjusted for kidney function and specific gravity, and fluoride concentration of tap water) and learning disability, as measured in the Canadian Health Measures Survey. In the combined sample, there was a small but significantly higher odds of learning disability among children with higher urinary fluoride, but this was not observed when examining adjusted measures of urinary fluoride (generally more accurate). Limitations included the absence of objective assessments of IQ or similar measures and the absence of data on pre-natal exposure which is now the major concern (see below).
- [A high-quality cohort study \(ELEMENT: Early Life Exposures in Mexico to Environmental Toxicants\)](#) studied urinary fluoride in mothers during pregnancy and then from their children at 6-12 years (299 mother-child pairs). An increase in the mother's urinary fluoride by 0.5mg/L predicted a lowering of 2.5 IQ points. The mean urinary fluoride was 0.9mg/L which is in the general range of exposures reported for other populations of adults. Though this study is based on subjects and fluoride consumption patterns in Mexico, the research was funded by the U.S. National Institutes of Health, and the work was led by Canadian researchers (Dr. Howard Hu, the former Dean of the Dalla Lana School of Public Health at the University of Toronto, and lead author Dr. Morteza Bashash, a public health researcher, also at the University of Toronto).
- [Another similar analysis from ELEMENT](#) found that higher levels of fluoride exposure during pregnancy were associated with global measures of attention deficit hyperactivity disorder (ADHD) and more symptoms of poor attention in children. One widely-stated caveat/criticism for these two ELEMENT studies just described is that the levels of urinary fluoride measured in pregnant Mexican women may not be relevant to Canada.
- This criticism is, however, addressed by a recent Canadian study. The [MIREC \(Maternal-Infant Research on Environmental Chemicals\)](#) cohort found that community water fluoridation appears to be a major source of fluoride exposure for pregnant women living in Canada, with urinary fluoride reflecting this exposure well. Further, this study reveals that the maternal urinary fluoride levels for women in communities with water fluoridation is comparable to that of Mexican women in the ELEMENT cohort. The amount of black tea consumed may further increase the exposure to fluoride.
- Of great relevance to the evolving evidence in this domain, another [MIREC study focusing on cognition](#) also examined the association between fluoride exposure and childhood IQ using similar methods to the Mexico study, but in a Canadian sample of 510 mother-child pairs; 38% received recommended levels of community fluoridated water in major Canadian cities. Women from fluoridated communities had higher urinary fluoride (average 0.69mg/L vs 0.40mg/L), and higher levels were associated with lower IQ scores in boys at age 3-4 years (each 1mg/L increase in urinary fluoride associated with 4.5 IQ points lower) but not in girls. The new Canadian cognition evidence is currently in the public domain as a [published and approved thesis \(Ms. Rivka Green, York University\)](#), and it is also officially 'in press' with a leading medical journal, due to appear in the late summer or early fall. Of note, the MIREC studies just described were, like the ELEMENT study, funded by the U.S. National Institutes of Health. The lead

investigator for this research is a Canadian colleague, Dr. Christine Till, Associate Professor of Psychology at York University.

- The O'Brien Institute team conducted interviews with both Dr. Morteza Bashash (ELEMENT study) and Dr. Christine Till (MIREC) to clarify points in both of their respective studies, and to hear their perspectives on the overall fluoride issue. Importantly, we note that both are very clearly taking an objective and neutral scientific perspective in the work they do, and they firmly assert that they are neither pro- nor anti-fluoride in their perspective. Both simply indicate that 'we need to get this right'. In that vein, both are engaged in continuing research that may shed more light on the question of whether ingested fluoride affects cognition.
- These very recent fluoride-cognition studies are being noticed and tracked by public health agencies. In Alberta, public health experts in Alberta Health Services are actively evaluating these new studies, and any others that may appear. [Public Health Ontario has also recently done a careful analysis of the ELEMENT study](#), acknowledging its strengths, and the need for close monitoring of this issue (Note: the Public Health Ontario analysis was released before the Canadian MIREC data became publicly available).

In summary, there is some new emerging evidence that fluoride exposure during pregnancy may be harmful to the brain development of children, with important studies having been published subsequent to the review of this evidence by the National Research Council in the U.S. in 2006. Many uncertainties remain about the mechanisms by which fluoride may harm brain development. Several – but not all – studies indicating toxicity have been performed in places where the ground water contains high levels of fluoride (versus community water fluoridation) and it is difficult to fully account for all the factors that may contribute to observed differences in IQ.

The new emerging studies in this domain need to be tracked very closely, and carefully evaluated as they appear. We expect that health agencies at local, national, and international levels will confer and compare notes as they iteratively review, and re-review, this evidence.

❖ ***Does community water fluoridation affect late-life cognition and/or cause dementia?***

There have also been some studies assessing potential associations between community water fluoridation (and/or amount of fluoride ingested) and cognition or dementia in later life. Results of these studies are inconsistent, and quality of these studies is variable. We summarize three studies that we identified:

- [An American study conducted in the 1970s](#) compared the annual incidences of dementia in three counties with differing fluoride concentrations of their water supply. The county with the highest level (4.2 ppm) had an annual incidence of primary neurodegenerative dementia (principally Alzheimer's disease) one-fifth lower than in the other two counties with lower fluoride levels 0.5 & 0.6 ppm.
- [Data from the Ontario Longitudinal Study of Aging](#) (from the late 1980s) shows significantly lower risk of impaired cognitive functioning if fluoride concentrations in the drinking water were higher and significantly less mention of Alzheimer's disease on death certificates if fluoride concentrations were greater than 0.86 ppm.

- [A very recent Scottish study](#) published earlier this year examined the association between fluoride levels in drinking water and dementia risk in 6,990 older subjects followed for just under 3 years. A dose-dependent relationship between fluoride levels and higher dementia risk was found. The authors themselves highlighted a number of methodological caveats surrounding the work, and urged caution and further research.

We conclude that research results on potential dementia risk associated with fluoride have been inconsistent. Methodological challenges include the difficulty of accurately assessing fluoride exposure over the life course, capturing all outcomes of interest, and dealing with potential confounders. An association between drinking fluoridated water and later life cognitive impairment or dementia has not been confirmed.

❖ ***Does community water fluoridation affect thyroid health and disease at a population level?***

This section of the report summarizes the studies that were identified by the [CADTH Report \(Sub-Report on Dental Caries and Other Health Outcomes\)](#). A further search of the recent medical literature identified an additional [Canadian study of interest](#) on the link between fluoride exposure and thyroid function, as these relate to a person's iodine status (see below).

The thyroid is a hormone-producing gland located in the neck. It controls metabolism in the body.

Hypothyroidism is a common medical condition and refers to an underactive thyroid. There is public interest in understanding whether higher levels of fluoride exposure can lead to a greater risk of having hypothyroidism.

Key findings from our evidence review:

- Low thyroid hormone (or hypothyroidism) results in a slow metabolism. This can lead to feelings of lethargy, fatigue, coldness, and weight gain. In children, it can negatively affect brain development, learning, and growth if left untreated. This condition can be diagnosed with a simple blood test. Treatment is usually straight forward with replacement of thyroid hormone.
- Eight studies identified through the CADTH review look at how fluoride exposure may affect thyroid function in humans. In general, most studies found no significant differences in thyroid function or size according to fluoride exposure after accounting for potential confounding factors. A couple of studies reported a small measurable increase in thyroid stimulating hormone levels with higher fluoride levels, but these differences were very small with hormone levels remaining well within the normal range. In contrast, one study reported the opposite, where higher water fluoridation was associated with lower thyroid stimulating hormone levels, but again these differences were very small and within the normal range. Overall, these differences were unlikely to be of any clinical significance, at least in adults, where such minor abnormalities are usually just followed without any need for treatment. Finally, one study suggested that hypothyroidism was more common in selected areas of England where water fluoride levels were higher compared to places where it was lower. But, this latter study has been extensively criticized for its methodological problems. It is also important to note that most of the studies cited above were of low scientific quality, and many looked at fluoride levels much higher than what is considered to be acceptable for drinking water in Canada.

- Of relevance, two studies of strong scientific quality were conducted in Canada. Neither of these found any significant association between fluoride exposure and thyroid hormone levels within the general population. People living with a thyroid condition, when compared to those without any history of thyroid problems, were not more or less likely to be exposed to higher levels of water fluoridation. However, it is possible that higher fluoride exposure may be associated with a slightly higher level of thyroid stimulation hormone in people with moderate-to-severe iodine deficiency, an uncommon condition among Canadian adults, and these differences were very small and also within the normal range.

In conclusion, hypothyroidism is a common condition that is easy to detect and treat in adults. There is insufficient evidence to say that water fluoridation at current Canadian levels is associated with harmful effects on thyroid function in the general population.

In relation to the preceding section reviewing evidence on the link between ingested fluoride and cognition, there is some belief that disturbances in thyroid function may underlie fluoride effects on the developing fetal or neonatal brain. This is certainly a possibility that warrants further exploration, as it would raise the possibility that the relatively small thyroid function effects that we summarize above (for non-pregnant adults, and fully-developed adult brains) may be more concerning in the context of pregnancy and/or neonates.

❖ ***Does community water fluoridation affect bone health?***

Skeletal fluorosis is a potentially crippling condition that arises from fluoride-induced increases in bone density. In mild forms, skeletal fluorosis can present with mild joint stiffness and skeletal pain. In more severe forms, stiffness and pain can be quite severe, and be associated with calcification of tendons and deformities of multiple joints.

Fortunately, this condition has never been described in relation to community water fluoridation in Canada. The existing studies linking skeletal fluorosis to fluoride ingestion from water are from India and Iran, where the fluoride levels were naturally present in local groundwater at very high levels (e.g., 10.0ppm) that far exceed the 0.7ppm level for community water fluoridation in Canada.

The CADTH report also reviewed the risk of hip fracture and bone cancer in residents of jurisdictions with community water fluoridation, and review findings indicate consistent evidence that there is no association.

We consider these to be reassuring results in relation to bone health. Fluoride, at high concentrations, is toxic to bone, as evidenced by significant skeletal fluorosis cases reported in relation to very high community water fluoride concentrations. We do not, however, find evidence of harm to bones at the fluoride levels typical of community water fluoridation programs.

SECTION 3: INTEGRATED APPROACHES TO PREVENTING TOOTH DECAY

This section discusses oral health and tooth decay in a more general manner, focusing less on community water fluoridation, and more on how programs can be structured to support better oral health at a population level. We begin the section by describing the burden of disease associated with suboptimal oral health and tooth decay, and while doing so, also describe the relevance of tooth decay relative to other health conditions. Following this, we discuss integrated and multifaceted approaches to improving oral health and preventing tooth decay.

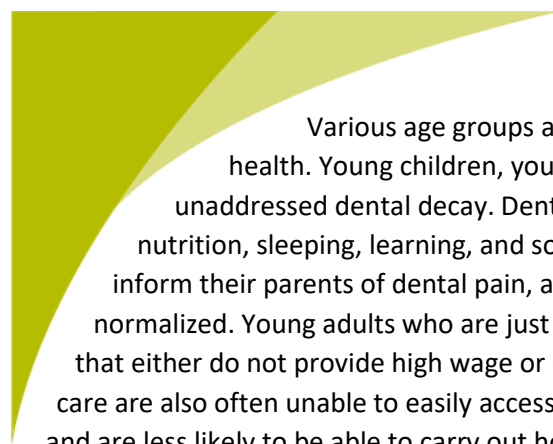
❖ ***What is the burden of disease associated with oral health and tooth decay, and how does this compare to other health conditions?***

The Global Burden of Disease Study in 2010, identified untreated decay in permanent teeth as the number 1 (most prevalent) disease globally among 291 diseases, noting that it affects 35% of the global population. Gum disease was the sixth most prevalent, and cavities in primary (baby) teeth was the tenth most prevalent disease.

According to a [2003 study](#), oral diseases are the fourth most expensive diseases to treat worldwide. Costs of dental treatment are high in most parts of the world, and there is a high prevalence of dental disease globally, resulting in a very high financial burden. The direct cost of treating dental diseases worldwide is estimated at US \$297 billion, with 82% spent in high-income countries. North America alone accounts for US \$120 billion. In addition, there are indirect costs relating to oral diseases affecting productivity (time lost from work or school due to pain and treatment) which are comparable to the range of economic losses associated with the 10 most frequent global causes of death. Further, there are additional intangible costs (e.g., quality of life impacts) that cannot easily be standardized or measured across countries.

Canadian data on prevalence of decay are somewhat limited, but the [Canadian Health Measures Survey](#) suggests that over half of children in Canada have or have had a cavity, and those who have unequal access to care tend to have more tooth decay. According to a [Canadian Academy of Health Sciences report \(2014\)](#), Canadians spend ~\$12 billion yearly on dental services. Of concern, costs could actually be higher, considering that approximately 6 million (~17%) Canadians avoid dental services due to the cost of care. Among the provinces, Alberta has the highest cost of dental care, where despite 70% of the population having private dental insurance, 62% of Albertans report limiting care for themselves, and 47% of Albertans report limiting dental visits for their children due to cost. ([Alberta Dental Review 2016](#)).

Provincial health systems in Canada absorb some of the population burden of dental disease. Patients with dental pain from tooth decay, but who are excluded from the private dental system because of lack of insurance, will often go to physician offices or emergency departments in attempts to access care. Definitive treatments such as a restoration (filling) or extraction, are not available from either family or emergency physicians, and patients will instead receive a prescription for antibiotics/pain killers and/or be advised to see a dentist.



Various age groups are particularly vulnerable to negative effects of suboptimal oral health. Young children, young adults, and seniors suffer important consequences from unaddressed dental decay. Dental decay in primary teeth of young children has consequences for nutrition, sleeping, learning, and social development. Young children are usually further unable to inform their parents of dental pain, as symptoms often progress slowly and subtly, thus becoming normalized. Young adults who are just launching out on their own can often be in employment situations that either do not provide high wage or employment-linked dental insurance. Seniors living in long-term care are also often unable to easily access dental care (because of mobility and/or transportation barriers) and are less likely to be able to carry out homecare (brushing) to care for their teeth. As with young children, tooth decay affects nutrition in the elderly, and as with very young children, some may be unable to communicate about painful teeth.

As reported in the [World Oral Health Report from 2003](#), tooth decay rates dropped in the 1970s and 80s (a drop that has been attributed by some to water fluoridation programs and fluoride toothpastes), but there has been a rebound since the 1990s in observed rates of tooth decay, particularly in primary teeth. The causes of dental cavities have not changed and include three essential factors: 1) cavity-causing bacteria; 2) susceptible tooth surfaces; and 3) the intake of dietary sugars and carbohydrates.

Of relevance to the primary focus of this report, it is believed that fluoride in saliva contributes to the reduction in cavities seen worldwide since 1950, and that this occurs through three fluoride-driven mechanisms: 1) promotion of remineralization of teeth; 2) reduction of bacteria in the mouth; and 3) strengthening the enamel so it is more acid-resistant.

❖ ***Are other countries or communities following more integrated approaches to oral and dental health, and how are those approaches working?***

It is widely accepted that jurisdictions need to consider integrated and multifaceted approaches to oral health and dental care. Fluoride treatment programs have historically been part of existing programs, and the approaches to delivering fluoride have included various approaches to topical application (gels, rinses, sealant, toothpaste) and ingestion (water fluoridation, fluoridation of salt, and fluoridation of other ingested foods).

Optimal integrated oral health programs are not only about fluoride. Other approaches are also needed, and these can include: 1) coordinated approaches to population-based education on oral health and hygiene; 2) preventive dentistry services; 3) improving the affordability and equity of access to dental services for treatment; and 4) strategies that actively seek out and support vulnerable individuals and populations.

Among higher income countries internationally, those that do not use community water fluoridation as a preventative measure against tooth decay tend to have other measures in place to promote oral health. In some countries, this involves the use of other sources of ingested fluoride such as fluoridated salt. A few countries have developed dental public health care systems that enhance population access to dental care, so that population dental care needs can be met.

The table below presents some high-level information on selected countries' approaches to delivering ingested fluoride as a public health intervention:

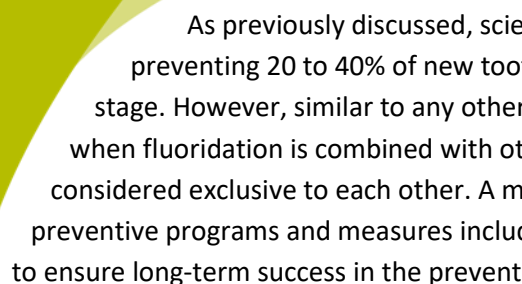
Other nations (beyond Canada) with prevailing community water fluoridation programs	<ul style="list-style-type: none"> • U.S. (began in 1945); as of 2014, 74.4% of population on public water systems have access to fluoridated drinking water • Australia (began in 1960); as of 2017, 89% of population have access to fluoridated drinking water • New Zealand (began in 1954); as of 2014, 56% of population have access to fluoridated drinking water
Other nations following different approaches to delivering oral fluoride	<ul style="list-style-type: none"> • Switzerland (fluoridated salt since 1955); as of 2004, market share of fluoridated salt was 88% • France (fluoridated salt since 1985); fluoridated salt is consumed by 13% of the population, including at schools

There are different ways that individuals may receive fluoride, including use of fluoride-containing toothpaste, receiving fluoride treatment at the dentist, consuming foods that were prepared in areas that have community water fluoridation in place, and of course through consumption of water containing fluoride that is either naturally-occurring or that has been added through community water fluoridation.

[An extensive 2009 systematic review on fluoride](#) summarized and ranked different approaches to the administration of fluoride, including ingested fluoride (via water, salt, or food) and various topical administration methods.

Table: Overall Ranking of Effectiveness of Preventive Programs for Tooth Decay

Preventive Program	Range of Caries Reduction	Overall Ranking
Community water fluoridation	20-40%	1
Sealant program	23-87% (median 60%)	2
Tooth brushing	24-56%	3
Fluoride varnish	24-46%	4
Fluoride gel	14-28%	5
Fluoride mouth rinses	0-26%	6
Salt fluoridation	13.3-89.5%	7
Milk fluoridation	35.5-78.4%	Cannot be ranked
School water fluoridation	38.9%	Cannot be ranked
Xylitol	62-70%	Cannot be ranked
Casein derivatives	Not available	Cannot be ranked



As previously discussed, scientific evidence reports that community fluoridation is effective in preventing 20 to 40% of new tooth decay and it is capable of reversing tooth decay at an early stage. However, similar to any other preventive measure, prevention of tooth decay is enhanced when fluoridation is combined with other measures. Dental preventive programs should not be considered exclusive to each other. A multifaceted approach that includes a combination of different preventive programs and measures including community-based health promotion activities is the best way to ensure long-term success in the prevention of tooth decay.

Importantly, programs relying on ingested fluoride should not be viewed as the only way to enhance oral health and reducing dental decay at a population level. In this regard, Scotland presents an interesting case study. Scotland has proactively put oral health programs in place, while also making a decision to *not* implement community water fluoridation.

The Government of Scotland has explicitly recognized oral health to be an integral part of overall health, and has committed to improving the oral health of the population. The [National Health System \(NHS\) Scotland has an oral health plan](#) that includes: 1) strategies for educating the public on oral health; 2) approaches to mitigating oral health inequity; 3) support for the vulnerable elderly; 4) workforce planning considerations; and 5) a comprehensive preventive care system for children called [Childsmile](#). The *Childsmile* program is designed to improve the oral health of children in Scotland and reduce inequalities in access to dental services and dental health. The program includes coordinated approaches to education surrounding oral hygiene and effective tooth brushing, alongside a proactive program for fluoride varnish application in nursery and primary schools.

Compared to Canada, the dental public health care system in Scotland is more comprehensive. It includes a dental examination free of charge for everyone, and free dental treatment for everyone under age 18, as well as pregnant women, and low-income individuals. (The O'Brien Institute for Public Health enthusiastically endorses the merit of such programs and national policies.)

Importantly, the Alberta approach is not solely focused on water fluoridation. Alberta Health Services has developed an [Alberta Oral Health Action Plan \(OHAP\)](#), and through that plan establishes similar preventive initiatives tailored to local settings. The OHAP preventive services include the application of fluoride varnish and dental sealants for children, and daily mouth care for seniors living in Continuing Care facilities. Such preventive programs have been in place since 2010 and these are reaching 17% of children in socially vulnerable target groups across the province. The prevention rate for fluoride varnish ranges from 24 to 46%, and this surface treatment approach is classified as the fourth most cost-effective initiative in preventing tooth decay. In comparison, community water fluoridation reaches everyone in the community.

Relative to Scotland's national oral health strategy and its *Childsmile* program, Alberta is somewhat constrained in its ability to more broadly intervene to improve oral health across the entire population. The biggest obstacle in the current Alberta context is that dental care in this province is almost entirely situated within the private sector whereby individuals and families must have private or employer-sponsored insurance, or pay out of pocket, to receive even basic dental care. Dental public health services in Alberta are extremely limited in scope

and are entirely targeted to lower income communities. This is problematic because dental cavities are not restricted to those living in lower income communities, but rather are spread across the population.

In light of this limited dental public health infrastructure and private financing context, there is understandable strategic interest in the pan-population reach of community water fluoridation as an intervention. Indeed, community water fluoridation is an appealing public health intervention, considering its reach to the entire population, remarkably low per-person costs relative to any form of dental treatments, and its demonstrated benefit in reducing tooth decay, particularly when that benefit is measured and considered through a lens of population-wide impact. The corresponding Alberta position statement on water fluoridation has thus been as follows:

“Alberta Health and Alberta Health Services recognize that community water fluoridation effectively prevents tooth decay, especially among people who are most vulnerable. It offers significant benefit with very low risk and reaches all residents who are connected to a municipal water supply. Therefore, Alberta Health and Alberta Health Services endorse community water fluoridation as a foundational public health measure to prevent dental disease and improve oral health.” (*Position statement on community water fluoridation, Government of Alberta, January 2017*)

Now, however, a key finding of this O’Brien Institute report is that this dental public health intervention (i.e., community water fluoridation) does need to be carefully reviewed and continuously tracked for its safety in the face of the very recent cognition studies appearing in the literature. The history of public health, and how public health evidence evolves over time, teaches us that this water fluoridation story will unfold in one of two ways: i.e., either 1) that a flurry of new studies could emerge, reassuring us that the cognition concerns are not that major and perhaps driven by some other confounding factor that comes to light; or alternatively 2) that a flurry of new studies could affirm that the cognition safety findings are replicated, significant, and clarified mechanistically. In this latter scenario, a long-standing public health intervention would then need to be reconsidered, and replaced with only topical fluoride application programs, along with other elements of the integrated oral health programs just discussed above.

In closing, we reiterate that new emerging studies on fluoride and cognition need to be tracked and carefully evaluated on an ongoing basis. In parallel to this, jurisdictions like Alberta should continue to foster and invest in integrated and multifaceted oral health strategies that enhance health at a population level.

SECTION 4: THE COMMUNITY WATER FLUORIDATION DEBATE

❖ ***What are the economic considerations for a community water fluoridation program? Are there opportunities for broad cost savings and efficiencies with respect to overall population health?***

According to the [2019 CADTH Report – Budget Impact Analysis](#), the expected net impact of community water fluoridation on total costs for a large urban municipality such as Calgary is a savings of approximately \$34 per person per year, accrued over a 20-year horizon. Importantly, however, the economic benefits of implementing a community water fluoridation program in Calgary principally accrue to citizens and to their insurers rather than to the City that would typically pay for water fluoridation, since the program will significantly reduce the incident of dental caries. Extrapolating from the CADTH report (Table 18), for a city the size of Calgary, a community water fluoridation program is expected to result in a reduction of about 3 million cases of decayed, missing, and filled teeth over 20 years. This is roughly two incidents per person on average.

We note as a caveat that some critics have questioned the base assumptions of the CADTH report on number of cavities prevented per person over a 20 to 40 year period. Nevertheless, even if estimates of benefit were cut in half, this remains an economically attractive population intervention for protection of teeth against tooth decay, particularly if a *societal perspective* is taken to the consideration of cost savings arising from fluoride. The societal perspective recognizes, and accepts, that a public expenditure paid for by a municipal budgetary silo leads to savings accrued in a different budgetary silo – i.e., either by citizens who save on dental costs, insurance companies, or the provincial healthcare system (none of whom paid for the water fluoridation).

❖ ***Since oral health is a topic for all levels of governments in Canada, how are other jurisdictions handling the costs and implementation of programs? Are there examples of shared jurisdiction?***

Across Canada, decisions about fluoridation are made by municipal governments. There are at least two reasons for this. First, water services are a municipal responsibility, and adding fluoride to drinking water is part of that broader municipal process. Second, from a public health ethics point of view, it is argued that decisions about fluoridation are best made at the level of government that is closest to the people – that is the municipal level. The ensuing section on ethical and legal considerations will highlight that decisions about public health interventions such as fluoridation must be made via democratic decision-making procedures, which are the public health counterpart to informed consent. Democratic decision-making procedures may take the form of a city council vote, or a public vote such as a plebiscite.

Some people have argued that decision-making and funding for fluoridation should fall to the provincial level, because the province has jurisdictional responsibility for health care. This argument certainly has some merit, but it represents a conflation of public health and health care, which are not the same thing. Provinces are indeed jurisdictionally responsible for health care, which is provided via Alberta Health Services. Public health, defined as ‘the science and art of preventing disease, promoting health, and prolonging life through the organized efforts of society’, goes well beyond the health care system, and demands involvement from different

levels of government including cities. Fluoridation is one of many public health policies for which cities have responsibility. Others include pedestrian and cycling infrastructure, smoking bylaws, waste disposal, green space and trees, and of course water services more generally.

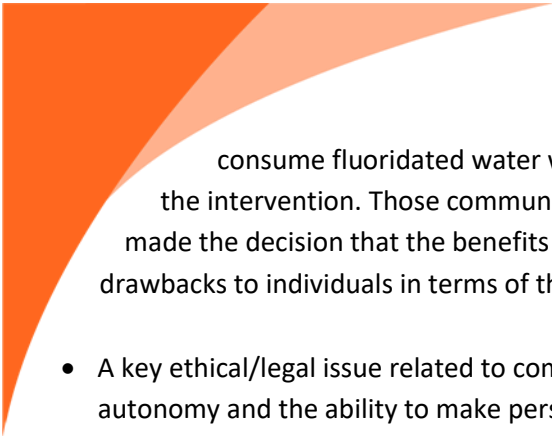
The [2019 CADTH Report – Budget Impact Analysis](#) sub-report addresses the challenging issue of budgetary silos, and the fact that water fluoridation costs are incurred municipally while savings are accrued elsewhere. To address this, novel intergovernmental strategy and integrated policies are encouraged. Indeed, one could certainly think about an arrangement where different levels of government work together to provide the conditions for oral health (perhaps considering *Childsmile* as one example). We would be delighted to hear such a discussion here in Alberta. It is important to note, however, that in our current context, as discussed earlier, dental care is almost entirely situated within the private sector, which means that individuals and families must have private or employer-sponsored insurance, or pay out of pocket, to receive even basic dental care. Dental public health services in Alberta are extremely limited in scope and are targeted to lower income communities. This is problematic because dental cavities are not restricted to those living in lower income communities, but rather are spread across the population. In light of the limited dental public health infrastructure in our Alberta context, significant effort and expense (vastly exceeding the costs of fluoridation) would be required to entertain a truly integrated and multifaceted inter-jurisdictional arrangement.

❖ ***There are many diverging views on community water fluoridation, including the concepts related to individual rights and personal choice with respect to the public water supply. How are these issues being contemplated elsewhere and how can Calgary provide balance here?***

The ethical considerations surrounding community water fluoridation are both complex and controversial. Views are certainly highly polarized on this front, and we note that the [CADTH report – sub-report on ethical considerations](#) and a recent formal submission to Calgary City Council from the Safe Water Calgary advocacy group present diametrically opposed positions on the ethics of water fluoridation.

Recognizing this, the O'Brien Institute team will not weigh in with an unsolicited third position on whether water fluoridation is dichotomously ethical or not. Rather, we will highlight a few of the ethical and legal considerations that are in play. We note that many of these are addressed in the literature review and ensuing discussion presented in the CADTH ethics sub-report.

- Population-level policies can be very powerful in terms of their ability to improve health at a population level, and community water fluoridation is an example of such a population-level policy intended to protect the teeth of all. With that considerable leverage, however, come other issues that could be considered drawbacks by individual citizens.
- When municipalities are considering a policy like community water fluoridation, a decision must be made that balances the potential benefits to the collective against any potential collective drawbacks that might exist, and then also the individual drawback of presenting individuals who do not want to

A large orange graphic element in the top-left corner of the page, consisting of a solid orange triangle and a lighter orange curved shape that extends towards the center.

consume fluoridated water with the challenge of actively needing to pursue ways to opt out of the intervention. Those communities that have fluoridation in place have, implicitly or explicitly, made the decision that the benefits of fluoridation for the population's oral health, outweigh the drawbacks to individuals in terms of the difficulty of opting out.

- A key ethical/legal issue related to community water fluoridation programs centres around individual autonomy and the ability to make personal health-related decisions. Individual autonomy concerns arise because once fluoride is in the water, those who wish to opt out must purchase bottled water or consider filtering solutions. However, these can be costly alternatives. Furthermore, it should be noted that it is particularly challenging to individually opt out of water fluoridation, whereas it is actually simpler for individuals to decline other public health interventions such as vaccinations.
- Autonomy arguments are regularly raised by opponents of community water fluoridation. In these arguments, opponents rightly point out that fluoride does not necessarily need to be ingested through water, because people can get adequate amounts of fluoride through applications to the surfaces of teeth. The notable counterargument to this viewpoint, however, is that socially vulnerable groups cannot access such tooth surface fluoride alternatives. Individual autonomy must therefore be balanced against other ethical values such as protecting the vulnerable. Autonomy arguments are also complicated by the fact that fluoride confers the greatest benefits to children, who by virtue of their young age and dependence on parents or guardians, do not have the capacity to make the autonomous choice to seek out or refuse fluoride.
- Canada's constitution has no freestanding right to autonomous decision-making, but rather all rights are subject to reasonable limitations. Rights can be limited where there is a pressing societal goal, an intervention is rationally connected to that goal, rights are minimally impaired, and there is proportionality between the infringement on rights and the societal benefits.
- Courts have generally found policy interventions of various types to be minimally-impairing when decisions for their implementation are evidence-based, where governments have tried to avoid adopting an all-or-nothing approach (and if necessary, have provided opt-out mechanisms), and where governments have engaged in a deliberate and democratic decision-making process.

We reiterate that the ethical considerations around community water fluoridation are both complex and controversial. Accordingly, there is no simple right or wrong answer on this front. Ongoing multi-stakeholder public discourse is required in democratic processes informed by evolving evidence and societal perspectives.

❖ ***For those who want to opt out of water fluoridation, can fluoride be removed from tap water by filtering systems? Do sources of bottled water contain fluoride?***

At the residential level, fluoride removal can be achieved by activated alumina filters, distillation or through the use of reverse osmosis systems. Depending on the size and type of system purchased, these will remove between 90 and 99% of the fluoride in the water. Importantly, household Brita-type water pitchers and faucet mounts will not remove fluoride from the water.

Meanwhile, the majority of bottled waters on the market do not contain levels of fluoride approximating the North American standard for community water fluoridation (0.7ppm). However, the various types and brands of bottled water can vary substantially in their fluoride content.

❖ ***In today's society with the increasing penetration of social media, how can municipal policy-makers make sense of the multi-media barrage they receive surrounding fluoride?***

Two O'Brien Institute members with expertise in oral health and communications and culture have contributed the following analysis on the social media discourse surrounding fluoride.

- **Social media platforms can serve as a venue for public engagement on health issues. However, our use of social media far outpaces our understanding of how to use it well and respectfully.**
 - The very fast uptake of social media for public comment (i.e., comment sections on news articles in this case) is a big shift from traditional communication about health issues. Usually health organizations use mass media, radio/television advertisements, posters, and population-level intervention campaigns (e.g., to stop texting and driving, to increase acceptance of seat belts).
 - On the pro side, social media activity demonstrates that citizens are engaged around important public health interventions. On the con side, there are some social media growing pains as individuals and organizations adjust to making the best use of a very new tool that is still something of a wild west/new frontier.
 - As with many other aspects of internet use (e.g., ownership of personal digital photos, protection of youths' personal information on social media), the extraordinarily swift uptake of social media means that the public is still collectively learning how to respectfully engage/converse, as we gain consensus on appropriate etiquette (e.g., moderation of comments, options to rate, report, or flag inappropriate comments, shared meanings-ALL CAPS/bold/italics = shouting) ([Binns, 2012](#)). Many are of the opinion that online news site commenting systems are 'broken' ([Zamith & Lewis, 2014](#)). Depending on mood and the context of a discussion online, anyone can troll ([Cheng, 2017](#)), intentionally or unintentionally 'fishing' for other readers to pull into a circular discussion ([Coombs et al, 2005](#); [Herring et al 2002](#)). A lack of civility is rampant in many social media platforms, and fragmentation of threads by random, unrelated messages reduces possibilities for high-quality discussion ([Zamith & Lewis, 2014](#)). Change is needed for online discussion systems to become valuable public spheres for democratic discussion and deliberation of issues.

- **Compared to traditional venues, online discussion of any health intervention will result in more complex and nuanced discussion because the general public cares deeply about health issues.**

- Mass media and population-level campaigns are blunt tools that, by their nature, can provide only simple and non-nuanced messages, e.g., ‘fluoridation is effective for prevention of tooth decay’, ‘seat belts save lives.’ While these may well be accurate messages that reflect the balance of evidence, there is substantial nuance or complexity that cannot easily be communicated with such tools.
- Social media are certainly valuable sources of information to gain a sense of prevailing public views, and various platforms can prove valuable in public deliberation of important issues ([Zamith & Lewis, 2014](#)) including public health issues like fluoridation. However, we continue to face challenges. In a brief search of two Calgary news websites in the past year on the topic of fluoridation, we found that fully one-third of publicly posted comments contained polarizing pro/anti fluoridation content, i.e., comments designed to persuade but without being sufficiently deep in their content to promote meaningful or helpful dialogue. Furthermore, we note (and not surprisingly so) that it is individuals who hold polarized positions on fluoridation who are the most vocal on social media, as opposed to those who are not emotionally invested in the issue, are in middle, are undecided, or are wondering what is best. Unfortunately, polarization is not amenable to dialogue and can quickly degenerate into name calling and stonewalling genuine discussion ([Binns, 2012](#); [Meyer et al, 2019](#)).
- Forums are needed for real concerns and deeper discussion to take place. Venues/opportunities are needed where citizens’ reasonable concerns can be shared and questions asked, with expert responses provided ([Meyer et al, 2019](#)).
- In science, evidence is neither pro- nor anti-, but rather it is better described as strong, average, or weak, in terms of a study’s quality, limitations, and practical significance. These factors are central to determining how new studies contribute to maintaining or challenging the dominant view that the balance of evidence supports or refutes an intervention of interest.

We anticipate that social media platforms will continue to be challenging to municipal decision-makers in coming months to years, as new studies emerge in relation to community water fluoridation. The various platforms will of course continue to operate, and polarized views (often with adversarial tone) will continue to be expressed and disseminated therein. Societally, however, we need to continue to strive for respectful discourse (both within existing social media platforms and through other approaches to public discourse), in which time and care is taken to permit careful and detailed discussion of new information as it emerges.

CONCLUDING STATEMENT

We end this report with a brief statement from the O’Brien Institute’s fluoride report writing team, on behalf of the Institute’s full membership and the broader University of Calgary community:

We are honoured to have been given the opportunity to contribute this report to the City of Calgary as a knowledge resource. As stated at the outset, the O’Brien Institute is committed to a vision of *better and health care*, achieved through the *promotion and pursuit of evidence-informed public policy for health*. We hope that this report will contribute to just that, and look forward to ensuing dialogue with City Council, City committees, and various other stakeholders as this report is shared and discussed.

APPENDICES

APPENDIX 1 – City of Calgary Resolution: Water Fluoridation Calgary

Notice of Motion C2019-0219: WATER FLUORIDATION IN THE CITY OF CALGARY (as approved with amendments, 2019 February 25)

Moved by Councillor Colley-Urquhart Seconded by Councillor Farkas

That with respect to Notice of Motion C2019-0219, the following be adopted, as amended:

NOW THEREFORE BE IT RESOLVED that Council:

1. Engage the University of Calgary's O'Brien Institute for Public Health (OIPH) to conduct an objective assessment of the evidence:
 - a. In the extant literature; and,
 - b. By enlisting other University of Calgary partners such as the School of Public Policy as appropriate.
 - c. In consideration of jurisdictions in the world where tooth decay rates are decreasing; and,
 - d. In consideration of a cost-benefit analysis of water fluoridation with regard to more direct dental interventions, particularly in consideration of the lack of access to affordable dental care in Calgary; and,
 - e. In consideration of dental health as a public health vector with regard to other disease vectors impacting our population; and,
 - f. In consideration of piloting other potential approaches to public dental health like Scotland's Child Smile program; and,
 - g. In consideration of a more up to date and comprehensive comparison between dental caries rates in Calgary post de-fluoridation and Edmonton; and,
 - h. By examining other questions and concerns from members of City Council by conducting individual interviews; and,
2. Invite the University of Calgary's OIPH to report and present their findings to Council through to the SPC on CPS no later than June 2019, and, invite the study's Principal Investigator, Dr. Lindsay McLaren, to present her findings and recommendations, and respond to questions concurrently.
3. Engage other potential willing and qualified bodies, such as Dr. Hardy Limeback BSc PhD (Biochemistry) DDS, Head, Preventive Dentistry, University of Toronto, to similarly assess water fluoridation and other programs to improve dental health.
4. Invite any other party participating in this inquiry to present findings at the same time.

APPENDIX 2 – Compiled list of questions from the Council Meeting (February 25, 2019)

How will this analysis be put together?
Has this type of analysis been done before?
Is there any proof that water fluoridation is beneficial for children, or other relevant groups, dental health?
Has the CADTH produced any research in the areas of the potential benefits, potential harms, cost, ethics, legal in regards to water fluoridation?
Is the CADTH report something you could analyze on Calgary's behalf?
How do you have civil and respectful conversations about this contentious issue?
What do you say to the people who believe fluoridation should be an individual decision, as opposed to a public health policy for the common good?
Is there a study that is truly scientific, which has a subject, control groups, as well as comparable study groups, that compares cities with things like socio-economics well defined, that shows benefits of water fluoridation?
There were so many things in the McLaren study, for example, 'non-significant trend towards increase,' that didn't give me the confidence to make this multi-million dollar decision. We need clear evidence to say if it is a benefit, or a detriment.
Is there any study that states "what is the best method to treat the teeth with fluoride?"
Are there any studies that show that water fluoridation benefits certain age or subject groups, and what does it do to all of the others?
If water fluoridation is re-introduced, the equipment will need to be upgraded. Would it be better to take the millions of dollars needed to do these upgrades, plus the operating costs, and actually put it into a different method to treat those who are being disproportionately affected by dental health issues?
Is water fluoridation really that important of an issue compared to all of the other health issues we face as a population?
Many groups (newcomers to Canada, those of a lower socio-economic background) may not have the best dental health practices to begin with. Does adding fluoride to the water make a difference in these cases?
What does the research show when it comes to other variables besides fluoridation for oral health? For example, diet.
What about the idea that oral health is as much part of total health as anything else?
What is working in other jurisdictions where tooth decay is decreasing? There are European jurisdictions where they don't fluoridate, but are seeing improvements in oral health outcomes because of things like reducing obesity, diabetes and other health factors. Will you be looking at those jurisdictions?
What has prevented this report from happening in the past eight years? AHS knew City Council was talking about it. There were two public hearings. Alberta was the last province to have a dental fee guide, and 70 per cent of demists are not following it. Children don't have access to affordable dental care. I worry about this single approach, when it needs a far more complicated approach.

Will you be looking at the ethics, and the idea of personal choice when it comes to the water supply, and at other proven interventions, and making recommendations to different levels of government?
Would it be possible for the three orders of government, or the University, to initiate a pilot, something like Childsmile in Scotland, or a similar program?
It's so expensive here to get dental care. How to we have an impact there (reduce cost so more people can get dental care, more often).
If families are drinking water that has had the fluoride removed (either by filtering or by drinking bottled water), is the cost to put it in in the first place even worth it?
There is a report from Harvard that councillor Farrell and I hope you can look at as well.
If it's a public health issue, do you know of any other jurisdictions where the province pays to have this implemented in cities? Can you include a comparable to other jurisdictions to see what they are doing?
What do you say to people who say that the O'Brien Institute and the University of Calgary have already formulated an opinion, and cannot remain unbiased?
There seems to be evidence both for, and against, fluoridation. How are you going to disseminate the studies that show potential for harm?
The different countries that have withdrawn from fluoridation, in Europe for example, are saying that they have reviewed all of the data and research and made the decision to remove it. Will you review those decisions and why they were made?
I trust that this report will look at if there is any evidence for harm, in any organs, etc. What do we know about the long-term effects?

APPENDIX 3 – A high-level summary of the Councillor meetings/discussions

The O'Brien Institute for Public Health undertook a standardized engagement process with the City of Calgary's City Council.

Pursuant to the City Council motion on Community Water Fluoridation, each councillor and the Mayor received an introductory invitation email citing context and rationale.

- If the recipient replied affirmatively, a meeting was scheduled.
- If the recipient didn't reply either affirmatively or negatively, they received up to 3 follow up emails.
- If the recipient declined, there was no further contact.

At least one business day prior to a scheduled meeting, councillors received a complete interview script including a list of proposed questions, as well as the summary of questions compiled from the council hearing. Each meeting was face to face and was scheduled for 30 – 60 minutes based on councillor schedule availability. All but one was held at the council offices. Robin Hopkins, Issue Strategist for the City of Calgary, was present at all meetings. Interviews were conducted by either Dr Aleem Bharwani or Dr William Ghali. During each interview, field notes were taken by Dr Bharwani and sent by email to the participating councillor to review for additions or clarifications. In no case were any additions or clarifications received.

	Result of:		
	First Email	Second Email	Third Email
Invitee a	No Response	Scheduled	
Invitee b	Scheduled		
Invitee c	No Response	Scheduled	
Invitee d	Scheduled		
Invitee e	No Response	Declined	
Invitee f	No Response	Scheduled	
Invitee g	No Response	Scheduled	
Invitee h	No Response	Scheduled	
Invitee i	No Response	No Response	No Response
Invitee j	Scheduled		
Invitee k	No Response	Scheduled	
Invitee l	No Response	Scheduled	
Invitee m	Scheduled		
Invitee n	No Response	No Response	No Response
Invitee o	No Response	No Response	No Response

SUMMARY OF DISCUSSIONS WITH COUNCILLORS

Fluoride Effectiveness:

What is the relative **effectiveness of Community Water Fluoridation and its alternatives**? Who are the beneficiaries and does effectiveness vary by cost or demographics (age, socioeconomics, new immigrants etc)? Are certain methods more effective than others: painted on teeth vs ingested vs swish/spit. Why did those interventions stop, and are any schools still using those interventions? What is the effectiveness of educational initiatives? From other jurisdictions, compared to community water fluoridation, what is the relative impact of improved access to dental insurance or lower cost dental care? Are caries lower in districts with lower dental costs? What can we learn based on the single funding envelope that supported the Alex when fluoride was removed from the water? What can we learn from European examples such as Childsmile.

Community Water Fluoridation Risks:

What are the risks of community water fluoridation? What are the risks to **city employees handling undiluted fluoride** during the dilution process? What are the risks to **citizens** consuming fluoride, based on i) multiple possible sources and concentrations of fluoride (toothpaste, food, natural levels in water), ii) age, weight of consumer, iii) transportation and storage methods? Has rates of fluorosis changed over time?

Community Water Fluoridation Benefits:

What is the **pocket book impact** to citizens? What is the cost of community water fluoridation per citizen vs the cost savings per citizen arising from not paying for treatment of resulting dental caries? Is the pocket book impact different in someone with vs without insurance (or with a cap on coverage)? What is the actual benefit to dental caries reduction?

Community Water Fluoridation Opportunity Cost:

What is the **political** opportunity cost? Among the cadre of important issues, what is the relative ROI of spending time on this vs other public health issues?

Causes of Dental Caries:

What **causes** dental caries? How do we attribute cause of caries from fluoride deficiency vs other causes e.g. diet? How do our outcomes compare to other cities with/without community water fluoridation? Is water fluoridation **mass medication**? What is the role of citizen **choice** on this issue? What is the appropriate term: chemical vs medication vs mineral? If the government doesn't mandate vaccinations how can it mandate fluoride? What are public health comparables?: smoking restrictions, iodized salt, walkable urban design.

Ethical Responsibility to Fluoride Opponents:

In a potential scenario of community water fluoridation, what is the City's **responsibility to provide non fluoridated water alternatives**? What are the reasons someone couldn't or wouldn't drink fluoridated water? What is the risk of fluoride interaction with medications? (dose dependence; drug interaction) What is the incidence of fluoride allergy? How cheap and easy is it to remove fluoride in their homes?

Jurisdictional Appropriateness:

What is the **budgetary** opportunity cost? Often investments that prevent downstream consequences benefit the very same budget down the road. When savings, due to an intervention, accrue to a different budget than that

from which the investment is made, what options exist to share either the cost or benefits with either different orders of government, insurance companies, or family budgets?

Should this decision be under **provincial (not city) jurisdiction**? Do decision, funding and administration necessarily need to be all at the same order of government? If experts on this issue are provincial, shouldn't decision be made by province? If this is a health decision, should the cost not be from a provincial health budget? Why was this issue initially delegated to the City? Was this ultimately a budget issue due to provincial cuts or was it a pure health policy decision?

Governance:

If an issue is decided by plebiscite, should it be reversed by anything other than plebiscite? (e.g. city council vote)

Report Credibility:

Report will be considered **credible, fair and balanced** if the report:

- articulates guiding principles of the Institute as it relates to this work
- explicitly declare process of data inclusion and analysis, and articulates how it overcomes biases, in relation to this particular knowledge synthesis activity; declares relationship with other national bodies doing similar work; solicits and reviews specific articles or documents from councillors; engages objectively and deliberately with opponents; highlights ability to tap resources locally, provincially, globally
- conveys pros and cons, including relative strength of each pro or con claim

OIPH is considered by some to be disadvantaged due to a prevailing assumption the OIPH is pro fluoride. This arises because there is not a clear understanding of the differential role of scientists vs Institute. The report should make this distinction clear:

- In the City, if anyone makes a statement, that statement is considered a City position. People assume the same about the OIPH: if anyone has stated a position, it is perceived to be the position of the OIPH.
- Start with a letter from the executive that the OIPH does not take a position on any given policy issue – but individual scientists can do so based on their individual research. Give examples from over the last 5 years where this has been the case – where positions were explicitly not taken by OIPH but where Institute members may have. Clarify and educate about academic freedom and its difference from the corporate world.

Report Usability:

Report will be **readable** if the average citizen can understand it, helped if information is presented visually; complex numerical information is simplified into low/medium/high categories; comparisons, benchmarks or taxonomies are used to illustrate and contextualise claims (e.g. express the hierarchy of evidence); executive summary is brief with a longer appendix for those interested in details.

de Grood, Anna

Subject: FW: Water Fluoridation

From: Jeff McKay [mailto:checkpoint_jeff@hotmail.com]

Sent: Tuesday, June 04, 2019 10:51 AM

To: Office of the Mayor ; City Clerk

Subject: [EXT] Water Fluoridation

Good day Mr. Nenshi

I am writing this email to make it known that I officially oppose water fluoridation. Adding medication to our water supply is simply not moral. There is no one size fits all foods, drinks, activities, or medications. While some may be not affected, others will be severely affected. What medicine I take should be between me and my doctor, with proper consent and follow-ups. Please Mr. Nenshi, do not add this chemical to our water.

Flouride only shows up in the environment as calcium fluoride and our water here in the Bow River has 0.1 - 0.3 ppm of Calcium fluoride already in it. The fluoride they add to community water supplies is Hydroflourisillic acid. It contains lead, arsenic, and many other heavy metals that go unchecked into the water. How can we say that it's safe to add lead to the water or arsenic? Even at extremely low concentrations, purposely adding this to the water is criminal.

I know you are just trying to do what is best for our children but let's be honest here. This is a magic bullet approach. Even the most pro-fluoride studies show only a 10 - 25% decrease in dental caries. This means if a child has 6 cavities he may now only have 4 - 5. We are going to spend 6 million dollars plus an additional \$750,000 a year for that? Why don't we lobby the provincial government to implement programs that will EDUCATE our lower class on proper foods and brushing? Or use the money to lower the cost of local organic food for those in need. This could have many far-reaching impacts, such as lower obesity, lowering the rates of chronic disease and much more.

Finally, I will end on this. The Obrian Institute for Public Health is currently reviewing the CADTH report. The CADTH report, however, excludes some of the top studies that show Fluoride harms the fetus and lowers I.Q rates. The Bashash study in 2017 was amazingly done, with proper controls and the OBIPH has ignored this study. As someone who is looking to start a family in this amazing city, how can you tell me my baby will be safe? How can I trust our public health experts when they are not taking in all the information? I am not a conspiracy nut nor am I trying to make life more difficult for you but please Mr. Nenshi, keep this toxic substance out of our water. I love Calgary so much and I think you have all done a great job on city consol navigating these tough times.

Many Thanks
Jeffrey McKay

de Grood, Anna

Subject: FW: Please keep fluoride OUT of our water

From: alia khan [<mailto:alia-khan@live.com>]

Sent: Thursday, June 06, 2019 6:25 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Please keep fluoride OUT of our water

Dear Mayor and city Council-I write to you as a concerned Citizen of Calgary regarding the debate of adding fluoride back into our water. As a Social Worker (who has studied brain development) and a Nutritional Therapy Practitioner I am extremely concerned about the possibility of adding fluoride into our water- it is toxic.

I understand that the University of Calgary's O'Brien Institute for Public Health (OIPH) is to conduct an assessment of evidence with regards of fluoridation and present their findings to council...It is extremely important to note that this group is pro-fluoride and they will be conducting their review with a lens that promotes fluoridation. It is only a reasonable request that another review is conducted from an unbiased group and also present their findings. I'd recommend contacting the Safe Water Calgary group.

I believe the debate for bringing fluoride back into our water started with the concern for children's oral health - Tooth decay is not a fluoride "deficiency" it is from the overconsumption of processed foods. If you look at the work of Dr. Weston A Price who was a dentist you will clearly understand this connection. Adding fluoride to our water is certainly a concern for our health and well-being as well as the environment.

The fluoride ion is very small and extremely difficult to remove from water. It requires expensive reverse osmosis or distillation which strips away all essential minerals from our water. These minerals are our spark plugs- they are required for every enzymatic reaction on the human body. People that want or need to avoid swallowing fluoride (to avoid dental fluorosis, those who suffer kidney or thyroid impairment, mixing baby formula etc.) deserve equitable access to safe drinking water and should not be burdened with finding and paying for an alternative source of water. For those who THINK it is a useful intervention, fluoride is easily and cheaply available via toothpaste, from a MD or pharmacist, from dentist as sealants, gels and rinses, and from a variety of bottled drinks, teas and processed foods.

Please do not add fluoride back into our water, it was taken out for a reason. I'd be happy to share more research and information as to why adding it into our water is a terrible idea that will impact our environment, our citizens health and generations to come. I will part with some points about fluoride.

SOME POINTS ABOUT ARTIFICIAL WATER FLUORIDATION

- Artificial water fluoridation, otherwise known as the addition of toxic industrial scrubber waste product from Florida and China to our public water, is a failing public health practice. Fluoride and water fluoridation are not safe, effective, or ethical.
- Fluoride is not needed for a single body function.

- There is no such thing as a fluoride deficiency.
- The latest studies showing neurotoxicity are the most alarming as the damage to our kids is essentially irreversible.
- Artificial water fluoridation is a form of mass medicating without informed consent. There is no personal freedom of choice. UNESCO: "In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent."
- Governments that institute artificial water fluoridation perform no monitoring or follow up ever on the population thus are unaware of the negative impacts.
- There is no control of dose or dosage for there is no control of the water people drink or adsorb transdermal.
- Only 5% of the world still participates in this antiquated practice.
- The fluoride ion is very small and very difficult to remove from water. It requires expensive reverse osmosis or distillation.
- 99% of water is not consumed but is used to flush toilets, water lawns, etc. and goes into our environment unchecked. The Canadian Environmental Protection Act classifies fluoridation products as persistent, bio-accumulative and toxic to the environment and nearly all of the water treated with fluoridation products ends up back in the environment with less than 1% used for drinking.
- Natural calcium fluoride in our rocks and rivers is very tightly bound and behaves very differently in our bodies than the industrial waste hydrofluosilicic acid which is the form used by cities adding fluoride to water.
- Voting whether or not to medicate other people by plebiscite is highly unethical.
- In Canada 98% of BC and Quebec are not fluoridated. BC boasts of having some of the best oral health in Canada.
- 97% of Europe is not fluoridated-much more progressive than us in many ways.
- Fluoride, for those who think it is a useful intervention, is available easily and cheaply with toothpaste, from an MD or pharmacist, from dentist as sealants, gels and rinses, and from a variety of bottled drinks, teas and processed foods.
- The pro fluoridationists seem to believe that repeating the words "safe and effective" many times over will actually make it so.
- There are now well over 2,000 studies showing harm and damage to virtually all organs and body systems.
- Around 15 Nobel Laureates in Medicine have made strong statements about fluoridation, some calling it the biggest scam ever propagated against humanity.
- Fluoride breaches and crosses the placental and blood brain barriers, designed to protect us against such toxins. Some research highlights how fluoride easily displaces iodine in the body, iodine being indispensable to human health.
- The most harmed by side effects are the fetus, babies, children, the elderly, the chronically ill, and people of colour.

· People that want or need to avoid swallowing fluoride (to avoid dental fluorosis, those who suffer kidney or thyroid impairment, mixing baby formula etc.) deserve equitable access to safe drinking water and should not be burdened with finding and paying for an alternative source of water.

Needless to say my family and I do not support the use of artificial fluoride in our water. Thank you for your time.

Your concerned Citizen,

Alia Khan-Elhady
403-542-7866
MSW, RSW, NTP

de Grood, Anna

Subject: FW: [EXT] Please Keep Flouride Out of Our Water

From: Eugene Elhady [<mailto:eugeneelhady@gmail.com>]

Sent: Thursday, June 06, 2019 9:51 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Please Keep Flouride Out of Our Water

Dear Mayor and city Council,

I write to you as a concerned Citizen of Calgary regarding the debate of adding fluoride back into our water. I am extremely concerned about the possibility of adding fluoride into our water- it is toxic.

I understand that the University of Calgary's O'Brien Institute for Public Health (OIPH) is to conduct an assessment of evidence with regards of fluoridation and present their findings to council...It is extremely important to note that this group is pro-fluoride and they will be conducting their review with a lens that promotes fluoridation. It is only a reasonable request that another review is conducted from an unbiased group and also present their findings. I'd recommend contacting the Safe Water Calgary group.

I believe the debate for bringing fluoride back into our water started with the concern for children's oral health - Tooth decay is not a fluoride "deficiency" it is from the overconsumption of processed foods. If you look at the work of Dr. Weston A Price who was a dentist you will clearly understand this connection. Adding fluoride to our water is certainly a concern for our health and well-being as well as the environment.

The fluoride ion is very small and extremely difficult to remove from water. It requires expensive reverse osmosis or distillation which strips away all essential minerals from our water. These minerals are our spark plugs- they are required for every enzymatic reaction on the human body. People that want or need to avoid swallowing fluoride (to avoid dental fluorosis, those who suffer kidney or thyroid impairment, mixing baby formula etc.) deserve equitable access to safe drinking water and should not be burdened with finding and paying for an alternative source of water. For those who THINK it is a useful intervention, fluoride is easily and cheaply available via toothpaste, from a MD or pharmacist, from dentist as sealants, gels and rinses, and from a variety of bottled drinks, teas and processed foods.

Please do not add fluoride back into our water, it was taken out for a reason. I'd be happy to share more research and information as to why adding it into our water is a terrible idea that will impact our environment, our citizens health and generations to come. I will part with some points about fluoride.

SOME POINTS ABOUT ARTIFICIAL WATER FLUORIDATION

- Artificial water fluoridation, otherwise known as the addition of toxic industrial scrubber waste product from Florida and China to our public water, is a failing public health practice. Fluoride and water fluoridation are not safe, effective, or ethical.

- Fluoride is not needed for a single body function.
- There is no such thing as a fluoride deficiency.
- The latest studies showing neurotoxicity are the most alarming as the damage to our kids is essentially irreversible.
- Artificial water fluoridation is a form of mass medicating without informed consent. There is no personal freedom of choice. UNESCO: "In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent."
- Governments that institute artificial water fluoridation perform no monitoring or follow up ever on the population thus are unaware of the negative impacts.
- There is no control of dose or dosage for there is no control of the water people drink or adsorb transdermal.
- Only 5% of the world still participates in this antiquated practice.
- The fluoride ion is very small and very difficult to remove from water. It requires expensive reverse osmosis or distillation.
- 99% of water is not consumed but is used to flush toilets, water lawns, etc. and goes into our environment unchecked. The Canadian Environmental Protection Act classifies fluoridation products as persistent, bio-accumulative and toxic to the environment and nearly all of the water treated with fluoridation products ends up back in the environment with less than 1% used for drinking.
- Natural calcium fluoride in our rocks and rivers is very tightly bound and behaves very differently in our bodies than the industrial waste hydrofluosilicic acid which is the form used by cities adding fluoride to water.
- Voting whether or not to medicate other people by plebiscite is highly unethical.
- In Canada 98% of BC and Quebec are not fluoridated. BC boasts of having some of the best oral health in Canada.
- 97% of Europe is not fluoridated-much more progressive than us in many ways.
- Fluoride, for those who think it is a useful intervention, is available easily and cheaply with toothpaste, from an MD or pharmacist, from dentist as sealants, gels and rinses, and from a variety of bottled drinks, teas and processed foods.
- The pro fluoridationists seem to believe that repeating the words "safe and effective" many times over will actually make it so.
- There are now well over 2,000 studies showing harm and damage to virtually all organs and body systems.

- Around 15 Nobel Laureates in Medicine have made strong statements about fluoridation, some calling it the biggest scam ever propagated against humanity.
- Fluoride breaches and crosses the placental and blood brain barriers, designed to protect us against such toxins. Some research highlights how fluoride easily displaces iodine in the body, iodine being indispensable to human health.
- The most harmed by side effects are the fetus, babies, children, the elderly, the chronically ill, and people of colour.
- People that want or need to avoid swallowing fluoride (to avoid dental fluorosis, those who suffer kidney or thyroid impairment, mixing baby formula etc.) deserve equitable access to safe drinking water and should not be burdened with finding and paying for an alternative source of water.

Needless to say my family and I do not support the use of artificial fluoride in our water. Thank you for your time.

Your concerned Citizen,

Eugene Elhady

de Grood, Anna

Subject: FW: [EXT] ARTIFICIAL WATER FLUORIDATION

From: Robert C Dickson [<mailto:drbobdickson@shaw.ca>]

Sent: Monday, June 17, 2019 10:18 AM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] ARTIFICIAL WATER FLUORIDATION

Good morning.

As you are aware, I am a family physician who has studied artificial water fluoridation for 2 decades. I reside in the community of Varsity.

I ask that you do NOT support any attempt to reintroduce water fluoridation in Calgary.

Fluoride and artificial water fluoridation are neither safe, effective nor ethical. Fluoride is not needed for a single body function.

Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone.

Thanks. I look forward to your response, and to the July 24th open public forum on this issue.

Dr Bob

Robert C Dickson, MD, CCFP, FCFP

Founder SAFE WATER CALGARY

www.safewatercalgary.com

111-3437-42 St NW

Calgary, AB T3A 2M7

Home: 403-242-4403 Cell: 403-560-4574

drbob_is@me.com

de Grood, Anna

Subject: FW: [EXT] NO to 'water fluoridation' being reintroduced in Calgary

From: David Moll [<mailto:dmgn078@gmail.com>]

Sent: Tuesday, July 02, 2019 12:25 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] NO to 'water fluoridation' being reintroduced in Calgary

Dear Mayor and Council,

We reside in the community of Huntington Hills NW, in Calgary. We ask you do not favor water fluoridation to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function. Click on the links below on the subject.

I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone.

We look forward to your response,

the Family Moll

Lawsuit Set to End Water Fluoridation in the US

<http://woked.co/lawsuit-water-fluoridation/?fbclid=IwAR1SYz61UtUdbE5Roqraa-s7a3AhKMM8TxRus2-V7bSCUaqJmi3Ek3zIFYw>

50 REASONS TO OPPOSE FLUORIDATION

<https://fluoridealert.org/articles/50-reasons/>

de Grood, Anna

Subject: FW: [EXT] Say not to Water Fluoridation in Calgary

From: Andrea Terrones [<mailto:andreaterrones@gmail.com>]

Sent: Tuesday, June 25, 2019 11:56 AM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Say not to Water Fluoridation in Calgary

Dear Mayor and Council,

I reside in the community of Mt. Pleasant.

I ask you do not favor water fluoridation to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone.

I look forward to your response,

Andrea Terrones

de Grood, Anna

Subject: FW: [EXT] Water Fluoridation

From: Erin Colborne [<mailto:er.colborne@gmail.com>]

Sent: Friday, July 05, 2019 7:40 PM

To: Chu, Sean <Sean.Chu@calgary.ca>

Cc: City Clerk <CityClerk@calgary.ca>

Subject: [EXT] Water Fluoridation

Dear Mr. Chu,

Thank you for taking the time to read this email. My name is Erin Colborne and I live in ward 4. I am writing to you today to say that I am officially opposed to water fluoridation. I ask that you please do what you can to prevent this substance from being added to our drinking water.

Fluoride is not needed for a single bodily function. And while I understand that some people want to consume it, there are currently many options available for them to do so. Fluoride is in most toothpaste, and there are also inexpensive gels you can use, and supplements you can take. In Europe, they have gone the route of adding fluoride to table salt, which makes it very easy for people to access (should they want to consume it). Please note that over 90% of Europe does not add fluoride to their water, and they generally consider it to be an outdated practice.

On the other hand, when fluoride is added to tap water, it is very difficult to remove. This is particularly detrimental to people with kidney or thyroid issues as consuming fluoride has been shown to negatively affect both these conditions. In order to remove fluoride from tap water, a whole home water filtration system is required and the ones good enough to remove fluoride are in the \$8,000 to \$10,000 dollar range. If fluoride is put in our tap water, how will city council support the rights of people who cannot or do not wish to consume it?

I have heard that the main reason we want to add fluoride to the water is to help the children. Which is certainly a wonderful cause. However, the McLaren study showed that fluoride only had an effect of half a cavity over the course of a person's life. A healthy diet and proper oral care have been shown to have a significantly larger effect on children's health. Furthermore, the Bashash study showed a 7 point decrease in the IQ of children born to women who consumed fluoride while pregnant. Bashash was a US government-funded study and is one of the best IQ studies done to date but for seemingly no real reason the CADTH report chose to exclude it. My partner and I are hoping to start our own family in the next few years so this causes me a considerable amount of concern. Does it make sense to prioritize our children's teeth over their brains?

If we really want to help the children, I believe there are other ways that would be more targeted and cost-effective. In Scotland, they have a program called Childsmile. This program teaches children about their mouths, proper oral care, the food they consume and how it affects them. Its main goal is to improve equality in both dental health and access to dental services. I love this idea because it arms our children with knowledge that can benefit them throughout their lives. This program has also shown to not only improve oral health but also decrease childhood diabetes and obesity.

I also feel that an education program like Childsmile would be significantly less than the \$6 million dollars it will cost to fix the fluoride infrastructure and have a significantly larger impact on children's overall health.

When we are cutting \$60 million from our emergency services, schools, and hospitals, can the city really afford to spend money on something as controversial as fluoride?

In conclusion, I just want to reiterate that I am opposite to adding fluoride to our drinking water. Thank you for the great work you do for our city, and thank you for taking the time to read my email.

Sincerely,
- Erin Colborne

de Grood, Anna

Subject: FW: Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services
Attachments: Committee Agenda Item Submission request 061919.pdf; AMA Letter re Water Fluoridation 061919.pdf; ABP Fluoride May 2019.pdf

From: Annette E. Ross [<mailto:Annette.Ross@albertadoctors.org>] **On Behalf Of** Alison M. Clarke
Sent: Wednesday, June 19, 2019 4:01 PM
To: City Clerk
Cc: Office of the Mayor ; Gualtieri, Franca ; Mike Gormley ; Alison M. Clarke
Subject: [EXT] Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services

Dear City Clerk,

On behalf of President Clarke, please see the attached request to include items to the Community and Protective Services Committee agenda for July 24, 2019.

Warm regards,

Alison M. Clarke, MD, CCFP, FCFP

President

Alberta Medical Association

12230 106 Ave NW

Edmonton AB T5N 3Z1

Phone: 780.482.2626

Fax: 780.482.5445

www.albertadoctors.org

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June 19, 2019

Office of the City Clerk
The City of Calgary
P.O. Box 2100, Stn. M
Calgary, AB T2P 2M5

Dear City Clerk:

Re: Report to Community and Protective Services Committee per Notice of Motion C2019-0219 "Water Fluoridation in The City of Calgary"

Attached, please find a copy of the Alberta Medical Association's submission for the above noted agenda item for the July 24th meeting of the Standing Policy Committee on Community and Protective Services. While we have distributed a copy of these materials to members of City Council directly, we would appreciate your inclusion of these materials to the official agenda package of this meeting for distribution to Council, City Administration, the public and the media.

Thank you for your assistance on this matter.

Warm regards,

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapathients* Views on Water Fluoridation in Calgary

CC: His Worship Mayor Naheed Nenshi
Michael A. Gormley, Executive Director, AMA



June 19, 2019

Councillor Diane Colley-Urquhart
Chair, Community and Protective Services Committee
The City of Calgary
P.O. Box 2100, Stn. M
Calgary, AB T2P 2M5

Dear Councillor Colley-Urquhart:

Re: Report to Community and Protective Services Committee per Notice of Motion C2019-0219 "Water Fluoridation in The City of Calgary"

I am writing you today in regard to the above noted report being considered by the Standing Policy Committee on Community and Protective Services on July 24, 2019.

On behalf of Alberta physicians, I applaud Calgary City Council for taking this initial step to reassess the decision to discontinue community water fluoridation. Alberta's doctors strongly endorse the practice of fluoridation in municipal water systems, in accordance with Government of Canada guidelines, and we are hopeful that your deliberations at this meeting will lead to its re-introduction in Calgary.

Dental health is an important foundation to overall community health and wellness, and community water fluoridation remains one of the safest, most efficacious, cost-effective and equitable preventative measures to reduce tooth decay and promote overall dental health.

The safety and benefits of municipal water fluoridation are well established in medical research, and it is clear based on local data that cessation of municipal water fluoridation in Calgary in 2012 has contributed to a decline in the oral health of children since.

As physicians we feel strongly about this issue, and so do our patients. In May, we put the question of municipal water system fluoridation to our online advisory patient community, albertapatients.ca. This representative survey, which included nearly 1,100 responses from patients living in The City of Calgary, found wide-spread support for fluoridation. Looking specifically at the Calgary results, two-thirds (66%) say they approve of fluoridating municipal water systems (nearly one-half strongly approve), compared to 27% who disapprove. I have attached a copy of these survey results to this letter for your reference.

...2

City Council's willingness to collaborate with the fine work being conducted by the University of Calgary's O'Brien Institute for Public Health on this important matter is laudable, and Alberta's physicians encourage you to re-introduce fluoridation in the municipal water supply for the betterment of community health.

We look forward to your thoughtful consideration on this matter.

Warm regards,

A handwritten signature in blue ink, appearing to read 'A Clarke'.

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapathients* Views on Water Fluoridation in Calgary

CC: City of Calgary Council
City Clerk's Office
Michael A. Gormley, Executive Director, AMA



albertapathients

Your Voice Matters

albertapathients

Views on Water Fluoridation in Calgary

May 2019

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www.albertapathients.ca

This research was conducted with and for the albertapathients.ca online community, operated by the Alberta Medical Association and research partner ThinkHQ Public Affairs Inc.

To learn more about albertapathients or to register as a member, please visit our website at www.albertapathients.ca.

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Please attribute any research findings to albertapathients.ca.

>> Research Methodology

- Online survey was fielded via the albertapathients online research panel
 - Field dates: May 2 – 17, 2019
 - Sample size: n=3,498
- Results reflect a representative sample of patients in Alberta
- Data was weighted to reflect gender, age and region of Albertans who have used the health care system within the past year
- This online survey utilizes a non-random sample; therefore, the margin of error is not applicable. However, for interpretation purposes, a probability sample of this size would yield a margin of error of +/- 1.7 percentage points 19 times out of 20 at a 95% confidence interval
 - Accuracy of sub-samples of the data decline based on sample size

>> Water Fluoridation

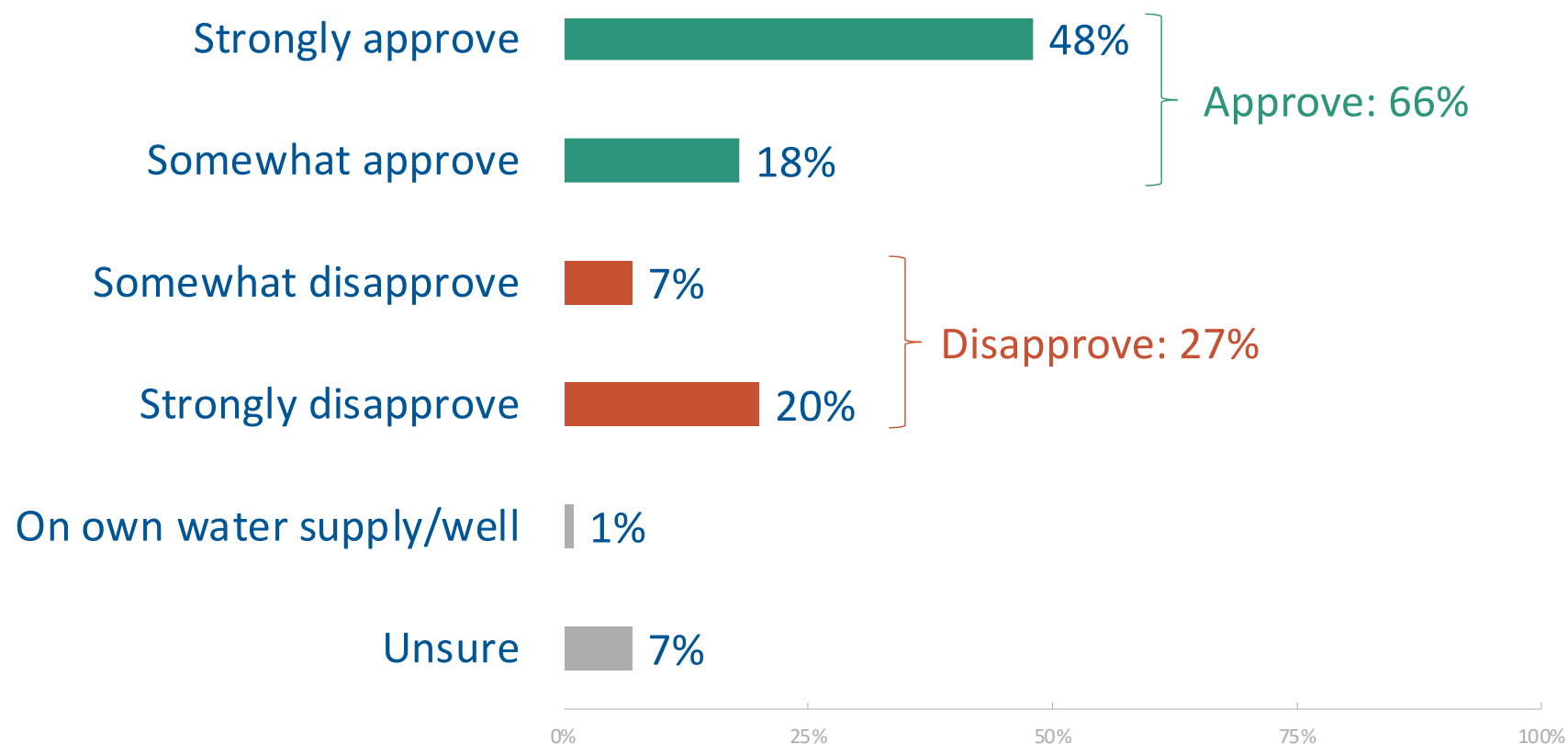
-Key Findings

- A majority (64%) of Alberta patients offer support for municipal fluoridation of the water supply to promote good dental health vs. 23% who disapprove
- In Calgary, where City Council will soon re-examine their decision to remove fluoride from the municipal water supply, 66% approve of fluoridation (48% strongly, 18% somewhat) vs. 27% who disapprove

>> Approval of Public Water Supply Fluoridation

-Calgary Proper Only Sample

"Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?"



>> Approval of Public Water Supply Fluoridation

-Calgary Proper Only Sample by Key Demographics

“Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?”

	TOTAL	Age (Years)				Gender	
	Calgary Proper (n=1,077)	<45 (n=566)	45-54 (n=191)	55-64 (n=166)	65+ (n=153)	Male (n=552)	Female (n=525)
Approve	66%	67%	61%	68%	73%	69%	65%
Disapprove	27%	26%	30%	28%	20%	26%	27%
On own supply/well	1%	2%	-	1%	1%	2%	-
Unsure	7%	5%	9%	3%	5%	3%	7%

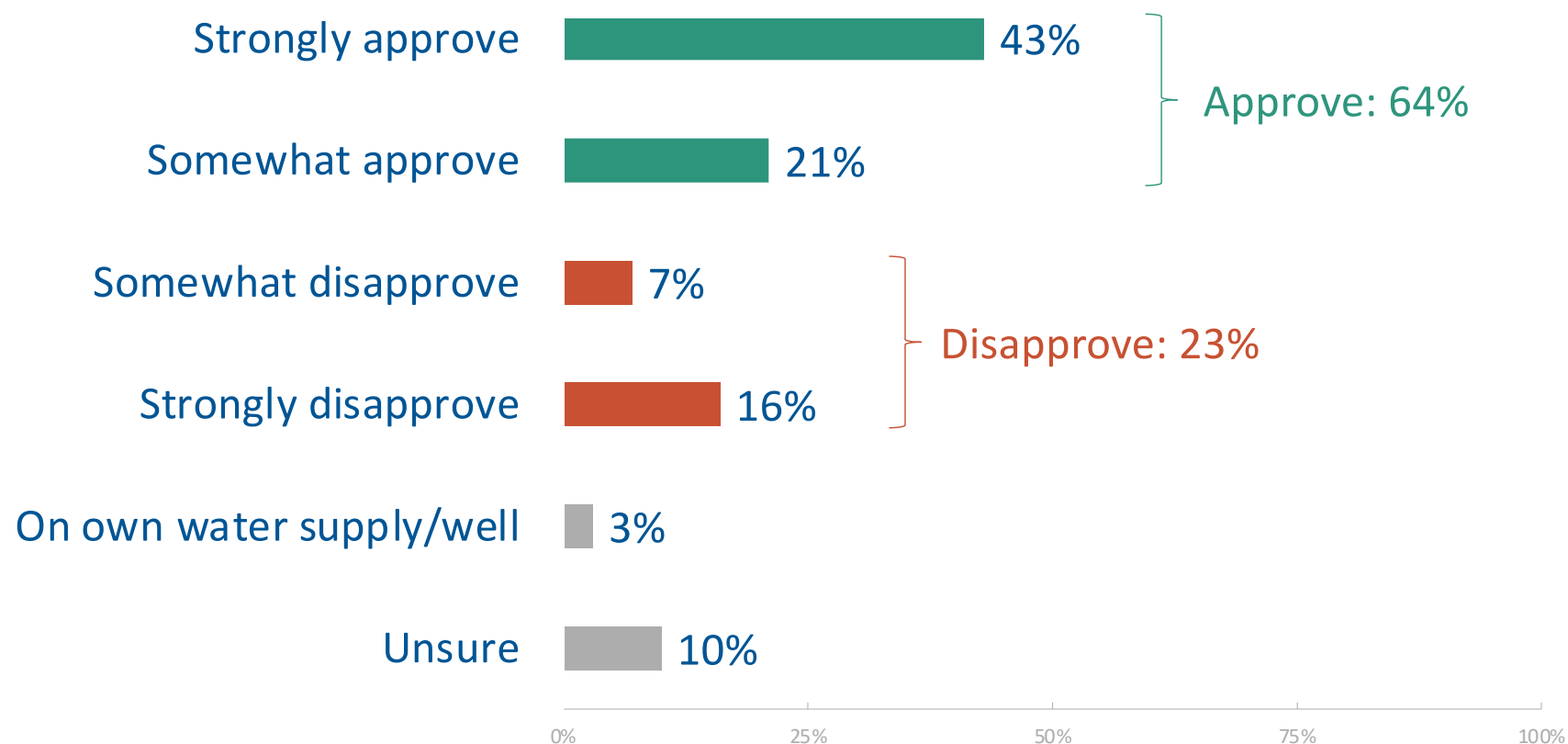
 Significantly higher  Significantly lower

Base: Calgary Proper

>> Approval of Public Water Supply Fluoridation

- Province-wide Sample

"Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?"



Base: All respondents (n=3,498)

>> Approval of Public Water Supply Fluoridation

- Province-wide Sample By Key Demographics

“Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?”

	TOTAL	Age (Years)				Gender	
	Alberta (n=3,498)	<45 (n=1,1771)	45-54 (n=615)	55-64 (n=557)	65+ (n=555)	Male (n=1,740)	Female (n=1,758)
Approve	64%	65%	62%	62%	66%	70%	59%
Disapprove	23%	22%	25%	26%	21%	20%	27%
On own supply/unsure	13%	12%	12%	12%	12%	10%	15%

	TOTAL	Region				
	Alberta (n=3,498)	Calgary (n=1,221)	Edmonton (n=1,104)	North (n=422)	Central (n=391)	South (n=360)
Approve	64%	67%	66%	60%	56%	66%
Disapprove	23%	26%	21%	23%	26%	21%
On own supply/unsure	13%	7%	14%	17%	18%	13%

 Significantly higher  Significantly lower

Base: All respondents



albertapatients
Your Voice Matters

www.albertapatients.ca

For more information, contact:
Marc Henry, President
ThinkHQ Public Affairs Inc.
MLH@THINKHQ.CA

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**ALBERTA
MEDICAL
ASSOCIATION**



de Grood, Anna

Subject: FW: [EXT] EXCELLENT LETTER

From: Robert C Dickson [mailto:drbob_is@me.com]

Sent: Sunday, June 09, 2019 12:33 AM

To: Office of the Mayor

Cc: Maria Castro ; City Clerk

Subject: [EXT] EXCELLENT LETTER

Hi, Mayor Nenshi. I try very hard not to inundate Council with safe water studies and information, tho I could easily be sending you quality information daily.

However, this excellent letter, from a dentist colleague in the US who was formerly a supporter of artificial water fluoridation, is a must read!

Thanks! Enjoy our new found spring.

Dr Bob

Robert C Dickson, MD, CCFP, FCFP

Founder SAFE WATER CALGARY

www.safewatercalgary.com

111-3437-42 St NW

Calgary, AB T3A 2M7

Home: 403-242-4403 Cell: 403-560-4574

drbob_is@me.com

Editor's note: On May 27, the Cape Breton Post published a column by Sydney resident Marlene Kane which called for a ban on water fluoridation. On June 6, the Post published a letter from Juliet Guichon, an assistant professor at the University of Calgary, who called the ban fear mongering. This prompted a response from many parts of the country and beyond. Here are a few:

For my first 25 years as a dentist with a Masters Degree in Public Health, I promoted water fluoridation or fluoride supplements, as taught in school.

But reading the science myself over the next 17 years has been like a knee in the gut. Both my professions of dentistry and public health have been wrong, but we are changing.

A few reasons why dentistry and public health are reconsidering their support of fluoridation:

1. Too many are ingesting too much fluoride. Most children in the United States now have dental fluorosis, a biomarker of too much fluoride. Excess fluoride is harming many.
2. If a person wants more fluoride for their children, other sources of fluoride are available such as non-organic foods, fluoride toothpastes, fluoride medications, tea, grapes, fluoride supplements and

more. Adding even more fluoride for everyone - those without teeth, those who have had too much fluoride, or those with chemical sensitivities - makes NO public health sense. Dental caries treatment is elective treatment, not a highly contagious life threatening disease.

3. The dosage of fluoride is not controlled. Not everyone drinks the same amount of water or ingests the same amount of fluoride from other sources.

4. We have no high quality studies of fluoridation's effectiveness, safety or cost effectiveness. The research is mixed and controversial.

5. Current studies raise serious concerns for adverse effects and we have not even begun to seriously look at synergistic effects of different chemicals either for benefit or risk.

Good scientists do not simply trust other scientists. Circular referencing of our like-minded friends is more like gossip than science. Fluoridation is a house of cards, public health's darkest hour and like most developed countries will soon be stopped.

Bill Osmunson, DDS, MPH

Bellevue, Wash.

de Grood, Anna

Subject: FW: [EXT] Please say no to Water Fluoridation in Calgary

From: Lily Mae [<mailto:lilymae341@gmail.com>]

Sent: Friday, June 28, 2019 11:21 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Please say no to Water Fluoridation in Calgary

Dear Mayor and Council,

I reside in the community of Panorama Calgary Alberta.

Thank-you for taking the time to read my email. I appreciate you hearing my concern.

I am writing to ask you not to favor the reintroduction of water fluoridation in Calgary.

I know the concern surrounding this issue is coming from a good place, wanting to protect the health of our teeth and lifestyle within that. However there has to be other options than reintroducing fluoride back into the water.

I personally have allergic reactions to fluoride and am very concerned I won't be able to protect myself, if it ends up in the public water again.

I strongly feel for those who have poor dental hygiene, a simple prescription fluoride rinse would be a more effective form of treatment. Plus would allow the choice to remain open to those who don't need or want to use fluoride. A common ground.

Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice.

Water Fluoridation denies a person's right to choose. You cannot guarantee that fluoride is safe and effective for everyone.

I look forward to your response,

Ruby Martin

de Grood, Anna

Subject: FW: [EXT] safewatercalgary@gmail.com

From: Diane Vlassie [<mailto:dianevlassie@gmail.com>]

Sent: Sunday, June 30, 2019 5:05 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] safewatercalgary@gmail.com

Dear Mayor and Council,
I reside in the community of Renfrew, Calgary, Alberta

I ask you do not favor water fluoridation to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone.

Thank you for your consideration in this matter.

Diane Vlassie
Brevity Bkpg and Tax Services
cell 403 703 1662

"My attitude is that the world is full of problems created and maintained by humans and some are more universal and dire in effect than fluoridation. But fluoridation is one of the more easily solvable problems and when we solve it we demonstrate that people can take just power into their own hands and make the world a bit better for many if not for all. People need such demonstrations. Then on to the next." Dr. James Beck, co-author of THE CASE AGAINST FLUORIDE

de Grood, Anna

Subject: FW: [EXT] Water fluoridation

From: Stephanie Hrehirchuk [<mailto:shrehirchuk@shaw.ca>]

Sent: Sunday, June 30, 2019 1:59 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Water fluoridation

Dear Mayor and Council,

I reside in the community of Tuscany, NW Calgary.

I ask you do **not** favor water fluoridation to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to choose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone.

This article from Harvard Public Health points out the many reasons it is in fact **not** safe:

https://www.hsph.harvard.edu/magazine/magazine_article/fluoridated-drinking-water/?fbclid=IwAR1CIx141wzSB0A47Tlasq-yG2YvBmO5tAOBTwnOafSWmI0B8V2hMIN_G1M

We are making positive strides toward a healthful, thriving Calgary. Let's not take a giant step backward by fluoridating our water and subsequently our river.

I look forward to your response,

Stephanie Hrehirchuk

stephaniehrehirchuk.com



Every print copy sold plants a tree!

de Grood, Anna

Subject: FW: Water Fluoridation Issue

From: Nestor Shapka [mailto:nestor_shapka@hotmail.com]

Sent: Tuesday, July 09, 2019 10:56 AM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Water Fluoridation Issue

Dear Mayor and Council,

I am a practicing **dentist** in the small town community of Bonnyville, Alberta.

I ask that you **DO NOT** support water fluoridation to be reintroduced in Calgary.

Fluoride is **NOT A BENIGN** ingredient as people would have you believe.

Fluoride is a **POISON**.

It is **TOXIC** even at low dosages to infants and small children and is well recognized as such by Health Canada and by the Canadian Dental Association. HEALTH CANADA and the CANADIAN DENTAL ASSOCIATION both **AGREE** that for these populations, the only correct amount of fluoride to be **INGESTED** is **ZERO**.

We do use poisons within our society but we do not ever suggest that these poisons are not poisons. That is what the general dental community would have you believe. That somehow this poison is important for your teeth while they ignore the negative effects on the rest of your body. BUT AT WHAT COST TO THE BODY? At what cost to vulnerable populations like infants and small children. Studies show and prove harm to infants and small children hence the need for these populations to avoid fluoride.

SO WHY THE NEED TO ADD IT TO A COMMUNITIES DRINKING WATER?

There are alternatives and safer ways to use fluoride, as there are for other toxic materials.

Fluoride and artificial water fluoridation are neither safe, effective, nor ethical, FOR THESE POPULATIONS.

It has been proven over and over that for infants and children that there is great harm.

Fluoride is not needed for a single body function.

I would suggest that Council representatives support freedom of choice, and Water Fluoridation denies a person's their right to choose. People still have access to fluoride through conventional methods such as tooth paste and rinses. IT IS NOT NEEDED IN THEIR WATER. There is no consent when added to water. This is not "informed consent". You cannot guarantee that fluoride is safe and effective for everyone.

I look forward to your response,"

Dr. Nestor B Shapka, BSc, DDS, FIAOMT

de Grood, Anna

Subject: FW: Calgary's Water

From: Doris Reimer [<mailto:doris@reimerllp.com>]

Sent: Tuesday, July 09, 2019 11:47 AM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; jeff.davidson@calgary.ca; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Cc: pat.fule@strathmore.ca; lorraine.bauer@strathmore.ca; tari.cockx@strathmore.ca; denise.peterson@strathmore.ca; melanie.corbiell@strathmore.ca; bob.sobol@strathmore.ca; jason.montgomery@strathmore.ca; jthackray@strathmore.ca; mchalmers@chestermere.ca; lbald@chestermere.ca; cburness@chestermere.ca; mfoat@chestermere.ca

Subject: [EXT] Calgary's Water

Dear Mayor and Council:

I live in Eau Claire and am very concerned about the possibility that we can once again have fluoride in our drinking water. I can't believe Council is even considering it and wonder why this has come up yet again. What's next – putting sunscreen in the pubic water system? ***I do not consent.***

Fluoride is a toxic substance and putting it in the public water leaves us all with no choice but to ingest it. No study or report touting its possible effect of preventing tooth decay will convince me it's beneficial or justified. Anyone who wants fluoride can get it from other sources. Juliet Guichon – the fluoride mouthpiece is unconvincing as she spews obviously false information into the public domain. Juliet tries to make a case by linking fluoride to vaccines – stating: “vaccination and fluoridation are public health measures that prevent infectious disease and ultimately save lives”. What do vaccines have to do with fluoride? I'm not aware of anyone claiming that fluoride saves lives. Then, in a Calgary Herald article, she compares children's teeth to “butter” (due to lack of fluoridated water). Who would make such an insane statement in public without some financial gain or interest?

Surely the City is not funding Juliet's campaign? If the City plans to justify to Calgarians to spend \$\$\$ millions on fluoridating the public water supply in the name of 'preventing infectious disease' and 'sparing tooth decay' in children—it's just not going to fly. I'm a lawyer in downtown Calgary's struggling business community and am making sure word gets out on City Council's actions on health and spending.

I myself drink a lot of water. I'm a long distance runner and consume way more water than the average person to stay hydrated. I'm angry at the thought that I might have to ingest fluoride against my will and that I may be put in a position to have to curb my physical activity to reduce fluoride intake.

The mere thought of forcing the public to consume fluoride through its drinking water is beyond absurd and unethical. What right does anyone have to put such substance into something as necessary as water?

I thank the Councilors who stand against this proposal and hope this gets shut down before it goes any further. I ask that you please respond to my concerns.

Yours truly,

Doris E. Reimer
Barrister & Solicitor
Suite 5100, 150-6th Avenue SW
Calgary, Alberta T2P 3Y7
Direct: 403.261.9001 Fax: 403.398.0220

de Grood, Anna

Subject: FW: fluoride debate

From: Terry Barnhart [<mailto:barnso@hotmail.com>]

Sent: Tuesday, July 09, 2019 1:02 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk ; lorraine.bauer@strathmore.ca; tari.cockx@strathmore.ca; denise.peterson@strathmore.ca; melanie.corbiell@strathmore.ca; bob.sobol@strathmore.ca; jason.montgomery@strathmore.ca; jthackray@strathmore.ca; mchalmers@chestermere.ca; lbold@chestermere.ca; cburness@chestermere.ca; mfoat@chestermere.ca

Subject: [EXT] fluoride debate

Dear Mayor and Counselors,

I'm writing to you in advance of the upcoming public forum on public water fluoridation.

I'm absolutely dumbfounded that the city would be considering such a backward step. There are many reasons for this idea to be defeated, among them are just a few listed below:

-All citizens have a right to safe, clean, **un-medicated** water

-Flouride that is commonly used for water fluoridation is highly toxic as it is an industrial waste by-product generated from waste stacks from the US and China

-When medicine is delivered by water, there is no control of dose or dosage, no matter what concentration. Because of this, small children, babies, and fetuses get a much higher dose. For example, when a baby formula is made from fluoridated water, it can have as much as 200 times the amount of fluoride than a mother's breast milk

-swallowing fluoride delivers it to the entire body- the brain and neurological system, the thyroid, bones, kidneys- potentially causing harm to all organs and systems

These are just a few of the reasons among many others to trash this idea to the dustbin. At the end of the day, it is simply unethical and immoral to put a toxic substance into the public source of **all** citizens water supply that is nearly impossible to opt-out, especially average and below-average income people.

Oh, and one last thing that should surely be of great concern to you is that we've all read about the difficulty the city is having with budgets, with having to cut/reduce services in a number of important areas. It is insanity that we would spend millions to re-introduce an extremely controversial substance into our drinking water.

I am a professional engineer and investment banker in the downtown business community and a voter with many family, friends and business associates,

Thank you in advance for reading this letter and to the councilors that stand against the fluoride proposal.

I would appreciate a response to my concerns that I've shared.

Terry Barnhart

-

de Grood, Anna

Subject: FW: No to Water Fluoridation

From: Paulie [<mailto:pauliedu@shaw.ca>]

Sent: Thursday, July 11, 2019 2:27 PM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] No to Water Fluoridation

Dear Mayor and Council,

I live in Ramsay, the riding of Gian-Carlo Carra.

I love the fact that I can drink water, untainted by fluoride, from my tap.

If I wished to be medicated with fluoride, I would speak to my health care practitioners and not to politicians.

Fluoride is available in drops for those who want it. I do not want it and I value the freedom to choose whether I want fluoride in my water or not

I will not vote for anyone who supports enforced water fluoridation.

Thank you,

Paulie Duhaime



Foothills Interventional Cardiology Service



July 12, 2019

Community and Protectives Services Committee
City of Calgary
800 Macleod Trail S.E
Calgary, Alberta T2P 2M5

Dear Members of Community and Protective Services Committee,

I write regarding community water fluoridation.

Dental decay is [associated with coronary heart disease](#). By reducing dental decay with fluoridation, you have the opportunity to reduce the number of people who need my services because they might be at lower risk of morbidity and mortality related to heart disease.

I encourage you to help improve the health of Calgarians by reinstating community water fluoridation.

Yours sincerely,

A handwritten signature in black ink, appearing to read "M. Traboulsi".

Mouhieddin Traboulsi, MD, FRCPC.
Interventional Cardiologist.
Clinical Professor of Medicine, Cumming School of Medicine
University of Calgary

de Grood, Anna

Subject: FW: [EXT] A VERY IMPORTANT REPORT
Attachments: Statement in Opposition to Water Fluoridation - Calgary 2019 v3.pdf

From: Robert C Dickson [<mailto:drbobdickson@shaw.ca>]
Sent: Friday, July 12, 2019 2:12 AM
To: Hopkins, Robin
Cc: Maria Castro ; City Clerk
Subject: [EXT] A VERY IMPORTANT REPORT

PLEASE NOTE: *This document is intended for Calgary City Council, O'Brien Institute of Public Health, and City of Calgary Community Services only. If you received this document directly from Safe Water Calgary, you are permitted to make and retain a copy of this file for your use for informational purposes only. Safe Water Calgary is the owner of this document and our permission is required before the file is distributed, shared, copied, or any portions of it extracted.*

Good day, Robin. We hope you are enjoying Stampede!

This is the culmination of many works of long hours with an international team. Thanks for your assistance and diligence throughout the process.

Attached is perhaps the most important document you will read this year on the topic of artificial water fluoridation.

We at Safe Water Calgary, along with numerous scientists, toxicologists, doctors, dentists and researchers from across North America and from the UK and Ireland, have been working tirelessly for many weeks to produce scientific evidence to balance the omissions and errors in the mammoth CADTH Report on Fluoridation referenced several times in the February 25, 2019, City Council meeting.

The CADTH report is likely to be the basis of the upcoming OIPH Report that you and Council commissioned in February, and is to be delivered next week and for public consultation July 24.

We respectfully request that you read this report so that you are prepared for and aware of what is to follow prior to and including July 24.

Sincerely,

Dr Bob

Robert C Dickson, MD, CCFP, FCFP
Founder SAFE WATER CALGARY
www.safewatercalgary.com
111-3437-42 St NW
Calgary, AB T3A 2M7
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From: [Safe Water Calgary](#)
To: [Public Submissions](#)
Cc: [Bob Dickson](#)
Subject: [EXT] Submission update and registration
Date: Friday, October 18, 2019 12:10:57 AM
Attachments: [Statement in Opposition to Water Fluoridation - Calgary July 17 2019.pdf](#)

Hello Public Submissions,

I had sent a document for the previous Fluoridation Hearing date of July 24. Still within the deadline I then sent its updated version as some corrections were needed but somehow the updated document was not included on the agenda.

Please see the attached file. Please remove the previous file and replace with the one attached. Please confirm receiving this message.

Dr. Robert Dickson,

Paul Connett, PhD,

and myself are now preregistered to speak.

Would you kindly confirm in writing this is the case and the approximate place we have in the pre-registration list (our number on the list to speak)?

Thank you for all the work you do,

--

Maria Castro

Executive Assistant and Campaign Manager

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AND THE UK**

STATEMENT IN OPPOSITION TO ARTIFICIAL WATER FLUORIDATION

**A Refutation of the CADTH Report
on Community Water Fluoridation of 2019**

**ANALYSIS
AND
SCIENCE
REVIEW –
July 17,
2019**

ERRATA & IMPORTANT UPDATES

This page lists important updates, the errors and their corresponding corrections for the document titled *Statement in Opposition to Water Fluoridation – Calgary 2019 v3 (a)*. This document, *Statement in Opposition to Water Fluoridation – Calgary July 17 2019 (b)*, is the updated version.

Important Addendum		
Appendix /p. 27 //	<p>Addition of Appendix to highlight information from an upcoming Canadian study on Neurotoxicity.</p> <p>The abstract of this study titled <i>Fluoride Exposure during Fetal Development and Childhood IQ: The MIREC Study</i>, by Green et al., was presented by the authors at the Joint Annual Meeting of the International Society of Exposure Science and the International Society for Environmental Epidemiology (ISES-ISEE) held in Ottawa, Canada, las August 26-30, 2018.</p> <p>This study reinforces the findings in Bashash et al. 2017 study – Reference (11) under Neurotoxicity section.</p> <p>See Appendix for the study abstract. The full and updated paper is expected to be published August 2019.</p>	
Section / Page / Line / Footnote	Original (a)	Type of Update (b)
SIGNED / pp. 3,4 //		Addition of signatories
HYPOTHYROIDISM / pp. 11, 12//		Correction of minor text syntax for better clarity and addition of references.
EFFECTIVENESS/ p. 17 /"Decay rates over time in Calgary and Edmonton" Graph /	Graph used on previous file had missing point markers on the image and it was missing its caption with description of graph data.	The corrected version of the graph and its caption is included on this document.
EFFECTIVENESS / p. 20 /"Tooth Decay Trends" Graph/	Previous graph presented data from 1965 to 2000 in reference to DMFT rates, and it is missing caption and reference of source.	Replaced graph with its updated version "Development of DMT-12" which includes data up to year 2014, caption, and source reference.

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PERMITTED USES

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EXECUTIVE SUMMARY ON ARTIFICIAL WATER FLUORIDATION

We at Safe Water Calgary submit this scientific report to the Calgary City Council, City of Calgary Community Services, the O'Brien Institute of Public Health (OIPH), and the city clerk for official record.

This statement is a summary providing documentation of the concerns voiced by Robert Dickson, MD; Hardy Limeback, PhD, DDS; and Paul Connett, PhD in their meetings with Dr. William Ghali and the OIPH in late May and early June 2019, as well as the scientific evidence and citations to critique the massive Canadian Agency for Drugs and Technologies in Health (CADTH) report "Community Water Fluoridation Programs: A Health Technology Assessment" (1) released earlier this year.

The CADTH report supports water fluoridation. We have reviewed major portions of this document. Unfortunately, it is deeply flawed. First and foremost, it has omitted numerous key, peer-reviewed scientific studies identifying the health risks of fluoride and fluoridated water. For the studies it does include, there are numerous statements that misrepresent scientific findings or have factual errors.

The Calgary City Council resolved that OIPH "conduct an objective assessment of the evidence in the extant literature." We do not find that CADTH is objective. Its report is a review rather than original scientific literature and it does not provide a reliable or objective summary of the literature. Our detailed findings on specific portions of the CADTH report are provided in the attached submission.

Based on what we believe is a more objective assessment of the full extant literature, our findings can be summarized in four key areas:

- **Ethics:** Artificial fluoride added to public drinking water for the purpose of reducing cavities is a drug. Adding any drug to water is a direct violation of our citizen's right of informed consent. No other drug, in Canada or anywhere in the world, is allowed in drinking water.
- **Health risks:** There is significant scientific evidence that, among many other identified possible risks:
 - Fluoride is neurotoxic and fluoridation can cause brain damage, including lower IQs in children and higher rates of ADHD
 - Fluoride is an endocrine disruptor, and fluoridation can impair thyroid function.
 - An excess of fluoride causes dental fluorosis and fluoridation significantly contributes to mild, moderate and severe forms. Fluorosis is irreversible - many cases are cosmetically objectionable and may cause damage to the enamel.
 - At least 1% of the population (at least 15,000 people in the Calgary area) would have their health immediately put at risk due to chemical hypersensitivity to fluoride in the water
- **Effectiveness:** Fluoridation is minimally effective. It is generally acknowledged that fluoride's efficacy is mainly topical, not ingested.
- **Cost-effectiveness:** Fluoridation, when considering all factors including health risks, has no economic savings; indeed, it is an enormous cost to society.

Based on the available scientific evidence, we urge CALGARY CITY COUNCIL and the OIPH to reject and oppose artificial water fluoridation.

Signed

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Calgary, AB

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Signed July 10, 2019

With acknowledgment for their contributions to:

Rick North, Volunteer, Safe Water Calgary and Fluoride Action Network

Maria Castro, Executive Assistant, Safe Water Calgary

ETHICS

CADTH argues that fluoridation **“can be ethically justified because its public health benefits are significant enough to override the concerns related to individual choice.”**

But artificial water fluoridation is unethical from several perspectives.

Health Canada (1) defines a drug as any substance used for **“the diagnosis, treatment, mitigation or prevention of a disease, disorder, abnormal physical state, or its symptoms, in human beings or animals.”** Fluoride added to water to prevent cavities, is, therefore, being used as a drug.

Fluoridation violates the rights of all people called for in the UNESCO Declaration on Bioethics and Human Rights (2) which says in Article 6, **“Any preventive, diagnostic and therapeutic medical intervention is only to be carried out with the prior, free and informed consent of the person concerned, based on adequate information.”**

If Calgary approves fluoridation, it is giving city councillors an authority over its citizens – to administer a drug - that not even their own personal physicians possess. Prescribing drugs is not a one-size-fits-all procedure. A doctor prescribes a drug based on an individual’s personal medical history, for a specific dose and a specific period of time. The doctor must also explain its potential benefits and harmful side effects. But it’s still up to the patient to decide to take the drug or not. Fluoridation violates all these safety protocols and our right of informed consent.

As Dr. Arvid Carlsson, 2000 Nobel Prize winner in physiology or medicine, stated, water fluoridation is **“obsolete”** and **“against all modern principles of pharmacology.”** (3)

Several European nations, including France, Germany, Belgium and the Netherlands, have cited the improper and/or unethical nature of adding any drug to drinking water as one reason they have banned fluoridation. (4)

No other drug is allowed to be put in public drinking water, in Canada, or anywhere in the world. There are no good reasons why fluoride should be the only exception.

Adding fluoride to drinking water because some people may get cavities makes no more sense than adding aspirin because some people have headaches or adding a statin drug because some people have high cholesterol. Virtually all drugs have harmful side effects that can result from higher doses and/or the age of exposure of those drinking it. With fluoridation, there is no control whatsoever over who ingests the drug and how much they drink, making it especially risky to vulnerable sub-populations like pregnant women, children and those who consume a lot of water such as diabetes and kidney patients, athletes and manual laborers.

Moreover, people are exposed to fluoride from numerous sources including food, pesticide residues, dental products (particularly toothpaste swallowed by young children), medications, and proximity to fluoride-emitting industries. All add to the toxic load.

CADTH's ethics claim is built on the premise that its benefits outweigh its risks. But this argument is totally unsupported by the scientific evidence. First, fluoridation's benefits are minimal, at best less than one cavity reduction per child in permanent teeth (see Effectiveness section for documentation), with no credible documentation that it significantly helps socioeconomically disadvantaged children or adults.

Second, the chemical used to fluoridate most water, fluorosilicic acid, is, according to water regulation agency NSF International (5), legally allowed to contain low levels of lead and arsenic. Health Canada cites arsenic as a carcinogen and lead as a neurotoxin that can lower IQ. The U.S. EPA has determined there are no safe levels of either. Drinking water may already naturally contain these contaminants, but it is clearly unethical to knowingly add them to drinking water.

Third, no one questions that ingested fluoride can be toxic. The only question that remains is how toxic it is at levels in fluoridated water. As shown in the Health Risk section, there is substantial evidence that it poses serious threats to our health. Even if fluoridation was two or three times as effective, it would not justify putting so many people's health at risk from so many conditions. Once fluoride is ingested, teeth, while very important, are relegated to only a minor role in the overall health picture.

Finally, fluoridation is also a social justice concern. Low income and minority populations are more susceptible to kidney disease and diabetes, both of which, according to the NRC Report (pp. 303, 260), can be exacerbated by ingested fluoride (6). They typically can't afford bottled unfluoridated water or expensive filters to avoid it, and are at higher risk of adverse effects, whether they realize it or not. This cannot be justified.

HEALTH RISKS

As stated several times before the Calgary city council, the OIPH committee is relying heavily on the 2019 CADTH report. This review was favorable toward fluoridation.

From the start, this creates a bias. To provide balance concisely, this statement from Safe Water Calgary won't address each possible health risk. Instead, it will concentrate on just a few cited by CADTH and explore its biases and omissions in depth.

CADTH relied heavily upon Australia's National Health and Medical Research Council (NHMRC) 2016 (1) report which was an update of NHMRC's 2007 report (2). NHMRC is part of the Australian government and has endorsed fluoridation since 1958. It cannot be considered balanced and objective regarding health risks. The 2007 NHMRC report didn't review any animal or biochemical studies or clinical trials. It only examined studies in English. It had more pages reviewing teeth (106) than all other tissues and organs combined. There was less than one page each for neurotoxicity and the endocrine system. There were actually over three times as many citations from dental journals than non-dental journals.

The updated NHMRC report's study of health effects, covering October 2006 to October 2014, had similar limitations. It also excluded all animal and biochemical studies. It only compared water with fluoride compared to unfluoridated water, or water with fluoride at one level compared to water with fluoride at a different level. It excluded all studies measuring fluoride blood or urine levels, which are typically more relevant measurements of fluoride exposure than water concentrations.

CADTH omitted the U.S. National Research Council's (NRC) 2006 report "Fluoride in Drinking Water" (3), considered the most comprehensive and authoritative review ever conducted on fluoride's toxicity. This 507-page volume took three years to complete and reviewed over 1100 human, animal and cellular studies from the previous 50 years. It was compiled by a well-balanced blue-ribbon committee of 12 leading North American scientists including fluoridation advocates, opponents and others who hadn't taken a position. Hardy Limeback, PhD, DDS, the only Canadian on the committee, is the former head of preventive dentistry at the University of Toronto and former president of the Canadian Association for Dental Research.

While the NRC committee wasn't charged with evaluating water fluoridation itself, its findings had multiple relevant applications. It also identified gaps in knowledge and called for more research on fluoride's connection to numerous harmful health conditions. This directly contradicted the certainty of U.S. government authorities since the 1950's that fluoridation had been demonstrated safe, which started the spread of fluoridation to Canada and other nations.

One more very important note must be added. Fluoridation supporters routinely dismiss studies measuring harm from water that has higher fluoride levels than recommended artificial fluoridation rates of 0.7 – 1.0 parts per million. But standard toxicological risk assessment practice, as noted in the reference book A Small Dose of Toxicology (p. 260) (4), always includes a margin of safety factor of at least 10 to account for human variability, protecting more vulnerable sub-populations at higher risk of harm than the average. For example, numerous studies have found fluoride's harm at 2 ppm. To protect everyone in a population, the level of fluoride must be reduced to less than 0.2 ppm.

This would, and should, effectively end artificial water fluoridation.

NEUROTOXICITY

CADTH concluded that **“Overall, there was limited evidence for no association between water fluoridation at the current Canadian levels and IQ or cognitive function.”**

The ambiguous wording of this statement alone provides little reassurance that fluoridation is not neurotoxic to the fetus and children. More importantly, it ignores numerous high quality studies – human, animal and cellular – that have repeatedly demonstrated fluoride’s neurotoxicity, including at levels of exposure caused by water fluoridation in Canada.

CADTH, NHMRC and other fluoridation advocates commonly cite one study, Broadbent et al. 2015 ([1](#)), to support their claim that fluoridation doesn’t lower IQs in children. Broadbent, a dentist and fluoridation advocate, found no difference in the IQs of children and adults who spent their first 3 to 5 years of life in fluoridated vs. non-fluoridated areas of Dunedin, New Zealand. NHMRC/CADTH rates the study “High,” the only neurotoxicology study cited to achieve this designation.

But this rating is completely unjustified because it fails to account for several major weaknesses (Grandjean/Choi 2015 ([2](#)) and Osmunson et al. 2016 ([3](#))).

- The study’s small sample size of non-water-fluoridated subjects (only 99 compared to 891 water-fluoridated subjects) means it statistically has low ability to detect any differences in IQ.
- Even more importantly, 139 subjects took fluoride tablets (he doesn’t say which). Since fluoride tablets are only recommended for children living without water fluoridation, it’s likely a high percentage of the 99 living in the non-fluoridated areas took them. A 1996 New Zealand study, Guha-Chowdhury et al., ([4](#)) found that children taking fluoride tablets in areas without fluoridation had as much or even more total fluoride intake as those in fluoridated areas not taking fluoride tablets. The confounding factor of the fluoride tablets renders the study, and its results, virtually meaningless.
- As Broadbent himself acknowledged, studies have shown the average IQ of rural dwellers in New Zealand is lower to begin with than that of those who dwell in urban areas, possibly because fewer education opportunities may be available outside major cities. Nearly all of the non-water-fluoridated subjects lived outside the city.
- Even though Broadbent is critical of other studies that don’t account for several possible confounding factors, his study only controlled for four such factors and failed to account for the neurotoxins lead and manganese, both of which may have been elevated in the main non-fluoridated town.

CADTH also misrepresented the findings of at least one neurotoxicity study, Choi et al. 2014 ([5](#)), which found a statistically significant correlation between dental fluorosis, a biomarker of excess fluoride ingestion, and impaired cognitive function. The authors concluded that the study **“supports the notion that fluoride in drinking water may produce developmental neurotoxicity.”**

But CADTH said **“Beta coefficient showed no significant correlation between water fluoridation and cognitive function measurements”** and **“There were no statistically significant differences between fluoride levels for any subtests of cognitive function measurements.”**

CADTH's wording is technically true because it referred to results for water fluoridation levels, but ignores the more important results for fluorosis, which is a better indicator of early childhood exposures. CADTH's description of the study results thereby gives the opposite conclusion as the study's authors. This is misrepresentation at its worst.

CADTH's most striking bias is its omission of numerous strong, qualifying studies that showed significant neurotoxicity, including several conducted by Canadian researchers:

The 2006 NRC review (p. 222) stated unequivocally that **"It is apparent that fluorides have the ability to interfere with the functions of the brain"** and that, based on their review of five studies all showing that increased fluoride levels correlated with lowered IQs, the consistency of results were **"significant enough to warrant additional research on the effects of fluoride on intelligence."**

Xiang et al. 2003 (6): The strongest evidence NRC cited (p. 205) was this study that measured urinary fluoride levels, considered a more accurate indicator than water fluoride levels. Xiang found that every one part per million increase in urine fluoride levels lowered IQs by 5 points for both boys and girls. This dose-response relationship is much stronger than simply comparing two villages. Possible confounding factors such as lead, arsenic, parental education levels, SES levels, etc. were accounted for, and it was concluded that the difference in fluoride levels could be attributed to drinking water.

Since the 2006 NRC review, over 100 animal and over 50 human epidemiology studies have been identified (7) that overwhelmingly confirm neurotoxicity and lowered IQs. Several of the studies in animals and humans have specifically found that fetal exposure causes neurotoxic harm including lowered IQ, so exposure to pregnant women is at least as much a concern as exposure to children. The findings have been remarkably consistent with only a handful not finding an effect, Broadbent being one of them. The most important studies since the NRC 2006 report are:

Choi et al. 2012 (8): This Harvard-based meta-analysis found that children ingesting higher levels of fluoride tested an average 7 IQ points lower in 26 out of 27 studies. Most had higher fluoride concentrations than in Canadian fluoridated water, but many had total exposures to fluoride no more than what millions of Canadians receive. One co-author, Phillipe Grandjean, MD, PhD, is a consultant to the Danish National Board of Health, co-editor of Environmental Health, and author of over 500 scientific papers. One of the most highly respected research scientists on environmental toxins in the world, he concluded **"Fluoride seems to fit in with lead, mercury, and other poisons that cause chemical brain drain."** (9)

Malin/Till 2015 (10): The authors, psychologists Christine Till and Ashley Malin at Toronto's York University, found that U.S. states with a higher portion of artificially fluoridated water had a higher prevalence of ADHD. This finding was consistent across six different years examined, starting in 1992. The trend held up even after controlling for socioeconomic status, which can affect ADHD rates.

Bashash et al. 2017 (11): This international longitudinal study, one of the most robust ever done, followed a cohort of women in Mexico. It was funded by the U.S. National Institutes of Health and led by researchers at the University of Toronto. Reinforcing the 2003 Xiang study, it found that every one part per million in fluoride in pregnant women's urine was associated with a reduction of their children's IQ by an average 5-6 points.

Petition to the EPA 2017 (12): Several organizations and individuals filed a petition to the EPA to end artificial water fluoridation, based mainly on its neurotoxicity. The petition's massive documentation included that fluoride caused harm in 112 out of 115 animal studies and lowered IQ in 57 out of 61 studies, nearly all of which were statistically significant, and some at exposure levels commonly reached in fluoridated parts of Canada and the U.S. EPA denied the petition, leading to a lawsuit that will be tried in U.S. federal court in late 2019 or early 2020.

Till et al. 2018 (13): This study found that among 1,566 pregnant women in Canada, fluoride levels in urine were almost two times higher for women who lived in regions where the drinking water was artificially fluoridated compared to pregnant women in regions with non-fluoridated water. Its findings directly supported the seriousness of the 2017 Bashash study. The range of urine fluoride levels in women in fluoridated parts of Canada were virtually the same as those in the women in the Bashash study.

This same group has a paper in press that found a 4-6 point drop for every 1 mg/L increase in water fluoridation concentration. This suggests that fluoridated water in Canada at 0.7 mg/L could cause an average loss of 3-4 IQ points.

Bashash et al. 2018 (14): This study, also led by University of Toronto researchers, using the same cohort of women and children in Mexico, found that higher levels of fluoride exposure during pregnancy were associated with global measures of ADHD and more symptoms of inattention in their children, adding further evidence to the findings of the Malin/Till 2015 study in the U.S.

HYPOTHYROIDISM

Hypothyroidism (low thyroid function) causes much harm, including fatigue, memory problems, obesity, muscle and joint pain, depression and miscarriages and low birth rate for pregnant women. Its prevalence is very high - according to the Thyroid Foundation of Canada (1), 1 in 50 Canadians, and is 4 to 7 times more common in women. Drugs used to treat hypothyroidism are some of the most-prescribed medicines in the country.

In pregnant women, both clinical and subclinical (non-symptomatic) hypothyroidism may also lead to reduced IQ's in their children, and many cases go undiagnosed. Figures calculated from the 2006 NRC report (Klein et al, p. 263) show that a 140-pound pregnant woman with iodine deficiency would only have to drink 0.9 liters per day of fluoridated (0.7 ppm) water to be at increased risk of impaired thyroid function.

Numerous human, animal and epidemiological studies have found fluoride decreases thyroid function. In the 1940's and 1950's, fluoride was used as a treatment for *hyper*thyroidism (over-active thyroid).

Based on studies done from 1960 to 2005, the NRC report conclusively determined fluoride was an endocrine disruptor and **"The chief endocrine effects of fluoride . . . include decreased thyroid function."** (p. 8)

But even though scientific data linking fluoride ingestion with hypothyroidism is extensive, CADTH's summary on the subject was inconclusive: **"Overall, there was insufficient evidence for an association between water fluoridation at the current Canadian levels and thyroid function."** Unfortunately, CADTH's errors and omissions, which led to this statement, were especially glaring for this subject.

First and foremost, it omitted the major 2018 study Malin et al. (2) representing 6.9 million Canadians that found moderate to severely iodine-deficient adults (nearly 18% of the population) with higher fluoride levels had a greater risk of hypothyroidism. The study's lead scientist, Ashley Malin, is a researcher at the Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai in New York City.

She said **"I have grave concerns about the health effects of fluoride exposure . . . And not just from my study but the other studies that have come out in recent years . . . We're talking about potentially [more than] a million people at risk of an underactive thyroid due to fluoride exposure."** (Environmental Health News - Oct. 10, 2018 (3))

It also omitted a systematic review of 10 studies, Chaitnaya et al. 2018 (4), that **"suggests a positive correlation between excess fluoride and hypothyroidism"** and another 2018 study, Kumar et al. (5), that determined a **"Positive correlation exists between (dental) fluorosis and thyroid functional activity."**

CADTH also falsely reported the findings of two studies and made an incorrect statement on another:

For the 2018 Kheradpisheh et al. study (6), CADTH said **"Multivariable logistic regression analysis revealed no relationship between drinking water fluoride and hypothyroidism."** The author, however,

came to the opposite conclusion: **“The value of TSH hormone (greater impairment of thyroid function) increased by increasing water fluoride concentration”** and **“To help our thyroid function, we must consider limiting fluoride exposure and adding iodine to our diet.”**

For the 2014 Singh et al. study (7), CADTH said **“There was no significant difference in any of the thyroid function tests between groups.”** The authors’ conclusion tells a different story: **“The chronic over exposure of fluoride in drinking water causes growth disturbances particularly evident in adolescence and they result in thyroid dysfunction as studied by various authors . . . The results of this study question the validity of the fluoridation of drinking water, milk, fruit juices, and salt by public health authorities . . .”**

For the 2015 Peckham study (8), CADTH said **“only data from West Midlands (fluoridated) and Greater Manchester (non-fluoridated) of England were selected, instead of from the whole country.”** This is incorrect. The study had two models, one comparing West Midlands and Greater Manchester, and one that covered all of England. The study examined data from nearly every medical practice in the country. Peckham said **“Hypothyroidism is a major health concern and . . . fluoride exposure should be considered as a contributing factor. The findings of the study raise particular concerns about the validity of community fluoridation as a safe public health measure.”**

The established link between higher fluoride levels and increased hypothyroidism is highly significant in its own right. *But when the connection between hypothyroidism in pregnant women and lower IQ’s in their children is factored in, it becomes doubly important.*

DENTAL FLUOROSIS

Dental fluorosis is damaged tooth enamel, a visible sign of overexposure and toxicity, caused by an excess of swallowed fluoride by children up to 8 years of age. It comes from fluoridated water, food and drinks processed with it (including infant formula), food grown with fluoride pesticides, swallowed fluoridated toothpaste, fluoride tablets and other sources.

“Very mild” or “mild” fluorosis produces white streaks or mottling on up to 50% of the tooth surface. “Moderate” covers 50% to 100% of the entire surface with a white chalky appearance and/or yellow or brown staining. “Severe”, in addition to discoloration, can pit or crumble tooth enamel. Moderate and severe levels can actually increase cavity rates. All degrees of fluorosis are permanent.

CADTH concluded, **“There was a significantly higher risk of developing dental fluorosis in high fluoridated areas compared with in low fluoridated areas. The additional studies identified from the updated literature search also found that the prevalence of dental fluorosis and its severity increased with increased water fluoride levels.”**

NRC determined that severe fluorosis is both an adverse health effect and adversely harms appearance, and that some people would also find moderate fluorosis on front teeth cosmetically objectionable. NRC also estimated that fluoridated water at 1.0 ppm contributed 41% - 83% of all fluoride ingestion, depending upon the age group. At 0.7 ppm, the level of many fluoridated cities now, it may be slightly less, and other sources could be increased. But even so, NRC concluded, **“water will still be the most significant source of exposure.”** (pp. 60-68)

Fluoridation proponents often claim that fluoridation only causes very mild or mild fluorosis, not moderate or severe. While it’s accurate that fluoridation alone is unlikely to cause moderate or severe levels, there is no doubt it’s a major contributing factor to both prevalence and all levels of severity.

The U.S. has a much higher rate of fluoridation than Canada at 74%, and consequently, a much more serious fluorosis problem. As fluoridation rates have continued to increase in the U.S. over recent decades, overall fluorosis prevalence and severity in 12-15 year-olds has grown significantly worse.

Year	Prevalence	Percent Moderate/Severe
1986-1987	21.8%	1.2%
1999-2004	41.1%	3.7%
2011-2012	64.8%	30.4%

Two recent studies, both using highly respected NHANES statistics, have chronicled this trend. The figures above are from Neurath et al. 2019 (1) and similar increases for 16-17 year-olds were cited by Wiener et al.. 2018 (2). The U.S. CDC recently released a highly unusual paper (3) questioning its own NHANES figures on the sharp increase in moderate/severe in the 2011-2012 study period, which is under review. However, there can be no question that:

1. Fluorosis is a serious problem in the U.S.
2. Water fluoridation is a major contributor to this problem.
3. If Canada increases fluoridation, its fluorosis prevalence and severity rates will also increase.

Although one survey in Canada reported very low rates of moderate and severe fluorosis, others have found rates at least as high as the 1999-2004 data in the U.S. Also, most surveys in Canada greatly underestimate the severity because they only count the top front teeth. Neurath et al. 2019 (4) found that this method results in a halving of the rates of mild, moderate and severe fluorosis.

Fluorosis on the front teeth can cause significant embarrassment and anxiety over an individual's appearance, lowering self-esteem. Although fluorosis is permanent, it can be treated professionally, but at a very high cost. According to the U.S. Consumer Guide to Dentistry (5), lower-cost treatments cost between (US dollars) \$250 to \$1,500 per tooth and may only last 5-7 years. Porcelain veneers cost between \$925 to \$2,500 per tooth and may only last 10-15 years. Treatments are often not covered by insurance.

The Cochrane Collaboration (6) estimated that for a fluoride level of 0.7 ppm, the percentage of participants with fluorosis of aesthetic concern was approximately 12%.

Several published Canadian studies, none reported by CADTH, have shown that substantial percentages of people view fluorosis as aesthetically objectionable:

Study	Fluoridated Communities	Percent of Population Perceiving Fluorosis as Aesthetically Objectionable
Clark/Berkowitz (1997) (7)	British Columbia cities	Up to 4%
Brothwel/Limeback (1999) (8)	Ontario cities	19%
Leake (2002) (9)	Toronto	14%
Ito (2007) (10)	Brampton	9%

CHEMICAL SENSITIVITIES/IMMUNE AND INFLAMMATORY RESPONSES

CADTH addressed chemical sensitivities in a very limited way, covering only gastric discomfort, musculoskeletal pain and headaches. It only cited two studies for each of the three health problems. All six of the studies found that fluoride levels in water 1.5 ppm or greater increased the prevalence of the harmful effects. But CADTH determined that their quality was low and provided insufficient evidence for an association between any of them and fluoridation in Canada. CADTH, however, did not include any of the scientific studies cited below.

In one way, fluoride in artificially fluoridated water is no different than other drugs, chemicals, or various foods, such as peanuts or shell fish. There is a subset of the population that will have adverse reactions upon swallowing them. In some cases, even being exposed topically, such as in fluoridated toothpaste or mouthwash, will produce harmful effects.

There are biological differences between allergic reactions and intolerance, but many of the symptoms are the same. For the purposes of this discussion, the crux of the matter is any adverse reaction, regardless of its category.

These adverse reactions can appear as a variety of symptoms, including nausea, vomiting, abdominal pain, fatigue, headaches, itching, rashes, eczema, mouth ulcers, vision problems, numbness, muscular weakness, spinal pain and others.

George Waldbott, MD was a pioneering allergy specialist and vice president of the American College of Allergists. His textbook, Health Effects of Environmental Pollutants, was a standard in universities in the United States and abroad. He also published the first medical report on cigarette smoking causing emphysema in 1953. In all, he wrote several books and over 200 scientific articles. His work on fluoride is cited more than 30 times in PubMed and a very brief summary is available. ([1](#))

In his clinical practice in Michigan in the 1950's, Waldbott noticed that dozens of his patients suffering from the symptoms noted above were immediately relieved when they stopped drinking fluoridated water. He then ran blinded tests on many of them in which the patients were given water without knowing if it was fluoridated or not. The symptoms recurred only if they were given fluoridated water.

Another study, a 12-year project in New Jersey completed in 1961 by Reuben Feltman and George Kosel ([2](#)), had the same results. Working with pregnant women and their children, they concluded **"One percent of our cases reacted adversely to the fluoride. It was definitely established that the fluoride and not the binder was the causative agent . . . (the harmful dermatologic, gastrointestinal and neurological symptoms) have all occurred with the use of fluoride and disappeared upon the use of placebo tablets, only to recur when the fluoride tablet was, unknowingly to the patient, given again."**

Finally, in a double-blind clinical study in the Netherlands, Grimbergen 1974 ([3](#)), subjects suffering gastrointestinal problems, migraine-like headaches, joint pains and several other harmful conditions drinking fluoridated water also had their symptoms disappear when they switched to unfluoridated water. The Grimbergen study, based upon the work of Dr. Hans Moolenburgh and his team of 12

physicians and supporting scientists, played a significant role in the Netherlands' decision to ban fluoridation in 1976.

Since these studies, the research has continued to accelerate showing fluoride's harmful effects. Below are just three recent examples, with direct quotes from the studies' authors:

Gutowska et al. 2015 (4), **"It is well known that exposure to fluorides lead to an increased ROS production and enhances the inflammatory reactions."** (ROS stands for reactive oxygen species, more commonly known as oxidative stress, which can cause significant damage to cell structures.)

Follin-Arbelet et al. 2016 (5), **". . . the association between inflammatory bowel disease (IBD) and oral hygiene has been noticed before . . . exposure to fluoride seems indirectly associated with higher incidence of IBD. Fluoride toxicology and epidemiology documents frequent unspecific chronic gastrointestinal symptoms and intestinal inflammation."**

Ma et al. 2017 (6) **"The results showed that inorganic arsenic and/or fluoride induced significant increase in endothelial cell apoptosis (cell death) and inflammation . . ."**

In contrast to CADTH, the 2006 NRC report cited the work of Waldbott, Grimbergen and Feltman/Kosel and called for more research on fluoride's effects at differing fluoridated water levels. However, there already was enough scientific evidence for the authors to assert **"There is no question that fluoride can affect the cells involved in providing immune responses."** (p. 295)

There is solid scientific evidence that artificially fluoridated water will adversely affect 1% of Calgary's population. At least 15,000 people can be expected to suffer harmful reactions from chemical sensitivities alone.

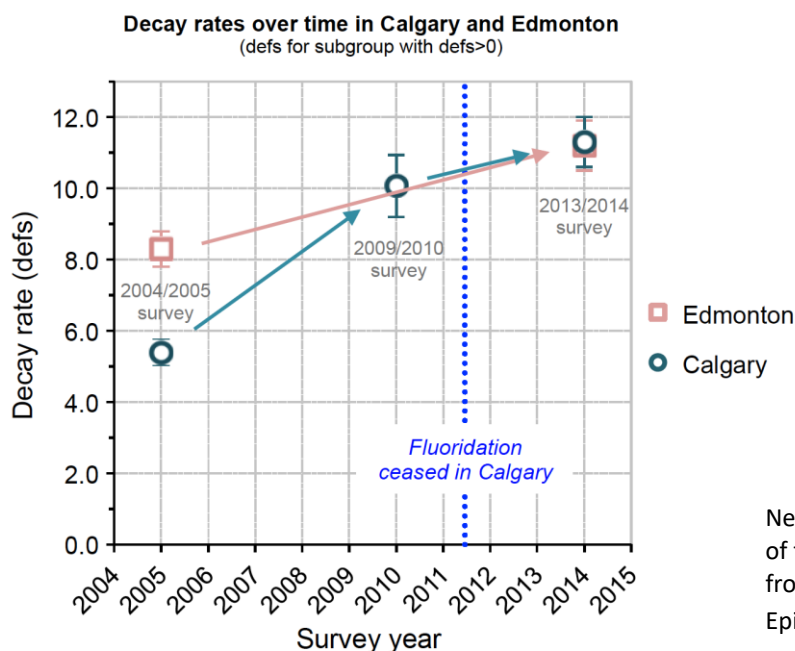
EFFECTIVENESS

According to CADTH, there was consistent evidence showing an association between fluoridation and reducing cavity rates in both primary and permanent teeth. There was insufficient evidence from studies on changes in cavity rates after a city had stopped fluoridating and no firm conclusions could be drawn.

One such study, McLaren et al. 2016 (1) has particular relevance to Calgary, which ended fluoridation in 2011, and Edmonton, which continued fluoridation, as a comparison. The study concluded **“findings observed for primary teeth were consistent with an adverse effect of fluoridation cessation on children's tooth decay”** and was publicized widely in the media. Fluoridation supporters used the study as a scientific justification for why Calgary and other cities should be fluoridated.

However, upon closer inspection cited in a subsequent study, Neurath et al. 2017 (2), critical data omitted by McLaren actually supported the conclusion that stopping fluoridation in Calgary had no effect on cavity rates.

McLaren's study only used data from two dental surveys in Calgary and Edmonton, one in 2004/2005, many years before Calgary stopped fluoridating in 2011, and the other from about 3 years after cessation. However, the study omitted a survey in Calgary from 2009/2010, just 1.5 years before cessation. When the cavity rate for primary teeth from this omitted survey is combined with the data used by McLaren, it is clear that decay had been increasing in Calgary at virtually the same rate before cessation as after cessation:



Neurath C, Beck JS, Limeback H, et al. Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada. Community Dent Oral Epidemiol. 2017;00:1–7

FIGURE 2 Dental decay rates for subgroup of those children with at least one defs (defs>0). Data for 2004/2005 and 2013/2014 from CDOE paper. Data for 2009/2010 from IJEH paper, but converted from deft to defs using conversion method described in text. Error bars indicate 95% CIs.

Edmonton, which had remained fluoridated, also experienced an increase in decay over the study period. Therefore, instead of providing evidence that stopping fluoridation caused an increase in decay, the full data show that when each city was fluoridated decay was increasing despite fluoridation. Factors other than fluoridation status must have been the cause of the increases in both cities. Moreover, the McLaren study did not control for confounding factors in either city that are commonly measured: socio-economic status, diet, ethnicity, dental care, dental hygiene practices and many others, a major weakness.

The media extensively publicized McLaren's original study. But it widely ignored the peer-reviewed Neurath et al. study, published in the same journal as McLaren's study, that documented that fluoridation cessation had virtually no effect on Calgary's cavity rates.

As CADTH reported, a number of studies have shown decreased cavity rates in fluoridated water areas. They have typically been expressed by percentage, but almost always omit actual number of cavities. When these figures are reported, fluoridation's minimal effectiveness becomes clearer.

Hardy Limeback, PhD, DDS, former head of preventive dentistry at the University of Toronto and former president of the Canadian Association for Dental Research, prepared the analysis below, as excerpted from his textbook, Comprehensive Preventive Dentistry.

Summary of Studies on Fluoridation Excerpted from Hardy Limeback, PhD, DDS 2012 textbook "Comprehensive Preventive Dentistry"				
Study Author	Country	Number of Subjects	Age of Subjects (years)	Surfaces Saved with optimum fluoridation
Heller et al. 1997	US	18,755	12	0.5*
Brunelle and Carlos 1990	US	16,498	12	0.5*
Angelillo et al. 1990	Italy	643	12	0.6
Selwitz et al. 1998	US	495	8-16	1.2
Ismail 1991	Canada	219	10-12	0.7
Clark 1991	Canada	1131	6-14	0.8
Slade et al. 1995	Australia	9,690 vs. 10,195	5-15	0.2
Jackson et al. 1995	US	243	7-14	1.2*
Kumar et al. 1998	US	1,493	7-14	-0.2
Armfield and Spencer 2004	Australia	5129	4-9	1.5
		4803	10-15	NS
Komarek et al. 2005	Belgium	4468	7-12	NS
Spencer et al. 2008	Australia	8183 (SA)	5-15	NS
Nyvad et al. 2009	Lithuania	300	12-15	NS
Ekstrand 2010	Denmark	191 municipalities	15	1.0-2.0
Armfield 2010	Australia	128,990	5-15	0.5

*Difference was statistically significant.

The Cochrane Collaboration (3) is considered the gold standard of evaluating effectiveness. Its 2015 analysis found a 26% DMFT (decayed, missing, filled permanent teeth) reduction in fluoridated areas. The U.S. CDC (4) cites a similar 25% reduction. Cochrane also cited **“insufficient evidence”** that **“fluoridation results in a change of disparities in caries levels across socio-economic status.”**

According to the 2007-2009 Canadian Health Measures Study, the latest figures available, the average DMFT rate for Canadian 6-19 year-olds is 3 cavities. When the percentage decreases for studies showing effectiveness above are applied, most come out to less than one cavity per child difference.

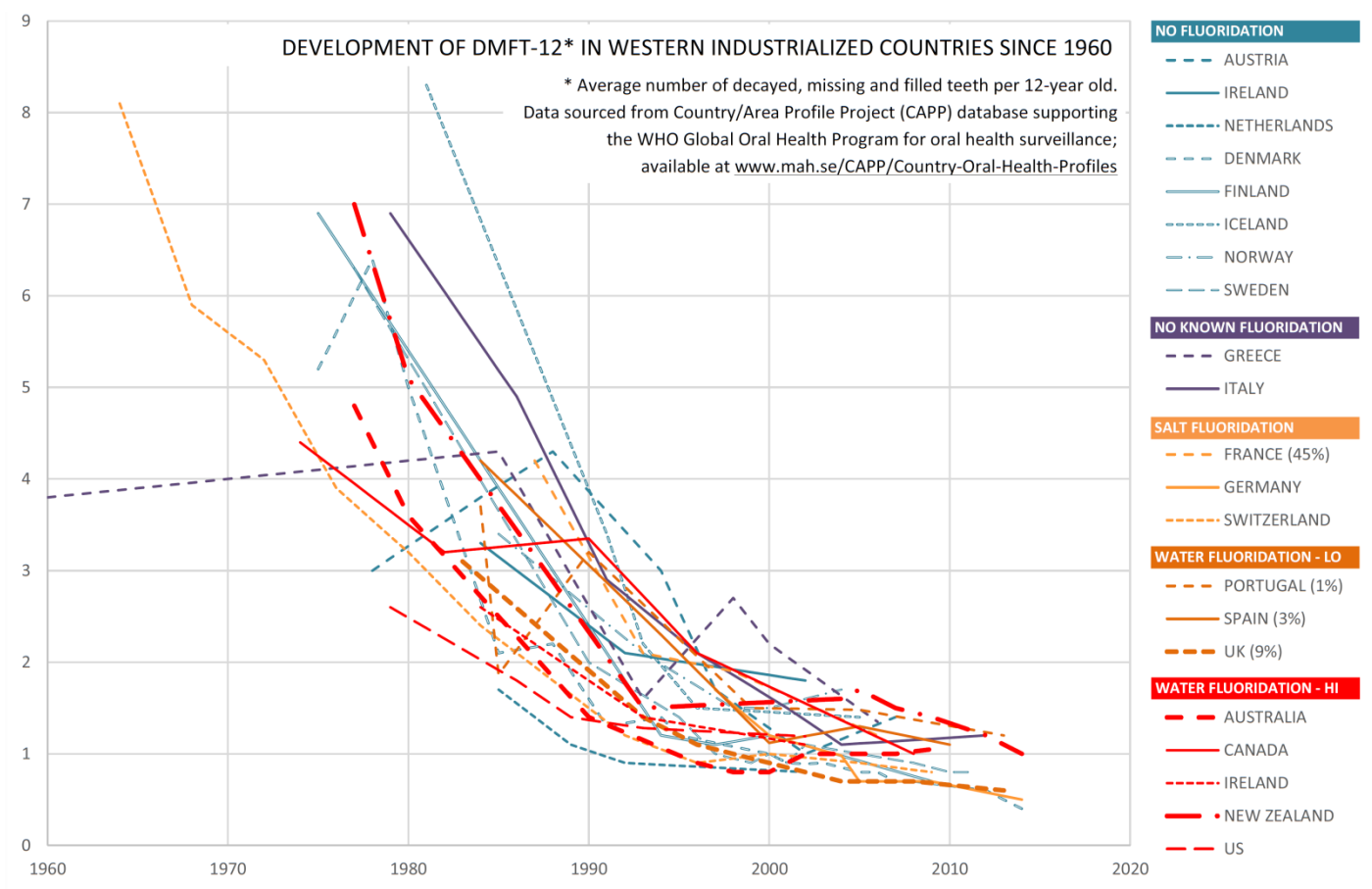
The Iowa Fluoride Study (IFS), funded by the U.S. National Institutes of Health, is the most comprehensive, ongoing research project in the U.S. - the only study in the U.S. or Canada measuring all sources of fluoride ingestion. CADTH, however, did not include any studies from IFS.

The most recent relevant study from IFS, Curtis et al. 2018 (5) found no significant correlation between ingested fluoride and cavity reduction, further validating a 2009 study from IFS, Warren et al. (6) that stated: **“Achieving a caries-free status may have relatively little to do with fluoride intake (emphasis in the original) . . . recommending an ‘optimal’ fluoride intake is problematic.”**

For adults, the strongest studies, Slade et al. 2013 (7), Slade et al. 2018 (8) and Do et al. 2017 (9), all found that fluoridation at most resulted in a one cavity reduction over a 40-year period. Cochrane stated, **““We did not identify any evidence . . . to determine the effectiveness of water fluoridation for preventing caries in adults.”**

Indeed, there is a consensus, including the CDC, NRC, Cochrane Collaboration, Iowa Fluoride Study and others that fluoride’s effectiveness is mainly topical (10), not from ingestion. There is little robust scientific evidence that swallowing fluoride provides any benefit over and above more appropriate topical applications.

Finally, World Health Organization data (11) shows cavity rates in children (age 12) have dropped as much in nations that don’t fluoridate (darker solid lines) as in nations that do (red/yellow dotted lines). Obviously, many individual and nationwide factors affect cavity rates, including diet, personal dental habits, socioeconomic status and professional dental care. Still, the WHO data is consistent with independent studies showing minimal effectiveness of fluoridation.



Development of DMFT-12 1960 – 2014. Percentages in parenthesis show the part of population covered by fluoridation measures, where reported by [Cheng et al. \(2007\)](#).

Source: Affidavit of Michael Lusk, affirmed on 27 April 2017, filed in *Lusk v. Tong and Commonwealth Ombudsman*, Federal Circuit Court of Australia, Sydney Registry, File No.1354/2017.

COST EFFECTIVENESS

CADTH determined that fluoridating the water was significantly cost effective: **“For a large urban municipality, the budget impact of CWF introduction compared with CWF non-implementation was found to generate net savings of more than \$525 million over twenty years.”**

CADTH’s analysis identified three main costs associated with not fluoridating water - increased dental bills, loss of productivity for time spent at the dentist’s office, and transportation costs to and from treatment. The only costs considered for fluoridating water were construction of fluoridation facilities and ongoing operation and maintenance.

It cited five reviews, all of which found that fluoridation was cost effective. It omitted the Ko/Thiessen 2015 analysis (1) which found no cost savings from fluoridation, rebutting the 2001 Griffin et al. study (2) which CADTH cited.

Moreover, the selection of studies used to compute the cost savings are highly questionable and we believe far too high. CADTH appears to have relied mainly on one study, Arrow 2015 (3), while omitting others cited in CADTH showing much less effectiveness, such as Lee/Han 2015 (4) and Broffitt et al.. 2013 (5). If anything, Slade 2013 (6), Do 2017 (7) and Slade 2018 (8) show at most one tooth saved from dental decay after 40 years of fluoridation. So, although this statement uses CADTH’s \$525 million figure in the bottom line analysis for comparison purposes (adjusted to \$1.2 billion for Calgary’s population), it is not a figure we are in agreement with.

CADTH’s conclusions on fluoridation’s cost-effectiveness are invalid from several other perspectives.

A major flaw of the entire report is that it ignores the huge health costs of fluoridation. Indeed, none of the five reviews that CADTH cited included these costs. Examining just two harms out of many, dental fluorosis and loss of IQ, puts this in proper perspective.

The losses from fluoridation from neurotoxicity alone are enormous.

As stated in the Neurotoxicity statement, the 2017 Bashash et al. study (9), funded by the U.S. National Institute of Health and led by the University of Toronto, found that every one part per million in fluoride in pregnant women’s urine was associated with a reduction of their children’s IQ by an average 5-6 points. This was reinforced by a 2018 study, Till et al. (10) that determined that fluoride levels in urine in Canadian pregnant women were almost twice as high for those who lived in regions where the water was artificially fluoridated.

A review by Bellinger (11) found that roughly \$18,000 (USD) in lifetime earnings is lost for every 1 point reduction in IQ. This equates to approximately \$23,000 CD at current exchange rates. (All figures below in Canadian dollars)

Estimates for Calgary’s population vary. For these benefit and cost estimates, 1.5 million (figuring population growth from the 2016 Census – Statistics Canada, the same source as CADTH) will be used. This Census is also the source for other figures.

CADTH based its conclusions on an urban population of 675,429. Calgary's 1.5 million population is 2.22 times this number. Therefore, its estimated benefits of net financial gains, \$525 million x 2.22 = approximately \$1.2 billion.

Assuming a conservative estimate of 1 IQ point loss per person in fluoridated Calgary (individuals vary – many would have no IQ loss, others could lose many IQ points), for an estimated working lifetime of 45 years, this equates ($\$23,000 \div 45$) to an approximate \$500 earnings loss per year, or \$10,000 loss per person for the 20 year period that CADTH used.

Calgary's working population can be approximated from ages 20 to 64. The Census total of that age group can be estimated at 960,000 people. Multiplying by the \$10,000 loss of income per person, this comes to a total loss just from IQ reduction of approximately \$9.6 billion.

For dental fluorosis, Hardy Limeback, PhD, DDS, former head of preventive dentistry at the University of Toronto and former president of the Canadian Association for Dental Research, prepared the analysis below on the treatment costs if Calgary fluoridates.

The cost of treating dental fluorosis if Calgary re-instates fluoridation

1. In 40 yrs., 650,000 children under age 6 will be exposed to fluoridated water
2. 1 in 10 (65,000) will end up with objectionable dental fluorosis
3. If half (32,500) get microabrasion and or bleaching, this will cost \$32.5 - \$50 million
4. If 40% (26,000) get bleaching/microabrasion PLUS some cosmetic fillings, this will cost up to \$75 million
5. If the remaining 10% elect to have porcelain veneers the cost is up to \$130 million

Total cost to treat dental fluorosis = \$255 million

6. If one tooth is saved from dental decay/person after 40 years and it costs \$175 to repair, then the dental cost savings is 1.5 M X \$175 = \$263 Million

Sources:

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6. Slade et al., 2013 J Dent Res

Dr. Limeback's figures are calculated over 40 years. To be consistent with CADTH's time horizon, the cost of treating fluorosis over 20 years would be half as much, approximately \$128 million.

Finally, one CADTH assumption was **“All of those who lived in a municipality with CWF are assumed to drink fluoridated water.”** But this doesn’t reflect the reality of Canadian water drinking habits. According to the latest (2017) figures from Statistics Canada ([12](#)), 20% of Canadians drink primarily bottled water and 8% drink a combination of tap and bottled. Since nearly all bottled water is unfluoridated, the presumed savings of fewer cavities from drinking fluoridated water would be reduced by at least 20%, approximately \$233 million.

The bottom line over a 20-year period if Calgary is fluoridated:
(Estimated figures rounded for simplicity)

GAINS

CADTH’s estimated net benefit in reduced cavities \$1.2 billion*

LOSSES

Estimated loss from IQ decline	9.6 billion
Estimated loss from dental fluorosis treatments	128 million
<u>Lowered estimate from bottled water drinking</u>	<u>233 million</u>
TOTAL LOSSES:	\$10 billion

NET LOSS from fluoridation

\$8.8 billion

***Safe Water Calgary believes this figure is very high.**

The estimated financial losses from fluoridating Calgary, \$8.8 billion, are staggering. These figures don’t include the massive medical costs of fluoridation-linked hypothyroidism and chemical sensitivity, nor other diseases linked to fluoride not covered by this statement, such as diabetes, musculoskeletal and kidney disease.

Another financial burden of fluoridation CADTH didn’t consider is the cost of avoidance. Many people will not drink fluoridated water, a significant number because of health risks. They will be forced to buy expensive filters or bottled water. Low income families will not be able to afford these alternatives, making this a major social justice issue. They will not have a choice.

CADTH said that its budget impact analysis encompassed **“a broad societal perspective.”** It is obvious that it did not.

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DISCLAIMER

This document is made for informational purposes only, and it should not be used as a substitute for medical advice. Safe Water Calgary is not responsible for any errors or omissions within the referenced materials.



APPENDIX

Fluoride Exposure during Fetal Development and Childhood IQ: The MIREC Study

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Abstract

Background: The potential neurotoxicity of early life exposure to fluoride, which has sparked controversy about community water fluoridation, is poorly understood. Objective: To test the association between fluoride exposure during fetal development and childhood IQ in a Canadian sample of 510 mother-child pairs enrolled in the Maternal-Infant Research on Environmental Chemicals (MIREC) birth cohort; 38% received "optimal" levels of community fluoridated water.

Methods: We measured three maternal urinary fluoride (MUF) concentrations during pregnancy, averaged them and adjusted them for specific gravity. Children's cognitive abilities were assessed using the Wechsler Primary and Preschool Scale of Intelligence-III at 3-4 years of age. We used multiple linear regression analyses to examine covariate-adjusted associations between MUF and IQ, and to test for interaction with child's sex. We retained the following covariates based on theoretical and statistical relevance: city, quality of child's home environment, maternal education, and race.

Results: Average MUF concentrations for all women were 0.51 mg/L (+/-0.36; range=0.06-2.44); MUF concentrations were lower in women supplied with non-fluoridated water (0.40 mg/L +/-0.27) than women supplied with fluoridated water (0.69 mg/L +/-0.41). MUF levels were inversely associated with Full Scale IQ in males ($B=-4.51$, 95% CI: -8.39, -0.63, $p=0.02$), but not in females ($B=2.43$, $p=0.33$). Among males, higher MUF levels were associated with a significantly larger reduction in Performance IQ ($B=-4.63$, $p=0.04$) than Verbal IQ ($B=-2.85$, $p=0.14$). Sensitivity analyses using MUF adjusted for creatinine and controlling for other known neurotoxins (i.e., lead, mercury and arsenic) did not substantially change the results.

Conclusion: An increase of 1mg/L of MUF during prenatal development was associated with a decrease of Full Scale IQ by 4.5 points in young boys.³²⁹



Office of the Prime Minister's
Chief Science Advisor



Health effects of water fluoridation: A review of the scientific evidence

A report on behalf of the Royal Society of New Zealand
and the Office of the Prime Minister's Chief Science Advisor

August 2014

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Office of the Prime Minister's
Chief Science Advisor



20 August 2014

Dr Roger Blakeley
Chief Planning Officer
Auckland Council

Dear Dr Blakeley

In February this year, on behalf of several Councils, you made similar requests to the Prime Minister's Chief Science Advisor (PMCSA), the Royal Society of New Zealand (RSNZ), and the Ministry of Health, to review the scientific evidence for and against the efficacy and safety of fluoridation of public water supplies. After discussion between the parties, it was agreed that the Office of the PMCSA and the RSNZ would establish a panel to undertake a review. This review would adhere strictly to the scientific issues of safety and efficacy (or otherwise), but take into account the various concerns that have been raised in the public domain about the science and safety of fluoride. It would not consider the ethical and philosophical issues that have surrounded fluoridation and influenced legal proceedings lately. The Prime Minister gave his consent for the Office of the PMCSA to be involved and funding was provided by Councils through your office and by the Ministry of Health.

We are pleased to advise the report is being delivered on the timetable agreed.

Process

Given this is inevitably an issue that arouses passions and argument, we summarise in some detail the process used.

As this was the first formal scientific review conducted jointly between the Office of PMCSA and the Royal Society a memorandum of understanding for the process was developed and has been followed.

The essence of the process was that the PMCSA appointed an experienced literature researcher to undertake the primary research and literature reviews. Following an initial scoping that included an extensive reading of the literature (informal, grey and peer reviewed) on the subject, a draft table of contents was agreed between the PMCSA and the President of the RSNZ. The RSNZ then appointed a panel of appropriate experts across the relevant disciplines that was approved by the PMCSA.

A member of civil society with expertise in local body issues, Ms Kerry Prendergast, was invited to be an observer to the panel and to be included in the discussions and drafting to be sure that it met local body needs. The scientific writer then produced an early partial draft of the report that was presented to a meeting of the expert panel, and their input was sought both as to framing and interpretation of the literature. The panel paid particular attention to the claims that fluoride had adverse effects on brain development, on the risks of cancer, musculoskeletal and hormonal disorders – being the major areas where claims about potential harms have been made.

Over the following weeks, the panel members joined in an iterative process with the scientific writer to develop the report. In its advanced form all the members of the panel, together with the PMCSA and the President of the RSNZ, agreed via email exchange on the final wording of the report and its executive summary. In this form it was sent out for international peer review by appropriate scientific experts in Australia, UK and Ireland. Following their suggestions (which were minor and did not affect the panel's conclusions), the report and executive summary were returned to the panel for comment.

Findings and recommendations

The report and its executive summary are very clear in their conclusions.

There is compelling evidence that fluoridation of water at the established and recommended levels produces broad benefits for the dental health of New Zealanders. In this context it is worth noting that dental health remains a major issue for much of the New Zealand population, and that economically and from the equity perspective fluoridation remains the safest and most appropriate approach for promoting dental public health.

The only side effect of fluoridation at levels used in NZ is minimal fluorosis, and this is not of major cosmetic significance. There are no reported cases of disfiguring fluorosis associated with levels used for fluoridating water supplies in New Zealand.

The use of fluoridated toothpastes does not change these conclusions or obviate the recommendations.

Given the caveat that science can never be absolute, the panel is unanimous in its conclusion that there are no adverse effects of fluoride of any significance arising from fluoridation at the levels used in New Zealand. In particular, no effects on brain development, cancer risk or cardiovascular or metabolic risk have been substantiated, and the safety margins are such that no subset of the population is at risk because of fluoridation.

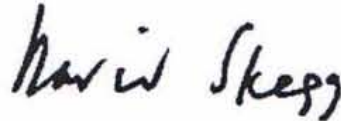
All of the panel members and ourselves conclude that the efficacy and safety of fluoridation of public water supplies, within the range of concentrations currently recommended by the Ministry of Health, is assured. We conclude that the scientific issues raised by those opposed to fluoridation are not supported by the evidence.

Our assessment suggests that it is appropriate, from the scientific perspective, that fluoridation be expanded to assist those New Zealand communities that currently do not benefit from this public health measure – particularly those with a high prevalence of dental caries.

Yours sincerely

A handwritten signature in blue ink, reading "Peter Gluckman".

Sir Peter Gluckman
Prime Minister's Chief Science Advisor

A handwritten signature in black ink, reading "David Skegg".

Sir David Skegg
President, Royal Society of New Zealand

Acknowledgements

This report was commissioned by Sir Peter Gluckman, the New Zealand Prime Minister's Chief Science Advisor (PMCSA), and Sir David Skegg, the President of the Royal Society of New Zealand (RSNZ), at the request of Auckland Council on behalf of several local Councils to review the scientific evidence for and against the efficacy and safety of fluoridation of public water supplies. Funding was provided by local bodies and the Ministry of Health. An Expert Panel (including a Panel Lay Observer) was appointed by the RSNZ to undertake the review, and international peer reviewers were selected. The report was prepared by Dr. Anne Bardsley, PhD, a researcher/writer in the PMCSA office working in close collaboration with the Expert Panel. The report was peer reviewed by international experts and the Director of the New Zealand National Poisons Centre before its release. Advisors from the New Zealand Ministry of Health (Departments of Oral Health, and Environmental & Border Health) provided comments on the final draft. In addition to the panel members and invited reviewers, we thank members of PMCSA staff for their contributions.

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Health effects of water fluoridation: A review of the scientific evidence

Executive Summary

Oral health and tooth decay in New Zealand

Despite notable overall improvements in oral health over the last half century, tooth decay (dental caries) remains the single most common chronic disease among New Zealanders of all ages, with consequences including pain, infection, impaired chewing ability, tooth loss, compromised appearance, and absence from work or school. Tooth decay is an irreversible disease; if untreated it is cumulative through the lifespan, such that individuals who are adversely affected early in life tend to have pervasive decay by adulthood, and are likely to suffer extensive tooth loss later in life. Prevention of tooth decay is essential from very early childhood through to old age.

The role of fluoride

Fluoride is known to have a protective effect against tooth decay by preventing demineralization of tooth enamel during attack by acid-producing plaque bacteria. In infants and young children with pre-erupted teeth, ingested fluoride is incorporated into the developing enamel, making the teeth more resistant to decay. Drinking fluoridated water or brushing teeth with fluoride toothpaste raises the concentration of fluoride in saliva and plaque fluid, which reduces the rate of enamel demineralisation during the caries process and promotes the remineralisation of early caries lesions. When ingested in water, fluoride is absorbed and secreted back into saliva, where it can again act to inhibit enamel demineralisation. A constant, low-level of fluoride in the mouth has been shown to combat the effects of plaque bacteria, which are fuelled by dietary sugars. Drinking fluoridated water accomplishes this through both topical and systemic actions.

Community water fluoridation as a public health measure

New Zealand water supplies generally have naturally low concentrations of fluoride. Fluoridation of public drinking-water supplies involves the deliberate adjustment of fluoride concentrations in drinking water from their naturally low levels (~0.1-0.2 mg/L* in most parts of New Zealand), upwards to between 0.7 and 1.0 mg/L. Public health authorities worldwide agree that community water fluoridation (CWF) is the most effective public health measure to reduce the burden of dental caries, reducing both its prevalence within a population and its severity in individuals who are affected. With a history dating back to the 1940s in the US, CWF is now practised in over 30 countries around the world, providing over 370 million people with optimally fluoridated water. Epidemiological evidence of its efficacy and safety has been accumulating for over six decades. The fluoride concentrations

* Fluoride concentrations in water are expressed as either mg/L or parts per million [ppm]; these units are effectively interchangeable. Fluoride concentrations in toothpaste are typically expressed as ppm.

recommended for CWF have been set based on data from both animal toxicology studies and human epidemiological studies to provide a daily oral exposure that confers maximum benefit without appreciable risk of adverse effects.

Naturally occurring concentrations of fluoride in water in some parts of the world (e.g. parts of China, Africa, and India) are much higher than those found in fluoridated water, and in some of these regions high fluoride intakes are known to cause problems in teeth and bones (dental and skeletal fluorosis). It is important to distinguish between effects of apparent fluoride toxicity at very high intakes, and effects that may occur at the much lower intakes from CWF. Some studies have failed to do so, giving rise to potentially misleading statements and confusion.

There remains ongoing debate about the long-term safety of adding fluoride to drinking water. It is important to separate concerns that are evaluable by science and those concerns that arise from philosophical/ideological considerations. With respect to the former it is important to note that the inherent nature of science is such that it is never possible to prove there is absolutely no risk of a very rare negative effect – science can only draw conclusions that are highly probable, but not absolute.

Most recently, the concerns for potential side effects have revolved around (a) whether consuming fluoridated water increases the risk of cancer (in particular osteosarcoma), and (b) the effects of fluoride on the cognitive development of children. The potential for increased bone fracture risk has also been extensively examined. While the scientific consensus confirmed in this review is that these are not significant or realistic risks, as a matter of public health surveillance, such claims continue to be studied and monitored in populations receiving fluoridated water.

'Artificial' vs 'natural' fluoride

The fluoride-containing compounds used for adjusting fluoride levels in drinking water have been shown to dissolve fully in water to release fluoride ions. These ions are identical to those found naturally in the water. The reagents used for water fluoridation in New Zealand are regularly tested for purity and to ensure that any trace metals (or other impurities) that they may contain, when added to drinking water, are well below the maximum safe limits described in the Drinking Water Standards for New Zealand. The water supply itself is then regularly monitored to ensure fluoride levels and any impurities (including from the source water) are within the maximum safe limits set in the Drinking Water Standards.

Evidence for benefits of water fluoridation

Analysis of evidence from a large number of epidemiological studies and thorough systematic reviews has confirmed a beneficial effect of CWF on oral health throughout the lifespan. This includes relatively recent studies in the context of the overall reduced burden of caries that has resulted from the widespread use of topical fluoride products (e.g. toothpastes, mouth rinses, and fluoride varnishes). In New Zealand, significant differences in decay rates between fluoridated and non-fluoridated communities continue to exist, despite the fact that the majority of people use fluoride toothpastes. These data come from multiple studies across different regions of the country conducted over the last 15 years, as well as from a national survey of the oral health status of New Zealanders conducted in

2009. Various studies indicate that CWF has an additive effect over and above that of fluoride toothpaste and other sources of fluoride that are now in common use. The burden of tooth decay is highest among the most deprived socioeconomic groups, and this is the segment of the population for which the benefits of CWF appear to be greatest.

Known effects of fluoride exposure – dental fluorosis

Dental fluorosis is a tooth enamel defect characterised by opaque white areas in the enamel, caused by excess exposure to fluoride while the teeth are forming in the jaw and before they erupt into the mouth. Tooth development occurs during the first 8 years of life; beyond this age children are no longer susceptible to fluorosis. In the common, mild forms it is of minor or no cosmetic significance, but severe forms result in pitted and discoloured teeth that are prone to fracture and wear. Dental fluorosis reflects overall fluoride absorption from all sources at a young age, and is a known effect of drinking water containing naturally very high concentrations of fluoride. The amount of fluoride added to water in CWF programmes is set to minimise the risk of this condition while still providing maximum protective benefit against tooth decay. No severe form of fluorosis has ever been reported in New Zealand.

The prevalence of mild dental fluorosis has increased somewhat since the initiation of CWF in communities around the world, but further increases have coincided with the widespread use of fluoridated dental products, particularly toothpaste and fluoride supplements. There is a substantial evidence base to indicate that inappropriate use of such dental products (e.g. young children swallowing large amounts of toothpaste; inappropriate prescribing of supplements) is the main factor in increasing fluorosis risk, as the prevalence of fluorosis has increased more in non-fluoridated areas than in fluoridated ones. Most of the dental fluorosis that occurs in this country is very mild, having effects that are only identified by professional dental examination. The levels of fluoride used for CWF in New Zealand are relatively low in the range that is known to cause minimal risk for cosmetically problematic fluorosis, as reflected in data from the 2009 New Zealand Oral Health Survey, which showed the overall prevalence of moderate fluorosis to be very low. The survey indicated that fluorosis prevalence is not increasing, and that levels of fluorosis are similar between fluoridated and non-fluoridated areas.

The risk for mild fluorosis that is associated with fluoride exposure is highest for formula-fed infants, and young children who are likely to swallow toothpaste. In some cases the fluoride intake by these groups can approach or exceed the currently recommended conservative upper intake level, but the rarity of cosmetically concerning dental fluorosis in New Zealand indicates that such excess intake is not generally a safety concern.

Analysis of evidence for adverse effects

A number of potential adverse effects of the consumption of fluoride have been suggested, though many have only been reported in areas where the natural level of fluoride in water is very high.

Most recently, the main issues in question are whether fluoride in drinking water has an impact on cancer rates (particularly the bone cancer osteosarcoma) or on the intellectual development (IQ) of children. Because fluoride accumulates in bones, the risk of bone

defects or fractures has also been extensively analysed. While there are published studies suggesting that such associations exist, they are mostly of very poor design (and thus of low scientific validity) or do not pertain to CWF because the fluoride levels in question are substantially higher than would be encountered by individuals drinking intentionally fluoridated water.

Cancer

The large majority of epidemiological studies have found no association between fluoride and cancer, even after decades of exposure in some populations. This includes populations with lifetime exposure to very high natural fluoride levels in water, as well as high-level industrial exposures. The few studies that have suggested a cancer link with CWF suffer from poor methodology and/or errors in analysis. Multiple thorough systematic reviews conducted between 2000 and 2011 all concluded that based on the best available evidence, fluoride (at any level) could *not* be classified as carcinogenic in humans. More recent studies, including a large and detailed study in the UK in 2014, have not changed this conclusion.

Bone cancers have received specific attention because of fluoride's deposition in bone. Although a small study published in 2006 claimed an increased risk for osteosarcoma in young males, extensive reviews of these and other data conclude that there is no association between exposure to fluoridated water and risk of osteosarcoma. Likewise, in the New Zealand context, data from the New Zealand Cancer Registry from 2000-2008 show no evidence of association between osteosarcoma incidence and residence in CWF areas.

We conclude that on the available evidence there is no appreciable risk of cancer arising from CWF.

Effects on IQ

Recently there have been a number of reports from China and other areas where fluoride levels in groundwater are naturally very high, that have claimed an association between high water fluoride levels and minimally reduced intelligence (measured as IQ) in children. In addition to the fact that the fluoride exposures in these studies were many (up to 20) times higher than any that are experienced in New Zealand or other CWF communities, the studies also mostly failed to consider other factors that might influence IQ, including exposures to arsenic, iodine deficiency, socioeconomic status, or the nutritional status of the children. Further, the claimed shift of less than one standard deviation suggests that this is likely to be a measurement or statistical artefact of no functional significance. A recently published study in New Zealand followed a group of people born in the early 1970s and measured childhood IQ at the ages of 7, 9, 11 and 13 years, and adult IQ at the age of 38 years. Early-life exposure to fluoride from a variety of sources was recorded, and adjustments were made for factors potentially influencing IQ. This extensive study revealed no evidence that exposure to water fluoridation in New Zealand affects neurological development or IQ.

We conclude that on the available evidence there is no appreciable effect on cognition arising from CWF.

Bone fractures

Fluoride is incorporated into bone during bone development and remodeling. Evidence from both animal and human studies suggests that water fluoride levels of 1 mg/L – a level considered optimal for prevention of tooth decay – may lead to increased bone strength, while levels of 4 mg/L may cause a decrease in bone strength.

Prolonged exposure to fluoride at five times the levels used in CWF (~5 mg/L) can result in denser bones that may be more brittle than normal bone, and may increase the risk of fracture in older individuals. However, despite a large number of studies over many years, no evidence has been found that fluoride at optimal concentrations in water is associated with any elevated risk of bone fracture. In children, intake of fluoridated water does not appear to affect bone density through adolescence.

We conclude that on the available evidence there is no appreciable risk of bone fractures arising from CWF.

Other effects

A number of other alleged effects of CWF on health outcomes have been reviewed, including effects on reproduction, endocrine function, cardiovascular and renal effects, and effects on the immune system. The most reliable and valid evidence to date for all of these effects indicates that fluoride in levels used for CWF does not pose appreciable risks of harm to human health.

Fluoride exposure in specific population groups

A number of public health agencies around the world, including the US Institute of Medicine, Health Canada, the European Food Safety Authority, the Australian National Health and Medical Research Council, and the New Zealand Ministry of Health provide recommendations on adequate intakes (AIs) for nutrients considered necessary for optimal health, as well as safe upper levels of intake (ULs). Fluoride is included among the nutrients assigned AI and UL recommendations.

Infants

Infants who are exclusively breastfed to 6 months of age have very low fluoride intake, and the low recommended intake level for this age group (0.01 mg/day) reflects this. Infants 0-6 months of age who are exclusively fed formula reconstituted with fluoridated water will have intakes at or exceeding the upper end of the recommended range (UL; 0.7 mg/day). The higher intakes may help strengthen the developing teeth against future decay, but are also associated with a slightly increased risk of very mild or mild dental fluorosis. This risk is considered to be very low, and recommendations from several authoritative groups support the safety of reconstituting infant formula with fluoridated water.

Young children (1-4 years)

Typical intakes of fluoride from water, food, and beverages in young children in New Zealand are within or below the recommended levels (0.7-2.0 mg/day depending on age and weight). However, intake of fluoride from toothpaste contributes a significant proportion of total ingested fluoride in this group. In combination with dietary intake this can raise the total daily intake above the recommended adequate intake level.

Consumption of fluoridated water is highly recommended for young children, as is the use of fluoride toothpaste (regular strength – at least 1000ppm), but only a smear of toothpaste should be used, and children should be supervised during toothbrushing to ensure that toothpaste is not swallowed/eaten.

Children (5+years) and adolescents

Fluoride exposure estimates for children and adolescents in New Zealand indicate that the average total dietary intake for this age group (including fluoride ingested from toothpaste) is below the recommended adequate intake level even in fluoridated areas. This group is not considered at high risk of exposure to excess fluoride, and consumption of fluoridated water and use of fluoride toothpaste ($\geq 1000\text{ppm}$) are both recommended.

Pregnant or breastfeeding women

Pregnant women are not themselves any more vulnerable to the effects of fluoride than their non-pregnant counterparts, but they may have concerns about fluoride ingestion and its possible effects on their unborn fetus. However, no studies to date have found any evidence of reproductive toxicity attributable to fluoride at or around levels used for CWF. The recommendations for fluoride intake for pregnant women therefore do not differ from those for non-pregnant women – i.e. they are encouraged to drink fluoridated water and to use full-strength fluoride toothpaste throughout their pregnancy. This is considered beneficial to their own oral health (which is often compromised by physiological changes in pregnancy) and safe for their offspring.

The same recommendations apply during breastfeeding. Fluoride does not transfer readily into breast milk, so the fluoride intake of the mother does not affect the amount received by her breastfeeding infant.

Adults and the elderly

Although most studies of the effects of CWF have focused on benefits in children, caries experience continues to accumulate with age, and CWF has also been found to help reduce the extent and severity of dental decay in adults, particularly with prolonged exposure. Elderly individuals may have decreased ability to undertake personal oral healthcare, and therefore are vulnerable to tooth decay, particularly in exposed root surfaces. As with other groups who are at high risk of tooth decay, consumption of fluoridated water can have important preventive impact against this disease in the elderly. Epidemiological studies have shown that elderly individuals indeed benefit from drinking fluoridated water, experiencing lower levels of root decay and better tooth retention. It should be noted that the increasing retention of natural teeth in the elderly brings with it an increased need for long-term maintenance of tooth function, and a continuing benefit of CWF exposure in this group.

Individuals with kidney disease

Chronic kidney disease is relatively common in New Zealand, with a higher prevalence amongst Māori, and numbers are increasing due to the increasing prevalence of hypertension and diabetes. Because the kidney is the major route of fluoride excretion, blood fluoride concentrations are typically elevated in patients with end-stage kidney disease, and this group may be considered to be at increased risk of excess fluoride

exposure. However, to date no adverse effects of CWF exposure in people with impaired kidney function have been documented.

Cost-effectiveness of water fluoridation

Tooth decay is responsible for significant health loss (lost years of healthy life) in New Zealand. The 'burden' of the disease – its 'cost' in terms of lost years of healthy life – is equivalent to 3/4 that of prostate cancer, and 2/5 that of breast cancer in New Zealand. Tooth decay thus has substantial direct and indirect costs to society.

There is strong evidence that CWF is a cost-effective use of ratepayer funds – with it being likely to save more in dental costs than it costs to run fluoridation programmes (at least in communities of 1000+ people). There is New Zealand evidence for this, along with evidence from Australia, the US, Canada, Chile and South Africa. CWF appears to be most cost-effective in those communities that are most in need of improved oral health. In New Zealand these include communities of low socioeconomic status, and those with a high proportion of children or Māori

Conclusions

The World Health Organization (WHO), along with many other international health authorities, recommends fluoridation of water supplies, where possible, as the most effective public health measure for the prevention of dental decay.

A large number of studies and systematic reviews have concluded that water fluoridation is an effective preventive measure against tooth decay that reaches all segments of the population, and is particularly beneficial to those most in need of improved oral health. Extensive analyses of potential adverse effects have not found evidence that the levels of fluoride used for community water fluoridation schemes contribute *any* increased risk to public health, though there is a narrow range between optimal dental health effectiveness and a risk of mild dental fluorosis. The prevalence of fluorosis of aesthetic concern is minimal in New Zealand, and is not different between fluoridated and non-fluoridated communities, confirming that a substantial proportion of the risk is attributable to the intake of fluoride from sources other than water (most notably, the swallowing of high-fluoride toothpaste by young children). The current fluoridation levels therefore appear to be appropriate.

This analysis concludes that from a medical and public health perspective, water fluoridation at the levels used in New Zealand poses no significant health risks and is effective at reducing the prevalence and severity of tooth decay in communities where it is used. Communities currently without CWF can be confident that this is a safe option that is cost saving and of significant public health benefit – particularly in those communities with high prevalence of dental caries.

Review methodology

This report aimed to evaluate the current state of scientific knowledge on the health effects of water fluoridation, in order to inform decision-making on continuing or implementing community water fluoridation, particularly within the New Zealand context. Several previous rigorous systematic reviews were used as the basis for this analysis, and literature searches in Medline, EMBASE, the Cochrane library database, Scopus, and Web of Science were undertaken to identify subsequent studies in the peer-reviewed scientific literature. Alleged health effects from both the scientific and non-scientific literature were considered, and many original studies relating to these claims were re-analysed. The main review sources are presented in the Appendix.

Aside from animal toxicity studies, articles considered for this review were those that had a primary focus on community water fluoridation or human exposure to fluoride at levels around those used for CWF. Studies were assessed for robust design, including adequate sample size, appropriate data collection and analysis, adjustment for possible confounding factors, and conclusions appropriate to the data analysis.

The report does not consider in depth the broader philosophical issues that lead some people to have objections to CWF.

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Health effects of water fluoridation:

A review of the scientific evidence

1. Background to water fluoridation issues

Fluoridation of public water supplies began as a public health measure in the United States in the 1940s, following results of epidemiological studies showing a link between elevated levels of fluoride in drinking water and reduced prevalence and severity of tooth decay (dental caries) in local populations. Community water fluoridation (CWF) entails an upward adjustment of the fluoride concentration in fluoride-poor water sources to a level that is considered optimal for dental health, yet broadly safe for the population that drinks the water.

Geological factors cause a significant variation in the natural concentration of fluoride in water around the globe. Much of the early work on fluoride was concerned with the effects of naturally occurring excessive fluoride concentrations in water and the associated prevalence of varying degrees of dental fluorosis, a tooth enamel mineralization defect that causes changes to the appearance of the enamel.^[1] Investigations into the causes of such enamel changes led to the discovery of the dental health benefits – specifically a protective effect against tooth decay – of an appropriate concentration of fluoride in drinking water. The link between moderately elevated levels of fluoride in water and reduced prevalence and severity of tooth decay led to trials of the addition of fluoride to drinking water supplies in some areas where the natural level of fluoride in the water was low.

Fluoridation of water supplies in New Zealand began in 1954. Currently more than half the population receives fluoridated water. Some of the larger centres without fluoridated water supplies currently are Whangarei, Tauranga, Whanganui, Napier, Nelson, Blenheim, and Christchurch and Rotorua. The most recent decision to fluoridate a low-fluoride community occurred in South Taranaki in 2014. New Plymouth and Hamilton have recently stopped their fluoridation programmes, though a decision has been made to restart fluoridation in Hamilton. A map of fluoridated water supplies in New Zealand can be viewed at: <http://www.drinkingwater.esr.cri.nz/supplies/fluoridation.asp>.

Despite its long history and a wealth of data showing marked improvements in oral health in communities following the introduction of fluoridated drinking water, and in general a broad social license for its use, this public health measure remains controversial. There is a perception that some questions of the potential for adverse health effects of water fluoridation remain incompletely resolved, and its usefulness has been debated given the significantly lower overall prevalence of caries (attributed to the widespread use of topical fluoride dental products), and in light of its known side effect of mild dental fluorosis. Recent years have seen some reevaluation of recommended fluoride levels in water, based on current research into fluoride availability in the broader environment, including intake from processed foods and beverages, and the introduction of new and/or improved fluoride dental products into the marketplace.

This report aims to evaluate the current state of scientific knowledge on the health effects of water fluoridation, in order to inform decision-making on continuing or implementing CWF, particularly within the New Zealand context.

1.1 Why is there societal concern?

At the core of opposition to water fluoridation is the viewpoint that it conveys an unacceptable risk to public health. It is also argued that adding fluoride to public water supplies is an infringement on individual rights. Silicofluorides used in CWF have been labelled by some opponents as 'unlicensed medical substances' that pose unknown dangers to human health. Such views have been put forth in essay format by Connett, [2] on anti-fluoride websites, [3] and in books such as *'The Fluoride Deception'*, [4] the foreword of which describes fluoride as "another therapeutic agent...that had not been thoroughly studied before it was foisted on the public as a panacea to protect or improve health."[†]

The public perception of risk can differ from that of scientists and experts, and involves not only the perception of the potential 'hazard', but also 'outrage factors' that include voluntariness and control. Outrage factors, as initially defined by Sandman,[5] modify the emotions associated with a risk and thereby inflate the perception of the risk. When exposure to a hazard is voluntary, it is perceived as being less risky. Disagreement between apparent 'experts' indicates to the public that the risks are unknown or unknowable, in which case they tend to take the 'worst case scenario' and judge the risk as more serious. In debates about water fluoridation, the public is confronted with wildly conflicting claims (largely via the internet and news media), and most citizens are not able to easily distinguish differences in authority of the 'experts'. Such confusion leads many to choose what they view as the 'safe' course – to vote against water fluoridation.

A recent survey in Australia indicated that Sandman's[5] outrage factors were indeed linked to opposition to water fluoridation.[6] However, the survey also found that the majority of respondents expressed support for water fluoridation, and overall, little outrage. To the opponents in the minority, fluoridation remains a high-outrage issue, despite scientific evidence that is strongly suggestive of its very low risk. The objection to CWF as a violation of rights is a philosophical argument that may vary with ease of access to non-fluoridated water. Such an objection would not necessarily diminish with increasing availability of evidence-based scientific information on fluoridation effects.

[†] The foreword to *'The Fluoride Deception'* also declares that fluorine is "an essential element in the production of the atom bomb, and there is good reason to believe that fluoridated drinking water and toothpaste – and the development of the atom bomb – are closely related."

Examples of issues that have caused some to express concern

- Dental fluorosis of any degree (although typically very mild) is fairly common. Fluorosis of some aesthetic concern may occur in around 8% of children consuming water containing fluoride at 1.0 mg /L from birth.
- Intake of fluoride by infants exclusively fed formula reconstituted with water fluoridated at 1.0 mg/L can reach or exceed the currently recommended daily upper level of intake, potentially increasing their risk of dental fluorosis.
- There are claims of health risks including cancer and reduced IQ in children. This is against the background that science cannot ever give absolute proof of the certainty of no risk – only state that risk is imperceptibly small.
- Some people are concerned about the lack of choice when their water supply is fluoridated and therefore the inconvenience of obtaining non-fluoridated water.

1.2 Consensus and Debate

Analysis of the peer-reviewed scientific literature reveals a clear consensus on the effectiveness of CWF: a large number of epidemiological studies and thorough systematic reviews concur that CWF has a beneficial effect on oral health throughout the lifespan. This includes relatively recent studies in the context of the overall reduced burden of caries that has resulted from the widespread use of topical fluorides. Yet the effectiveness of CWF continues to be questioned by a small but vocal minority. The avenues used to present opposing views tend to be those most easily accessed by the public, giving the impression that there is an even debate among 'experts.' In reality, the weight of peer-reviewed evidence supporting the benefits of water fluoridation at the levels used in New Zealand is substantial, and is not considered to be in dispute in the scientific literature.

There is, however, considerable ongoing debate about the long-term safety of adding fluoride to drinking water, because it is difficult to determine cause and effect and to definitively rule out all potential risks. The nature of science is such that no conclusion can be absolute, and while something can be readily proved to be unsafe, conceptually it is never possible to say that something has absolutely no risk associated with it. In other words, epidemiological methods cannot prove beyond a shadow of a doubt that there is no negative effect – it can make a conclusion highly probable, but not 100% certain. Absolute certainty is therefore an impossible claim. Demanding it can lead to the inappropriate use of the precautionary principle, causing unnecessary public alarm when the weight of evidence indicates that significant harm is extremely unlikely. Most recently, the CWF debate has revolved around (a) whether consuming fluoridated water increases the risk of cancer (in particular osteosarcoma), and (b) the effects of fluoride on the cognitive development of children. It is important to review the quality of evidence for such claims. While there are published studies suggesting that such associations exist, they are mostly of low validity (being poorly conducted or improperly analysed) or do not pertain to CWF because the fluoride levels in question are substantially higher than would be encountered by individuals drinking intentionally fluoridated water. Nonetheless, while the scientific consensus is that these are not significant risks, the nature of public health surveillance is

such that such claims will continue to be studied and monitored in populations receiving fluoridated water. The evidence for and against these and other claimed adverse effects of water fluoridation is presented in section 4.

There is a consensus that chronic consumption of high levels of fluoride in water increases the risk of dental fluorosis, and, at very high levels, skeletal fluorosis (changes in bone structure resulting from excess fluoride accumulation) can occur. Naturally occurring fluoride concentrations in water can range from very low (<0.1 mg/L,[‡] as is common in New Zealand) to in excess of 20 mg/L in parts of China and Africa. Risk/benefit analyses of fluoride concentrations associated with reducing the burden of caries and varying risks of dental fluorosis has established a range between 0.7 and 1.2 mg/L as a level of fluoride in water at which caries prevention is optimal and dental fluorosis risk is minimised (but not absent). Skeletal fluorosis does not occur with fluoride concentrations in this range.

The range of 0.7-1.2 mg/L was recommended for fluoridation of water supplies in the US to account for possible differences in fluid intake based on ambient air temperature (i.e. the lower bound was used in hotter climates where water consumption was assumed to be higher). However, more recent data have shown that tap water intake does not differ substantially based on ambient temperature, indicating that there is no need for different recommendations in different temperature zones, at least in the US. In 2011 the Department of Health and Human Services proposed that 0.7 mg/L fluoride should be the target level throughout the country.^[7] This updated recommendation assumes that significant caries preventive benefits can be achieved, and the risk of fluorosis reduced, at the lowest concentration of the original recommended range. Health Canada also recommends 0.7 mg/L as the fluoride target level for CWF.^[8] These lowered targets reflect concerns about increasing risks of dental fluorosis because of increasing fluoride exposure from additional sources, including toothpastes and food and beverages made with fluoridated water (see section 3.3). The revised fluoridation target level has not yet been widely adopted in the US, so the effects of this change are as yet unclear.

Knowns	Unknowns
<ul style="list-style-type: none"> • Tooth decay remains a major health problem in New Zealand, especially among low socioeconomic groups • Water fluoridation at levels used in New Zealand reduces the prevalence and severity of tooth decay without causing significant health effects • High intakes of fluoride can cause dental and skeletal fluorosis • High intakes of fluoride do not regularly occur in New Zealand 	<ul style="list-style-type: none"> • The absolute level of risk for potential, very rare health effects other than fluorosis • While benefit is certain there is less clarity as to the magnitude of the beneficial effect against the background of additional fluoride sources

[‡] Fluoride concentrations in water are expressed as either mg/L or parts per million [ppm]; these units are effectively interchangeable. Fluoride concentrations in toothpaste are typically expressed as ppm.

1.3 Weighing the evidence

1.3.1 Beneficial vs toxic doses

Like many elements that affect human health, fluoride is beneficial in small amounts and toxic in excess. More than 500 years ago, the physician and alchemist Paracelsus first stated the basic principle that governs toxicology: “All things are poisons, for there is nothing without poisonous qualities. It is only the dose which makes a thing poison.” In other words, for substances that have beneficial effects on health, “the dose differentiates a poison from a remedy.” Fluoride clearly benefits dental health when used topically or ingested in small doses, but in very high doses it is poisonous, and has been used as a component of pesticides. Similar examples can be found among beneficial health-promoting vitamins, including vitamin D, which in high doses is an effective rodenticide used to eradicate rats and possums, and in humans can cause musculoskeletal and renal disease.[9]

A principle of toxicology is that the individual response of an organism to a chemical increases proportionally to the exposure (dose). For most chemicals, there is a threshold dose below which there is no apparent adverse effect; however, this may depend on the sensitivity of the measurement technique and the size of the study. The larger a study is, the smaller the effect that can be detected. Further, a biological effect might be detected but have no functional (or health) significance. Threshold concentrations causing acute toxicity are determined through dose-response experiments in laboratory animals. The progression and reproducibility of an effect over multiple doses (known as a dose-response curve) can allow extrapolation of the potential for, or lack of, effects at other doses. Animal studies can sometimes provide evidence of potential impacts of long-term exposure to a range of different doses; in humans this requires epidemiological studies. From such studies, a ‘no observed adverse effect level (NOAEL)’ is derived, from which a tolerable daily intake (TDI) reference dose is determined by applying a safety margin of several orders of magnitude. The TDI indicates a daily oral exposure to the human population (including sensitive groups) that is estimated to be without an appreciable risk of deleterious effects during a lifetime.

Water fluoridation is a measure to regulate the fluoride concentrations in community water supplies to a level that is beneficial to health and not harmful for human ingestion. Because fluoride exhibits both beneficial and harmful effects, the World Health Organization (WHO) recognises an adequate lower level of intake and sets an upper limit on levels of fluoride in water (range 0.5-1.5 mg/L).[10] The recommendations are devised to ensure protection against adverse effects over the course of a lifetime, including in the most sensitive segments of the population. Likewise, the US Institute of Medicine (IOM), the Australian National Health and Medical Research Council (NHMRC), the New Zealand Ministry of Health (NZMoH), and other health authorities similarly recommend optimal intake levels for fluoride in their dietary guidelines for nutrients, but also set upper levels of intake to protect against potential adverse effects (see section 2.4).

1.3.2 Risk assessment

In public health and risk management terms, a distinction is made between a hazard, or an intrinsic propensity to cause harm, and a risk, which is the likelihood that a hazard will result in harm. Fluoride in high doses (beyond those used in CWF) does indeed pose a hazard, but in low doses the risk is considered minimal. Public health policy is based on the best estimate of true human risk.

Hazard = an intrinsic propensity to cause harm
Risk = likelihood that a hazard will result in harm

Estimates of risk from epidemiological studies, combined with toxicokinetic and mechanistic data, provide a starting point for risk analysis. Randomised, controlled clinical trials are not generally possible with an intervention such as CWF, so human data must come from epidemiological studies that compare exposed populations to non-exposed ones and make a statistical evaluation to determine whether there is an association between the exposure and a human health effect. A causal relationship is inferred based on the strength and consistency of the association in a sufficient number of different circumstances, and the presence of a graded relationship (for example, a progressive increase or decrease in adverse effect rates over a range of fluoride levels), as well the existence of a plausible biological mechanism by which fluoride could cause the effect. A common error is to accept an hypothesis on the basis of isolated supportive findings without looking at the evidence as a whole. A further error is to confuse observed associations between two factors with evidence for causation – i.e. that one factor causes the other.[§] Epidemiology has a number of ways of trying to resolve between association and causation.

Human risk estimates should be based on reproducible results, preferably in studies of human populations that have similar characteristics and exposures. Findings from studies of populations chronically exposed to high levels of fluoride – for example, those found naturally in groundwater and/or from industrial pollution or coal burning, as in China (where levels are often >4 mg/L) – cannot be easily extrapolated to populations receiving fluoride primarily from intentionally fluoridated drinking water over the range of 0.5-1.5 mg/L recommended by WHO.

In the case of CWF, epidemiological data have been gathered and scrutinised for over six decades, and vast amounts of research into its positive and negative effects have been published. Suggestions of harmful effects are put forth regularly, and the scientific and health communities regularly assess the risks with the best available laboratory and epidemiological tools. But science cannot prove a negative – it is not possible to design an experiment that proves without doubt that no harm will ever come from ingesting fluoride. Instead, results must be tested against the ‘null hypothesis,’ which posits that there will be no difference in health impact between a group that ingests fluoridated water and a control group that does not.

[§] To use a trite example, ice cream consumption and burglaries might be correlated in an epidemiological study. This does not mean that eating ice cream causes bad behavior (burglaries); rather the association could be explained by the increased likelihood that in hot weather people eat more ice cream, and are also more likely to leave their windows open.

The most reliable and valid evidence indicates that fluoride in levels used for CWF does not pose appreciable risks of harm to human health, and that the benefits significantly outweigh the risks.

1.4 Fluoridation around the world

The WHO recommends fluoridation of drinking water as the single most important intervention to reduce dental caries in communities.^[10] Around 30 countries worldwide have intentionally fluoridated water supplies, serving an estimated 370 million people. An additional >50 million people drink water that is naturally fluoridated at or near the optimal level, including those supplied from some water sources in Canada, the UK, Spain, Japan, Finland, Chile, Argentina and Australia that have natural fluoride levels of around 1.0 mg/L. Some of the countries where CWF is practised are shown in table 1, along with the percent of the population reached by the CWF schemes and also the number of people in these countries who have access to naturally-fluoridated water that is around the CWF optimum level (~1.0 mg/L).

It is sometimes claimed that European nations have abandoned the practice of fluoridation; this, in fact, is not the case. As of 2014, the UK, Ireland, and Spain fluoridate their water, while other nations put fluoride in table salt or acquire it naturally from higher levels present in drinking water, as in Sweden and Italy. Most experiences gained through water fluoridation, accumulated over decades of epidemiological research, also apply to salt fluoridation. As with water fluoridation, salt delivers fluoride both systemically and topically, and is used in some areas where water fluoridation is not feasible. Approximately 70 million Europeans consume fluoridated salt, including most of the population of Germany and Switzerland. The use of salt for fluoridation in Europe is based on the precedent of iodisation of salt to prevent endemic goitre, where, in Austria and Switzerland, a universally implemented salt iodisation programme totally prevented iodine-deficiency diseases. Salt fluoridation has been used in Switzerland since 1955.^[11] For many European communities, salt is used because their complex water systems make water fluoridation impractical.

Water fluoridation ceased in Germany after reunification of the country in 1990. A continued decrease in caries after cessation of CWF was observed, and has been put forth by some as proof that water fluoridation is both ineffective and unnecessary. However, the caries decline coincided with several other trends, including the introduction of fluoridated salt in 1992, a decrease in national sugar consumption in 1993 (down to 1967 levels of intake), and complete restructuring of the dental care system after reunification.^[12] A further study of other former East German cities suggested that the caries decline was unlikely to be caused by any one single factor, but that the availability of topical fluorides probably had the greatest impact. The authors concluded that for Germany “from our point of view, water fluoridation would still seem to be reasonable in all heavily-populated industrial areas with high or increasing caries prevalence.”^[13]

Fluoridation practices in Asia were reviewed in 2012 by Petersen et al.[14] Several countries that are currently unable to implement CWF programmes have used fluoridation of salt (e.g. Cambodia, Laos) or milk (Thailand) as a community public health measure. Costa Rica, Jamaica, and Colombia have salt fluoridation programmes that reach virtually 100% of their populations.[11] In 2007, the 60th World Health Assembly called on countries that have not yet established fluoridation schemes (water, where feasible, or alternatively salt or milk) to consider doing so.[15]

Table 1 – Countries/regions with fluoridated water (including community water fluoridation (CWF) and naturally fluoridated)

Country/region	Total population with CWF (number)	Population with naturally fluoridated water (number)	% of the population with optimally fluoridated water
Pacific			
New Zealand	2,330,000	--	56
Australia	17,600,000	144,000	80
Fiji	300,000	NA	36
Papua New Guinea	102,000	70,000	6
North America			
USA	194,206,000	10,078,000	74**
Canada	14,260,000	300,000	44
Central and South America			
Argentina	3,100,000	4,500,000	19
Brazil	73,200,000	NA	41
Chile	11,000,000	800,000	70
Guatemala*	1,800,000	NA	13
Guyana	45,000	200,000	32
Panama*	510,000	NA	15
Peru	500,000	80,000	2
Asia/Middle East			
Brunei	375,000	NA	95
Hong Kong	6,968,000		100
Libya	400,000	1,000,000	22
Malaysia	20,700,000	NA	75.5
Singapore	5,080,000	--	100
South Korea	2,820,000	NA	6
Vietnam	3,500,000	NA	4
UK/Europe			
Republic of Ireland	3,250,000	200,000	73
Serbia	300,000	NA	3
Spain	4,250,000	200,000	11
UK	5,797,000	330,000	10

Data from the British Fluoridation Society. *One in a million: the facts about fluoridation* (3rd edition March 2012)[16]

*pre-2003 data; **as % of population connected to public water supplies.

2. Fluoride sources, fluoridation, intakes & exposure

2.1 Naturally occurring fluoride levels

Fluoride is the naturally occurring reduced form of the electronegative element fluorine, which is found in all water sources in small but traceable amounts. High fluoride concentrations are found in groundwater in areas where fluoride-bearing minerals are common. Thermal waters of high pH are generally rich in fluoride. Seawater typically contains around 1.3 mg fluoride/L; surface waters such as rivers and lakes usually contain well below 0.5 mg/L. High natural groundwater fluoride concentrations have been reported from India, Pakistan, Africa, Thailand, Sri Lanka, Southern Asia, the Eastern Mediterranean countries, and many areas of China, where levels as high as 20 mg/L are reported. Both shallow and deeper groundwaters are affected; in general, the deeper groundwaters have higher concentrations. These areas are affected by endemic fluorosis (see section 4.3.2). [10]

Many groundwater resources in Central Europe exceed the WHO guideline value of 1.5 mg/L.[17] Concentrations in natural waters span more than four orders of magnitude (most 0.1-10.0 mg/L but some higher and lower).[18] It is not possible to predict the fluoride content of water on the basis of geology alone, other than in general terms.

In New Zealand, the highest natural levels of fluoride in groundwater are around 0.56 mg/L; rivers and lakes typically have fluoride levels around 0.05 mg/L. In most areas the fluoride levels are around 0.1-0.2 mg/L, though some areas (e.g. Northland) have natural fluoride levels of around 0.02-0.03 mg/L.[19] Geothermal or hydrothermal waters are the most likely to contain elevated fluoride levels, but these sources are not used for drinking-water supplies.[20]

2.2 Water fluoridation levels and monitoring in NZ

The NZMoH recommends that, for oral health reasons, the level of fluoride in drinking water in New Zealand should be between 0.7 and 1.0 mg/L. Based on WHO advice, the maximum acceptable value for fluoride in drinking water is 1.5 mg/L to prevent any known adverse health effects (dental or skeletal fluorosis).[21]

Actual fluoride levels in areas where fluoride is added to drinking water in New Zealand vary slightly, but are generally in the range of 0.7-0.9 mg/L. Samples from Dunedin ranged between 0.7 and 0.8 mg/L, with no evidence of attenuation with distance from the dosing point.[22] Other treatment plants show similar consistency in maintaining fluoride concentrations within a narrow range. The majority of samples were below 0.75 mg/L from most treatment plants in 2012-2013, with an average *maximum* level of 0.89 mg/L.[23] Fluoride levels in fluoridated supplies around the Auckland region average ~0.8 mg/L.[24]

2.2.1 Fluoride forms used for fluoridation

The fluorine-containing compounds used for fluoridation include sodium fluoride (NaF), sodium fluorosilicate (Na_2SiF_6), and hydrofluorosilicic acid (H_2SiF_6 ; also known as hexafluorosilicic acid [HFA]). The latter is most commonly used in New Zealand.[25] HFA is a liquid and is therefore easier to handle and to measure accurately into bulk water. This fluoride source is comparatively dilute; 15% acid contains just under 12% fluorine by mass (NaF contains 46% and Na_2SiF_6 contains 60% F).

To produce HFA, phosphate rock containing fluoride and silica is treated with sulphuric acid to produce two gases: silicon tetrafluoride and hydrogen fluoride. These gases are passed through scrubbers where they react with water to form hydrofluorosilicic acid.[26]

'Artificial' vs 'natural' fluoride in water

There have been assertions that 'artificial' fluorosilicates differ from 'natural' fluorides in their dissolution in water and their bioavailability following ingestion in humans. Jackson et al.[27] addressed these issues, and determined that HFA used to fluoridate water is effectively 100% dissociated to form fluoride ion under water treatment conditions, with bioavailability comparable to natural fluoride. Testing a range of water pH values and HFA concentrations, Finney et al.[28] also reported that at around pH7.0 and typical drinking water fluoride concentration, HFA dissociation to produce free fluoride ions was essentially complete.

In terms of chemistry and bioavailability there is no difference between added and "natural" fluoride. The laws of chemistry dictate that fluoride ions in solution in water are identical regardless of their source. The pharmacokinetics of exposure to natural vs artificial fluorides in water is discussed below in section 2.4.2.

Fluoridation compounds and interactions

The analysis by Jackson et al.[27] also concluded that fluoride at a concentration of 1 mg/L has essentially no interaction with other chemical species in water and no appreciable effect on the chemical speciation of iron, copper, or lead, and therefore would not influence their bioavailability and potential toxicity. The quantities of trace metal impurities occurring as a result of fluoridation were also determined to be very small, having no discernible impact on drinking water quality. The Irish Forum on Fluoridation (2002)[29] examined this issue with specific regard to HFA, which is also used for fluoridation in New Zealand. The assessment showed that the resulting concentrations of heavy metals in the HFA additive (including arsenic, mercury, chromium, cadmium, lead, nickel, selenium and antimony) after dilution in drinking water would be a minute fraction of the guideline values recommended by the WHO, and would have no appreciable toxic effects. The reagents used for water fluoridation in New Zealand are regularly tested for purity and to ensure that any trace metals (or other impurities) that they may contain, when added to drinking water, are well below the maximum safe limits described in the Drinking Water Standards for New Zealand.[30] The water supply itself is then regularly monitored to ensure fluoride levels and any impurities (including from the source water) are within the maximum safe limits set in the Drinking Water Standards.

There has been concern that fluoride in drinking water may increase human exposure to lead because it would cause the release of lead from pipes. This concern appears to be based on a single case study suggesting a relationship between fluoridation levels and blood lead concentrations,[31] and a study testing the release of lead from pipes with water containing fluoride at 2 mg/L in combination with chlorine, chloramine and/or ammonia.[32] The impact of fluoridation on lead bioavailability was carefully analysed by Urbansky and Schock,[33] who found no evidence for adverse health impacts of fluoridation via effects on lead. They concluded that reports linking fluoridating agents with human lead exposure were “inconsistent with accepted scientific knowledge” and that the chemical assumptions were “scientifically unjustified.” An evaluation by the European Commission’s Scientific Committee on Health and Environmental Risks (SCHER) in 2011[34] concurred with this conclusion.

2.2.2 Monitoring systems

There are 46 treatment plants for water fluoridation in New Zealand, supplying over two million people with drinking water in 116 ‘zones’. To comply with the Drinking Water Standards for New Zealand[30], fluoridated drinking water supplies must be sampled at least weekly to monitor levels at the point where the water leaves the treatment plant. Fluoride added to drinking water is not considered a contaminant or a health risk at the usual level of application, but is listed as a ‘Priority 2’ determinand** for monitoring in drinking water in New Zealand, based on the known effects of high concentrations of fluoride on human health.[30]

NZMoH publishes an annual report detailing the levels of monitored substances in drinking water.[35] In 2012-2013, no fluoride exceedances were found in water leaving any fluoridating treatment plant. Monitoring of fluoride was adequate for water supplied to 92 zones (2,059,000 people), but inadequate (low) at seven treatment plants supplying 12 zones (64,000 people). The previous year (2011-2012) the maximum acceptable value (MAV; 1.5 mg/L) was exceeded in one fluoridated zone (744 people), in 1 out of 52 samples. The fluoride concentration in this sample exceeded the MAV by 0.1 mg/L, and “action was taken to reduce the dose when the test result was obtained.”[35]

In general, it is concluded that fluoride levels in public water supplies are well controlled. Most of the test results fall within the required range according to the Drinking Water Standards for New Zealand[30], and are predominantly towards the lower end of the range (~0.7-0.8 mg/L).

** Priority 2 determinands are substances known to have some adverse effects on human health, but do not have to be measured in every water supply. They are distinguished from Priority 1 determinands - substances or organisms of public health significance with the highest priority for monitoring

2.3 Other sources of fluoride in NZ

2.3.1 Dental products

Aside from drinking water, toothpaste is the most common source of ingested fluoride in New Zealand. Young children have relatively poor control over swallowing reflexes, and are likely to swallow toothpaste during toothbrushing.[36, 37] This has led to concern that it could result in excessive intakes of fluoride.

Regular fluoridated toothpastes contain 1000 ppm fluoride, though higher strength varieties (1450 mg/L) have recently become available; those marketed for children 0-6 years contain 400-500 ppm fluoride. However, currently available data suggest that low fluoride toothpastes are not very effective in preventing tooth decay in children, and the NZMoH, as well as other health bodies such as Public Health England (PHE), recommends the use of toothpaste containing at least 1000 ppm fluoride in children 0-6 years of age (using a smear of toothpaste only), beginning as soon as the first primary tooth erupts. PHE recommends higher concentrations for children >6 years of age, and for adolescents and adults. A 2014 PHE report on oral health in England concluded that the risk of fluorosis from ingesting too much fluoride is linked more to the amount of toothpaste that is used, rather than to the fluoride concentration in the toothpaste.[38]

Data on actual toothpaste use in New Zealand children are not available, but, based on other studies, it is assumed that infants under the age of 12 months ingest 80% of the toothpaste dispensed on the brush, while children between 12 months and 3 years of age swallow ~68-72% of the toothpaste on the brush.[39]

2.3.2 Food and beverages

Most foods, aside from tea and marine fish, are relatively low in fluoride (<0.05 mg/100g[40]), although foods and beverages prepared with fluoridated water can contain appreciable amounts, depending on the fluoride concentration in the water. Tea leaves have high concentrations of fluoride (up to 400 mg/kg dry weight), and individual exposure due to the consumption of tea can range from 0.04 to 2.7 mg/day. High consumption of some types of tea (e.g. 'brick tea' made from older tea leaves) over long periods has been associated with the development of skeletal fluorosis in some developing countries, particularly if the water used for brewing is high in fluoride.[41] This has not been observed in New Zealand.

Infant formula

There has been some legitimate concern about the systemic intake of fluoride by infants and young children, and in particular, the level of fluoride present in infant formulas. The average intake by infants exclusively fed formula made up with fluoride-free water was estimated as 0.056 mg/day, or approximately 0.01 mg fluoride per kilogram body weight per day (mg/kg/day), which is at the lower end of the recommended range (see below – section 2.4.1). This is because infant formulas currently available in New Zealand are low in fluoride, but if they are reconstituted with water fluoridated at 0.7-1 mg/L, they can provide infants with fluoride at levels approaching or exceeding the recommended upper level for daily intake (particularly at the upper end of the fluoridation range, and for exclusively formula-fed infants drinking the maximum amount).[39]

The Australia New Zealand Food Standards Code specifies that powdered or concentrated infant formulas containing $>17\mu\text{g}$ of fluoride per 100 kilojoules (prior to reconstitution), or 'ready to drink' formulas containing $>0.15\text{mg}$ fluoride per 100mL must indicate on the label that consumption of the formula may cause dental fluorosis.[42]

2.4 Fluoride intakes and pharmacokinetics of exposure

In 2009, the Institute of Environmental Science & Research (ESR) estimated the total intake of fluoride from dietary sources (including water) and dental products by New Zealanders of all age groups using dietary modeling and analysis of total diet studies in the scientific literature.[39] The overall conclusion of the ESR report is that, aside from infants and young children, most New Zealanders have fluoride intakes that are below levels considered adequate for the prevention of dental caries, whether or not they consume fluoridated water.

2.4.1 Nutrient Reference Values and typical intakes

Nutrient Reference Values (NRVs) for Australia and New Zealand are provided by the NHMRC and NZMoH,[43] and include recommendations for fluoride intake. Dietary Reference Values (DRVs) used in Europe, which are similar to the NRVs, have recently been reviewed by the European Food Safety Authority (EFSA).[44] The US IOM also provides recommended dietary intakes for fluoride.[45]

The NRVs include recommendation on adequate intakes (AIs) for nutrients considered necessary for optimal health, as well as safe upper levels of intake (ULs). The AI level is estimated to be adequate for about 50% of the population (i.e. some will need more, and some less), and the UL is the highest intake level that is likely to cause no adverse effects in most of the population. In the case of fluoride, however, the UL for children up to 8 years of age (0.7-2.2 mg/day depending on age – see table 2) is based on the 'lowest observed adverse effect level' (LOAEL) for the occurrence of moderate dental fluorosis (see table 3 in section 3.3 for explanation of fluorosis levels), which is considered a cosmetic rather than functional adverse effect. For older children and adults, the UL is 10 mg/day, which is considered a 'no observed adverse effect level' (NOAEL) for the occurrence of skeletal fluorosis (i.e. there are no signs of skeletal fluorosis at this level of intake).[43, 45]

The ESR report suggests that the UL values should be reviewed, given the rarity of moderate dental fluorosis in Australia and New Zealand populations. Current data indicate that fluoride intake exceedances that occur occasionally in New Zealand do not constitute a safety concern.[39] As is the case with many environmental exposures, very young children are the group at greatest risk of exceeding the UL. This is because some infant diets rely heavily on foods/formula made up with the addition of water that may be fluoridated, and because young children tend to ingest fluoride from toothpaste[39] (see below).

Table 2 Nutrient reference values for fluoride as recommended by the US IOM[45] and the Australian NHMRC/New Zealand MOH[43]

Age group (reference weight)	Adequate Intake (AI)		Upper Level of intake (UL) ^c	
	mg/kg/day	mg/day	mg/kg/day	mg/day
<i>Infants</i>				
0-6 months		0.01		0.7
7-12 months (9kg)	0.05	0.5	0.1	0.9
<i>Children</i>				
1-3 years (13kg)	0.05	0.7	0.1	1.3
4-8 years (22kg)	0.05	1.0	0.1	2.2
9-13 years (40kg)	0.05	2.0	0.1	10
<i>Adolescents</i>				
14-18 years boys (64kg)	0.05	3.0	0.1	10
14-18 years girls (57kg)	0.05	3.0	0.1	10
<i>Adult males</i>				
19+ years (76kg)	0.05	4.0	0.1	10
<i>Adult females</i>				
19+ years (61kg)	0.05	3.0	0.1	10
Pregnant (61kg)	0.05	3.0	0.1	10
Lactating (61kg)	0.05	3.0	0.1	10

The Agency for Toxic Substances and Disease Registry (ATSDR) in the USA derived a chronic-duration, oral Minimal Risk Level (MRL) for fluoride of 0.05 mg/kg/day.[37] This represents an estimate of daily human exposure that is unlikely to pose any appreciable risk of adverse health effects. The MRL equates to a daily fluoride intake of 3.5 mg/day for a 70 kg adult or 0.65 mg/day for a 13kg toddler. These values are lower than the NHMRC ULs (0.9-1.3 mg/day for toddlers and 10 mg/day for adults).

In assessing the US Environmental Protection Agency (EPA) standards for maximum allowable levels of fluoride in drinking water (set at 4 mg/L – substantially higher than the MAV recommended by the WHO and used in New Zealand), the US National Research Council (NRC) determined that intakes in the 0.03-0.1 mg/kg/day range would be reached by persons with average exposures at fluoride concentrations of 1-4 mg/L in drinking water, especially the children.[46] These concentrations exceed those encountered in New Zealand, where drinking water supplies are normally below 0.9 mg/L (see section 2.2). The highest intakes (>0.1 mg/kg/day) would be reached by some individuals with very high intakes of water containing fluoride at 1 mg/L (e.g. 7L for a 70kg adult).

Infants

The adequate intake (AI) recommendation for fluoride for infants up to 6 months of age is 0.01 mg/day, which is based on the average concentration of fluoride in breast milk. It is estimated that breastfed infants (up to 6 months of age) have an average daily fluoride intake of 0.003-0.01 mg/day, reflecting ingestion of ~780 ml breast milk (less for newborns) at a fluoride concentration of 0.013 mg/L.[45] The AI of 0.5 mg/day for infants 7-12 months old is based on the well-documented relationship between water fluoride concentrations and caries.[43, 45] This corresponds to an intake of ~0.05 mg fluoride/kg bodyweight/day. The recommended upper intake level (UL) is 0.7 mg/day and 0.9 mg/day for infants 0-6 months and 7-12 months, respectively.

The average intake of fluoride for breastfed infants is low compared with that of formula-fed infants, regardless of whether the formula is reconstituted with fluoridated or non-fluoridated water. The fluoride content of prepared infant and toddler formula products available in New Zealand range from 0.069 to 0.081 mg/L.[39] Infants consuming formula made with non-fluoridated water will have fluoride intakes of around 0.059 mg/day – well below the UL of 0.7 mg/day (note – intake of 0.7 mg fluoride/day in formula equates to ~0.11 mg/kg/day for a 6kg infant[39]). However, if formula is reconstituted with water containing 0.7 or 1.0 mg/L fluoride, the mean estimated intakes are 0.66 and 0.93 mg/day, respectively.[39] A further modelling of fluoride intake by formula-fed infants in New Zealand calculated similar intake estimates,[47] and concluded that infants who are exclusively fed formula made with water fluoridated at 1.0 mg/L will thus regularly exceed the current UL for fluoride. However, it was also noted that the elevated risk associated with such exposure was almost exclusively for ‘very mild’ or ‘mild’ forms of fluorosis.(see section 3.3.4)

For infants aged 6-12 months whose teeth are brushed with a fluoride toothpaste, the estimated intake of fluoride is 0.14 mg/day for toothpaste with 400 mg/L fluoride, and 0.35 mg/day if the toothpaste contains 1000 mg/L fluoride. Based on modeling and diet studies, the ESR report concluded that fluoride ingestion from toothpaste combined with intake from food and drink would raise the total daily fluoride intake to just above the UL of 0.9 mg/day in fluoridated areas.[39] It is recommended that a minimal amount (a smear) of toothpaste should be placed on the brush when brushing an infants teeth.

Children and adolescents

The AI for children is based on the same mg/kg body weight requirement as infants (0.05 mg/kg/day), adjusted for standard body weights for the different age groups (see table 2). For older children who are no longer at risk of dental fluorosis, the maximum level for fluoride was set at 10 mg/day regardless of weight.

For a 4-year-old of average body weight (18 kg) and average water consumption (0.65 L/day;[48]), a fluoride concentration of 1.5 mg/L equals a daily dose of approximately 0.05 mg/kg/day. This average fluoride exposure is roughly equivalent to the US EPA reference dose (TDI) value of 0.06 mg/kg/day.[49] The TDI indicates a daily oral exposure that is estimated to be without an appreciable risk of adverse effects.

In young children, intake of fluoride from toothpaste contributes a significant proportion of total ingested fluoride, particularly in low-fluoride areas. The estimated mean intake of fluoride from toothpaste in toddlers aged 1-3 years is 0.3 mg/day for the recommended 1000 mg/L toothpaste (or 0.12 mg/day for 400 mg/L toothpaste). In combination with dietary intake this can raise the total daily intake above the AI.[39]

For children aged 5 and above, the estimated total dietary intake (including fluoride ingested from toothpaste) is below the AI even in fluoridated areas.[39] A study conducted in 6-7 year old children in the UK in 2007 found that total fluoride intake, urinary excretion and fluoride retention no longer reflect the fluoridation status of the community in which they reside, in part because of intakes from fluoridated dental products.[50]

Adults

The recommendation for fluoride intake in adults in Australia and New Zealand is 3 mg/day for women and 4 mg/day for men.[43] This is the same recommendation given by the US IOM.[45]

The average fluoride intake for adults living in fluoridated communities in the US ranges from 1.4 to 3.4 mg/day, while it is 0.3 to 1 mg/day in non-fluoridated areas.[45] The highest tolerable fluoride intake (10 mg/day) is only exceeded in areas with exceptionally high levels of natural fluoride in drinking water. This assumes that over three litres of water per day, containing ≥ 3 mg/L fluoride is consumed daily. [34] The estimated mean fluoride intakes for New Zealand adults, based on total diet and dietary modeling approaches, range from ~1.4 to 2.5 mg/day with fluoridated water, and ~0.8-1.3 mg/day with non-fluoridated water.[39] Only very high fluoride diets (0.1% of diets that include fluoridated water) would exceed the UL of 10 mg/day.

The US EPA recently reviewed and updated exposure estimates for fluoride, which account for dietary intake, changes in fluoridation practices and current use of consumer dental products,[51] and clarified the relationships between fluoride exposure and dental fluorosis. The agency identified a reference dose (TDI) of 0.08 mg/kg/day (5.6 mg/day for a 70 kg person) for protection of 99.5% of the vulnerable population against severe fluorosis.

In Germany, Austria, and Switzerland, reference values for nutrient intake are in agreement with the 0.05 mg/kg/day (3.5 mg/day for a 70 kg person) recommendations of the IOM, EFSA, and Australian NHMRC/NZMoH. If the fluoride content of drinking water is below 0.7 mg/L, the use of fluoridated table salt and/or fluoride supplements is recommended in these countries.[52]

Pregnant or breastfeeding women

The recommendations for fluoride intake for pregnant and breastfeeding women do not differ from those for non-pregnant women (AI 3 mg/day; UL 10 mg/day). Fluoride supplements are not required, as studies have not found a significant benefit to the offspring's dentition from enhancing maternal fluoride intake. Typical intake levels for women in New Zealand are considered safe for pregnant women. There are no data that show an increased susceptibility to fluoride that would warrant establishing a different intake recommendation for pregnant or breastfeeding women.[43, 45]

During pregnancy, fluoride is transferred from maternal blood through the placenta to the fetus. However, there are also data to suggest that the placenta sequesters some fluoride, resulting in lower concentrations in umbilical cord blood than in maternal blood.[53] Fluoride levels in cord blood reach, on average, 87% (~60-90%) of those in maternal blood.[54] The differences in concentrations suggest that the placenta acts as a partial filter.[55] Fluoride accumulation in the peripheral regions of the placenta has been observed, possibly correlating with foci of calcification.[56] This may limit passage of fluoride to the fetal circulation to some degree, such that the fetal blood fluoride concentration is not increased to the same extent as maternal plasma fluoride when maternal fluoride intake is increased. The effect of maternal intake on fluoride concentration in the amniotic fluid and fetal blood does not vary between intakes of 0.25 and 1.0 mg/day.

Only a small percentage of the fluoride from 1 mg/L drinking water reaches the fetal teeth. [57]

The transfer of fluoride from maternal plasma into breast milk is minimal (average concentrations are <0.02 mg/L), [42] and is virtually unaffected by the mother's fluoride intake unless intake is very high. Even at high daily intakes (e.g double the UL of 10 mg/day), breast milk fluoride levels were only found to be around 0.03 mg/L. [58]

2.4.2 Fluoride pharmacokinetics

Absorption, distribution and clearance

Most fluoride in food or water enters the bloodstream rapidly via the digestive tract, and about half leaves the body quickly in urine, usually within 24h unless large amounts (>20mg) are ingested. The majority of the fluoride that remains in the body is deposited in teeth and bones. [37, 46] There is substantial inter-individual variation in the metabolism of fluoride, which can be affected by dietary factors, age, and health status. The ingestion of fluoride with food delays its absorption and reduces its bioavailability. [59] In particular, intake of milk or other calcium-rich foods significantly lowers the peak plasma concentration of fluoride after ingestion. The plasma fluoride concentration is also modulated by the rate of urinary excretion. There are no apparent age-related differences in renal clearance rates between children and adults, [60] but renal insufficiency delays fluoride clearance. [61] Individuals with reduced glomerular filtration are likely to have increased plasma fluoride levels, and consequently, increased levels of fluoride in tissues, making them more susceptible to fluorosis (see section 4.6.5).

The amount of fluoride taken up by bone and retained in the body is inversely related to age. More fluoride is retained in young, growing bones than in the bones of older adults. Whereas adults retain about 50% of ingested fluoride, young children may retain as much as 80%, because it is incorporated into the rapidly developing skeleton and teeth. [61]

Once absorbed, fluoride is rapidly distributed throughout the body via the circulation. Ingested fluoride is taken up from the bloodstream into bone, and can be released back into blood as bone is remodelled. No homeostatic mechanism maintains blood fluoride concentrations – levels are determined by intake and exchange with fluoride accumulated in remodelling bone. [62] Fluoride also moves from blood into the salivary glands and back into the oral cavity in saliva. With regular intake, salivary fluoride concentration is maintained at a higher level, reflecting fluoride concentrations in the blood. [63] This is relevant to understanding the mechanisms of fluoride action in preventing dental caries (see section 3.2.2).

Exposure to 'natural' vs 'added' fluoride

The absorption, distribution, and excretion of fluoride that has been added to drinking water is similar to that of naturally occurring fluoride. Maguire et al. [64] analysed the pharmacokinetics and bioavailability of fluoride from naturally and artificially fluoridated tap waters with different degrees of water hardness (which is due to minerals in the water supply). The study concluded that any possible differences in bioavailability of fluoride between drinking waters in which fluoride was present naturally or added artificially (or hard

vs. soft waters) are insignificant compared with the large within- and between-individual variation in fluoride absorption following ingestion of water with fluoride concentrations close to 1.0 mg/L. No differences in fluoride absorption, distribution, or excretion in humans have been found for water fluoridated with any of the three commonly used fluoride sources.[65]

3. Water fluoridation and dental health

3.1 Oral health in New Zealand

Oral health is integral to general health and well-being. The 2009 New Zealand Oral Health Survey[66] has provided a detailed snapshot of the status of the nation's oral health, including data on the effect of CWF at a national level. The report concluded that, although oral health in New Zealand is generally good (and despite notable overall improvements in oral health in the last half century), dental caries remains the single most common chronic disease among New Zealanders of all ages, with consequences including pain, infection, impaired chewing ability, tooth loss, compromised appearance, and absence from work or school.[66] Caries is both cumulative and irreversible, continuing through the lifespan at an average rate of around one tooth surface per person per year. This has large direct and indirect costs to society. A 2013 report on health loss in New Zealand[67] found that dental caries was the cause of a loss of 7536 disability-adjusted life years (DALYs) in 2006, taking a greater toll on health than lower respiratory tract infections and chronic kidney disease. This is equivalent to 77% of the health loss from prostate cancer (9786 DALYs), and 42% of the health loss from breast cancer (17,870 DALYs).

A recent cohort study of 430 adolescents examined in 2003 at age 13 and again at age 16 showed that caries is still an important health problem in this age group in New Zealand adolescents, particularly among low-socioeconomic groups.[68] Although the study provides further evidence of the overall decline in caries prevalence and severity since the 1980s, it also suggests that there have been no improvements in recent years. Nearly 80% of the adolescents studied had experienced caries in their permanent teeth. There was a high proportion of Māori and people of low-socioeconomic status with untreated decay, confirming substantial ethnic and socioeconomic inequalities in dental health.

Significant disparities still exist in oral health status and access to services for children and adolescents, particularly for those of Māori and/or Pacific ethnicity. Cost remains an important factor in accessing dental care, and most adults receive care only when there is a problem, rather than attending for routine check-ups.[66]

3.2 Fluoride and caries prevention

3.2.1 Causes of dental caries

Dental caries is one of the most prevalent diseases in children, and remains a significant public health issue throughout the lifespan. Carious lesions are brought about by the metabolism of fermentable carbohydrates (dietary sugars) by oral bacteria, producing acid that diffuses into the tooth and dissolves the mineral of the enamel and dentine. The disease is initiated within the bacterial biofilm (dental plaque) that covers the tooth surface. It is initially reversible by removal of plaque, but otherwise progresses into chronic decay of the tooth surfaces.[69]

Caries is a disease process that ideally needs to be prevented and managed over a person's lifetime. In addition to the removal of plaque by tooth brushing and professional dental services, the most obvious approach to primary prevention of caries is to reduce sugar intake. These measures, however, require individual compliance and political will (e.g., only a few countries have adopted taxes on sugar-sweetened beverages or other high sugar products, and the impact of such fiscal approaches remains uncertain). Fluoride is an important complementary approach and is recognised as the main factor responsible for the considerable worldwide decline in caries prevalence that has occurred over the past half-century. Fluoride toothpaste has well-proven clinical effectiveness for caries prevention[70] and is the leading intervention for self-administered care, but as with brushing alone, is dependent on individual oral hygiene practices. In contrast, protection from caries by fluoride in the water supply appears to be independent of oral hygiene. The effects of fluoride toothpaste and fluoridated water are independent and additive.[71]

3.2.2 Mechanisms of fluoride action

The protective effect of fluoride in tooth enamel is due to its strong, spontaneous reaction with mineral ions such as calcium. Upon systemic exposure during tooth formation, fluoride is incorporated into fluorapatite [$\text{Ca}_5(\text{PO}_4)_3\text{F}$] in tooth enamel, replacing hydroxyapatite [$\text{Ca}_5(\text{PO}_4)_3\text{OH}$]. The fluorapatite crystals are more symmetric and stack better than hydroxyapatite, resulting in the formation of stronger teeth with shallower fissures, and enamel that is more resistant to decay.[73] After topical exposure to fluoride in dental products (e.g. toothpaste) or water, fluoride can be found in several compartments in the oral cavity: ionized in saliva and plaque fluid, bound as calcium fluoride, bound to enamel, and bound to soft tissues.[74] A constant low level of fluoride ion in saliva and plaque fluid reduces the rate of enamel demineralisation during the caries process and promotes the remineralisation of early caries lesions[72, 73] The usual levels in saliva are 0.03 mg/L fluoride or less, dependent on the use of fluoride products and fluoride in the drinking water. Models have predicted that a concentration of 0.1 mg/L fluoride in saliva would be almost completely protective against caries progression.[75, 76] In a review of studies of dental enamel chemistry and the mechanism of fluoride action on caries lesions, Robinson[77] determined that fluoride must continuously enter caries lesions to combat the effects of demineralisation by plaque.

These various studies suggest that the predominant effect of fluoride is mainly local (interfering with the caries process) rather than systemic (pre-eruptively changing enamel

structure), though the latter effect should not be dismissed (see below). To affect the caries process, fluoride must be present in plaque fluid and saliva during or shortly after sugar exposure in order to interfere with demineralization events.[63] This can be achieved either by topically-applied or water-borne fluoride.

A 2005 study by Ingram et al.[78] established that fluoride at the low levels found in fluoridated drinking water was capable of interacting with enamel apatite mineral in the presence of other salivary components. This research showed that a range of fluoride concentrations up to those in fluoridated water areas produced discernible differences in salivary fluoride levels, favourably influencing remineralisation.

Contribution of pre-eruptive fluoride exposure to preventive effects

Despite a substantial body of evidence suggesting that the predominant effect of fluoride in mitigating the caries process occurs post-eruptively and topically, some recent studies provide additional evidence of a systemic effect of fluoride on pre-erupted teeth. Singh et al.[79] found that fluoride is acquired in enamel during crown completion in the first permanent molars, during the time that the matrix is formed and calcified in the first 26-27 months of life. The same group had previously evaluated the pre- and posteruptive effects of fluoride exposure at the individual level, controlling for multiple fluoride sources and potential confounders, and showed a significant effect of pre-eruptive fluoride exposure on caries in permanent teeth.[80] However, they determined that maximum benefit was gained by having both pre- and post-eruptive fluoride exposure. Other groups have also found that a higher percentage of total lifetime exposure to fluoride was associated with lower caries burden,[81-83] indicating that fluoride is effective throughout the lifespan, including pre-eruptively.

3.2.3 Epidemiological evidence of CWF effects

Most of the studies and systematic reviews discussed below evaluated the efficacy of water fluoridation on dental caries prevention in children and adolescents. Studies that specifically looked at effectiveness of fluoridation in adults and the elderly are presented separately in section 3.2.4.

Evidence from international reviews and recent studies

Acknowledging that the prevalence of dental caries has declined markedly since the 1980s, a number of thorough systematic reviews have been carried out since 2000 to assess the ongoing public health effects and effectiveness of water fluoridation in the modern context. Some of the criteria used in these reviews to assess the quality of evidence, and a summary table of the main reviews and studies, are provided in the Appendix (tables A2 and A3). A number of additional comprehensive reviews provide support for the conclusions discussed below, including those published by the US Public Health Service in 1991,[84] the New Zealand Public Health Commission in 1994[85] the US Centers for Disease Control and Prevention (CDC) in 2001,[86] the UK Medical Research Council in 2002,[87] the Institut National de Sante Publique du Quebec in 2007,[88] and SCHER in 2011,[34] among others. These are summarised in the table A2 and are not described in detail here.

There are two common outcome measures reported in studies of the effect of fluoridation on dental caries. The percentage of caries-free children measures the proportion of children

in the population who have no past or current experience of caries in their teeth, and the number of decayed, missing, or filled teeth (designated 'dmft' for primary teeth, and 'DMFT' for permanent teeth) measures the severity of dental decay in an individual.

The UK NHS/York Review[89, 90] used stringent inclusion criteria of studies of the beneficial effect of CWF on caries. That is, it included only before/after studies (CWF was initiated after a baseline survey and caries prevalence/severity assessed later in the same age group – i.e. different group of children) or prospective cohort studies (following the same group of children from prior to initiation of fluoridation for a number of years, compared with a control group in a non-fluoridated area). Studies with a cross-sectional design were excluded, as these were not considered to be of sufficient epidemiological quality to draw conclusions (see Appendix table A2 for quality of evidence criteria used in the York review). This limited the number of included studies to 26, which were of 'moderate' quality, as most were not blinded (i.e. the examiners were aware of subject exposure status), and multivariate analysis was not used to control for potential confounding factors.

The review concluded that the best evidence available at the time (2000) supported fluoridation of drinking water for reducing caries prevalence, "both as measured by the proportion of children who are caries free and by the mean change in dmft/DMFT score." The report calculated the 'number needed to treat' as 6 (i.e. a median of six people need to receive fluoridated water for one extra person to be caries free). It also concluded that caries prevalence increases in communities that were fluoridated after withdrawal of fluoride from the water.[89, 90] Evidence from a subset of these studies conducted after 1974 (n = 10) also suggested that CWF has an additive effect over and above that of fluoride toothpaste and other sources of fluoride that are now in common use.

The second major systematic review of CWF was conducted by the Australian National Health and Medical Research Council in 2007.[91] This review included comparative cross-sectional studies that had been excluded in the York review, and additional studies that had been carried out in the intervening years. Only one additional relevant study was identified,[92] and this did not alter the conclusion of the York review. This new study was carried out by the US Community Preventive Services Task Force, which has recently released a statement recommending CWF "based on strong evidence of effectiveness in reducing dental caries across populations. Evidence shows the prevalence of caries is substantially lower in communities with CWF. In addition, there is no evidence that CWF results in severe dental fluorosis." [93] The NHMRC review pooled and reanalysed data from the York review and, after multivariate meta-regression analysis to adjust for confounding variables, found a 14.3% mean difference in the percentage of caries-free children following the introduction of CWF. In answer to the posed question 'Is intentional water fluoridation more efficacious than no water fluoridation in the prevention of dental caries?', the review concluded that 'the existing evidence strongly suggests that water fluoridation is beneficial at reducing dental caries'. [91]

The North South survey of children's oral health in 2002[94] found that decay rates among children in the Republic of Ireland, where water fluoridation reaches >70% of the population, were significantly lower than among children from non-fluoridated Northern Ireland. For example, among 5-year-old children, the average dmft (decayed, missing, or

filled primary teeth) was 1.3 in the Republic of Ireland vs 2.2 in Northern Ireland. This difference existed in spite of children in the Republic of Ireland having less favorable dental habits, including higher sugar intake, less frequent tooth-brushing, and lower usage of fluoride toothpaste. Caries levels among 15-year-olds with water fluoridation in the Republic of Ireland were 39.5% lower than those for the same age group with no water fluoridation in Northern Ireland.

Public Health England's 2014 Water Fluoridation Health Monitoring Report[95] on the effects of England's water fluoridation schemes on dental health indicators (including tooth decay and related hospital admissions and dental health inequalities) found that five-year-olds living in CWF areas were (on average) 15% less likely to have tooth decay than those in non-CWF areas (this was adjusted to 28% when deprivation and ethnicity were taken into account). Likewise, 12-year-olds were 11% less likely (21% accounting for deprivation and ethnicity) to have tooth decay than children of the same age in non-CWF areas. The lower caries experience associated with CWF was most apparent in the most deprived areas. In CWF areas, there were 45% fewer hospital admissions of children aged one to four for dental caries (mostly for extraction of decayed teeth under a general anaesthetic) than in non-CWF areas.

A recent (2014) Australian study of early-life fluoride exposure[96] used a cross-sectional population-based design that included 2,611 children aged 8-12-years from New South Wales, where >60% were exposed to fluoridated water almost continuously during their first 3 years of life, and just under 15% had no early exposure. Exposure to fluoridated water during the first 3 years of life was associated with better oral health of school-age children. The association between exposure to fluoridated water and dental caries in the primary dentition was confirmed in multivariate models for both the prevalence (prevalence ratio 0.83 for 100% exposure in first 3 years vs no exposure) and extent of dental caries (risk ratio 0.65). Exposure during the first 3 years was also associated with significantly lower caries experience in permanent teeth (RR 0.76 for 100% exposure vs 0% exposure). Another recent Australian study found that the introduction of CWF in 2005 to five remote indigenous communities with very poor oral health resulted in a significant reduction in the prevalence and severity of dental caries by 2012, particularly in children who had lifetime exposure to fluoridated water (4-8 year-olds in 2012 vs 4-8 year-olds in 2004).[97]

The US IOM Committee on Examination of the Evolving Science for Dietary Supplements analysed the evolution of evidence for relationships between nutrient intake and disease status in 2002[98] and found that the evidence for fluoride in reducing dental caries had strengthened since the previous report in 1997.[45] Fluoride was one of the few nutrients for which there was increased confidence in the relationship between the nutrient and a health effect (the others being calcium and vitamin D in relation to bone status). The additional evidence reviewed was considered to support and strengthen previous conclusions that exposure to fluoride at all ages (from fluoridated water, supplements, and topical application) prevents dental caries, and that both pre- and post-eruptive exposure has cariostatic (decay-stopping) effects.

The WHO considers fluoride a micronutrient with a beneficial effect on oral health. Following reviews of the evidence for health effects of fluoride in drinking water,[10, 99] the WHO continues to recommend fluoridation of water supplies, where possible, as the most

effective public health measure for the prevention of dental decay, as stated in their 2010 document for decision makers[100] and reiterated on the current (2014) WHO website, which states: "Public health actions are needed to provide sufficient fluoride intake in areas where this is lacking, so as to minimise tooth decay. This can be done through drinking water fluoridation, or, when this is not possible, through salt or milk fluoridation." [101]

Recent data from New Zealand

A number of studies have been carried out in New Zealand over the last decade that provide epidemiological data on oral health in relation to community access to optimally fluoridated drinking water.

The **New Zealand Oral Health Survey 2009**[66] found that overall, the NZ population had relatively good oral health, showing substantial improvements since the 1980s. The survey found that significant differences in decay rates between fluoridated and non-fluoridated communities continue to exist, despite the fact that the majority of people use fluoride toothpastes. The prevalence and severity of dental decay in five-year-old children was higher in non-fluoridated areas (55% caries-free; dmft = 2.2) than in fluoridated areas (58% caries-free; dmft = 1.8), a pattern that has been consistent over time. Similarly, 12-13-year-olds from non-fluoridated areas were less likely to be caries-free than their counterparts in fluoridated areas (45.1% vs 56.2%) and more likely to have higher DMFT scores (1.7 vs 1.2; i.e. more decayed, missing or filled permanent teeth), indicating more severe decay.

Importantly, levels of fluorosis were similar between fluoridated and nonfluoridated areas, and the overall prevalence of moderate fluorosis was very low. The findings support international evidence that water fluoridation has oral health benefits for both adults and children, and minimal risk of increasing fluorosis.

Auckland

In 2009, Kanagaratnam et al.[102] collected data on a cohort of 9-year-old children in the Auckland region in relation to their length of residence in fluoridated versus non-fluoridated areas, and observed a dose-response relationship between fluoride exposure and the prevalence of both dental caries and enamel defects (specifically diffuse opacities). The prevalence of decay in primary (deciduous) teeth was lowest in continuous residents of fluoridated areas (51%), highest in continuous residents of non-fluoridated areas (67%), and intermediate for those with intermittent fluoridation residency status. The severity of deciduous caries (dmft scores) also followed this pattern.

Northland

A cross-sectional epidemiological survey was conducted in 2007 that provided baseline data prior to initiation of fluoridation in two Northland communities (Kaitaia and Kaikohe); two other towns (Dargaville and Kawakawa/Moerewa) served as non-fluoridated control areas. The prevalence and severity of caries in Northland was very high compared with the rest of New Zealand (e.g. mean dmft of 5.6 vs a national mean of 2.3).[103] A second cross-sectional survey constituted the final report.[19] This study found that the water treatment plants serving the fluoridated communities did not consistently achieve fluoride concentrations at the desired level (levels ranged from 0.20-0.78 mg/L in Kaikohe and from 0.24-0.84 mg/L in Kaitaia, while they were 0.02-0.03 mg/L in the non-fluoridated areas).

Fluoridation for 2 years was associated with some improvement in caries levels, particularly among 12-13-year-olds. Of note was that the caries prevalence and severity in this age group was 2.5x the national average at baseline. This study has some weaknesses but suggests that fluoridation at optimal levels would be effective in reducing caries prevalence and severity in this region of very high caries burden.

Southland

A 2005 cross-sectional survey in which 436 children (mean age 9.8 years) were examined for enamel defects and dental caries found that children who were continuous residents of fluoridated communities had about half the caries experience (50% lower DMFS scores) of residents of non-fluoridated communities, but also a greater risk for diffuse enamel opacities (which were seen in just over half of all the study participants).[104] Children who had lived all of their lives (to age 4) in a fluoridated area had over twice the odds of having mild enamel fluorosis (diffuse opacity). Children who were reported as having eaten toothpaste before the age of 4 had 4-fold higher odds of having a hypoplastic defect (moderate fluorosis).

Canterbury and Wellington

A large cross-sectional analysis in 2004 of routinely collected data from school dental services examined differences in dental caries rates between children (8375 5-year-olds and 7158 12-year-olds) living in fluoridated and non-fluoridated areas of Canterbury and Wellington.[105] This study also looked at differences between ethnic and socio-economic groups. Overall, the study determined that the benefits of CWF continue to be significant in New Zealand. The prevalence and severity of caries was >30% lower in fluoridated areas, than in non-fluoridated areas. The advantage of fluoridation was greatest for Māori and Pacific children, and those in low socioeconomic groups.

Otago

A recent (2013) retrospective analysis of the need for treatment under general anaesthesia for children in fluoridated and non-fluoridated areas of Otago found that children from non-fluoridated areas underwent treatment at younger ages and had more teeth affected by caries than those from areas with CWF.[106] This suggests that CWF may have a positive impact on early childhood caries at the severe end of the spectrum, where the disease has the greatest cumulative negative consequences over the lifespan.

3.2.4 Studies in adult and elderly populations

With the exception of water fluoridation, virtually all primary caries-preventive programmes target children and youth, yet caries experience continues to increase with age. For example, among military recruits in Australia, those aged 31-35 had mean DMFT scores that were more than double that of the 17-20 year old group. Recruits who had lived more than half of their life with access to fluoridated drinking water had approximately 25% less caries experience than those with no lifetime exposure.[107] Young military recruits with long-term exposure to CWF had 38% less caries experience in approximal tooth surfaces (between teeth), and 26% reduction in caries in occlusal (chewing) surfaces than those with no or limited exposure.[108]

Griffin et al.[109] performed a systematic review that included 9 studies of the effect of CWF in adult populations, and concluded that CWF was beneficial in adults of all ages. Overall, the caries-prevented fraction was 34.6% in populations with lifetime exposure (vs no exposure). For the five studies conducted after 1979 (i.e. since the introduction of fluoridated dental products), the prevented fraction was 27.2% for water fluoridation.

A thorough review of adult oral health in Ireland in 2007[110] revealed that adults exposed to water fluoridation had lower DMFT scores, less caries on the aesthetically important teeth in the front of the mouth, and an average of 2.8 more healthy teeth than those in the non-fluoridated group. The New Zealand Oral Health Survey 2009[66] also found a statistically significant difference in DMFT scores for adults living in fluoridated vs non-fluoridated areas.

Slade et al. 2013[111] reported that Australian adults with prolonged exposure to fluoridated water had significantly lower age-adjusted DMFT and fewer decayed or filled tooth surfaces than those with negligible exposure. This included adults born before 1960, who were not exposed to CWF during early childhood, indicating that later but prolonged exposure was still effective in reducing the prevalence and severity of tooth decay in adults.

Elderly

The long history of CWF around the world now means that many adults in late life have experienced a lifetime of fluoridation. The benefits for adult dental health include lower levels of root caries, and better tooth retention into old age. A 2010 study in the US,[112] using data from the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System annual survey data (1995-1999), estimated the association between adult tooth loss and current CWF, CWF 20 years ago, and CWF at time of birth in a cohort of adults born between 1950 and 1969. They reported that CWF levels in an individual's county of residence at the time of birth were significantly associated with tooth loss – consistent with a lasting effect of early fluoride exposure throughout the lifespan. Similarly, elderly individuals in Ireland whose water supplies were fluoridated were found to be more likely to retain their natural teeth than those in non-fluoridated areas.[110]

It should be noted that the increasing retention of natural teeth in the elderly brings with it an increased need for long-term maintenance of tooth function. Elderly individuals may have decreased ability to undertake personal healthcare due to frailty, sarcopenia (loss of muscle strength), poor vision, and/or dementia. As with other groups who may have inadequate oral healthcare habits, the consumption of fluoridated water can have important preventive impact against caries in the elderly.

3.2.5 Health inequalities and cost effectiveness

A number of studies have suggested that the benefits of CWF are greatest among the most deprived socioeconomic groups, although the magnitude of the difference is uncertain.

The York Review[89] assessed 15 UK studies of the effect of CWF on social equity in dental health and concluded that the caries reduction benefit for disadvantaged social classes was greater than for higher social classes (the difference in mean DMFT score between fluoridated and non-fluoridated areas was 52.6% among low socioeconomic groups and

38.9% among high socioeconomic groups). However, the methodology used in the studies varied, and statistical analysis was not possible, so the reviewers suggested caution in interpreting the results. Other studies demonstrating a greater difference in caries reduction from CWF for low vs high socioeconomic groups include communities from New Zealand,[105, 113] Australia,[114] Ireland[115], and a recent blinded study from the UK.[116]

Cost-effectiveness

The cost-effectiveness of CWF in New Zealand was last evaluated in 1999; the findings were published in 2001.[117] CWF was found to be “cost-saving (dental cost savings exceeded fluoridation costs) for communities above about a thousand people”. The authors noted that for smaller communities, CWF may be considered cost-effective, depending on how a prevented decayed tooth surface is valued. They also reported that CWF was particularly cost-effective for “communities with high proportions of children, Māori, or people of low socio-economic status”. These conclusions may indeed underestimate the value of CWF in that this study did not include benefits of CWF after age 34 years and cost savings after age 45 years. It also used a relatively high discount rate (of 5%) compared to contemporary health economic practice in New Zealand (typically 3%).

In 2012 a cost-effectiveness study was performed in Australia,[118] a country that shares many characteristics with New Zealand. This study reported that extending CWF to all communities of at least 1000 people would lead to improved population health (3700 disability-adjusted life-years (DALYs), 95% uncertainty interval: 2200–5700 DALYs), and that there would be a 100% probability of this being cost saving. Furthermore, it found that by “averting 760,000 (430,000–1,300,000) child and adolescent caries lesions, the intervention can reduce the total cost of caries treatment by \$95 million (\$45 million–\$170 million)” (Australian dollars).

These New Zealand and Australian studies detailed above are compatible with other studies which indicate cost savings from CWF in the US,[119, 120] Australia,[121, 122] and Quebec, Canada.[123] A modelling study on CWF in South Africa also reported that benefits of CWF would exceed costs.[124] At least since the year 2000, there appear to be no published studies in the peer-reviewed literature that show that CWF is not cost-effective (i.e., in communities over 1000 people and where the water is not naturally fluoridated).

3.3 Dental fluorosis

Dental fluorosis is a type of hypomineralisation of tooth enamel that manifests as visually detectable differences in enamel opacity. Fluorosis develops from pre-eruptive exposure to excess fluoride in susceptible children; its effects occur only while the teeth are forming in the jaw and before they erupt into the mouth (age <8 years). In the mildest forms, the tooth is fully functional but has cosmetic alterations – almost invisible opaque white spots. In more severely fluorosed teeth, the enamel is pitted and discoloured and is prone to fracture and wear. An explanation of the different levels of fluorosis is provided in table 3. There is a dose-response relationship between fluoride intake and fluorosis, even when intake level is

relatively low.[34, 96] A higher prevalence of dental fluorosis has been observed concomitantly with overall lower caries experience.[125]

Table 3. Explanation of levels of fluorosis (scores according to the WHO Oral Health Surveys Manual)[126]

0 = Normal.	Enamel surface is smooth, glossy and usually a pale creamy- white colour
1 = Questionable	The enamel shows slight aberrations in the translucent normal enamel and which may range from a few white flecks to occasional spots
2 = Very mild	Small opaque, paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface
3 = Mild	White opacities of the enamel involving more than 25% but less than 50% of the tooth surface
4 = Moderate	The enamel surfaces show marked wear, and brown staining
5 = Severe	The enamel surfaces are severely affected and the hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance

There are other conditions that appear similar to very mild fluorosis, most notably the white spotting of teeth caused by use of antibiotics such as amoxycillin during childhood.[127] Enamel hypomineralisation can also occur as a result of illness (e.g. measles) or other major upset during tooth formation. The common misdiagnosis of these conditions may contribute to an over-estimation of the overall prevalence of fluorosis.

Dental fluorosis reflects overall fluoride absorption from all sources at a young age. The development and severity of fluorosis is highly dependent on the dose, duration, and timing of fluoride exposure.[34] The timing of fluoride exposure relative to developmental events for dentition is shown in table 4. The exposures listed therein do not imply that fluorosis can occur as a result of each exposure; for example, maternal fluoride intake during pregnancy and breastfeeding are unlikely to have a significant impact on the dentition of the fetus or nursing infant, unless intakes are extremely high (i.e. doses that would be toxic to the mother). From an aesthetic point of view, the only fluorosis that is of concern is that affecting the permanent incisors and canines, and the timing is restricted to a few years when the crowns of these teeth are forming.

Table 4. Timing of fluoride exposure relative to developmental events for dentition

Developmental event	Timing	Means of fluoride exposure
Early ossification of jaw and development/ amelogenesis of deciduous teeth	4-8 months <i>in utero</i>	Maternal intake crossing placenta
Eruption of deciduous teeth	6-24 months	Systemic ingestion – breast milk or formula
Amelogenesis of unerupted permanent teeth	3 months to 5 years	ingested milk (breast/formula/dairy), water, dental products
Eruption of permanent teeth enamel surface	5-16 years	food, water, soft drinks, tea, dental products

3.3.1 Mechanisms of fluorosis

The presence of excess amounts of fluoride during tooth formation can temporarily disturb the function of cells (ameloblasts) that secrete enamel-forming proteins during tooth development. Such disruption can cause hypomineralisation defects in the enamel of unerupted teeth,[75] and may represent a perturbation of fluoride's cariostatic effects on stabilisation of calcium apatite crystals and proteins in enamel. Excess fluoride alters the activities of calcium-dependent proteases, resulting in a delay in protein removal and disrupted mineralisation at the maturation stage of enamel formation. Continuous intake of excess fluoride during and after the secretory phase increases the risk of these defects occurring.[128]

There is some evidence for a genetic predisposition to fluorosis, possibly relating to differences in fluoride metabolism, which may explain some of the variability in fluorosis severity among individuals with similar fluoride intakes.[129]

3.3.2 Infant formula and fluorosis risk

Human breast milk is very low in fluoride, and it is clear that infants who are exclusively formula-fed have higher fluoride intakes than breastfed infants, and are thus at higher risk of dental fluorosis. However, the magnitude and significance of this increased risk is not clear. Levy et al.[130] suggested that the six- to nine-month-old period is most important for development of dental fluorosis in the primary teeth. An increase in fluorosis risk was found with greater intakes of reconstituted infant formula (with fluoridated water) between the ages of 3 and 9 months.[131] A review of changing trends in fluoride intake and fluorosis in infants[132] concurred that the higher risk of fluorosis in formula-fed infants related mainly to the reconstitution of powdered formula with fluoridated water (and not the formula itself), and suggested that, when feasible, low-fluoride water should be used. Erdal and Buchanan[133] used a health risk assessment approach to quantify fluoride intakes from infant formula and other sources associated with fluorosis in children. Their report supported concerns that a segment of the infant population in the US may be exposed to amounts of fluoride that elevate the risk of mild fluorosis, but the specific contribution of infant formula to this risk was not determined. It was again suggested that infant formula could be made up with low-fluoride water in order to reduce the potential risk.

A 1977 study in Sweden had reported that intakes of 0.1 mg fluoride/kg bodyweight/day caused some fluorosis in formula-fed infants. At the time, it was assumed that this level could be consumed by low-weight infants fed formula in low fluoride areas, by normal-weight infants in 0.8 mg/L fluoride areas, and by high-weight infants in 1.2-1.5 mg/L fluoride areas.[134] More recently, a systematic review found some data supporting the association between infant formula consumption and a higher prevalence of enamel fluorosis in permanent dentition, but considered the evidence for this effect to be weak.[135] The 2013 EFSA review determined that an intake of less than 0.1 mg F/kg bodyweight/day in children up to 8 years old corresponds to no significant occurrence of "moderate" forms of fluorosis in permanent teeth.[44]

Recommendations in the US previously suggested that powdered infant formula should be reconstituted with low-fluoride water to reduce the risk of dental fluorosis, but updated

recommendations are to use water fluoridated at around 0.7 mg/L.[136] Advice from Australia indicates that infant formula is safe for consumption whether reconstituted with fluoridated or non-fluoridated water.[137] Fluoridated water supplies in New Zealand are also considered safe for use in infant formula, though as with recommendations elsewhere, if parents are concerned with the risk of mild fluorosis, low-fluoride bottled water can be used for reconstitution in order to reduce fluoride exposure in this age group.

3.3.3 Topical fluorides and fluorosis risk

Intake of fluoride from fluoridated water in infants and young children is clearly not the only risk factor for dental fluorosis. Higher intake of fluoridated toothpaste between 16 and 36 months was also found to increase the risk of mild fluorosis.[131] A Cochrane review of topical fluoride and fluorosis in children found a statistically significant reduction in fluorosis if brushing of a child's teeth with fluoride toothpaste commenced after the age of 12 months, based on observational studies (odds ratio 0.70).[138] Randomised controlled trials showed use of toothpaste with 1000 mg/L fluoride was associated with an increased risk of mild fluorosis. The review concluded that if fluorosis is of concern, the fluoride level of toothpaste for children under 6 should be <1000mg/L. For children considered at high risk for dental caries (by a dentist), the benefits of higher fluoride toothpaste may outweigh risks of fluorosis – but careful parental monitoring is recommended.[138] Young children should use only a smear of toothpaste and should be supervised during toothbrushing to ensure that toothpaste is not swallowed/eaten.

3.3.4 Water fluoride levels associated with fluorosis

The increased prevalence of fluorosis that has been observed since the 1970s has been primarily attributed to the widespread availability of discretionary fluorides such as fluoridated toothpaste, fluoride supplements, and professionally applied fluoride varnishes, because the increase has occurred in both fluoridated and nonfluoridated areas. An examination of fluorosis trends in the US from the 1930s to the 1980s showed that the largest increase in fluorosis prevalence occurred in areas with suboptimal water fluoride levels.[139] The NHS/York review[89, 90] estimated that the overall prevalence of any fluorosis is 48% in areas fluoridated at 1.0 mg/L, and predicted that fluorosis of aesthetic concern would affect 12.5% of the population drinking water at this level of fluoride. The report acknowledged, however, that there is some debate about the significance of the lowest fluorosis scores of each of the various indices for defining an individual as 'fluorosed'.

In the US, some water supplies have natural fluoride levels around 4 mg/L, which is the concentration corresponding to the 'maximum contaminant level goal' (MCLG) – set by EPA. Severe enamel fluorosis occurs at an appreciable frequency, approximately 10% on average, among children in US communities with water fluoride concentrations at or near the current MCLG of 4 mg/L.[46] The prevalence of severe enamel fluorosis is very low (near zero) at fluoride concentrations below 2 mg/L.

The high levels of fluoride approaching the MCLG in the US are not found in drinking water in New Zealand, where most water supplies are below 1.0 mg/L fluoride (and closer to 0.7-

0.8 mg/L) most of the time. The NZ Oral Health Survey 2009[66] reported that 44.5% of 8–30-year-olds in New Zealand had some dental fluorosis, with the majority of fluorosis being ‘questionable’ or very mild; i.e. effects that are only identified by dental examination. Moderate dental fluorosis was rare (2.0%), and severe fluorosis was not observed (0.0%). In 9-year-old children living continuously throughout their lives in fluoridated areas of Southland, ‘questionable’ mild to moderate fluorosis could be detected by a dental professional in around 29%. Very mild, mild or moderate fluorosis was equally prevalent between fluoridated and nonfluoridated areas.[66]

A 2011 analysis by the US Department of Health and Human Service of fluorosis trends and fluoride concentrations showed that a plateau in the caries-preventive effects of fluoride occurred as levels in water increased between 0.7 and 1.2 mg/L, but that the percentage of children with at least very mild dental fluorosis continued to increase with increasing fluoride concentrations. This led to a proposal that the fluoride concentration for fluoridated water supplies should be adjusted to 0.7 mg/L rather than a range between 0.7 and 1.2 mg/L.[7] An evaluation of fluorosis prevalence in children before and after a minor downward adjustment in target fluoride levels (from 1.0 to 0.7 mg/L) in Hong Kong drinking water showed that fluorosis was less prevalent in children who were born after the reduction than in cohorts born before. Older cohorts with longer exposure to the higher fluoride concentration had correspondingly higher, but generally mild fluorosis prevalence.[140] Although it was not assessed directly in this study, a previous survey suggested that this reduction in fluorosis did not occur at the expense of increased dental caries, as the prevalence of caries continued to decline in Hong Kong during the period of the study.[141]

A 2010 report by the US EPA,[49] using studies that analysed caries scores in relation to fluorosis scores, found a U-shaped fluoride-caries relationship (i.e. high caries with both low [<0.5 mg/L] and high [>4 mg/L] fluoride) but a linear fluoride-fluorosis relationship (low fluorosis with low fluoride, high with high). Optimum fluoride between 0.7 and 1.0 was protective against caries and had minimal impact on fluorosis incidence.

3.3.5 Fluorosis of aesthetic concern

It is important to note that the seemingly high prevalence of fluorosis reported in some studies and systematic reviews includes mainly mild and very mild (and sometimes questionable) degrees of fluorosis, with only a small proportion that would be considered to be of aesthetic concern.

Surveys have shown that very mild to mild dental fluorosis is not associated with negative impact on perception of oral health,[142] and that adolescents actually preferred the whiteness associated with mild fluorosis.[143] In a recent study, adolescents answered a questionnaire regarding the impact of enamel fluorosis on dental aesthetics, older adolescents rated photographs of mild fluorosis more favorably than younger ones. A fluorosis score indicative of moderate fluorosis was the level considered to have aesthetic significance. Carious teeth were rated significantly lower than fluorosed teeth.[144]

Findings from a longitudinal cohort study of 314 South Australian children (aged 8-13 years) analysing the natural history of dental fluorosis were presented at the 2013 conference of

the International Association for Dental Research (IADR). The data showed that the diffuse mottling of enamel indicative of fluorosis fades during the adolescent years, with over 60% of teeth with mild fluorosis at baseline in 2003-4 showing no fluorosis at follow-up in 2010-11.[145] These changes are most likely the result of ongoing mineralisation by saliva.

4. Water fluoridation and potential health risks

A number of potential adverse effects of the consumption of fluoride have been suggested, though many have only been reported in areas where the natural level of fluoride in water is very high. Reports of possible adverse effects have been systematically reviewed in both the York review[89] and the more recent Australian NHMRC review.[91] Although the York review excluded a large number of cross-sectional studies when assessing CWF benefits, it included all studies for evaluation of potential adverse effects. The NHMRC used similar inclusion criteria. Evidence from these reviews as well as subsequent studies supporting or refuting these claims is evaluated below.

4.1 General toxicity

Over the years, fluoride has been tested in many of the same assays and test systems that are applied in the safety evaluation of new drugs and pesticides, including *in vitro/in vivo* genotoxicity assays, acute and chronic dose toxicity assays, and 2-year carcinogenicity studies in rats and mice.[59]

Acute toxic doses in animals are several hundred times higher than human intake levels in CWF areas (typically 0.05-0.1 mg/kg/day). Multiple-dose animal experiments show potential adverse effects on bone, liver, kidney, heart and testes, but only at doses greater than 4.5 mg/kg/day – again, far exceeding typical human exposures.[59] With regard to genotoxicity, various assays have shown inconsistent results. Fluoride does not show mutagenic potential in standard bacterial systems, but at high doses can produce chromosome aberrations in mammalian cells.[146] The 2002 WHO/IPCS[59] and 2006 NRC reviews[46] considered the evidence for genotoxic effects of fluoride, including assays using blood from people exposed to high levels of fluoride, to be inconclusive, and not relevant to exposures to humans from intentionally fluoridated water.

The York review[89] did not include analysis of *in vitro* or animal studies because the reviewers considered the available human data to be the most relevant in assessing the potential effect of doses used in CWF schemes, outweighing the potential effects of very high doses administered to animals or applied to cells in *in vitro* toxicity studies.

Nonetheless, animal and *in vitro* studies can generate mechanistic and toxicological data that provide biological plausibility for claims of cause and effect. Where appropriate, results of these toxicity studies will be described as background to the review of each type of potential human adverse effect in the following sections.

4.2 Cancer

A number of studies have investigated hypothetical mechanisms by which fluoride could act as a potential carcinogen, either directly via genotoxic or mitogenic effects, or indirectly via effects on thyroid and immune function. These studies were reviewed in a recent analysis by the California EPA,[147] which considered that an effect of fluoride on the development of osteosarcoma was mechanistically plausible, but concurred with previous analyses that human epidemiological evidence for fluoride carcinogenicity has not been demonstrated.

4.2.1 Animal data

A large number of animal carcinogenicity studies have been reported, and to date no effects have been observed at concentrations relevant to intentionally fluoridated drinking water. In most studies in which fluoride was administered orally to rodents, no mutagenic effects were observed. The most comprehensive carcinogenicity studies were conducted as part of the US National Toxicology Program (NTP) in the early 1990s. The first study showed a small number of bone cancers in male rats (but not in mice or female rats) exposed to fluoride in drinking water at concentrations up to 175 mg/L (intakes of 2.5-4.1 mg/kg body weight/day – 50 times the typical human exposure).[148] A follow-up NTP study found no increase in risk when fluoride concentrations were increased to 250 mg/L.[149]

Animal data have not shown a positive link to other forms of cancer. A two-year diet study in male and female rats (4-25 mg/kg/day in food) found no treatment-related tumors of any type despite clear signs of fluoride toxicity in teeth, bones, and stomach[150] A further study which showed an increased incidence of non-malignant osteomas in mice was confounded by possible effects of retroviral infection; thus the osteomas cannot be interpreted as an effect of fluoride.[151] In the more than 20 years since these studies were published, no experimental evidence of an association between cancer and fluoride has been reported.

4.2.2 Human data

Most studies have not found any association between fluoride and cancer in humans, even after decades of exposure in some populations. This includes industrial exposures as recorded and analysed by the US ATSDR.[37] A 1985 review of epidemiological evidence gathered since the introduction of CWF (~70 studies using data from 12 different countries), which included a commissioned reevaluation of some of the data,[152] found an absence of demonstrable effects on cancer rates following long-term exposures to either naturally elevated levels of fluoridated water or artificially fluoridated water supplies. The review found that studies suggesting an association between CWF and cancer had failed to consider the effects of social and environmental differences between the comparator groups, had applied and/or selected data inappropriately, and/or made errors in analyses. More rigorously conducted studies in the UK, Canada, Australia, and New Zealand did not reveal any association between CWF and cancer. The large human populations observed, and the consistency of the findings from many different sources of data in multiple countries, allowed the reviewers to conclude that CWF was not linked to cancer.

An ecological study of nine communities in the US examined cancer incidence rates in 36 body sites in relation to the proportion of residents supplied with CWF. Rates were positively correlated with the proportion of residents with CWF for 23 cancer types, negatively for four types, and for nine types no significant relationship was seen.[153] This study is considered to be flawed because actual fluoride concentrations were neither measured nor considered, and no adjustments for other causes of cancer were made.

Two additional ecological studies reported either no association[154] or an inverse relationship between water fluoride levels and cancer incidence (i.e. low cancer incidence in areas with high fluoride concentrations in the drinking water),[155] but these studies are also of low validity and should be interpreted with caution.

4.2.3 Osteosarcoma

Bone cancers have received attention because of fluoride's deposition in bone. A number of studies have been conducted in human populations to evaluate the potential association of CWF with osteosarcoma (a rare cancer, but the most common type of bone cancer). A 1993 review by the US NRC Committee on Health Effects of Ingested Fluoride[36] concluded that the weight of evidence available at that time did not support an association between fluoridation and osteosarcoma. A 1995 case-control study in osteosarcoma patients under the age of 25[156] found an inverse relationship between total fluoride exposures and osteosarcoma in males, (that is, high concentrations of fluoride were associated with less cancer), but no association in females. The study concluded that CWF exposure does not increase the risk of osteosarcoma, and may be protective. Other case-control studies also failed to find a link between CWF and osteosarcoma.[157, 158] The York review in 2000 concluded that there was no clear association between exposure to fluoridated water and risks of osteosarcoma or other cancers.[89]

A study published since the York review by Bassin et al.[159] has been the source of many claims linking fluoridated water with osteosarcoma. The study used a hospital-based case-control design with fluoride exposure assessment based on retrospectively collected data. A statistically significant increased risk was observed for males who were exposed to CWF at the upper end of the CDC target level (1.2 mg/L F) between 6 and 8 years of age, a time that coincides with the mid-childhood growth spurt in boys. No increased risk was observed in females. A subsequent correspondence submitted by some of the study's co-investigators warned that the findings of this preliminary study were not replicated in the larger study.[160] Patients recruited later than those in the preliminary subset agreed to provide bone samples in which the levels of fluoride could be tested, as fluoride levels in bone serve as an objective biomarker of chronic fluoride exposure. It has since been reported that bone fluoride levels in these samples did not correlate with the occurrence of osteosarcoma.[161]

Systematic reviews including the 2006 NRC review,[46] the 2007 NHMRC review,[91] and the 2011 SCHER report[34] all concluded that based on the best available evidence, fluoride could *not* be classified as carcinogenic in humans.

More recent studies have not changed this conclusion (see Appendix table A4 for a summary of cancer epidemiology data/conclusions and key animal studies):

- Analysis of data from the Northern Ireland Cancer Registry (NICR) and the National Cancer Registry of Ireland (NCRI) in 2011 on osteosarcoma incidence found no difference in incidence rates between fluoridated Republic of Ireland and non-fluoridated Northern Ireland (though no statistics were presented for specific age groups under 25 years).[162]
- An ecological analysis in 2012 of CDC Wonder database data on osteosarcoma incidence and fluoride in drinking water concluded that water fluoride status has no influence on osteosarcoma incidence rates.[163]
- A large and detailed study in England, Scotland and Wales, published in 2014, included 2566 cases of osteosarcoma and 1650 cases of Ewing sarcoma (a rare bone cancer) diagnosed in 1980-2005 and data on fluoride levels in small areas of residence. The analysis, which is more informative than those of previous ecological studies, found no correlation between fluoridated water consumption and these cancers.[164]
- A recent Water Fluoridation Health Monitoring report published by Public Health England[95] found no evidence of a positive association between fluoridation and osteosarcoma or other forms of cancer.
- Finally, in the New Zealand context, National Fluoridation Information Service (NFIS) data from New Zealand cancer registries from 2000-2008 shows no evidence of association between osteosarcoma incidence and residence in water fluoridated areas.[165]

4.3 Skeletal effects

4.3.1 Animal studies

Fluoride naturally accumulates in bone, but its prolonged maintenance there requires a rate of uptake equal to or exceeding the rate of clearance.[166] Thus, from a mechanistic viewpoint, fluoride may be expected to have effects on bone following high and prolonged exposure. Chronic, high-dose fluoride exposure studies in rats (22-50 mg/L in drinking water for up to 18 months) have shown inhibition of bone mineralization and reduced femoral bone strength, and bone remodelling alterations were observed in pigs given fluoride at 2 mg/kg/day.[59] These exposures are 20-50 times those experienced by people drinking optimally fluoridated water, but are relevant to areas of endemic fluorosis where natural fluoride levels are very high.

When considering exposures closer to those associated with CWF, evidence from animal studies suggests that a water fluoride level of 1 mg/L may lead to increased bone strength, while levels ≥ 4 mg/L may cause a decrease in bone strength.[167]

4.3.2 Skeletal fluorosis

Skeletal fluorosis is the result of very high fluoride intake over long periods of time – e.g. intakes of 20 mg/day over periods of 20 years or more cause crippling fluorosis

characterised by osteomalacia, osteoporosis, and/or osteosclerosis. Areas of the world where this is prevalent include parts of India, China, South Africa, and Tanzania.

The NRC 2006 report used modelling to test whether the EPA MCLG (4 mg/L) was protective against skeletal fluorosis.[46] The model estimated that bone fluoride concentrations resulting from lifetime exposure to fluoride in drinking water at 2 mg/L or 4 mg/L fall within or exceed the ranges historically associated with stage II and stage III skeletal fluorosis. However bone fluoride concentrations at which skeletal fluorosis occur can vary widely. The potential for fluoride accumulation in the skeleton is increased in patients with reduced renal function, who therefore have a higher risk for skeletal fluorosis. Nonetheless, evidence indicates that high fluoride intakes are still required (e.g. consumption of 4-8 L/day of water containing fluoride at 2-3 mg/L, or 2-4 L/day at 8.5 mg/L) to become symptomatic.[46] According to the ATSDR, skeletal fluorosis is extremely rare in the United States; it has occurred in some people consuming greater than 30 times the amount of fluoride typically found in fluoridated water.[37] Skeletal fluorosis has not been known to occur in New Zealand.

4.3.3 Fractures

The effects of fluoride intake on fracture risk and bone strength have been studied in animal models and in a large number of epidemiological studies, which have been extensively reviewed in the NRC report.[46], and more recently in a dose-response analysis by the US EPA.[49] The weight of evidence indicates that increasing amounts of fluoride might increase bone volume, but there is less strength per unit volume. The ATSDR found that fluoride at five times the level found in fluoridated water can result in denser bones that may be more brittle than normal bone and may increase the risk of fracture in older individuals.[37]

When study results were combined, a dose-response relationship indicated a gradient of exposure and increasing fracture risk at fluoride concentrations between 1.0 and 4.0 mg/L.[46, 49] The EPA review council concluded that lifetime exposure to fluoride at drinking-water concentrations of 4 mg/L or higher is likely to increase fracture rates in the population, compared with exposure to 1 mg/L, particularly in some demographic subgroups that are prone to accumulate fluoride into their bones (e.g., people with renal disease).

It should be noted that in many of the studies, the reference group was exposed to 1.0 mg/L fluoride in drinking water, and fracture rates were compared with groups having higher exposures. This makes these studies somewhat irrelevant to studying the effect of CWF. A study in Chinese populations with water fluoride levels ranging from 0.25 to 7.97 mg/L found a U-shaped pattern for prevalence of bone fracture and fluoride level; i.e. both high and low fluoride levels were associated with increased risk.[168] The lowest fracture rate was observed in populations where the fluoride concentration in water was 1-1.06 mg/L – near optimal levels used in CWF.

The York report[89] reviewed 29 studies (all of low validity) that assessed whether there was an association between water fluoridation and bone fractures or bone development problems. No evidence of an elevated risk of fractures could be attributed to water

fluoridation at optimal levels. In children, intake of fluoridated water does not appear to affect bone density parameters through adolescence.[169]

4.4 Neurotoxicity/IQ effects

4.4.1 Animal studies

Animal studies using extremely high doses of fluoride have revealed various deficits in learning and behaviour following prolonged exposure. For example, Pereira et al.[170] studied rats fed 100 mg/L fluoride in drinking water for 30 days – 100 times the level in optimally fluoridated water – and noted memory deficits compared with rats who were not dosed with fluoride. Other studies fed rats sodium fluoride by gavage at a level of 5.0 mg/kg/day – again 100 times the recommended level for children (0.05 mg/kg/day). In one study, rats consuming fluoridated water (0, 2.9, 5.7, 11.5 mg/kg body weight/day) showed no evidence of learning deficits in any of the fluoride-exposed groups.[171] This represents chronic ingestion up to 230-fold higher than that experienced by humans whose main source of fluoride is fluoridated water. While these studies are informative from a high-dose, chronic toxicity standpoint, they have little relevance for typical exposures to humans from drinking water at levels used in CWF regimens.

4.4.2 Human studies

Recently there have been a number of reports from China and other areas where fluoride levels in groundwater are naturally very high (fluorosis endemic regions) claiming an association between high water fluoride levels and slightly reduced intelligence (measured as IQ) in children. These studies, which were almost all of very low validity (no adjustment for confounding variables, population level data), were reviewed and meta-analysed by Choi et al,[172] who concluded that the results supported a possibility of adverse neurodevelopmental effects of high fluoride intake. The definition of 'high' fluoride varied considerably in these studies, but most levels were higher than those considered acceptable in the US, and much higher than any level found in New Zealand. In many cases the fluoride level of the 'low' fluoride group was similar to that of artificially fluoridated regions of New Zealand. Setting aside the methodological failings of these studies, Choi et al. determined that the standardised weighted mean difference in IQ scores between "exposed" and reference populations was only -0.45. The authors themselves note that this difference is so small that it "may be within the measurement error of IQ testing".[172] The studies considered only fluoride exposure from drinking water at the population level, although it is likely that other significant environmental sources of fluoride exposure may have been overlooked. In China, for example, grains and other foods are often contaminated with fluoride from coal fires.[173] Most of the studies fail to consider the effects of lead, arsenic, iodine deficiency, socioeconomic status, or nutritional status of the children; thus the strength of evidence is questionable,[46] and not considered relevant to the situation in New Zealand.[174] The 2011 SCHER report also concluded that human studies do *not* support the conclusion that fluoride in drinking water impairs children's development at levels permitted in the EU.[34]

In including fluoride in a list of chemicals possibly causing human developmental toxicity, Grandjean and Landrigan[175] cite only the Choi et al.[172] review, of which Grandjean is a coauthor, as evidence. While no plausible biological mechanism explains the alleged association of fluoride with IQ, overall there is some evidence of possible, slight adverse effect on the developing brain at high fluoride concentrations. There is no convincing evidence of neurological effects at fluoride concentrations achieved by CWF.

A recently published prospective, longitudinal study in New Zealand compared data on IQ and reasoning abilities in a cohort of 1037 individuals born in 1972-73. IQ was assessed at ages 7, 9, 11 and 13 years and averaged into a measure of childhood IQ. Adult IQ was assessed at the age of 38 years. Early-life exposure to fluoride from a variety of sources was recorded using prospective data, and adjustment was made for potential confounding variables. This relatively high quality study revealed no evidence that water fluoridation affects neurological development or IQ.[176]

4.5 Other effects

4.5.1 Reproductive and related effects

No laboratory animal studies have reported reproductive toxicity at low fluoride doses.[37] Decreased fertility and sperm and testes damage have been observed in laboratory animals (rats) at extremely high doses (over 100 times higher than levels of fluoridated water). Other studies reviewed by the ATSDR found no effect.[37] The 2006 NRC review of EPA fluoride standards[46] concluded that adverse reproductive and developmental outcomes occur only at very high concentrations that are unlikely to be encountered by US populations. Although a single, small study on rats exposed to 2, 4, and 6 mg/L sodium fluoride for 6 months reported adverse affects on fertility and reproduction (reduced sperm motility),[177] other larger studies have shown no reproductive effects over multiple generations of rats exposed to fluoride in drinking water at doses up to 175 mg/L[178-180] and no effects on spermatogenesis in doses up to 100 mg/L.[181, 182] A study of Mexican men found that fluoride intakes up to 27 mg/day did not affect sperm motility or other sperm parameters. Some of the men had occupational exposure to fluoride in addition to exposure from drinking water at a concentration of ≥ 3 mg/L.[183]

Rats exposed to very high doses of sodium fluoride (100 or 200 mg/L) in drinking water for 6 months exhibit ovarian dysfunction, possibly as a result of increased oxidative stress in ovarian cells.[184] Female fertility also decreased following 12 weeks of exposure of rats to these same excessive concentrations of fluoride. The daily fluoride intake of these rats was 5.2 mg/kg/day.[185]

The York review in 2000[89] did not find any evidence of fluoride-attributable reproductive toxicity in humans, and the 2006 NRC review of EPA fluoride standards[46] concluded that adverse reproductive and developmental outcomes occur only at very high concentrations that are unlikely to be encountered by U.S. populations. Equally, these high concentrations of fluoride are unlikely to be found in New Zealand. The 2011 SCHER report[34] found no

new studies indicating that fluoride in drinking water influences human reproductive capacity. No additional studies have been identified since this review.

Birth defects

Animal studies have not found any increase in the incidence of birth defects at doses that do not cause maternal toxicity (i.e. the fetus is not more sensitive than the mother).[37] This, in combination with the lack of clear genotoxicity data, brings into question the plausibility of fluoride having a potential effect on the incidence of birth defects, particularly at the low exposure levels associated with CWF.

Nonetheless, several epidemiological studies have looked at the incidence of Down's Syndrome births in relation to fluoridation status. Early links between CWF and Down's syndrome were refuted by later studies.[186, 187] Takahashi[188] reworked the data of the later studies and claimed that fluoride exposure in optimally fluoridated areas was associated with increased risk of Down syndrome for younger mothers (<30-32y). However, a systematic review by Whiting et al.[189] judged all of the available evidence as being of low validity (see Appendix table 1 for criteria) as the studies did not properly assess or adjust for multiple confounding factors, and no conclusion of a link between fluoride exposure and Down's syndrome could be drawn.

The Water Fluoridation Health Monitoring Report for England 2014[95] analysed the distribution of Down's syndrome births in 324 local authorities by fluoridation status and also found no evidence of an association of CWF with Down's syndrome.

Sudden Unexplained Death of an Infant (SUDI)

Studies from New Zealand [190, 191] found no association between fluoride and SUDI (also known as 'sudden infant death syndrome' or 'cot death'). In one of those studies[191], a nationwide case-control database of SUDI was evaluated for fluoride exposure status and controlled for the method of infant feeding (breast or reconstituted formula) with the conclusion that exposure to fluoridated water prenatally or postnatally at the time of death did not affect the relative risk of SUDI.

4.5.2 Endocrine effects

Questions have been raised about potential thyroid impacts from fluoridated drinking water. Studies of animals with iodine deficiency showed effects on thyroid function at fluoride doses of 3-6 mg/kg/day,[192-194] and in one study, at doses in the range of 0.4-0.6 mg/kg/day.[192] The levels of thyroid hormones T3, T4, and TSH are altered in response to excess fluoride in rodents.[59]

The mechanisms of potential fluoride effects on endocrine organs and hormones have been extensively reviewed by the NRC.[46] Most of the reviewed animal studies were designed to ascertain whether certain effects occurred, and not to determine the lowest exposures at which they occurred. The report concluded that fluoride (at unspecified levels) can affect normal endocrine function or response, and that better characterisation of fluoride exposure in humans in epidemiological studies is needed to investigate the potential endocrine effects of fluoride. Two small studies in India that examined the relationship between dental fluorosis and thyroid hormone alterations yielded contradictory results.[195, 196]

Studies conducted in areas of endemic fluorosis suggest that excess fluoride may be associated with thyroid disturbances similar to those observed in iodine deficiency (e.g. goitre), and that high fluoride intake could exacerbate the effects of iodine deficiency. A review of the literature to 1984, including well-controlled studies in large populations exposed to fluoride over long periods, found no convincing evidence of a link between human goitre and fluoride intake.[197] Systematic analysis of studies by the NHS/York review[89] also yielded no significant association between fluoride levels in water and the prevalence of goitre. The York review included a study by Jooste et al.,[198] which examined the prevalence of childhood goitre in relation to water fluoride levels in six towns in the Northern Cape of South Africa where iodine deficiency was not noted. The study found that goitre prevalence did not correlate with fluoride levels: although goitre prevalence was highest in towns with high fluoride (where moderate to severe dental fluorosis was prevalent), it was also high in towns with low fluoride levels, and lowest in one town with optimal fluoride. The authors suggested that the high rates of stunting and undernutrition in the other towns predisposed the children to the risk of goitre development, which could be exacerbated in the presence of excess fluoride.

Both the NHS/York (2000)[89] and the SCHER (2011)[34] reviews concluded that neither animal or human studies to date support a role for fluoride-induced thyroid perturbations in humans in the absence of iodine deficiency.[34]

4.5.3 Cardiovascular and renal effects

Because fluoride accumulates in calcified tissues, there is a suggestion that exposure to fluoride will affect aortic calcification. In fact in animal studies, fluoride (50 mg/L in drinking water) did not affect the deposition of calcium in rat aorta – but blocked increase in phosphorus (in vivo and in vitro models). A number of studies indicate that fluoride may reduce aortic calcification in experimental animals and humans.[199] This preventive effect was recently confirmed by *in vitro* experiments, but *in vivo* findings from the same studies showed the opposite result – that phosphate-induced aortic calcification was accelerated following exposure of uremic rats to fluoride in water at around 1.5 mg/L.[200] The authors suggested that chronic kidney disease could be aggravated by relatively low concentrations of fluoride, which (in turn) accelerates vascular calcification. However, further studies are required to test this hypothesis.

Liu et al.[201] conducted a cross-sectional analysis of the possible relationship between excess fluoride intake from drinking water and carotid atherosclerosis development in adults in fluoride endemic areas of China. They reported a correlation between atherosclerosis prevalence and water fluoride concentration. However, no attempt was made to adjust for confounding variables or moving between regions. The 'normal' fluoride level group (considered low in this study) had mean fluoride water level of 0.85 mg/L (range 0.04-1.20 mg/L), which is similar to or higher than CWF levels in New Zealand. Epidemiological research suggests no link between water fluoride levels and heart attacks.[202-204]

A 1987 clinical case report suggested a possible link between long-term exposure to high-fluoride water (8.5 mg/L) and the development of renal disease,[205] but other studies and systematic reviews have found no evidence that consumption of optimally fluoridated drinking water increases the risk of developing kidney disease. However, individuals with impaired kidney function experience higher/more prolonged fluoride exposure after ingestion because of reduced urinary fluoride excretion, and those with end stage kidney disease may be at greater risk of fluorosis.[206]

The Water Fluoridation Health Monitoring Report for England 2014[95] analysed the incidence of kidney stones in relation to CWF and found evidence that the incidence was lower in fluoridated areas than in non-fluoridated areas.

4.5.4 Immunological effects

There are two types of potential effects of fluoride on the immune system – hypersensitivity reactions and immunotoxicity effects (weakening of the immune system). Information on both is limited. Earlier reviews concluded that the evidence did not support claims that fluoride was allergenic.[36, 87] The NRC committee, who analysed effects of fluoride in drinking water at the EPA's MCLG level of 4 mg/L, did not find any human studies where immune effects were carefully documented. The report suggested that immunosuppressed individuals could be at greater risk of potential immunological effects of fluoride.

An interesting case is presented by a study in Kuopio Finland, where a planned and publicised discontinuation of CWF was carried out one month early, without the public being told. Surveys were taken at three time points: 1) when the public was aware CWF was currently implemented, 2) when the public believed CWF was still implemented but it had been discontinued, and 3) when the public was aware the CWF had been discontinued. Symptoms of allergic skin reactions were reported for surveys 1 and 2 but the number of reports substantially diminished in survey 3, suggesting that some 'reactions' to fluoride were related to beliefs rather than actual exposure.[207]

4.6 Impact on specific demographic groups

4.6.1 Pregnant women

Pregnant women are not themselves any more vulnerable to the effects of fluoride than their non-pregnant counterparts, but they may have concerns about fluoride ingestion and its possible effects on their unborn fetuses. In humans, fluoride crosses the placenta and is transferred from mother to fetus,[208] but there is also evidence that the placenta may act as a partial barrier to accumulation of fluoride in the fetal circulation, since levels in amniotic fluid and cord blood are lower than in maternal blood. None of the major reviews of fluoride effects (2000 NHS/York,[89] NHMRC 2007,[91] SCHER 2011[34]) found any evidence of reproductive toxicity attributable to fluoride at or around levels used for CWF. No new data have been published since these reviews.

In the past, fluoride supplements were recommended for pregnant women as fluoride was considered beneficial to fetal tooth development. The first enamel is formed in the

developing fetus around the third to fourth month of gestation. Although fluoride is not essential for tooth development, enamel containing fluoroapatite is more resistant to acids (dissolves at a lower pH) than enamel containing only hydroxyapatite.[73, 209] However, studies of fluoride supplementation in pregnancy have not shown them to be effective, and because of the possibility of increased risk of fluorosis, fluoride supplements are no longer recommended.

Physiological changes occurring in pregnancy can negatively affect maternal oral health. There is also evidence for *in utero* transmission of cariogenic bacteria from mother to child.[210] The American Academy of Pediatric Dentistry considers perinatal fluoride exposure a protective factor against the development of early childhood caries by helping to delay colonisation of the infant oral cavity by cariogenic bacteria.[211] Pregnant women are therefore encouraged to use fluoridated toothpaste and to consume fluoridated water.

4.6.2 Formula-fed infants

There is no evidence that typical fluoride intakes from formula feeding, using optimally fluoridated water for reconstitution, has any adverse effects on infant or child development aside from a possible greater risk of dental fluorosis. Feeding with formula reconstituted with fluoridated water may be associated with lower caries experience in permanent teeth.[212]

The American Dental Association have provided evidence-based recommendations[136] that suggest infant formula can be made up with 'optimally fluoridated' drinking water (now 0.7 mg/L in the US), but that parents should be aware of the potential risk for development of mild enamel fluorosis. If fluorosis is a concern, or in areas where local water supplies contain fluoride at higher levels, ready-to-feed formulas or powdered formulas reconstituted with low-fluoride water are recommended.

4.6.3 Young children

It is possible that some children in New Zealand could exceed the UL for fluoride intake when fluoridated water is consumed, although most evidence points to the effect of swallowing toothpaste in contributing to excess fluoride intake, and the development of mild to moderate fluorosis in young children.[39] Very young children should be supervised while brushing, and should use only a smear of toothpaste with a fluoride concentration of 1000 ppm.

The UL for fluoride intake in children is based on the endpoint of increased risk of moderate dental fluorosis. Because moderate fluorosis is very rare in New Zealand, the level of exceedance of UL that may occur in New Zealand children is not considered to be a safety concern.[213]

4.6.4 Elderly

Fluoride plasma and bone concentrations tend to increase with age, partially due to accumulation over time, and also to decreased renal clearance. [46] The elderly are therefore likely to have relatively higher bone fluoride concentrations. However, epidemiological data to date do not suggest any increased risk of fracture due to fluoride exposure in this older population. Nevertheless, the NRC review[46] suggested that more

research is needed on bone concentrations in the elderly as a potentially sensitive population. A recent EPA study analysing exposure and risks [51] suggested that 0.08 mg/kg/day intake of fluoride was protective against fractures in all populations (including vulnerable groups).

4.6.5 Renal-impaired individuals

Chronic kidney disease affects a significant proportion of the New Zealand population, with a particularly high prevalence among Māori and Pacific people. Numbers of affected individuals are increasing due to the increasing prevalence of hypertension and diabetes. Because the kidney is the major route of excretion, blood fluoride concentrations are typically elevated in patients with kidney disease.[214, 215] Only a few studies have examined fluoride concentrations in bone in renal patients, but these have noted markedly elevated (possibly up to 2-fold) bone fluoride levels[46]. However, the potential effect of these higher bone fluoride levels is currently unknown. Adverse effects of fluoride exposure from CWF in renal-impaired individuals have not been documented. However, the scarcity of data indicates that further studies are required.

5. Summary

A large number of studies and systematic reviews have concluded that water fluoridation is an effective preventive measure against tooth decay that reaches all segments of the population, and is particularly beneficial to those most in need of improved oral health. Extensive analyses of potential adverse effects have not found evidence that the levels of fluoride used for community water fluoridation schemes contribute any increased risk to public health, though there is a narrow range between optimal dental health effectiveness and a risk of mild dental fluorosis.

In establishing guidelines for drinking-water quality, the WHO notes that fluoride is one of few chemicals for which the contribution from drinking water to overall intake is an important factor in preventing disease. Conversely, it is also noted as causing adverse health effects from exposure through drinking water when present in excessive quantity. WHO states that “it may not be possible to achieve effective fluoride-based caries prevention without some degree of dental fluorosis, regardless of which methods are chosen to maintain a low level of fluoride in the mouth”[216] A guideline value of 1.5 mg/L fluoride in drinking water has been recommended as a level at which dental fluorosis should be minimal.[10] A 2011 update of the WHO Guidelines for Drinking-Water Quality concluded that this guideline value should be maintained, as there is no new evidence to suggest a need for revision.[21] For optimal dental health, WHO suggests that the optimal range should be 0.8-1.0 mg/L, and that drinking water supplies should have fluoride levels raised or lowered to this range if possible.[100, 217]

Water fluoridation in New Zealand has been ongoing since the 1950s, with notable benefits to the oral health of its residents. The levels of fluoride found naturally in New Zealand water sources (typically 0.1-0.2 mg/L) are below those known to benefit oral health, but are

adjusted to between 0.7 and 1.0 mg/L (usually ~0.8 mg/L) in areas served by CWF schemes. The most recent New Zealand Oral Health Survey[66] indicated that fluoridation continues to be of benefit to communities that receive it, despite overall reductions in tooth decay that have resulted from widespread use of fluoridated dental products since the mid-1970s. The prevalence of fluorosis of aesthetic concern is minimal in New Zealand, and is not different between fluoridated and non-fluoridated communities, confirming that a substantial proportion of the risk is attributable to the intake of fluoride from sources other than water (most notably, the swallowing of high-fluoride toothpaste by young children). The current fluoridation levels therefore appear to be appropriate. It is important, however, that the chosen limit continues to protect the majority of high-exposure individuals.

This analysis concludes that water fluoridation continues to provide dental health benefits to the population of New Zealand, with no evidence of serious adverse effects after many decades of exposure. Based on these findings, we conclude that CWF is a sound public health policy practice. Communities that currently do not provide CWF – particularly those with high dental caries prevalence – would benefit from its implementation. To be effective, a public health intervention must be meeting a public health need – the effectiveness of the intervention is highest where there is the highest need. There is strong evidence that CWF is a cost-effective use of tax payer funds – with it being likely to save more in dental costs than it costs to run fluoridation programmes (at least in communities of 1000+ people). There is New Zealand evidence for this, along with evidence from Australia (three studies), the US (two studies), Canada, Chile and South Africa. The New Zealand study reported that CWF was most cost-effective in “communities with high proportions of children, Māori, or people of low socio-economic status”.

Conclusions

Councils with established CWF schemes in New Zealand can be confident that their continuation does not pose risks to public health, and promotes improved oral health in their communities, reducing health inequalities and saving on lifetime dental care costs for their citizens. Councils where CWF is not currently undertaken can confidently consider this as an appropriate public health measure, particularly those where the prevalence and severity of dental caries is high. A forthcoming study from the Ministry of Health is expected to provide further advice on how large a community needs to be before CWF is cost-effective (current indications point to all communities of 1000+ people).

It is recommended that a review such as this one is repeated or updated every 10 years – or earlier if a large well-designed study is published that appears likely to have shifted the balance of health benefit vs health risk.

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Abbreviations

AI = adequate intake
ATSDR = Agency for Toxic Substances and Disease Registry (USA)
CWF = community water fluoridation
dmft = decayed, missing, or filled primary (deciduous) teeth
DMFT = decayed, missing, or filled permanent teeth
DRV = dietary reference value
EFSA = European Food Safety Authority
EPA = Environmental Protection Agency (USA)
ESR = Environmental Science & Research (NZ)
HFA = hydrofluorosilicic acid; hexafluorosilicate
 H_2SiF_6 = hydrofluorosilicic acid; hexafluorosilicate
IOM = Institute of Medicine (USA)
LOAEL = lowest observed adverse effect level
MAV = maximum acceptable value
MCLG = maximum contaminant level goal
MRL = minimal risk level
NaF = sodium fluoride
 Na_2SiF_6 = sodium fluorosilicate
NHMRC = National Health and Medical Research Council (Australia)
NOAEL = no observed adverse effect level
NRC = National Research Council (USA)
NRV = nutrient reference value
NTP = National Toxicology Program (USA)
NZMoH = New Zealand Ministry of Health
PHE = Public Health England
TDI = tolerable daily intake reference dose
SCHER = Scientific Committee on Health and Environmental Risks (Europe)
UL = tolerable upper level of intake
WHO = World Health Organization

Appendix

Table A1. Study characteristics and levels of evidence criteria for epidemiological studies of community water fluoridation (CWF) – used in the UK NHS/York review[89] and the Australian NHMRC review. [91]

HIGH quality of evidence – minimal risk of bias
<ul style="list-style-type: none"> • Prospective study design (not retrospective or cross-sectional), starting around the time of either initiation or discontinuation of CWF, and with a long follow up • Randomisation, or addressing and adjusting for multiple possible confounding factors • Blinded: fluoridation status of participants is unknown to those assessing outcomes.
MODERATE quality of evidence – moderate risk of bias
<ul style="list-style-type: none"> • Studies that started within three years of the initiation or discontinuation of CWF, with a prospective follow up for outcomes. • Studies that measured and adjusted for at least one confounding factor (but less than 3) • Not blinded - fluoridation status of participants was known to those assessing primary outcomes, but other provisions were made to prevent measurement bias.
LOWEST quality of evidence – high risk of bias
<ul style="list-style-type: none"> • Cross-sectional or retrospective studies using concurrent or historical controls • Studies that failed to adjust for confounding factors.

Table A2. Major reviews, guidelines, and oral health reports on community water fluoridation (CWF)

Review	Year	Scope of review/Inclusion criteria	Conclusions	
			CWF efficacy	CWF adverse effects
Public Health Service – USA [84]	1991	Comprehensive qualitative assessment of health benefits and risks, prepared by PHS Ad Hoc Subcommittee on Fluoride. Analysed NTP fluoride carcinogenicity studies, published studies on humans and animals, Public input was requested and submissions reviewed.	Fluoride has substantial benefits in the prevention of tooth decay. Numerous studies, taken together, clearly establish a causal relationship between water fluoridation and the prevention of dental caries. The health and economic benefits of water fluoridation accrue to individuals of all ages and socioeconomic groups, especially to poor children.	<ul style="list-style-type: none"> - CWF at optimal level does not pose a detectable cancer risk to humans. - More studies are needed to determine whether there is a link between CWF levels and bone fractures. - No indication of adverse effects in other organ systems. - Mild fluorosis has increased in all areas (fluoridated or not) due to introduction of additional fluoride sources
Public Health Commission - NZ [85]	1994	Review of the benefits and costs of CWF, with particular attention to recent scientific literature and NZ-related literature	Average individual lifetime benefit of CWF in NZ = prevention of 2.4-12.0 DMFT; At population level (with 50% of population exposed to CWF) = prevention of 58,000-267,000 DMFT/year in NZ. Greatest caries prevention benefit in lower SES groups, Māori, and children	<ul style="list-style-type: none"> - Possible small increased risk of hip fracture. - No evidence of link to cancer, except possible small increased risk of osteosarcoma cannot be ruled out. - Little/no adverse cosmetic impact from dental fluorosis; moderate fluorosis likely due to other fluoride sources - No scientific basis for concern about other health effects from CWF at 1 mg/L
NHS Centre for Reviews and Dissemination, University of York (UK) [89]	2000	Systematic review of 214 studies in all languages using strict quality criteria for inclusion. Cross-sectional studies were excluded. Overall the validity of the studies was considered moderate or low.	The best available evidence suggests that CWF does reduce caries prevalence, both as a proportion of children who are caries free and by the mean change in dmft/DMFT score. A beneficial effect was still evident in spite of the assumed exposure to non-water fluoride in all study populations after 1974	<ul style="list-style-type: none"> - Fluorosis of any degree was estimated to occur in 48% of people consuming water at 1.0 mg/L fluoride. - Bone fracture studies found no association with CWF - No clear association was found between CWF and cancer incidence or mortality (including bone cancers, thyroid cancer, and all cancer) - Insufficient evidence exists for other possible negative effects

Table A2 continued

Review	Year	Scope of review/Inclusion criteria	Conclusions	
			CWF efficacy	CWF adverse effects
Centers for Disease Control and Prevention (CDC) - US [86]	2001	Review/guideline on use of fluorides for prevention and control of dental caries in the US – looks at all modalities. Does not review safety.	Recommends that all persons drink water with an optimal fluoride concentration and brush teeth twice daily with fluoride toothpaste	Not assessed
Medical Research Council (MRC) – UK [87]	2002	Mostly reiterated York review but considered what future research could help inform risk management decisions on water fluoridation.	Conclusions as per those in York. Also found that water fluoridation reduced dental caries inequalities between high and low SES groups. Suggested studies needed to provide better estimate of effects of CWF against background of widespread use of fluoride toothpaste.	- Evidence suggests no link to cancer, and no effect on fracture risk (but cannot rule out the possibility of a small %change - either increase or a decrease - in hip fractures.) - No evidence of any other significant health effects
US Task Force on Community Preventive Services [92]	2002	Reviews 21 qualifying studies of CWF, including 15 starting of continuing CWF, 5 stopping or reducing CWF, and 1 with changes in both directions.	Strong evidence shows that CWF is effective in reducing the cumulative experience of dental caries within communities. Starting CWF decreased caries experience by 30-50%. Stopping CWF lead to ~17% increase in caries experience. CWF was cost saving in all studies.	Not assessed
Ireland Forum on Fluoridation [29]	2002	First major review of CWF in Ireland since it was introduced in 1964. Based on presentations by Irish and international experts examining scientific evidence representing views both for and against CWF. Also addressed issues of concern to the Irish public.	CWF has been very effective in improving oral health in the Irish population, especially children, but also adults and the elderly, and should continue as a public health measure	- Best available and most reliable evidence indicates that human health is not adversely affected by CWF at the maximum permitted fluoride level (1 mg/L) - There is evidence that dental fluorosis is increasing in Ireland.
Ireland North-South survey of children's oral health [94]	2002	Survey of oral health in fluoridated Republic of Ireland (RoI) compared with non-fluoridated Northern Ireland (NI)	CWF was the major contributor to lower decay rates in RoI compared with NI, despite worse oral health habits in RoI.	Fluorosis is increasing in Ireland, more so in fluoridated areas.

Table A2 continued				
Review	Year	Scope of review/Inclusion criteria	Conclusions	
			CWF efficacy	CWF adverse effects
WHO – International Programme on Chemical Safety (IPCS) [59]	2002	Environmental Health Criteria report on the relationship between fluoride exposure and human health, to provide guidelines for setting exposure limits - focused on adverse effects	Not assessed	Effects on teeth and skeleton (both beneficial and harmful) are observed at exposures below those associated with other adverse health effects. Effects on bone are the most relevant with regard to assessing potential adverse effects of long-term exposure
WHO - Fluoride in Drinking Water [10]	2006	A detailed review and guideline primarily focusing on effects of high natural fluoride and its removal. Also reviews animal and in vitro evidence for adverse effects of fluoride exposure	Fluoride concentrations in drinking-water of about 1 mg/L are associated with a reduced incidence of dental caries, particularly in children, compared with lower water fluoride levels.	Although health effects of high natural fluoride are documented, no credible evidence was found that water fluoridation is associated with any adverse health effects aside from dental fluorosis
National Research Council (NRC) – US [46]	2006	Review of health effects associated with the US EPA's maximum contaminant level goal (MCLG) for fluoride (4 mg/L)	Not assessed	A threshold for severe dental fluorosis occurs at ~2 mg/L F in water. Other effects at the MCLG level were equivocal. Review concluded that the MCLG should be lowered
National Health and Medical Research Council (NHMRC) - Australia [91]	2007	Synthesis of evidence on efficacy and safety of different forms of fluoridation. Included York review + 5 additional studies since 1999	CWF remains the most effective and socially equitable means of achieving community-wide exposure to the caries preventive effects of fluoride.	<ul style="list-style-type: none"> - CWF is associated with dental fluorosis, but the majority is not of aesthetic concern. Prevalence reduced by more appropriate use of other fluoride sources - Minimal effect on fracture risk. Fluoridation at 0.6-1.1 mg/L may lower risk compared with higher and lower levels No clear association with cancer Insufficient evidence to conclude regarding other possible negative effects
Scientific Advisory, Institut National de Sante Publique du Quebec [88]	2007	Synthesis of current evidence with respect to safety and efficacy of CWF to determine whether Quebec fluoridation policy (CWF at 0.7 mg/L) needs to be reviewed or remain unchanged	CWF is the most effective and economical public health measure for preventing caries.	The scientific data currently available does not show that water fluoridation at concentrations deemed beneficial to dental health is harmful to humans.
Griffin et al. – [109]	2007	Systematic review of 9 studies of CWF effectiveness in adults 20-60+ years (n = 7,853 subjects).	Caries prevented fraction for lifetime exposure vs no exposure was 34.6% and 27.2% in 5 studies published after 1979	Not assessed

Table A2 continued				
Review	Year	Scope of review/Inclusion criteria	Conclusions	
			CWF efficacy	CWF adverse effects
Ireland adult oral health report [110]	2007	Survey designed to analyse the differences in oral health of Irish adults according to exposure to CWF.	Exposure to CWF has a statistically significant impact on number of teeth retained and caries experience in adults	Not assessed
Scientific Committee on Health and Environmental Risks (SCHER) report - EU [34]	2010	Critical review of available information on hazard profile and epidemiological evidence of adverse and/or beneficial effects of fluoride (particularly evidence since 2005 or any evidence not considered by SCCP [212] and EFSA [218] panels	CWF reduces caries prevalence and severity, especially among children from low SES groups. However, topical fluoride application (toothpaste or varnish) is the most effect in preventing tooth decay.	<ul style="list-style-type: none"> - Acknowledges risk for mild dental fluorosis in children. - Concludes that typical human fluoride exposures do not influence thyroid function, IQ, or reproductive capacity. - Fluoride cannot be classed as to carcinogenicity. CWF is not expected to lead to unacceptable risks to the environment.
US EPA Dose-Response analysis of non-cancer effects [49]	2010	Technical analysis of human dose-response data on dental and skeletal fluorosis, and skeletal fractures	Not assessed	Severe dental fluorosis may be experienced by a small % (0.5%) of populations exposed to F at 2 mg/L. No clear evidence that F at this level will cause other types of adverse health effects (skeletal fluorosis or bone fractures)
2009 Oral Health Survey - NZ [66]	2010	Detailed survey of oral health status in New Zealand. Not designed as an in-depth CWF study, but data examined for any protective effect against caries, and impact on prevalence and severity of dental fluorosis	Overall, children and adults living in fluoridated areas had significantly lower lifetime experience of dental decay (ie, lower dmft/DMFT) than those in non-fluoridated areas. CWF cost-effectively provides benefits above and beyond those from other fluoride sources alone (eg, toothpaste and tablets).	Overall prevalence of moderate fluorosis was very low (~2%; no severe fluorosis was found), and no significant difference in the prevalence of moderate fluorosis (or any of the milder forms of fluorosis) between people living in fluoridated and non-fluoridated areas.
Health Canada Drinking Water Guidelines [8]	2010	Encompasses all major reviews, + case reports and clinical studies. Based on Health Canada's review of available science, as supported by the Expert Panel Meeting on fluoride.	A fluoride concentration of 0.7 mg/L in drinking water provides optimal dental health and is protective against adverse effects	The weight of evidence does not support a link between exposure to fluoride in drinking water at 1.5 mg/L and any adverse health effects including cancer, immunotoxicity, reproductive and/or developmental toxicity, genotoxicity, and/or neurotoxicity

Table A2 continued				
Review	Year	Scope of review/Inclusion criteria	Conclusions	
			CWF efficacy	CWF adverse effects
Rugg-Gunn and Do [219]	2012	Review of studies pre and post 1990	Effect of CWF on caries reduction is smaller in studies post 1990 vs earlier. Studies analysing continuous vs non-continuous residency in CWF areas clearly show the caries preventive effect increases with higher % of life exposed to fluoridated water	Not addressed
Public Health England [95]	2014	Water fluoridation Health monitoring report for England	<p>CWF areas vs non CWF areas</p> <ul style="list-style-type: none"> –45% fewer hospital admissions for caries in children aged 1-4y –15% fewer 5 year olds with caries (28% taking into account SES and ethnicity) –11% fewer 12 year olds with caries (21% adjusting for SES/ethnicity) 	<ul style="list-style-type: none"> –No significant effect of general health, hip fracture, osteosarcoma, overall cancer, Down's syndrome, or all cause mortality –Kidney stones, bladder cancer lower in CWF areas. –Dental fluorosis higher in CWF areas but still low overall (1% vs 0.2%)

Table A3. Cancer data – major reviews, recent studies, and key animal data

Major reviews	Year	Conclusions
UK Working Party on Fluoridation of Water and Cancer [152]	1985	Extensive analysis of cancer epidemiological evidence found an absence of demonstrable effects on cancer rates following long-term exposures to naturally elevated or artificially fluoridated water - permits conclusion of safety of fluoridated water.
International Agency for Research on Cancer (IARC)/WHO [220]	1987	Studies show no consistent trend of higher cancer rates in CWF areas, but evidence inadequate to draw firm conclusions. Fluorides labeled “non-classifiable as to their carcinogenicity in humans.”
Public Health Service – USA [84]	1991	Animal studies “fail to establish an association between fluoride and cancer.” Population-based studies (n >50 over 40 years) indicate “Optimal fluoridation of drinking water does not pose a detectable cancer risk to humans.” An evaluation by NCI of osteosarcomas using nationwide age-adjusted incidence data from the entire SEER database for the years 1973-1987 found a slightly increased incidence in young males in fluoridated vs. non-fluoridated areas, but “an extensive analysis reveals that it is unrelated to the introduction and duration of fluoridation.”
National Research Council (NRC), USA [36]	1993	“Laboratory data are insufficient to demonstrate a carcinogenic effect of fluoride in animals.” “The weight of the evidence from epidemiological studies completed to date does not support the hypothesis of an association between fluoride exposure and increased cancer risk in humans.”
NHS Centre for Reviews and Dissemination, University of York (UK) [89]	2000	“No clear association between water fluoridation and incidence or mortality of bone cancers, thyroid cancer, or all cancers was found.”
WHO – International Programme on Chemical Safety (IPCS) [59]	2002	“In spite of the large number of studies conducted in a number of countries, there is no consistent evidence to demonstrate any association between the consumption of controlled fluoridated drinking-water and either morbidity or mortality from cancer”
WHO - Fluoride in Drinking Water [10]	2006	Conclusion unchanged from 2002 WHO-IPCS report[59]
National Research Council (NRC) – US [46]	2006	Data from humans, genotoxicity assays, and studies of mechanisms of actions in cell systems indicate “the evidence on the potential of fluoride to initiate or promote cancers, particularly of the bone, is tentative and mixed.”
National Health and Medical Research Council (NHMRC) - Australia [46]	2007	Included 4 additional studies + York review. Conclusions unchanged from York review [46] This analysis includes the case-control study of Bassin et al. [89]
California EPA, [147]	2011	The hypothetical mechanisms of fluoride carcinogenicity are considered to be plausible, but overall, the current body of epidemiologic evidence on the carcinogenicity of fluoride is considered inconclusive.
Public Health England [95]	2014	No differences were found between fluoridated and non-fluoridated areas in overall cancer rate or osteosarcoma incidence. Bladder cancer rates were lower in fluoridated areas than in non-fluoridated areas.
Recent studies	Year	Conclusions
Bassin et al. [159] (+comment [89])	2006	Preliminary data suggested that exposure to fluoride in drinking water was linked to increased risk of osteosarcoma in boys but not girls. Analysis of full study data did not support this conclusion.
Kim et al. [161]	2011	Fluoride levels in bone samples from osteosarcoma tumors were the same as in other bone cancers that did not show increased risk with CWF.
Comber et al. [89]	2011	Data from 1994–2006 on osteosarcoma incidence from the Northern Ireland Cancer Registry (NICR) and the National Cancer Registry of Ireland (NCRI) were analysed, with cases divided into ‘fluoridated/non-fluoridated groups based on residence at time of diagnosis. No significant differences were observed between fluoridated and non-fluoridated areas in either age-specific or age-standardised incidence rates of osteosarcoma.

Table A3 continued		
Recent studies	Year	Conclusions
Levy and Leclerc [163]	2012	Used cumulative osteosarcoma incidence rate data from CDC Wonder database and SEER 9 cancer registries categorised by CWF status between 1992 and 2006 – concluded that water fluoridation status in the continental U.S. has no influence on osteosarcoma incidence rates during childhood and adolescence. The study provides no evidence that young males are at greater risk of osteosarcoma from fluoride in drinking water than females of the same age group.
Blakey et al. [164]	2014	Ecological analysis using high-quality population-based data on osteosarcoma and Ewing sarcoma cases diagnosed in Great Britain between 1980 and 2005. Fluoride levels were assigned on a small-area basis, allowing improved classification of exposure. Found no evidence of association between these cancers and fluoride in drinking water (whether from CWF or naturally occurring at optimal level)
Key animal studies		
National Toxicology Program (NTP, USA [148])	1990	Statistically significant increases in osteosarcomas observed in male rats drinking water with up to 175 mg/L fluoride, but not in female rats or male or female mice similarly exposed.
National Toxicology Program (NTP, USA [149])	1992	Findings from previous NTP study not replicated in male rats of the same strain receiving a higher fluoride dose (250 mg/L), also via drinking water, for 2 years
Maurer et al. [150]	1990	No treatment-related tumor findings were observed in two-year diet studies in male and female Sprague-Dawley rats

de Grood, Anna

From: Dr Leonard Smith <dr.smith@healthymouthhealthychild.org>
Sent: Friday, July 12, 2019 3:16 PM
To: Public Submissions
Subject: [EXT] new zealand fluoride report 2014.pdf
Attachments: new zealand fluoride report 2014.pdf; ATT00001.txt

Sirs:

This is one of the most comprehensive evaluations with respect to public fluoride use.

It would be worthwhile for each Council member to read it !

Respectfully

Dr Leonard Smith

de Grood, Anna

From: Annette E. Ross <Annette.Ross@albertadoctors.org>
Sent: Friday, July 12, 2019 9:37 AM
To: Public Submissions
Cc: Shannon E. Rupnarain
Subject: [EXT] FW: Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services
Attachments: Committee Agenda Item Submission request 061919.pdf; AMA Letter re Water Fluoridation 061919.pdf; ABP Fluoride May 2019.pdf
Importance: High

Good Morning and Happy Friday!

Just checking in to see if there has been a decision made on our request to be top of the order of speakers for July 24th Committee meeting as one of our speakers will be travelling from Edmonton and will need to return same day. Please advise when possible. Thank you.

Respectfully,

Annette Ross
Administrative Assistant, Public Affairs
T 780.482.0312

From: Annette E. Ross
Sent: July 2, 2019 2:50 PM
To: 'publicsubmissions@calgary.ca'
Cc: Shannon E. Rupnarain
Subject: FW: Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services
Importance: High

Good Afternoon,

Regarding our submission and invitation from Councillor Diane Colley-Urquhart to speak at the committee meeting on the 24th. Can you please advise which time slot has been allocated for President Clarke and Emily Cooley to speak? We need time to allow Emily to excuse herself from clinical responsibilities.

Please advise as soon as you can – thank you so much!

Annette Ross
Administrative Assistant, Public Affairs
T 780.482.0312

From: City Clerk <CityClerk@calgary.ca>
Sent: June 19, 2019 4:05 PM
To: Annette E. Ross <Annette.Ross@albertadoctors.org>; Public Submissions <PublicSubmissions@calgary.ca>
Cc: City Clerk <CityClerk@calgary.ca>
Subject: FW: Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services

Hello Public Submissions,

Please find the attached documents for the July 24th meeting.

Thank you

Jodie

Business & Logistics Liaison
City Clerk's Office - Citizen and Corporate Services
313 – 7 Ave SE
P.O Box 2100, Stn M Mail Code #8007
Calgary, AB T2P 2M5
P: 403-268-5851
E: jodie.stevens@calgary.ca

One City, One Voice



ISC: Protected

From: Annette E. Ross [<mailto:Annette.Ross@albertadoctors.org>] **On Behalf Of** Alison M. Clarke
Sent: Wednesday, June 19, 2019 4:01 PM
To: City Clerk <CityClerk@calgary.ca>
Cc: Office of the Mayor <TheMayor@calgary.ca>; Gualtieri, Franca <Franca.Gualtieri@calgary.ca>; Mike Gormley <mike.gormley@albertadoctors.org>; Alison M. Clarke <president@albertadoctors.org>
Subject: [EXT] Agenda Item Submission for July 24th Standing Policy Committee on Community and Protective Services

Dear City Clerk,

On behalf of President Clarke, please see the attached request to include items to the Community and Protective Services Committee agenda for July 24, 2019.

Warm regards,

Alison M. Clarke, MD, CCFP, FCFP

President
Alberta Medical Association
12230 106 Ave NW
Edmonton AB T5N 3Z1
Phone: 780.482.2626
Fax: 780.482.5445
www.albertadoctors.org

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June 19, 2019

Office of the City Clerk
The City of Calgary
P.O. Box 2100, Stn. M
Calgary, AB T2P 2M5

Dear City Clerk:

Re: Report to Community and Protective Services Committee per Notice of Motion C2019-0219 "Water Fluoridation in The City of Calgary"

Attached, please find a copy of the Alberta Medical Association's submission for the above noted agenda item for the July 24th meeting of the Standing Policy Committee on Community and Protective Services. While we have distributed a copy of these materials to members of City Council directly, we would appreciate your inclusion of these materials to the official agenda package of this meeting for distribution to Council, City Administration, the public and the media.

Thank you for your assistance on this matter.

Warm regards,

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapathients* Views on Water Fluoridation in Calgary

CC: His Worship Mayor Naheed Nenshi
Michael A. Gormley, Executive Director, AMA



June 19, 2019

Councillor Diane Colley-Urquhart
Chair, Community and Protective Services Committee
The City of Calgary
P.O. Box 2100, Stn. M
Calgary, AB T2P 2M5

Dear Councillor Colley-Urquhart:

Re: Report to Community and Protective Services Committee per Notice of Motion C2019-0219 "Water Fluoridation in The City of Calgary"

I am writing you today in regard to the above noted report being considered by the Standing Policy Committee on Community and Protective Services on July 24, 2019.

On behalf of Alberta physicians, I applaud Calgary City Council for taking this initial step to reassess the decision to discontinue community water fluoridation. Alberta's doctors strongly endorse the practice of fluoridation in municipal water systems, in accordance with Government of Canada guidelines, and we are hopeful that your deliberations at this meeting will lead to its re-introduction in Calgary.

Dental health is an important foundation to overall community health and wellness, and community water fluoridation remains one of the safest, most efficacious, cost-effective and equitable preventative measures to reduce tooth decay and promote overall dental health.

The safety and benefits of municipal water fluoridation are well established in medical research, and it is clear based on local data that cessation of municipal water fluoridation in Calgary in 2012 has contributed to a decline in the oral health of children since.

As physicians we feel strongly about this issue, and so do our patients. In May, we put the question of municipal water system fluoridation to our online advisory patient community, albertapatients.ca. This representative survey, which included nearly 1,100 responses from patients living in The City of Calgary, found wide-spread support for fluoridation. Looking specifically at the Calgary results, two-thirds (66%) say they approve of fluoridating municipal water systems (nearly one-half strongly approve), compared to 27% who disapprove. I have attached a copy of these survey results to this letter for your reference.

...2

City Council's willingness to collaborate with the fine work being conducted by the University of Calgary's O'Brien Institute for Public Health on this important matter is laudable, and Alberta's physicians encourage you to re-introduce fluoridation in the municipal water supply for the betterment of community health.

We look forward to your thoughtful consideration on this matter.

Warm regards,

A handwritten signature in blue ink, appearing to read "A Clarke".

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapathients* Views on Water Fluoridation in Calgary

CC: City of Calgary Council
City Clerk's Office
Michael A. Gormley, Executive Director, AMA



albertapathients

Your Voice Matters

albertapathients

Views on Water Fluoridation in Calgary

May 2019

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www.albertapathients.ca

This research was conducted with and for the albertapathients.ca online community, operated by the Alberta Medical Association and research partner ThinkHQ Public Affairs Inc.

To learn more about albertapathients or to register as a member, please visit our website at www.albertapathients.ca.

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>> Research Methodology

- Online survey was fielded via the albertapatient's online research panel
 - Field dates: May 2 – 17, 2019
 - Sample size: n=3,498
- Results reflect a representative sample of patients in Alberta
- Data was weighted to reflect gender, age and region of Albertans who have used the health care system within the past year
- This online survey utilizes a non-random sample; therefore, the margin of error is not applicable. However, for interpretation purposes, a probability sample of this size would yield a margin of error of +/- 1.7 percentage points 19 times out of 20 at a 95% confidence interval
 - Accuracy of sub-samples of the data decline based on sample size

>> Water Fluoridation

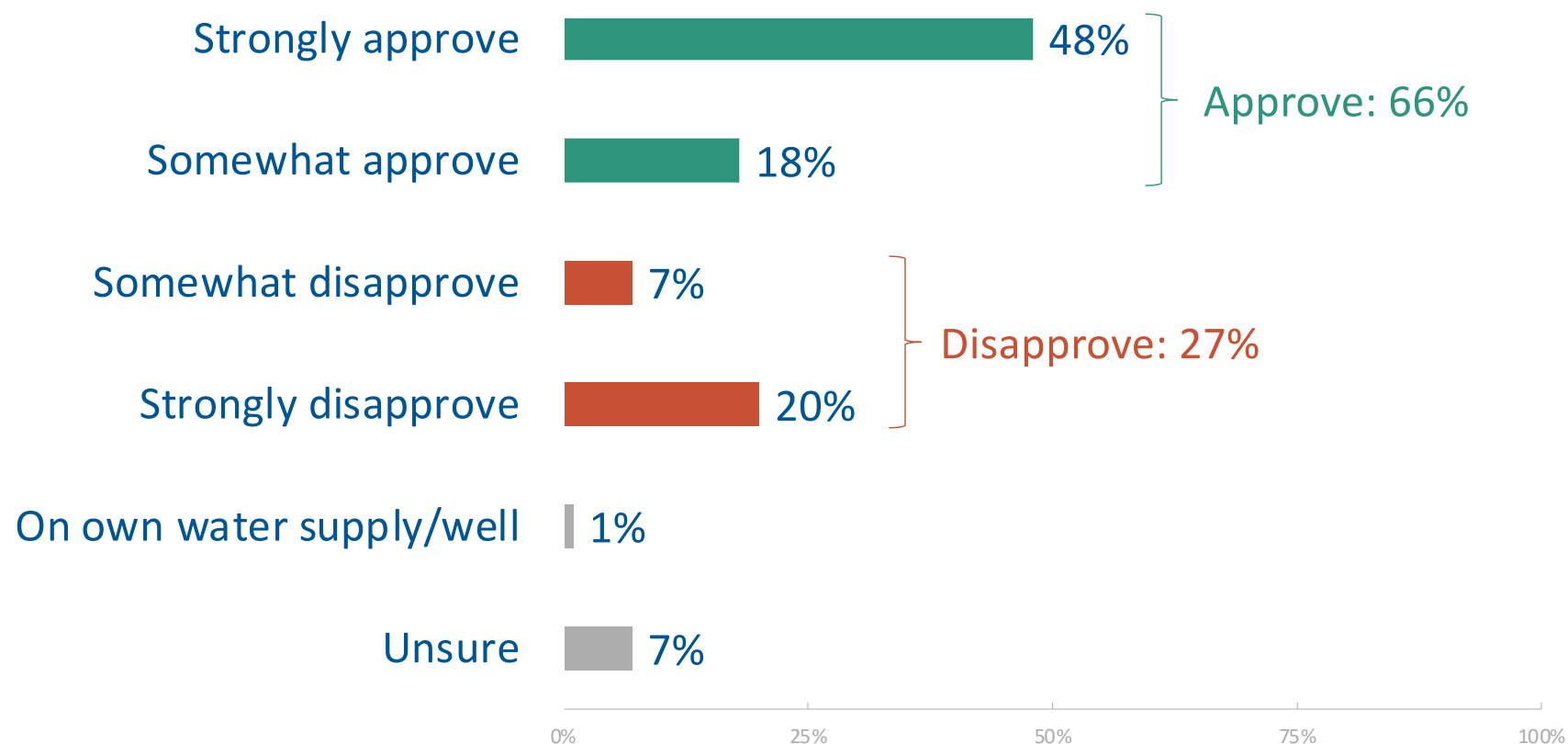
-Key Findings

- A majority (64%) of Alberta patients offer support for municipal fluoridation of the water supply to promote good dental health vs. 23% who disapprove
- In Calgary, where City Council will soon re-examine their decision to remove fluoride from the municipal water supply, 66% approve of fluoridation (48% strongly, 18% somewhat) vs. 27% who disapprove

>> Approval of Public Water Supply Fluoridation

-Calgary Proper Only Sample

"Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?"



Base: Calgary proper (n=1,077)

>> Approval of Public Water Supply Fluoridation

-Calgary Proper Only Sample by Key Demographics

“Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?”

	TOTAL	Age (Years)				Gender	
	Calgary Proper (n=1,077)	<45 (n=566)	45-54 (n=191)	55-64 (n=166)	65+ (n=153)	Male (n=552)	Female (n=525)
Approve	66%	67%	61%	68%	73%	69%	65%
Disapprove	27%	26%	30%	28%	20%	26%	27%
On own supply/well	1%	2%	-	1%	1%	2%	-
Unsure	7%	5%	9%	3%	5%	3%	7%

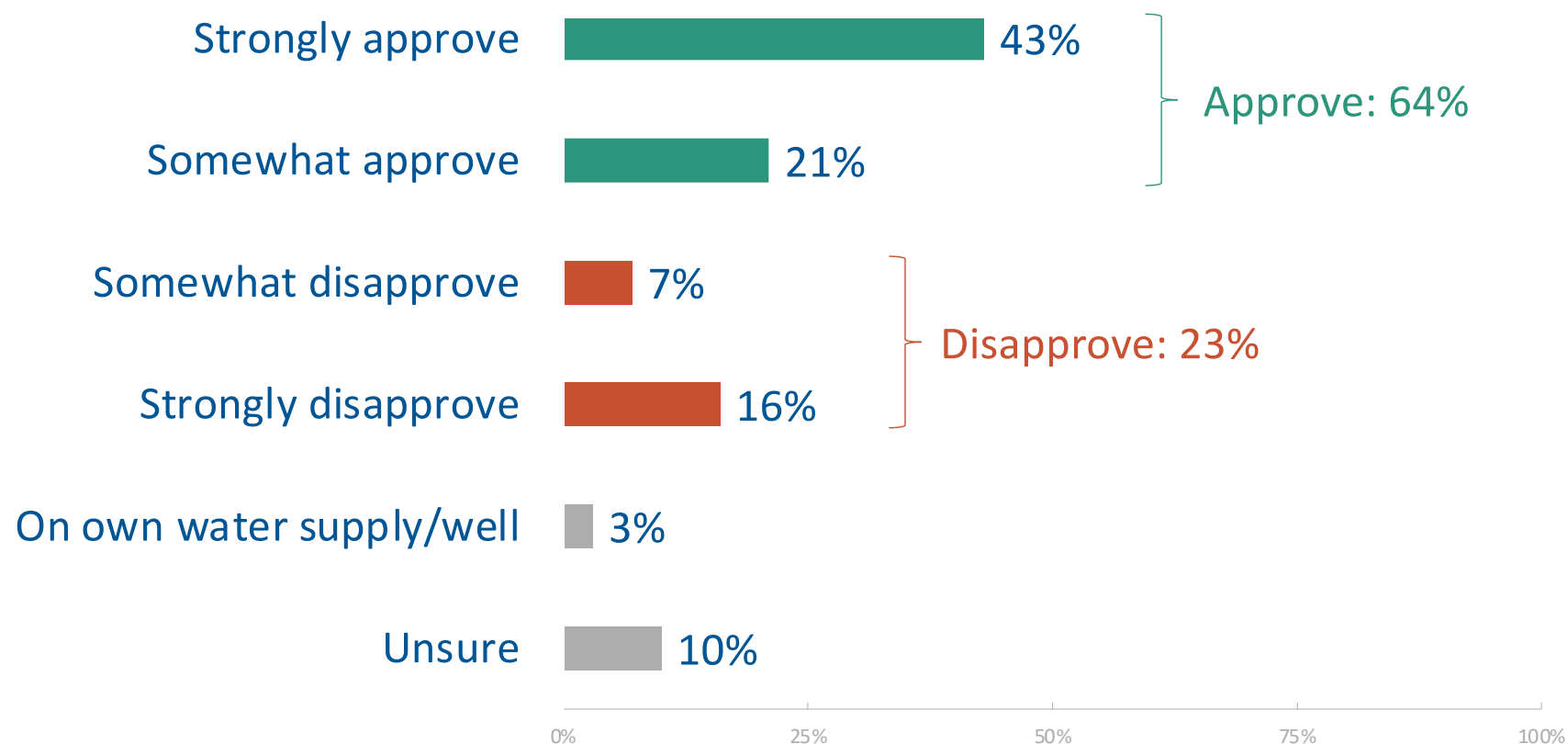
 Significantly higher  Significantly lower

Base: Calgary Proper

>> Approval of Public Water Supply Fluoridation

- Province-wide Sample

"Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?"



Base: All respondents (n=3,498)

>> Approval of Public Water Supply Fluoridation

- Province-wide Sample By Key Demographics

“Regardless of whether or not the community you live in does this today, how would you personally feel about fluoride being added to the water supply in your community?”

	TOTAL	Age (Years)				Gender	
	Alberta (n=3,498)	<45 (n=1,1771)	45-54 (n=615)	55-64 (n=557)	65+ (n=555)	Male (n=1,740)	Female (n=1,758)
Approve	64%	65%	62%	62%	66%	70%	59%
Disapprove	23%	22%	25%	26%	21%	20%	27%
On own supply/unsure	13%	12%	12%	12%	12%	10%	15%

	TOTAL	Region				
	Alberta (n=3,498)	Calgary (n=1,221)	Edmonton (n=1,104)	North (n=422)	Central (n=391)	South (n=360)
Approve	64%	67%	66%	60%	56%	66%
Disapprove	23%	26%	21%	23%	26%	21%
On own supply/unsure	13%	7%	14%	17%	18%	13%

 Significantly higher  Significantly lower

Base: All respondents



albertapatients
Your Voice Matters

www.albertapatients.ca

For more information, contact:
Marc Henry, President
ThinkHQ Public Affairs Inc.
MLH@THINKHQ.CA

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**ALBERTA
MEDICAL
ASSOCIATION**



It's about More Than Just Baby Teeth: An Examination of Early Oral Care in Canada

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Abstract It may come as a surprise to the public and to medical practitioners that the most common infectious disease in young children is dental decay and that oral health is the most prevalent unmet healthcare need of children. Children who present with early childhood caries (ECC) can suffer from pain, sleeplessness, malnutrition, difficulty playing, struggles in school, and toxic stress. Although it is almost completely preventable through low-cost preventive measures, prevalence is very high in Canada affecting over one quarter of children. Several factors interact on different levels (child, family and community) to create a situation in which ECC prevails. Recommendations for prevention are presented and include early visits to a dentist, dental care as part of prenatal care, interdisciplinary collaboration across health and social services, as well as many others.

Keywords Early Childhood Caries, Child, Oral Health, Prevention, Canada

1. Introduction

It may come as a surprise to the public and to medical practitioners that the most common infectious disease in young children is dental decay [1] and that oral health is the most prevalent unmet healthcare need of children [2]. In fact, the number of children with early childhood caries (ECC) exceeds the number of children with asthma five fold [1]. Even in its simplest manifestations, ECC could require surgery under a general anaesthetic. One in 100 children under age 5 in Canada will have this surgery making it the leading cause of day surgery in children [3]. The public cost of the hospital care alone for oral surgery in children ages 1-5 is over \$21 million annually; a figure which excludes the associated costs of anaesthesia, surgeons and travel costs

[3,4]. Unlike many other infectious diseases, ECC is almost completely preventable at very little cost through proper oral hygiene and feeding practices. So why, then, do Canadians pay over \$1500 per case to treat ECC [3]?

For better or for worse, the Canada Health Act ensured that the acute care illness treatment system centered on doctors and hospitals would be tasked with looking after the health promotion and development of our children. The Act does not cover dental care and has led to the belief that oral health should be considered apart from overall health; however, consider that the mouth is the gateway to the body and what affects the mouth affects the whole person. The exclusion of dental care from the overall medical system, the lack of dental education in medical school, and poor collaboration between dentists, doctors and allied health professionals have contributed to the social failure reflected in ECC.

ECC has been dismissed by the medical system as a *dental* problem not a *health* problem, and service providers have failed to appreciate the vital link between oral health in children and overall wellbeing. Furthermore, the link between health service use and oral health is underappreciated, as dental pain is one of the leading causes for emergency room visits in paediatric hospitals [5]. Untreated, children with ECC suffer from toothache (acute and chronic), sleep deprivation, malnutrition, difficulty playing, struggles attending school [6], failure to thrive [7], deficiency in hemoglobin levels, decreased serum albumin and ferritin [8], and in extreme cases, death [9]. Ironically, some of the results of ECC are also the cause of the problem. Children who lack proper nutrition do not possess the vitamins and minerals to maintain a healthy oral environment [10,11].

These assaults are fundamentally harming physical and mental development which can cause children to experience what is known as toxic stress; strong, frequent or prolonged activation of the body's stress management system without

adequate adult support [12]. Toxic stress is known to cause permanent architectural changes in the brain that lead to higher incidences of addictive behaviors, obesity, diabetes, cardiovascular disease, anxiety disorders, suicide, and incarceration [13-16]. This tells us that early oral health care is about more than just baby teeth, and moreover, it is most definitely a health issue and not just a dental issue. Unfortunately, there is a gap between the important role that healthy baby teeth play in oral and overall development and the care these small teeth receive at home and in the community.

Unique to this particular infectious disease, is that it can be almost completely eliminated through prevention. Furthermore, prevention comes at little cost to families and the health care system. Despite this, the prevalence of ECC in Canada remains high [17]. While epidemiologic data describing ECC in the general Canadian population are sparse, Canadian caries prevalence trends are similar to those in the United States [17]. Rates of caries in permanent teeth continue to decline, however, the prevalence of childhood caries in children ages 2 to 5 years has increased from 24% in 1988 to 28% in 2004 [18-20]. Nearly 20% of children between the ages of 2-5 years old who present with ECC do not receive treatment [18]. Treatment is expensive and risky as it often involves general anesthesia, and, furthermore, does little in the long term as the bacteria that causes ECC is still present in the body after the affected tooth/teeth are restored or removed. This indicates that prevention is preferable to treatment.

Educational efforts, community awareness and changes in public policies are required as ECC remains a complex problem necessitating multifaceted intervention. Several actions (or inactions) on multiple levels interact to create an environment that allows for poor oral health in a child. A conceptual model has been developed [21] which proposes that children's oral health is influenced on three levels: child, family, and community (see Figure 1). What follows are suggestions to preventing ECC on all three levels.

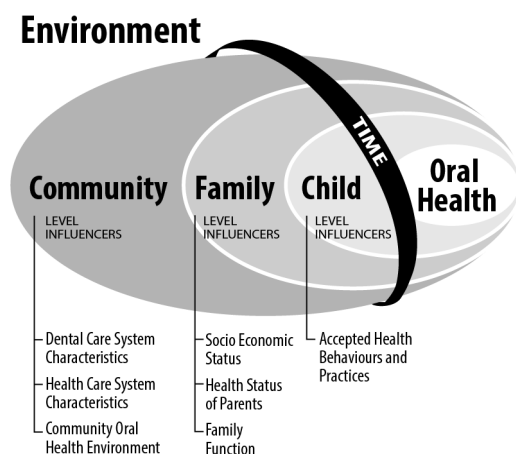


Figure 1. Child, family, and community influences on oral health outcomes of children. Adapted from Fisher-Owens, et al. (2007).

2. Preventive Strategies

2.1 Child Level Preventive Strategies

Prevention of ECC through the elimination of child-level or individual influences include simple, low-cost tasks such as daily wiping of gums and brushing teeth with an appropriate sized toothbrush and a small amount of fluoridated toothpaste, reducing the amount of sugary foods consumed, and eliminating the use of bottles and/or no-spill cups of milk, formula or juice in bed. Educating caregivers on the ill-effects of pre-chewing food for children to reduce the chance of sharing oral bacteria is crucial. A visit to a dentist by the first birthday to assess the oral condition and prevent progression if decay is present is the current recommendation made by the Canadian Dental Association [17] as delayed first dental visits are directly correlated with increases in ECC [22].

Behavior modification in children is a viable ECC prevention method. The first step in getting a person to process the information in a behavior change message is to gain and maintain that person's attention [23]. Once attentive, Social Cognitive Theory proposes that enhanced skills and confidence (self-efficacy) in doing the new behavior can lead to the change [24]. Videogames can fulfill both of these requirements. Today's youth are exposed to videogame entertainment at an early age, thereby making it recognizable, familiar and attention grabbing. Additionally, many videogames are created with levels and rewards, creating a form of focus and goal-setting for the player and enhancing skill development through progression. Studies examining health-related behavior change videogames for children and youth have shown that it is possible to achieve positive outcomes [25,26]. However, to be successful, behavior change videogames must be designed with a strong foundation in psychological and instructional theory [26]. Designing a simple videogame (or app that requires minimal motor skills) for very young children could be one method to engage and empower children in their own healthy futures.

2.2 Family Level Preventive Strategies

On a family level, important influences to address include the health status of the parents, socioeconomic status (SES), social support, coping skills, physical safety, culture, and health behaviors and practices. Many of these factors interact to either improve or worsen outcomes. Tooth development begins *in utero*; therefore inclusion of oral examinations as a part of prenatal health is important. Furthermore, proper maternal nutrition benefits the developing fetal tooth buds and provides a good basis for the primary teeth [27]. Gomez and Weber [28] found that providing oral health education and treatment for pregnant women was successful in keeping their children free from caries through age three and a half as compared with a control group.

The family unit provides immediate role-modeling for the

child and observed actions can have both direct and indirect impacts on children's oral health. Caregiver health status including oral, mental and physical health, influence how children see, understand and react to health care practices. Examples of supports to promote parental health include easily accessible community health and dental clinics, informal and formal social groups, access to fitness equipment and harmful behavior cessation counseling. Most communities have a community center that is available for both public and private events. Having a space to gather in which is close to home and can provide childcare is often the hardest challenge to overcome, especially for high risk individuals. Using such spaces for public health education and service delivery is a possible option.

Caregiver health and other social factors can impact the ability to provide adequate modeling and support to children financially. Providing financial support for those families who cannot afford proper nutrition and dental care is one step toward preventing ECC and many other deleterious health conditions. Children from low SES backgrounds show the highest ECC prevalence [3,20,29-30] in part due to a lack of affordable preventive and treatment services [31]. However, providing financial assistance is only one piece of the puzzle. A study of 820 families who received one of two forms of financial assistance for dental care were surveyed. While 89% stated that the financial assistance helped them to access services for oral care that they would otherwise not be able to use, only 44% actually used services within the previous 12 months [32]. Providing financial aid for dental care is only beneficial if services are accessible and accessed. A common problem reported is that dentists limit treatment of the beneficiaries of aid programs due to low payment rates, administrative hassles and missed appointments [33]. Changing the structure of how public dollars is spent on oral care to provide services such as very low-cost, easily accessible clinics rather than subsidies could increase user uptake and promote preventive rather than restorative care.

Resiliency and coping skills enable people to make healthy choices. Social support through family, friends and community provides such skills and is associated with better health [21]. Safe environments for caregivers and children are very important for proper health. Children with a history of maltreatment and neglect suffer disproportionately from ECC. A recent Canadian study examined a population of two to six year old children who had suffered some form of maltreatment and found that 57% of the maltreated children had ECC, compared with 30% of five year olds in the broader community [34]. Identifying those families in need of secure environments can prevent ECC. Furthermore, working with families who refuse oral treatment for their children should be a priority as oral neglect is a form of abuse. Reporting these families to the authorities is an option; however refusal for treatment may be as a result of the high cost/inaccessibility of treatment. Identifying these families and working with them to provide alternatives to dismissing the situation is necessary.

Finally, culture and family health practices influence oral health outcomes. The perceived importance of oral care, the foods consumed and the practices observed in the house can affect ECC. Studies from around the world show that children from immigrant populations and ethnic or cultural minorities report a higher prevalence of ECC than the population in which they live [19,35-39]. Wendt and colleagues [40] found that children in immigrant households had their teeth brushed less often, used less fluoridated toothpaste and had more visible plaque than children from non-immigrant households. Belonging to a culture where dental disease is endemic and therefore not seen as a concern, or where preventive care is not the norm may be reasons why some families choose not to access care [41]. Providing culturally appropriate educational material, taking into account language and imagery, targeted evidence, location for dissemination, and strategies that involve the broader culture [42] are important to consider.

2.3 Community Level Preventive Strategies

Community-wide prevention comes in the form of interdisciplinary collaboration, public health education programs and public policy at the various levels of government. Community-wide services should include preventive education and treatment from non-dental professionals such as primary care physicians, nurses and social workers. In 2003, The American Academy of Pediatrics created a policy stating that by age six months every child should have an oral health examination including a caries risk assessment from a qualified pediatrician or pediatric healthcare professional [43]. In addition to screening for oral health disease, doctors can take this opportunity to educate parents on the risk factors for caries even before a child's teeth begin to erupt. The doctor's office is an ideal screening venue as the majority of children will visit a doctor long before visiting a dentist [44]. However, a study of physicians indicated that the level of instruction in medical school was insufficient to provide such care [45]. Fortunately, it has been found that with only two hours of training, physicians were able to identify with adequate accuracy cavitated carious lesions in children's teeth and provide referral [46]. As such a minor amount of time is required to educate health professionals in identifying early oral deficiencies; continuing education is a viable avenue for training with the assistance of dental professionals. Greater collaboration between medical and oral health professionals is needed to provide adequate, holistic care.

Due to the myriad of variables that need to be considered, public health educational campaigns have been met with varying degrees of success. For many decades attention has been paid to developing the necessary skills (i.e. health literacy) to make positive health behavior choices [47]. More recently, social marketing – the marketing of ideas rather than hard goods – to promote socially beneficial behavior change has become a useful method for taking complex

messages and translating them into concepts that large groups are able to digest and act upon [48]. Many health agencies worldwide use social marketing as a means for information dissemination [49] with great success due to its wide reach. Translating information to present it as relevant to a group is necessary to gain and maintain attention for behavior change. The following scenario is an example of how information can be translated to have a specific effect:

Most people know that the use of seat belts is successful in preventing serious injury if involved in a collision, much as most people know that appropriate dental hygiene is successful in the prevention of tooth decay. In a US National Highway Traffic Safety Administration survey, 56% of those who stated that they *rarely* or *never* used seat belts agreed that they would prefer to be belted in an accident [50]. This highlights the problem faced by public health workers and policy makers: it is not that people need to be convinced of the benefits of seat belt use, rather that they need to be convinced that they may be in an accident [51]. The message here is that perhaps ECC prevention should not focus on the benefits of dental hygiene *per se*, but rather on convincing parents and policy-makers that young children develop caries.

3. Conclusions

Despite all of the evidence, scientific research does not always translate into public health policy. Policy-makers need to take the stand that ECC prevention is as important as cancer prevention (anti-tobacco campaigns) and alcoholism prevention (under-aged drinking campaigns). Provincial governments could include dental visits for children until the age of majority in the health services provided (as is done for eye care) to ensure adequate access to oral health care. Alternatively, dental care could be included in the fee schedule for well-baby doctor visits until age 12 months. In a study of over 1,000 Canadian dentists, 74% responded that the government is not doing enough to promote oral health, and that public funding should be spent primarily on prevention [33].

In an economic climate where governments are remiss to allocate new dollars, the benefits of shifting funding from tertiary restoration to primary prevention should be highlighted. By not placing an importance on oral health and ECC prevention, the message being sent from those who have the power to educate, provide services and create policy is that it is not a priority for the greater community, and therefore, it does not need to be a priority for the individual. Oral health professionals, and undoubtedly those who have suffered from the effects of ECC, would likely state otherwise. It is about more than just baby teeth, and it is time that oral health care for young children is made a priority in Canada.

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The Relation Between Exposure to Intimate Partner Violence and Childhood Dental Decay: A Scoping Review to Identify Novel Public Health Approaches to Early Intervention

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ABSTRACT

Background: Early childhood dental decay or caries (ECC) is common, often painful and costly to the health care system, yet it is largely preventable. A public health approach is needed, especially as socially vulnerable children most at risk for ECC are less likely to access conventional treatment. Exposure to intimate partner violence (IPV) in the family represents an important social vulnerability for children, yet little is known about ECC in this context. We explored the relation between ECC and exposure to IPV as well as opportunities for community-based early interventions to prevent ECC.

Methods: We searched 5 electronic databases. All primary research and reviews that focused on childhood decay and exposure to IPV or that referred to community settings (specifically women's shelters) for oral health service delivery were included.

Results: Of 198 unique documents identified, 12 were included in the analysis. Although limited, our findings suggest a positive relation between exposure to IPV and ECC, the mechanisms of which are not well studied. Women's-shelter-based prevention programs may hold promise in terms of detecting and addressing ECC. Over the time frame of the literature reviewed, we observed a subtle shift in emphasis away from individual behaviours and biological models toward upstream societal structures.

Conclusions: The available literature suggests that the issue of ECC and IPV may be poised to embrace a public health approach to early intervention, characterized by community collaboration, interprofessional cooperation between dentistry and social work and an equitable approach to ECC in a socially vulnerable group.

Social vulnerability and dental health

Despite improvements over the past 50 years,¹ significant social inequities in dental health exist: the burden of dental diseases is far higher among populations experiencing social disadvantage.^{2,3} Given the link between systemic and oral health,⁴ addressing oral health inequities is an important goal.^{5,6} An important contributor to those inequities is unequal access to dental care. Dental care in Canada is largely privately financed and delivered, with only 6% publicly funded. Although the system generally works well, significant barriers to access exist for populations identified as vulnerable.⁷

Primary tooth decay or early childhood caries (ECC) has also increased in recent decades,² suggesting a need for consideration of young children's circumstances. We aimed to understand ECC in families experiencing intimate partner violence (IPV), as one type of vulnerability. IPV is increasingly recognized as a consequential form of child maltreatment,^{8,9} strongly intertwined with social determinants of health including stress, income and housing.¹⁰ Exposure to IPV and neglect (including dental neglect) were identified as the primary types of child maltreatment in Canada in 2008, and the most common combination of substantiated child maltreatment.¹¹ Among substantiated cases of exposure to IPV in Canada in 2003, 60% involved children 7 years of age or under,¹² and high rates of IPV continue.¹³

Health professional approaches to child maltreatment

In the health professions literature,^{14,15} child maltreatment and oral health are linked through a key focus on mandated reporting — the obligation for oral health professionals to identify and report suspected child abuse or neglect.¹⁶ In clinical practice, care providers have the opportunity to identify signs of potential abuse (e.g., unexplained bruises of the head and neck, broken teeth) and to help families access appropriate services.^{17,18}

Regrettably, self-report surveys among health professionals suggest that family violence (including child maltreatment and exposure to IPV) is significantly under-identified and under-reported.¹⁸⁻²⁰ Dental professionals may report suspected cases less frequently than other professions²¹ and feel the least responsible to identify or intervene.²⁰ Possible reasons for this include: fear of consequences of misidentified cases,²⁰ perceived differing cultural norms, embarrassment, perceived ineffectiveness of reporting and lack of training in reporting processes.²² Education and training seem to increase health professionals' ability to identify suspected abuse, although reporting rates have not materially increased.^{19,20} Some evidence suggests that mandated reporters are uncomfortable identifying and responding to less blatant forms of child maltreatment, such

as exposure to IPV.²³

Shifting to a public health approach to IPV

Early reference to IPV as a public health issue occurred in the 1980s and 90s, opening the door for public health approaches to addressing the social aspects of IPV.²⁴ In Canada, 80% of violence is against women, with 30% experiencing IPV in their lifetime.²⁵ Trocmé and colleagues¹² found that older children (age 8–15 years) were more frequently victims of physical and sexual abuse, while younger children (the relevant ECC group) were more often victims of exposure to violence.

A public health approach builds on the knowledge that "health" is generated in everyday life, rather than primarily through health care and, therefore, multiple avenues²⁶ (e.g., creating supportive environments, developing personal skills, reorienting health services) and strategies (e.g., advocating, enabling) are warranted.²⁷ Multiple avenues mean more opportunities to reach families experiencing IPV around access to supports, including but not limited to oral health services, and this involves inter-professional collaboration.²⁸ In our setting, the relevance of this work was heightened by newly available publicly funded community dental programming,²⁸ providing an opportunity for new preventive access points for families experiencing IPV.

Purpose of our study

Our purpose was, first, to understand the nature of research activity in the existing literature regarding the relation between exposure to IPV and ECC, defined as any tooth decay (mild to severe) in primary teeth.²⁹ Second, as this project was part of a broader initiative focused on community-based prevention services (cihr-irsc.gc.ca/e/50711.html), we were interested in studies reporting on community-based dental service initiatives, specifically as related to populations experiencing IPV.

Methods

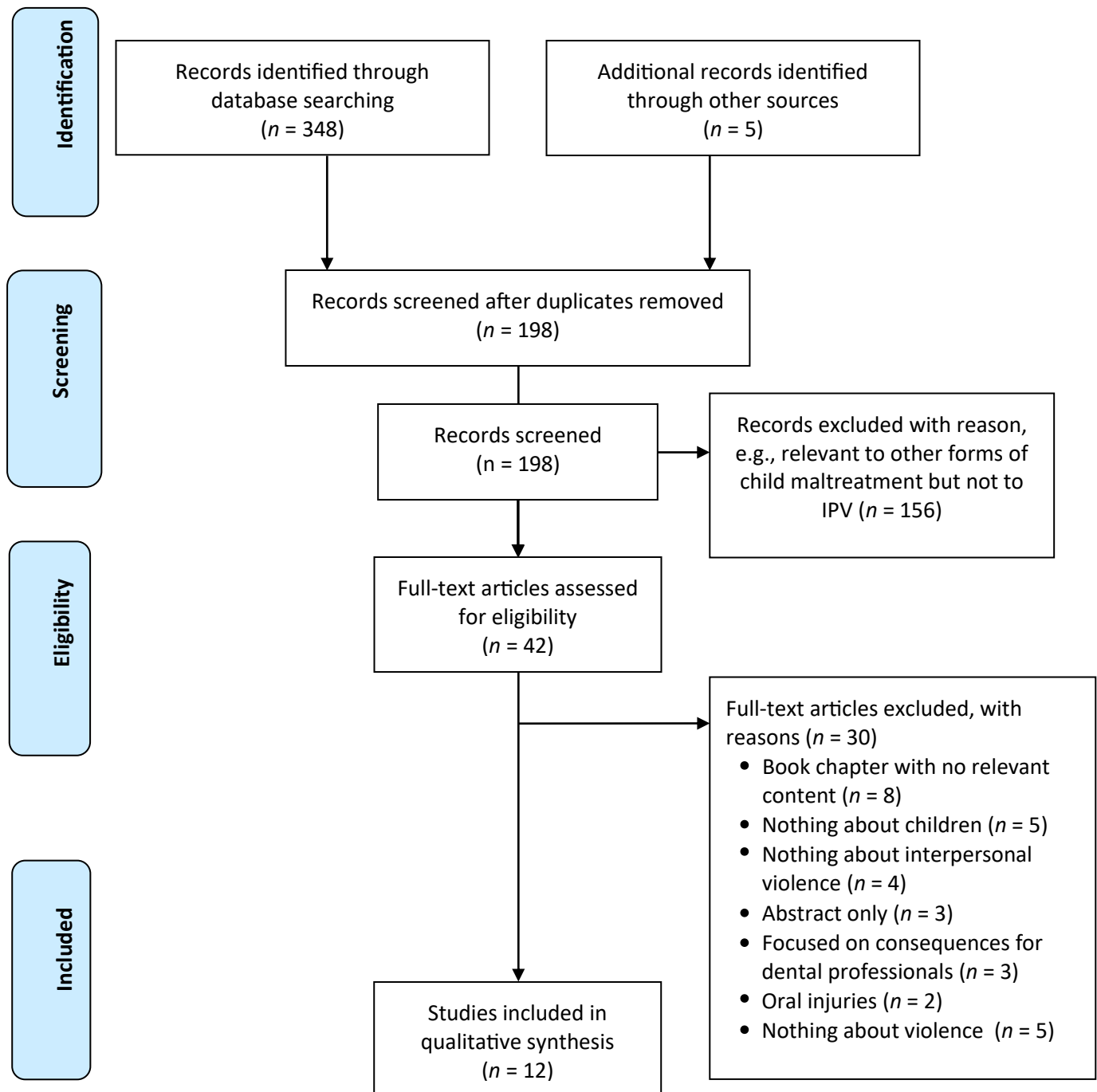
Identifying relevant studies, screening and selection

We undertook a scoping review,³⁰ with the help of a librarian (DLL). Research ethics board approval was not required.

We identified synonyms for our 2 key concepts, IPV and ECC, and used an iterative search strategy because of the evolving nature of the conceptualization of IPV³¹ in the literature. **Figure 1** details our screening process, which took place in May and June 2017.³²

We searched 5 electronic databases (CINAHL, EMBASE,

Figure 1: Flow chart showing selection of articles for review.



MEDLINE, ScienceDirect and Web of Science) and 6 relevant dental public health journals (i.e., *Journal of the Canadian Dental Association*, *Canadian Journal of Dental Hygiene*, *Journal of the American Dental Association*,

Journal of Dental Hygiene, *International Journal of Dental Hygiene* and *International Journal of Dentistry*) with no date limits and limited to the English language. We considered for inclusion all primary research and reviews focused

Table 1: Summary of 6 research studies on the relation between early childhood caries (ECC) and exposure to domestic violence (DV).

Authors and year	Type of study	ECC	DV	Relation
Blumberg & Kunken 1981 ³³	Case study	Severe decay in very young children (bottle-fed)	<ul style="list-style-type: none"> Child abuse, described as deliberate inflicting of physical injury or harm on a child. Neglect may be physical, nutritional or emotional. Both have immediate emotional and physical effects but also long-term. 	<ul style="list-style-type: none"> Authors' clinical experience suggests that mother and child may be exposed to threats of physical harm or violence because of crying child. Mothers may resort to bottles with sweet liquids that silence the child, keeping her and the child safe from harm, but unfortunately contributing to severe decay.
DiMarco et al. 2010 ³⁶	Quantitative, regression analyses	Oral health = total score on dental caries and injuries among children (mean age 6.38 years)	<ul style="list-style-type: none"> Victimization was a predictor variable (i.e., history of physical, emotional and sexual abuse). 	<ul style="list-style-type: none"> No relation found between mother's history of victimization and child's dental caries.
Lorber et al. 2014 ⁴⁰	Quantitative, regression analyses	Child oral health level via parent report and DMFS score (mean age 10 years)	<ul style="list-style-type: none"> DV described as a noxious family environment and measured as observed hostility and aggression between parents. 	<ul style="list-style-type: none"> Nonsignificant positive trend toward female-to-male aggression and hostility having an impact on children's level of decay and oral health.
Bright et al. 2015 ⁴¹	Quantitative, regression analyses	Decayed teeth in children 1–17 years old (mean age 8.59 years)	<ul style="list-style-type: none"> Adverse childhood experiences (ACES), one of which was exposure to domestic violence. 	<ul style="list-style-type: none"> Children exposed to domestic violence had greater odds than not exposed of having fair or poor parent-reported overall oral health condition. Odds of poorer oral health condition and dental decay increased exponentially as number of ACES increased.
Sano-Asahito et al. 2015 ⁴²	Descriptive re: percentage of decay	Decay measured in oral exam among children aged 2–15 years (no mean given)	<ul style="list-style-type: none"> 20 of 65 participants categorized as having "exposure to domestic violence against the mother." 	<ul style="list-style-type: none"> Children ($n = 39$) who were abused (physical, psychological, sexual, neglect) had more untreated decay (62%) compared with all other children in the study ($n = 26$), among whom only 42% had untreated decay. This latter group included 20 children who had been exposed to violence against the mother.
Lorber et al. 2017 ⁴⁴	Quantitative, regression analyses	Decay determined by oral exam of children (mean age 10 years)	<ul style="list-style-type: none"> Looking at female-to-male emotional aggression and pathways to ECC. 	<ul style="list-style-type: none"> Weak evidence that mothers who are aggressive toward fathers have children who consume more cariogenic drinks, resulting in greater decay.

Note: DMFS = decay-missing-filled surfaces index, ACES = adverse childhood experiences.

on exposure to IPV and ECC or childhood decay or that referred to community settings (specifically women's shelters) for dental service delivery to women and/or children. We hand-searched the ancestry (reference lists) and progeny (cited bys) of all retained articles for additional relevant publications.

Charting the data

To provide meaningful information and comparisons among documents, we charted key information: bibliographic details, type of document and methodological details, how the concepts of ECC and IPV were discussed and main findings. For the documents related to shelter-based dental services, we also gathered contextual information.

Collating, summarizing and reporting the results

We analyzed the data in 3 stages.³⁰ CW and RL read the documents multiple times, charting key information, then summarized the information to promote meaningful comparisons.³⁰ The research team discussed the findings as related to the research purpose, the literature and the broader research and policy/practice context, especially around novel opportunities for a public health approach to early intervention.

Table 2: Summary of 6 research studies related to shelter-based dental services.

Authors and year	Type of study	Population/location	Contextual information
DiMarco 2007 ³⁴	Mixed methods: quantitative questionnaire and qualitative follow-up questions	Mothers with children, living in homeless shelters in a midwestern US city (n = 120)	<ul style="list-style-type: none"> Mothers experiencing homelessness and with a history of victimization perceived more barriers to access to care than other mothers in the shelter. Dental caries was the no. 1 health problem experienced by children in the shelter, with nearly half presenting with untreated decay. Other barriers included: lack of insurance or unwillingness of dental service providers to accept the mother's medical insurance; transportation and childcare; appointment dates that were too far in the future (i.e., 1–3 months away); and various issues related to health, family violence or homelessness taking precedence over dental care.
Petrosky et al. 2009 ³⁵	Commentary	Women served by several domestic violence shelters in Rochester, New York, US	<ul style="list-style-type: none"> Describes a 15-year "integrated and collaborative" program between social work and dentistry that aimed to enhance dental resident education and impact community dental health outcomes in New York State. Projects operate on the premise that "poor oral health follows from psychosocial factors that need intervention," for example, using a health project counselor to manage perceived barriers to care.
Abel et al. 2012 ³⁷	Qualitative: needs assessment via focus groups/interviews	Dental residents (n = 10) and mothers experiencing domestic violence (n = 50) in Florida	<ul style="list-style-type: none"> After conducting needs assessments with stakeholders, this group developed programming to educate general dentistry residents in Florida, US, to provide oral health services for women living in, or receiving outpatient services from, domestic violence shelters. Shelter clients wanted to receive care in a safe, familiar place. They wanted dentists to be professional, respectful and sensitive. This project identified that dentists need integrated, experiential learning to address issues around domestic violence in their patients.
Abel et al. 2013 ³⁸	Mixed-methods: quantitative questionnaire and qualitative follow-up questions	Women recently safe from domestic violence and who had received dental care through the shelter-based program (n = 37)	<ul style="list-style-type: none"> Evaluated the above-noted program³⁷ via pre- and post-treatment questionnaires. Shelter-based dental care improved oral health outcomes (clients experienced less pain, less avoidance of eating because of pain, less embarrassment because of how teeth look, less interference with eating, drinking, talking after treatment) Clients reported high level of satisfaction with dental residents' behaviour (e.g., listening, taking time, explaining procedures in full).
Guardia Tello 2013 ³⁹	Qualitative: interviews and document analysis	Interviews with dental hygienists, dentists and domestic violence experts in Alberta (n = 13)	<ul style="list-style-type: none"> Analysis of dental regulatory body and professional association documents related to DV (e.g., policy, code of ethics, position statements, handbooks) In conversation, dentists and hygienists did not perceive a strong link between ECC and DV. Even where ECC was severe, they were more likely to point to education or money as the cause. In instances of mothers pacifying crying children with sweet liquids to avoid physical abuse, dental hygienists and dentists described this as a consequence of the mother's reasonable attempts to stay safe and survive. They believed more research was needed in this area. Correspondingly, they reported little urgency in reporting children's exposure to IPV as "child abuse," as is outlined in dental regulatory and professional association documentation.
VEGA 2016 ⁴³	Project summary	Women experiencing IPV and children exposed to IPV	<ul style="list-style-type: none"> A 3-year Canadian project (2015–2018) that strategically aims to reach the broader health professional community around specific needs of women experiencing domestic violence and the appropriate tailoring of health services to better support them. Acts as a central hub to provide all health professionals with consistent evidence, knowledge, tools and training to address health impacts of domestic violence, particularly around children's exposure to IPV. Provides trauma- and violence-informed clinical guidelines for health professionals to promote client safety and well-being in all aspects of care.

Note: DV = domestic violence, ECC = early childhood caries, IPV = intimate partner violence.

Results

Descriptive analysis

From 198 unique documents, we retained 12 for review.³³⁻⁴⁴ Of these, 9 (75%) were primary research articles.^{34,36-42,44} The remaining 3 included 1 commentary,³⁵ 1 commentary-style reflection³³ and 1 project summary.⁴³

Of the 12 retained documents, 6 looked at the relation between ECC (or childhood decay) and IPV.^{33,36,40-42,44} The

remaining 6 focused on community-based, collaborative, service models.^{34,35,37-39,43} All documents were from high-income countries, with 9 from the United States,^{33-38,40,41,44} 2 from Canada^{39,43} and 1 from Japan.⁴² One document was published in 1981,³³ with the remainder published between 2009 and 2017.³⁴⁻⁴⁴ The 9 primary research documents used quantitative methods (n = 5),^{36,40-42,44} qualitative methods (n = 2)^{37,39} or mixed methods^{34,38} (n = 2).

We identified 3 thematic groupings: (1) evolving refinement

of child maltreatment conceptualization in ECC research; (2) the nature of the relation between exposure to IPV and ECC; and (3) approaches to early dental public health intervention.

Thematic grouping 1: Evolving refinement of child maltreatment conceptualization in ECC research

In our examination of the literature, we observed progression toward a more sophisticated and differentiated conceptualization of child maltreatment. The earliest document³³ focused primarily on "child abuse" (inflicting physical harm) and "neglect" (physical, nutritional and frequently emotional) and its relation to childhood tooth decay. Although the authors describe "intra-family abuse," which includes abuse of the mother, the phenomenon is not fleshed out and children's exposure to that form of abuse is not considered.³³ Similarly, in comparing tooth decay in "abused" and "non-abused" children, Sano-Asahito et al.⁴² define abuse as physical and sexual abuse of children; children who had "only" been exposed to violence against their mother were classified as non-abused.

In contrast, other documents display a stronger understanding of the complexity around family violence, disentangling and classifying its interrelated areas more fulsomely: child maltreatment, intimate partner abuse and children's exposure to IPV, which could include exposure to violence against the mother, mother to father hostility/aggression and father to mother hostility/aggression.^{40,42,44} The inclusion and recognition of the various forms of IPV that children could be exposed to^{40,42,44} suggests that impacts of such exposure in childhood are distinct from other forms of child abuse, which supports their examination in relation to health problems, including ECC.

Thematic grouping 2: The nature of the relation between exposure to IPV and ECC

Articles investigating this relationship are diverse and suggest that this area of study is at the exploratory stage^{33,36,40-42,44} (**Table 1**). The seminal document³² in this field presents a case study highlighting potential threat of IPV in response to a fussy infant or child, where mothers, to protect against further abuse, may reasonably opt to placate infants with sugary liquids in bottles, potentially increasing the risk of decay. Three quantitative studies suggest a positive relation between exposure to IPV and the presence of childhood decay.^{40,41,44} One study of a random sample of 135 couples recruited from New York State, found a non-significant trend ($p = 0.09$) toward a positive association between inter-parental emotional hostility and poor dental health in children as measured by decayed, missing due to decay and filled teeth (primary and permanent) and parent-reported children's oral health status.⁴⁰ A national study of adverse childhood experiences in the United States found that children exposed to IPV had greater odds of fair or poor parent-reported oral health relative to non-exposed

children.⁴¹ A follow-up to the New York study noted above,⁴⁰ with the same sample, explored mediators (i.e., sugary drinks or snacks and child tooth-brushing) of the relation between inter-parental aggression or hostility and childhood decay.⁴⁴ Only sugary drinks was statistically significant; however, the relation became non-significant when controlling for income, suggesting a complexity that needs further investigation.

In contrast, a study of a sample of mothers living in homeless shelters found that the oral health of children of those with a history of victimization (emotional, physical and/or sexual abuse; 60% of the sample) was similar to that of children of mothers without such a history.³⁶ The final study in this group⁴² found that among children in protective care, 62% of "abused" children (those experiencing physical, psychological, sexual abuse and neglect) had untreated decay versus 42% of non-abused children. Here though, children exposed to IPV were classified as non-abused.⁴² The latter finding suggests that children exposed to IPV were less affected by decay relative to children experiencing more blatant maltreatment (e.g., physical or sexual abuse), but provides no insight relative to children who experienced no maltreatment.⁴²

Thematic grouping 3: Approaches to early dental public health intervention

Our final thematic grouping centred around domestic violence shelters and community-based opportunities for early dental public health intervention^{34,35,37-39,43} (**Table 2**). A thesis study³⁹ used focus groups and document analysis to investigate dentists', hygienists' and regulators' framing of "the intersection of ECC and domestic violence," concluding that dental professionals seemed unready to appreciate a potential link between exposure to domestic violence and ECC. Instead, their clinical experience suggested lack of parental education as a reason why children develop ECC.³⁹ In light of the tendency in dentistry to under-identify and under-report child abuse, these findings support our search for service opportunities beyond traditional settings.

Of the 5 remaining documents,^{34,35,37,38,43} 1 assessed barriers to dental care and provided minimal instrumental supports to reduce barriers among a convenience sample of 120 families living at a homeless shelter in the midwestern United States.³⁴ Mothers with a history of emotional, physical or sexual abuse perceived more barriers to care than those without such a history.³⁴ Simple interventions to improve access — providing a telephone and contact information for dentists who would accept the mother's publicly funded dental insurance — resulted in nearly half (43%) of those contacted booking a dental appointment for their children and 10% already receiving oral health services at 1-month follow up, which suggests that these simple interventions were effective.³⁴

Three other articles^{35,37,38} described programs to train dental

care providers and provide community-based care through domestic violence shelter collaborations. One described a 15-year "integrated and collaborative" program in New York State,³⁵ where social work activities were added to dental residents' training regarding IPV. The residents undertook experiential opportunities (e.g., shelter and home visits with social workers, riding the bus as a sole method of transportation) and reflected on their own biases around the life circumstances of their clients. Examples of other projects in this program included using a health counselor to manage barriers to care, increase clients' oral health knowledge and provide support, such as appointment making, reminders and assistance with transportation. The results showed a decrease in appointment cancellations and an increase in kept appointments.³⁵

Abel and colleagues extended the initiative above to develop³⁷ and evaluate³⁸ educational programming for general dentistry residents in the United States to provide oral health services for women receiving in- or outpatient services through domestic violence programs.^{37,38} Separate focus groups with shelter clients and dental residents³⁷ informed the program, which was highly successful based on patient pre- and post-treatment surveys.³⁸ For example, women relayed views on how to provide comfortable dental care; how they felt about discussing domestic violence with the dentist; and what is important for the dentist to know, say or do in relation to the client's history of domestic violence and oral health circumstances.³⁷ Dentists also benefited from integrated, experiential learning to address issues around domestic violence in their patients.^{37,38}

The final study is an online Canadian initiative that strategically aims to reach the broader health professional community around the specific needs of those experiencing domestic violence.⁴³ Violence, Evidence, Guidance, Action (VEGA) is a response to the identified need for the delivery of "evidence-based, compassionate, and integrated care" to families experiencing domestic violence. This 3-year strategic effort, currently in progress, addresses the health impacts of domestic violence, acting as a central hub for consistent evidence, knowledge, tools and training for health and allied social service professionals, including dental professionals.⁴³ For example, VEGA provides guidelines to assist health professionals in providing trauma- and violence-informed care including asking about domestic violence as a health issue, listening with empathy and without judgement, validating and believing the client, and showing support by assisting with connections to information and community services.⁴³

Discussion

We set out to explore research on the relation between exposure to IPV and ECC and opportunities for early intervention specifically related to community-based dental

prevention. Although such research is limited and inconsistent, it suggests a positive association between children's exposure to IPV and tooth decay. One explanation for the inconsistencies may be the broad age range of children considered (often 2–16 years) and the resulting variation in the determinants of decay. Inconsistent or mixed results may furthermore reflect a literature in the early stages of development.

We found that conceptualization of IPV has evolved, and, consistent with the growing literature on adverse childhood experiences and their lifelong impacts,^{12,21,45} there is an appreciation that even perceived "lesser" forms of violence, such as exposure to IPV (relative to direct physical or sexual abuse), can impact children's health, including oral health.

Generally, dental research and policy are characterized by a steady focus on biological and behavioural factors (the "lifestyle agenda") that contribute to dental diseases,⁴⁶ especially childhood decay.⁴⁷ Here though, we see some movement away from these downstream factors toward a public health approach, which embraces a social determinants of health lens⁴⁶ to acknowledge that lifestyle factors are largely driven by socioeconomic and political conditions. Through a focus on family dynamics and access to services,^{35,36,41} the studies reviewed here subtly recognize gender and power relations in households as integral to oral health inequalities^{40,44} and, thus, begin to move away from labeling individual behaviours as personal failings. We concur that any movement in dental policy and research toward the common risk factors that underpin many chronic diseases (i.e., the social determinants of health), better aligns dental public health with the broader public health agenda.⁴⁶

Our findings indicate a growing interest in incorporating social work into community-based dental programs to improve oral health outcomes for people experiencing domestic violence.^{35-38,43} Although community-based programming does not replace mandated reporting by dental personnel, it is certainly 1 way to offset some of the negative consequences of domestic violence and offers a pathway for clinical dentistry to build relations with organizations addressing domestic violence. The experiential learning of dental residents around the social determinants of health, for example, seemed to assist in developing professionals with an appreciation for the varied challenges and complexity mothers experiencing family violence might face in pursuing dental care for their children.

A key strength of this paper was our iterative and comprehensive approach to developing the search terms and identifying relevant published literature. That said, we excluded the grey literature; the complex and evolving nature of IPV constrained our ability to search the grey literature, although such a search may have yielded relevant documents.

Conclusion

Childhood tooth decay and IPV are important dental profession and public health concerns, making this work both timely and relevant. As with public health generally, there is a clear need for the dental profession and for dental public health to address complex problems using approaches that incorporate social determinants and that are collaborative; our work highlights contributions to that important broader trend.

Moving forward, we make 2 suggestions for dental professional curricula. First, the use of evidence-based guidelines for trauma- and violence-informed care⁴³ seems a promising avenue for dental trainees to develop the nuanced set of skills that will ensure that client safety, autonomy, dignity and well-being guide all decisions around client disclosures in dental interactions.⁴³ Second, opportunities for experiential learning in community settings should be prioritized. In these settings, dental professionals can develop an appreciation of the impact of circumstances, such as domestic violence, on health; but more important, they may develop the critical lens needed to truly address socially determined inequities, that is, to act as advocates for change at a systems level.⁴⁸

Such a reorientation of curricula should better serve clients and may support a way forward for the profession to build trusting relationships with all clients, including those who are vulnerable. Our group is taking the first steps in exploring such an opportunity in Calgary, Alberta, where we are working to coordinate dental and community health worker capacity within the domestic violence shelter system to deliver decay screening, oral health education and referral for families experiencing domestic violence, with a focus on ECC prevention and trauma- and violence-informed care.

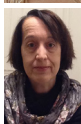
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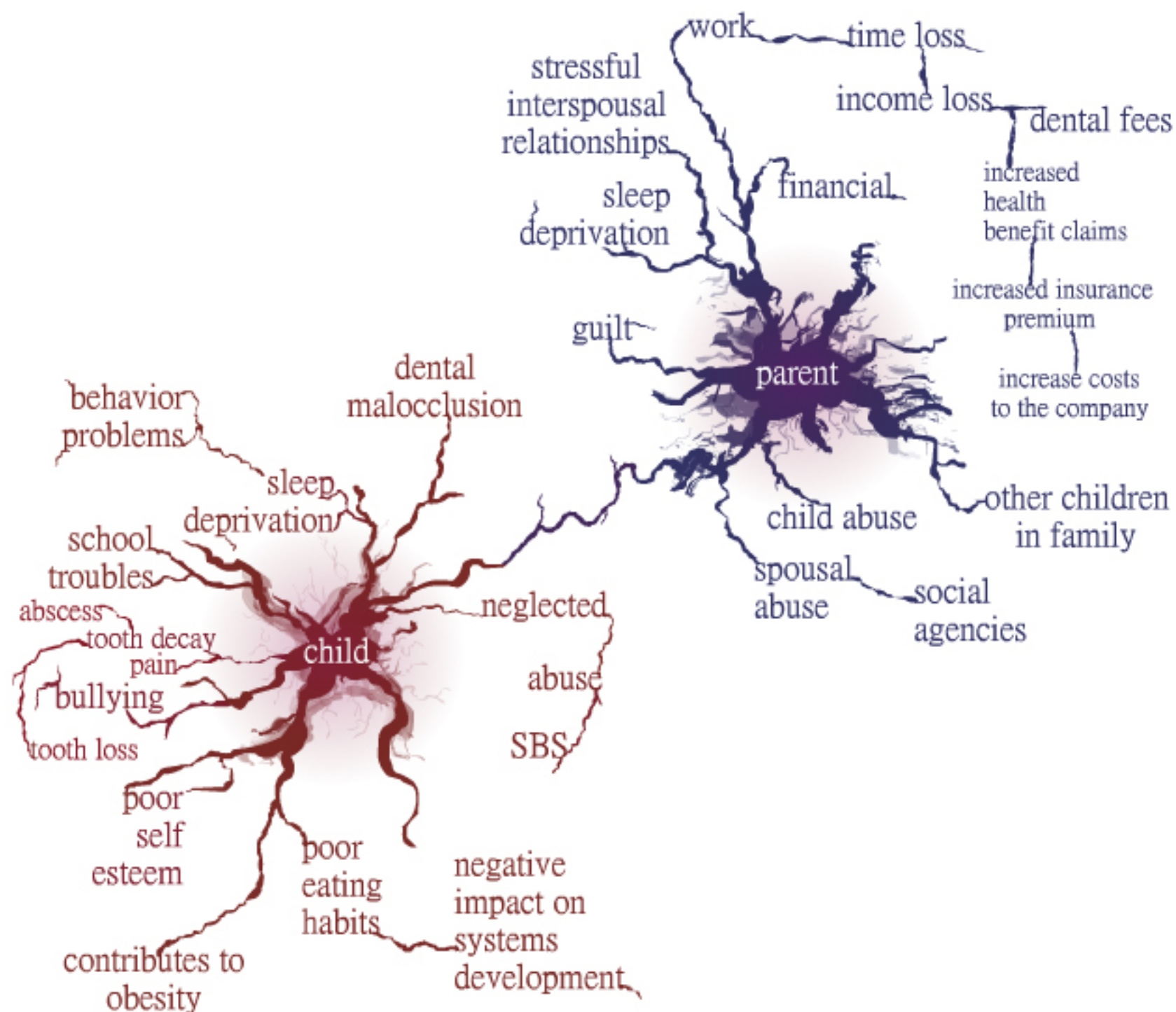
This article has been peer reviewed.

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de Grood, Anna

Subject: FW: [EXT] Fluoride Discussion with Council
Attachments: ITS ABOUT MORE THAN JUST BABY TEETHUNIVERSAL JOURNAL OF PUBLIC HEALTH.pdf; Dispel the myth, save the child Contemporary Pediatrics.mht; JCDA--THE RELATION Between Exposure to Intimate Partner Violence and Childhood Dental Decay.pdf

From: Dr. Smith <myproducts@shaw.ca>
Sent: Saturday, July 13, 2019 7:56 AM
To: Public Submissions <PublicSubmissions@calgary.ca>
Subject: [EXT] Fluoride Discussion with Council

Dear Sirs:

Attached please find three articles and a mind map that outline the impact early childhood caries(tooth decay in the primary teeth) has on the child from 6months of age onward , on the family and Society.
Early childhood caries(ECC) is a progressive ,infectious disease that is ABOUTMORE THAN JUST BABY TEETH!
Yours truly,

Dr Leonard Smith

Link to website article:
C:\Users\lagibb\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\41AA374J\Dispel the myth save the child Contemporary Pediatrics (003).mht

de Grood, Anna

From: Julianne McKinnon <julianne@prospectorsearch.com>
Sent: Saturday, July 13, 2019 11:50 PM
To: Public Submissions
Subject: [EXT] Bring back fluoridation

We recently learned of the opportunity to speak at the City of Calgary Community and Protective Services on the issue of fluoridation. My husband, Lachlin McKinnon, and I will be at the June 24th meeting and welcome the chance to share our concerns about Calgary's decision to remove fluoride from our drinking water and the effect it is having on our children and those who need it the most.

We have three daughters (aged 10, 8 and 6) who take oral health seriously. Their grandmother worked in oral public health for AHS for four decades. Each of our daughters has had regular dental care since one year of age, seeing a pediatric dentist twice a year for regular check-ups and cleanings. We ensure that our daughters brush often and floss regularly. They do not drink pop and know the importance of a water rinse even after school lunch and snacks, when tooth brushing isn't possible.

Regrettably, last fall, Vivian (our 8-year old) was told that she had eight cavities, two in each of her four rear molars. Needless to say, we were terribly disappointed. Her dentist, Dr. Krusky, mentioned that since the fluoride was removed from the water, he has seen "hockey stick" growth in the volume of cavities he's seeing. We are fortunate to have some dental benefits that covered the cost of some of the fillings. We paid the balance out-of-pocket. We are lucky to have been in a position to do so. No doubt many parents wouldn't do anything either for financial reasons, the inability to take time off work for four appointments or because they know those teeth eventually fall out. But, imagine the effect on the other healthy permanent teeth.

I implore the City of Calgary to consider reintroducing fluoride in its water – if not for privileged children like Vivian, but for the many, many children who desperately need the fluoride for oral health the most.

Julianne McKinnon

Julianne McKinnon MBA, CMC, CPHR

P R O S P E C T O R
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de Grood, Anna

From: Donna Mayne <donnajeanmayne@gmail.com>
Sent: Sunday, July 14, 2019 4:32 PM
To: Public Submissions; City Clerk
Cc: mayoro
Subject: [EXT] Submission for the Standing Policy Committee on Community and Protective Services Hearing on Artificial Water Fluoridation Agenda
Attachments: Letter for Calgary Council.pdf; Summary Refutation WECHU Report of 2018 final.pdf; Refutation WECHU Report of 2018 final.pdf

Dear City Clerk,

Please ensure the attached documents are shared with your standing committee and placed on the public agenda concerning artificial water fluoridation.

These documents show how The Windsor / Essex County Health Unit not only failed to provide any credible foundation that cessation here caused an increase in oral health issues but, they also provide alerts to disingenuous tactics used by an American fluoride lobbyist group. Please don't fall for them.

Respectfully,

Donna Jean Mayne
Windsor, ON
N9G 1L3

donnajeanmayne@gmail.com

Dear Councillors

I'm writing to warn you not to be deceived the way our City Council in Windsor Ontario was deceived. Do not confuse endorsements and anecdotal hype with published, variable-controlled studies. Don't be intimidated into overlooking the fact that fluoride has nothing to do with ensuring drinking water is as safe as it can be. Trust qualified fluoride toxicity experts. Trust your common sense and keep in mind, fluoride **IS** more toxic than lead.

Background: Following are a few reasons Windsor Ontario voted for artificial fluoridation cessation in 2013 – reasons that are still valid.

- The U.S. National Research Council's 2006 Review on Fluoride in Drinking water raised multiple health concerns.
<https://www.nap.edu/catalog/11571/fluoride-in-drinking-water-a-scientific-review-of-epas-standards>
- *"Fluoride has no known essential function in human growth and development and no signs of fluoride deficiency have been identified,"*
<https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2012.EN-283>
- Our 2002 Safe Drinking Water Act states, "Dilution is no excuse for adding a contaminant to drinking water. The chemical agent most commonly used to fluoridate water (H₂SiF₆) contains arsenic and other co-contaminants."
http://www.nsf.org/newsroom_pdf/Fluoride_Fact_Sheet_2019.pdf
- Dangerous overfeeds and spills continue to occur, poisoning consumers and placing workers and first responders at risk.
<http://fluoridealert.org/search-results/?q=overfeeds%20spills>
- The inability to control individual dose and the fact that fluoride accumulates in the body renders the notion of an "optimum concentration" obsolete.
- Artificial Fluoridation flies in the face of ethical medical practice, which affords individuals the right to consent

Since then, data from Stats Canada has shown no significant difference in oral health between mostly fluoridated Ontario and Quebec where fluoridation is virtually non-existent. <https://www.theglobeandmail.com/life/health-and-fitness/fluoridation-may-not-do-much-for-cavities/article4315206/>

Recent studies by academics in Canada, the U.S. and abroad warn that fluoride exposure at levels in artificially fluoridated communities threaten fetal brain development and thyroid function (Bashash et al., 2017(2), 2018(3); Till et al., 2018(4), Malin et al., 2018(5), and Yu et al

Cochrane, a trusted global independent network of researchers conducted a systematic review on water fluoridation in 2015. They concluded there was insufficient evidence to determine fluoridation results in a change of disparities in caries levels across socioeconomic status (SES). They also stated that there is little contemporary evidence that AF is effective and older study models that claimed benefit were at a high risk of bias.

http://www.cochrane.org/CD010856/ORAL_water-fluoridation-prevent-tooth-decay.

Incredibly, against this backdrop of information, our newly elected 2018 Council voted for re-introduction last December. Why?

Two Reasons:

1. A very flawed and biased Oral Health Report that in **NO WAY** demonstrated we had an oral health crisis related to fluoridation cessation. (Refutation attached)
2. Johnny Johnson, representing a handful of fluoride lobbyists calling themselves the American Fluoridation Society.

Expect Johnson to say, as he did here, that the science behind artificial water fluoridation is too complex for your understanding; and that you should depend on the recommendations of public health “authorities.”

Expect him to claim he is there to help protect you from misinformation and then ridicule safe-water advocates, distort both the nature of the fluoridation agent and the NRC 2006 Review with patently false claims. <https://youtu.be/JLxh7-anxMs>

Among Johnson’s claims:

- Even at 4mg/L, fluoride “causes no health problems whatsoever.”

2006 NRC Summary “In light of the collective evidence on various health end points and total exposure to fluoride, the committee concludes that EPA’s MCLG of 4 mg/L should be lowered. Lowering the MCLG will prevent children from developing severe enamel fluorosis and will reduce the lifetime accumulation of fluoride into bone that the majority of the committee concludes is likely to put individuals at increased risk of bone fracture and possibly skeletal fluorosis, which are particular concerns for subpopulations that are prone to accumulating fluoride in their bones. <https://www.nap.edu/catalog/11571/fluoride-in-drinking-water-a-scientific-review-of-epas-standards>

The U.S. actually lowered the maximum contaminant level for fluoride in water twice prior to Johnson’s 2018 presentation. Lowering down to 1mg/L is currently under consideration.

http://www.nsf.org/newsroom_pdf/Fluoride_Fact_Sheet_2019.pdf

- “Calgary where they’ve had a 146% increase” in decay from 2011-2014.

McLaren “There was no spike but rather a gradual increase, and the trend observed was not since fluoridation was stopped, but rather over a time period during which cessation occurred: 2004/05 to 2013/14” (cessation occurred in 2011).

http://www.caphd.ca/sites/default/files/MosaicNewsletter_FALL17_final.pdf

A Ticking Time Bomb

Incidentally, much of the highly corrosive wastewater used in fluoridation comes from Johnson's home state of Florida where containment issues have become a multi-billion dollar issue for Mosaic Fertilizer LLC.

<https://www.epa.gov/enforcement/mosaic-fertilizer-llc-settlement>

Sarasota Magazine calls it a "ticking time bomb" *"These are massive piles of waste materials called phosphogypsum that are left over from the fertilizer manufacturing process. They rise up to 200 feet high and cover some 400 acres. On top of each one is a pond of acidic water from 40 to 80 acres in size."*

<https://www.sarasotamagazine.com/articles/2017/4/26/florida-phosphate>

It's fluoride overkill – not fluoride deficiency

- Dental fluorosis rates from over-exposure are up 31% from 2002-2012 now effecting 65% of U.S.teens.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5929463/>
- Dementia rates are up. (Fluorine bonds with aluminum and influences its absorption.) <https://www.ncbi.nlm.nih.gov/pubmed/30868981>
- Fluoride disrupts thyroid function; Thyroid drug perscription rates are up. <https://www.webmd.com/drug-medication/news/20150508/most-prescribed-top-selling-drugs>
- Fluoride levels in The Detroit River (Windsor's source of water) exceed protective limits 0.12ppm established by the Species at Risk Act.
- Inorganic fluorides are included in Canadian Environmental Protection Act's *Priority Substance List* – toxins considered to be entering the environment in quantities to have "an immediate or long-term harmful effect on the environment or its biological diversity."
<https://www.canada.ca/en/environment-climate-change/services/management-toxic-substances/list-canadian-environmental-protection-act/inorganic-fluorides.html>
- The Ontario Ministry of Health has known for 20 years that Canadians are excessively exposed to fluorides. *"In Canada, actual intakes are larger than recommended intakes for formula-fed infants and those living in fluoridated communities. Efforts are required to reduce intakes among the most vulnerable age group, children aged 7 months to 4 years."*
<http://www.health.gov.on.ca/en/common/ministry/publications/reports/fluoridation/fluoridation.aspx>
- Studies demonstrate that fluoride exposure may increase dental caries risk in malnourished children.
<https://www.hindawi.com/journals/tswj/2014/293019/>
- There are growing concerns about inordinate fluoride exposure from all sources, like pesticides, fumigant residues, fluorinated pharmaceuticals dental products, PFOAs and PFAs – "forever" fluoride-based chemicals.
<https://www.businessinsider.com/erin-brockovich-contaminated-water-warning-pfas-chemicals-2018-12>

- Our children aren't fluoride-deficient they are nutrient-deficient. Between 2005-2015 Windsor's average household income dropped "... the city of Windsor has one in three children under the age of six living in poverty."
<https://windsor.ctvnews.ca/windsor-has-worst-drop-in-average-income-in-ontario-from-2005-to-2015-1.3587942>

While the CDC endorses artificial fluoridation; their own data shows no correlation between fluoridation rates and better oral health or reduced discrepancies in health across SES. In fact, some of the most fluoridated states also rank higher than national average in tooth loss due to decay. The U.S. national average for complete tooth loss in seniors in 2014 was 14.9%

<https://www.cdc.gov/fluoridation/statistics/2014stats.htm>

Kentucky 99.9% fluoridated. 23.9% complete tooth loss in seniors

"Since 2001, the number of third- and sixth-graders in need of early or urgent dental care rose from 32 percent to 49 percent statewide."

<https://www.kentucky.com/news/politics-government/article109136977.html>

Illinois 98.5% fluoridated. 16.5% complete tooth loss in seniors

"We have babies come to us who already have a mouthful of decay...It's the result of a combination of poor diet, poor oral hygiene, poor parental education and a lack of access to routine care."

<https://www.chicagotribune.com/columns/eric-zorn/ct-teeth-poverty-dental-care-health-zorn-perspec-0630-md-20170629-column.html>

Georgia 92% fluoridated. 19.3% complete tooth loss in seniors

"The prevalence of tooth decay among children with low socio-economic status is 50% higher than the prevalence of tooth decay among children in high SES."

https://dph.georgia.gov/sites/dph.georgia.gov/files/MCH/OralH/GA%20Burden%20of%20Oral%20Health%20Report_061914%20NEWEST.pdf

British Columbia 1.2% fluoridated

"BC's caries free rate appears to be above that national average.... In 2012-13, 67.3% of 5-6 year olds in BC were caries free."

<https://www.health.gov.bc.ca/library/publications/year/2014/provincial-kindergarten-dental-survey-report-2012-2013.pdf>

The 2006 British Columbia Dental Association (BCDA) Adult Dental Health Survey shows clearly that since 1986 there has been a very substantial decrease (approximately 40%) in the average number of missing teeth within the 66-85 age group.

Respectfully,
Donna Jean Mayne
Windsor, ON
donnaJeanmayne@gmail.com

SUMMARY
REFUTATION of the Windsor Essex County Health Unit
Oral Health Report of 2018

37 professionals, including dentists, doctors, and various scientists believe the report:

- provides no credible foundation for recommending artificial fluoridation.
- does not conclude that cessation of artificial water fluoridation is related to increased dental caries and poor oral health.
- interprets data with obvious bias and manipulation
- is negligent in its omission of safety concerns regarding fluoride's toxicity.
- ignores decreasing rates in oral health occurred prior to cessation.
- neglects to acknowledge day surgery rates were actually at their highest during fluoridation.
- irresponsibly dismisses dental fluorosis (a sign of fluoride over-exposure) even though U.S. dental researchers (NHANES 2012) now state that it effects 65% of teens with more than 30% having conditions considered moderate to severe.
- disingenuously reports zero incidents of fluorosis by screening children too young to have their adult teeth.
- makes alarmist and misleading statements in their summary about growing treatment rates while failing to explain eligibility criteria changed.
- outlines the importance of understanding barriers to good oral health but does not control for confounding factors such as recent immigration, the opioid crisis, diet, the aging population or declining income levels.
- manipulates data to falsely represent residents' wishes.

REFUTATION OF THE WINDSOR ESSEX COUNTY HEALTH UNIT'S 2018 ORAL HEALTH REPORT



REFUTATION of the Windsor Essex County Health Unit Oral Health Report of 2018

We the undersigned medical and health-care professionals are persuaded by the attached document that the Medical Officer of Health and Windsor Essex County Health Unit have misled the Mayors and Councillors of Windsor, LaSalle, and Tecumseh about the safety and effectiveness of artificial water fluoridation (AWF).

Further, the Windsor Essex County Health Unit's (WECHU) 2018 Oral Health Report has been erroneously framed as conclusive proof that cessation of AWF in Windsor, LaSalle, and Tecumseh caused an alarming increase in dental decay. ***This claim has no credible foundation.***

The evidence of AWF's benefits is weak (Cochrane, 2015 (1)). In addition, there is increasing knowledge of fluoride's neurotoxicity.

Current studies by academics in Canada, the U.S. and abroad warn that fluoride exposure at levels in artificially fluoridated communities threaten fetal brain development and thyroid function (Bashash et al., 2017(2), 2018(3); Till et al., 2018(4), Malin et al., 2018(5), and Yu et al (6)).

On Dec. 17, 2018, Windsor City Councillor Irek Kusmierczyk cited for Dr Ahmed two studies published by the University of Toronto in partnership with Harvard University, Indiana University and the University of Michigan. Dr. Ahmed dismissed their findings because a review by Public Health Ontario raised questions about methodology.

Quotes from Windsor City Council Meeting:

Timestamp: 9:50:30

Councillor Irek Kusmierczyk: *I've read so many journal articles, medical journal articles, dental journal articles, you name it and, ah, there are some good articles and there are some not so good articles.....There's two studies that caught my eye, and I want to get your comment on it. So there are two studies published in 2017 and 2018, both were published by **University of Toronto**, and they were published in partnership with **Harvard University, University of Michigan, Indiana University**. They were sponsored by – I think it's the **National Institute of Health**, and what they found in both of those studies, is that there was an association between exposure to fluoride in pregnant women and elevated incidences of ADHD and lower IQ among their children. What is really remarkable about this study is that they actually followed 213 mother-child pairs from pregnancy, and they tested the children for example at age two, at age four, age six, at age ten.*

So this was a longitudinal study, and the findings, I'm trying to quote from one of the lead authors, the conclusion was "Our findings are consistent with a growing body of evidence suggesting that the growing, fetal nervous system may be negatively affected by higher levels of fluoride exposure". They are not saying this is fact, they're not saying they are making an absolute conclusion, but what they're saying is that we need to investigate this more. There is enough grounds, the methodology seems to be fairly solid, there is enough grounds here that we need to do a little bit more research. Can you comment on that?

Timestamp: 9:52:23

Dr. Ahmed: *Sure. As I mentioned, this document is recently prepared by Public Health Ontario, our scientific body, and it touches on specifically those studies. And, ah, I would just say that those studies, and I'm quoting verbatim, "This study was critiqued by other researchers for methodological limitations including measurement error and no consideration for other potential explanatory variables (such as pre-term birth or exposure to tobacco, alcohol, arsenic or lead) apart from SES. The results are advised to be interpreted with great caution due to high risk of ecological fallacy (water fluoridation measured at state level) and confounding bias."*

(Note: Dr. Ahmed **was in error**, as the Public Health Ontario (PHO) report he was using did not review the Bashash studies the Councillor referenced.)

Dr. Ahmed: *And as you know, ahem, ah, Councillor, ah, there, any time when you are looking at any study, confounding and bias is one of the most important thing that you have to look to make any kind of conclusion and, ah, based on the, the methodology, if those questions are raised, it, it, it raises doubt in terms of what the conclusions how the conclusions are being drawn and whether it can be applicable to other communities or other, ah, other individuals.*

Councillor Irek Kusmierczyk:...and we know that association does not mean causation.

Dr. Ahmed: **EXACTLY.**

The WECHU 2018 Oral Health Report ignores this maxim in a shameful effort to claim a decline in oral health following the cessation of AWF. This is a false conclusion because it fails to consider potentially confounding factors, such as economics. Be advised that:

- Windsor has recently experienced the worst average-income drop in Ontario. One in three children under the age of six now live in poverty. ... They are not *fluoride-deficient*, they are nutrient-deficient – a key contributor to tooth decay). Further, their parents can't afford dental care which is another precursor to poor oral health. (7)
- Recently arrived immigrants and refugees suffer a greater burden of oral health issues. And Windsor has seen nearly 11,000 new Canadians settle here since 2011.(8)

UNACKNOWLEDGED IN THE WECHU REPORT:

Figures 7 & 9. The number and rate of day surgeries for oral health (caries related) issues among children (1 to 17 years) had its peak in **2011** and has been less than that amount for each year since. *Therefore, the rate of day surgeries for children does not appear to be negatively affected by removal of artificial fluoride from the water supply.*

Figures 7 & 9. The number and rate of day surgeries for oral health (caries related) issues among adults 18+ had its peak in 2011 and has been less than that amount each year since. **The rate of day surgeries has decreased 38.1% from 2011 to 2016.** *Therefore, the rate of day surgeries for adults does not appear to be negatively affected by removal of artificial fluoride from the water supply.*

Figure 5. The peak amount of children attending the Emergency Department (ED) for oral health-related problems (not including accidents) was 65 in 2012 (**before fluoride was removed from the water**). In 2016, the amount of children was **reduced by 13.8%** to 56. The peak amount of adults attending the ED for oral health-related problems was 954 in 2013, which was reduced by 10.8% to 851 in 2016.

DIRECT RESPONSE TO WECHU ORAL HEALTH REPORT - 2018

Executive Summary (pages 7-8)

Oral Health Profile of Windsor-Essex County:

Claim 1 – *“Nearly 1 in 4 residents report having no dental insurance coverage.”*

➡ Nearly 1 in 4 residents over 18 don’t have dental coverage (see Figure 1). As there is a variable of 16.6 to 33.3, this figure may be closer to 1 in 2 residents over 18 who don’t have dental coverage.

Claim 2 – *“Just over 1 in 10 households with a child between 1 and 6 years, saw a dental professional for their child for the first time before their child’s first birthday “*

➡ AWF has no influence over the caregiver’s ability or decision to provide a visit to a dental professional.

Claim 3 – *“There is an average of 921 emergency department visits each year for problems related to oral health.”*

➡ This data does not support artificial fluoridation because it is based on average numbers, instead of percentages in a population. It does not account for confounding factors such as lower income status (a reason people seek emergency help instead of seeing a dentist) or the drug crisis (meth mouth) Windsor is currently experiencing. It is important to note that the trend is decreasing in the amount of ED visits for oral health (see figures 7 and 9).

Claim 4 – *“The estimated average total cost for emergency dental visits is \$508,259 per year in Windsor-Essex County.”*

➡ Artificial fluoridation will not change the cost of treatment for an ED visit. Page 11 in the report states, “... People are going to hospital emergency departments for dental problems because they are in pain and cannot afford dental treatment in the regular oral health care setting.”

Claim 5 – *“Over 9 in 10 visits to the emergency departments were by adults (18+) with the highest rates observed in young adults between 20 to 29 years of age.”*

➡ 90% of oral health related visits to the emergency room were by adults and most of them were between 20 to 29 years old, which is an age group not likely to have dental coverage and most likely to have drug addictions.

Claim 6 – *“Each year, there is an average of 1,323 day surgeries for oral health (caries-related) reasons with the rates of day surgeries consistently higher in children (1 to 17 years) between 2010 and 2016.”*

➡ True. According to Figure 10, we have always had higher than provincial average but rates were at their highest prior to 2013 – while we were still fluoridating. In 2010, Windsor-Essex County rate of day surgeries for oral health was 305% more than the rate for the province as a whole. This increased to 318% in 2011, and then steadily decreased to 289% in 2016. **Therefore, one can make the argument that our rate of day surgeries has improved since fluoride has been removed from the water!**

Claim 7 – *“Approximately 4 in 5 residents in Windsor-Essex County support community water fluoridation.”*

➡ Opinions in surveys do not support evidenced-based science. The Community Needs Assessment Survey, was not a random survey and was highly susceptible to bias given the means of deployment. It provided three options for response: Yes: 63.8%, No: 18.4% and I Don’t Know: 17.8%. This is not 4 in 5.

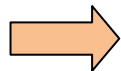
Further, the WECHU removed an entire category in their report and then misrepresent the results by stating that 78% of people polled “supported” AWF. **This is direct manipulation of the statistics in an effort to mislead the reader at large, and public policy makers specifically.** Further, Dr. Ahmed **repeatedly cited the manipulated poll results** when replying to direct, thoughtful questions by a dissenting Windsor City Councillor in an effort to persuade him to support AWF.

Claim 8 – *“None of the nine municipalities in Windsor-Essex County fluoridate their water supplies.”*

➡ Correct. Leamington and Kingsville have never fluoridated their water because the H.J. Heinz Company would not permit it. Lakeshore and Amherstburg both decided independently to stop prior to the Windsor, LaSalle and Tecumseh decision. The Niagara and Waterloo regions also stopped prior to Windsor and Dr. Ahmed, unknowingly compared Niagara’s good oral health – twice – to Windsor’s oral health at the December Council meeting.

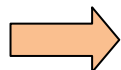
Oral Health Assessment in schools and preventative services in Windsor-Essex County:

Claim 1 – *“In the 2016/2017 school year, 18,179 children from 119 schools were screened for oral health issues. Between 2011/2012 to 2016/2017, the percentage of children with decay or requiring urgent care has increased by 51%.”*



- Increasing rates began prior to cessation.
- A “30 second no touch screening” cannot be considered accurate for the purposes of assessing dental health on a scientific basis.
- Statistics often appear more alarming in percentages. In this instance, 51% translates to 5 more children out of 100 with a sign or hint of a cavity.
- New Canadians often bear a greater burden of oral health problems and one child with several cavities can alter statistical averages. This confounding factor was never addressed.
- Household incomes have dropped recently and we now have the highest rate of children living in low-income households – 24%. This was not a variable factored in the report even though barriers such as income and education level were identified on page 10. of the report.
- London, Ontario has also experienced an increased in the amount of children requiring urgent care and they have remained fluoridated. (9) **Windsor-Essex County continues to move in the same direction as other parts of Ontario, whether they are fluoridated or not.**

Claim 2 – *“A three-fold increase in the proportion of children eligible for topical fluoride was observed between the 2011/2012 and 2016/2017 school years.”*



This is an extremely misleading claim to be placed in the summary because the report later explains on page 28 how government criterion for eligibility automatically changes in non-fluoridated communities. And again, on pg.39, they state: **“The large increases in treatment in 2016 and 2017 are due to the changes to HSO program in January 2016.”**

Before 2013, a child from Windsor, LaSalle and Tecumseh needed to have a history of smooth surface decay **and** a presence of smooth surface decay to qualify. Now, all children in Windsor, LaSalle, and Tecumseh that have a history, **or** currently have smooth surface decay qualify. Naturally, there will be a significant increase.

Claim 3 – *“When compared to Ontario, the percentage of children with urgent dental needs in 2016/2017 was two-times greater in Windsor-Essex County. A similar trend was observed for all other school years.”*

➡ This point is based upon Figure 11 in the report, in which the 2016/2017 data is missing for Ontario. Given the data ratios provided in the chart, **there are even more reasonable questions regarding the reliability of the school screening program results.**

Claim 4 – *“There is a decreasing trend in the proportion of caries-free children observed in JK, SK and Grade 2, from 7 in 10 (70%) children being caries-free in JK to 5 in 10 (50%) in Grade 2.”*

➡ This point is in reference to Figures 14 and 15. Upon review of the Figures, you will see that the overall trends are the same in communities that have never fluoridated their water as Windsor, LaSalle and Leamington. Therefore, this point **does not** support the need to add artificial fluoride to the water.

Claim 5 – *“The measure of decayed, missing, extracted, and filled teeth (deft/DMFT index) was highest in 2016/2017 and lowest in 2011/2012 school year indicating a trend in more oral health concerns among children at the time of school entry over time. Similar observations were found across the different grades.”*

➡ This point is in reference to Figure 13, however if you look at Figure 14, you see that the **data moves in the same direction for the Never Fluoridate communities** in Essex County, as well as the Previously Fluoridated Communities. **Further showing that it isn't the removal of the fluoride from the water that has caused the alleged increase in dental decay** (remembering also the unreliability of the dental screenings performed at schools).

Claim 6 – *“From 2011/2012 to 2016/2017, communities that recently ceased fluoridation observed a greater decrease in the percentage (13%) of students without caries compared to an 8% decrease in the communities that were never fluoridated.”*

➡ However, there are years that the rate of cavity free children has **increased AFTER** fluoride was removed and years when it **decreased BEFORE** fluoride was removed.

Claim 7 – *“Between 2011/2012 and the 2016/2017 school year, there were no instances of moderate or severe fluorosis in children screened.”*

➡ **This is a particularly egregious statement!** Moderate to severe fluorosis is when the condition of fluorosis is so advanced that teeth become brown, pitted and brittle.

WECHU's dental fluorosis statistic (Table 7 on page 29, and Table 8 on page 35) is based on screenings of kindergarten students, however **kindergarten students are too young to assess for dental fluorosis because the required indicator teeth have not**

yet erupted from their gums. Dental fluorosis normally appears on the permanent teeth and not on primary.

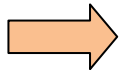
The *Association of Public Health Epidemiologists in Ontario* needs to be held accountable for setting this useless screening standard. If the WECHU actually had performed any due diligence in understanding dental fluorosis, then they would have known that JK or SK students would not show the signs yet for accurate results, so screening them for fluorosis is worthless. Also, they would have known the dental fluorosis is more than a mere cosmetic issue and therefore, careful screening, accounting and statistics for all cases do need to be kept.

Dental fluorosis is a visible biomarker for fluoride toxicity that develops before tooth eruption on the permanent teeth. Health Canada's Guidelines for Canadian Drinking Water Quality Guideline Technical Document on Fluoride, 2010 describe it as "*a permanent hypomineralization of tooth enamel due to fluoride-induced disruption of tooth development... in people with high exposure... occurs only when exposure to fluorides happens during tooth formation.*" (10)

WECHU reports on only *moderate or severe* dental fluorosis, thus dismissing as irrelevant the mild cases of this biomarker for fluoride toxicity. This is an intentional departure from the Association of Public Health Epidemiologists in Ontario's Core Indicator for dental fluorosis. (11) (12)

Meanwhile, the American Association for Dental Research has just released a survey (NHANES 2019) demonstrating that a large increase in the prevalence and severity of fluorosis has occurred since 1986. ***"For ages 12 to 15 years —an age range displaying fluorosis most clearly—total prevalence increased from 22% to 41% to 65% in the 1986–1987, 1999–2004, and 2011–2012 surveys, respectively. The rate of combined moderate and severe degrees increased the most, from 1.2% to 3.7% to 30.4%."*** This proves children are being over-exposed to toxic fluorides and WECHU has acted in a negligent manner by inappropriately reporting the condition for the past several years. (13)

Claim 8 – *"With the new Healthy Smiles Ontario program, a total of 7,973 preventative oral health services were offered by the Windsor-Essex County Health Unit in the 2016/2017 school year."*



A reasonable amount of time should be given to see if the new Healthy Smiles Ontario program would improve dental decay rates in the children. Or we should be adopting Scotland's very successful and pro-active "Childsmile" program.

It is a mistake to rush to put chemicals classified as developmental neurotoxins, back into the water especially since they bio-accumulate and there is evidence of increasing exposures from other sources and harm.

Introduction - What is oral health?

The report states that Oral Health is more than just tooth decay, but mouth and facial pain, periodontal disease, and any other negative issues that impact the oral cavity. As a result of this definition, we need to keep in mind that AWF is only upheld as a tool to fight dental caries and **not periodontal disease** or other matters that may affect Oral Health.

Why does oral health matter?

On page 9 the report states, “*In recent years an increasing amount of research has shown the important link between oral health and overall health. Oral health issues have been linked to respiratory infections, cardiovascular disease, diabetes, and poor nutrition. More recently, evidence has emerged that shows a link between maternal periodontal disease and babies with low birth weights (Ministry of Health and Long-Term Care, 2012).*”

The above claims by the Ministry of Health and Long-Term Care are made on page 7 of their 2012 report on Oral Health, which states the following: (14)

On Respiratory Infections - *Many studies have shown that poor oral hygiene in older adults is a major risk factor for aspiration pneumonia. The micro-organisms that cause pneumonia are commonly found in significantly high concentrations in the dental plaque of elderly people with gum disease. [Emphasis added]*

On Cardiovascular Disease (Heart Disease and Stroke) - *There is also a link between gum disease and cardiovascular disease (CVD). However, there is no evidence to confirm a causal relationship or that treating gum disease will prevent CVD or modify its outcomes. [Emphasis added]*

On Diabetes - *The connection between periodontal disease and diabetes is what is described as a two-way relationship. People with diabetes have a higher susceptibility to contracting infections, and so are at greater risk of developing gum disease. Conversely, oral infections can increase the severity of diabetes by increasing blood sugar levels. Harmful periodontal bacteria may mediate increases in insulin resistance, resulting in an increase in blood glucose. [Emphasis added]*

On Poor Nutrition - *Poor oral health can have a significant impact on nutritional status. If your mouth is sore and infected, it is hard to eat. For some, particularly seniors, poor oral health can lead to substantial weight loss, dehydration, and infirmity.*

On Low Birth Weight Babies - *Poor oral health in pregnancy may also have a negative effect. There is evidence that suggests that periodontal disease may contribute to premature delivery and/or low birth weight in the newborn baby. In turn, babies who are pre-term or low birth weight have a higher risk of developmental complications, asthma, ear infections, birth abnormalities, and behavioural difficulties, and are at a higher risk of infant death.*
[Emphasis added]

As one can see from the above, the more serious health effects of poor Oral Health stem from periodontal disease (gum disease) and **NOT** from caries/cavities. So, the next logical question would be, “*What are the effects of Artificial Water Fluoridation (AWF) on periodontal disease?*” The answer is alarming. **Fluoride is shown to worsen periodontal disease!**
(15) (16) (17)

The paper, “*Fluoride Exposure and Periodontal Disease*” written in 2016 by Declan Waugh, BSc. CEnv. MCIWEM. MIEMA, cites many studies over the decades and includes this shocking information:

“Research documentation from the pharmaceutical company Sepracor (renamed Sunovion Pharmaceuticals Inc), indicates that **fluoridated toothpaste may cause or contribute to periodontal bone loss**. This finding is serious because periodontal bone loss is the number one cause of tooth loss among adults. Patents supplied by the pharmaceutical company disclosed that concentrations of fluorides from fluoridated toothpastes and mouthwashes activate G proteins in the oral cavity, thereby promoting gingivitis and periodontitis, as well as oral cancer. The patent findings supply the biochemical explanation for **earlier reports by many researchers who had found increased gingivitis and gum inflammation due to fluoridated water**, or other sources of fluoride. In 1996 three biochemists Aberg G, Jerussi TP and McCullough JR working for Sepracor investigated fluoride implications in periodontal disease. Realizing that **fluorides activate G proteins**, they reasoned that fluorides would also be involved in the activation of **those G proteins which regulate the pathways involved in gingivitis and periodontitis** - and they decided to test for the ability of fluoride to activate two integral receptors involved in periodontal disease - the prostaglandin E2 receptor (PGE2) and the thromboxane A2 (TXA2) receptor. Both are coupled to G proteins called G q/11. The scientists conducted a test with sodium fluoride based on a well-established in-vitro protocol

model involving HL-60 cells. These are Human Leukemia cells often used in biochemistry investigations, as one can observe fundamental and critical signals involved in the activation of the body's immune system - because of the cells' ability to respond to foreign organisms. The authors reported:

"We found that fluoride, in the concentration range in which it is used for the prevention of dental caries, stimulates production of prostaglandins and thereby exacerbates the inflammatory response in gingivitis and periodontitis.... Thus, the inclusion of fluoride in toothpastes and mouthwashes for the purpose of inhibiting the development of caries may, at the same time, accelerate the process of chronic, destructive periodontitis."

However, instead of alerting the public health officials to their findings, they went looking for an agent which would counteract the adverse effects of fluoride choosing a non-steroidal anti-inflammatory agent (NSAID) called ketoprofen. They conducted more studies to see if ketoprofen was efficient in off-setting the damaging fluoride affects, and in 1996 filed a patent on their new concoction now containing both fluoride and ketoprofen. In 1998 they obtained a patent for a topically applied fluoride product in which they state that:

"The present invention is a method for preventing dental caries by administering a fluoride salt into the oral cavity while at the same time controlling periodontal bone loss by administering, in addition to the fluoride salt, an amount of an NSAID sufficient to inhibit the production of prostaglandins induced by the fluoride."

Further, the Canadian Dental Association's 2010 report cited by the WECHU recommends increased access to dental health services for periodontal disease prevention and treatment. It only mentions water fluoridation with respect to prevention of dental carries.

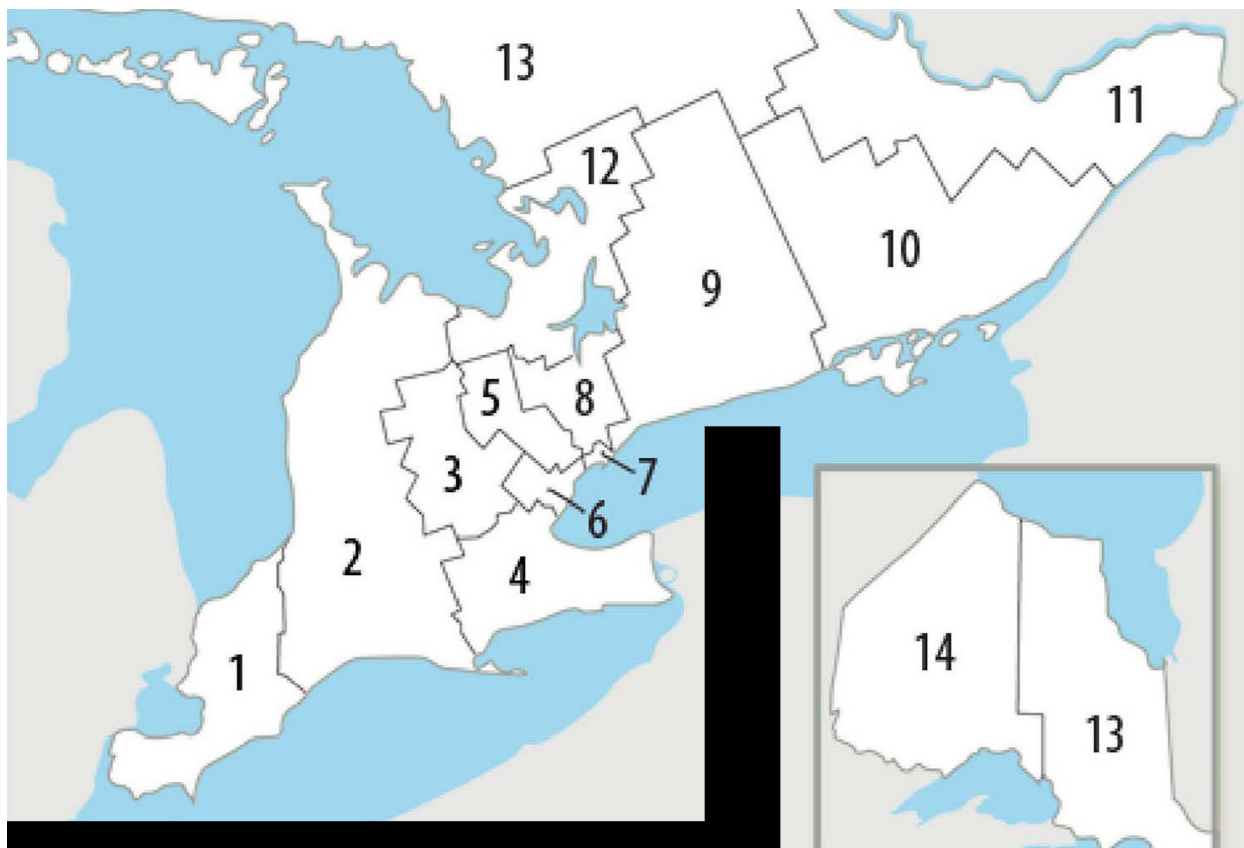
Therefore, it is a misleading for the WECHU to conflate AWF with negative health effects associated with poor Oral Health. It is a mistake by lawmakers to interpret the recommendation by the WECHU for AWF to have any positive effect on the underlying periodontal disease that is associated with respiratory infections, cardiovascular disease, diabetes, and low-birth weight.

Why is oral health important to children?

The WECHU report cites the amount of school days that are lost each year due to dental visits or dental sick days are 2.3 million. However, many of those lost school days are for **routine preventative dental visits** and not a result of dental carries. Nevertheless, the WECHU report leads you to believe it is for corrective dental visits or dental sick-days, as this statistic follows this sentence: “*Dental issues and oral pain can also result in missed school days and negatively impact learning and behaviour.*”

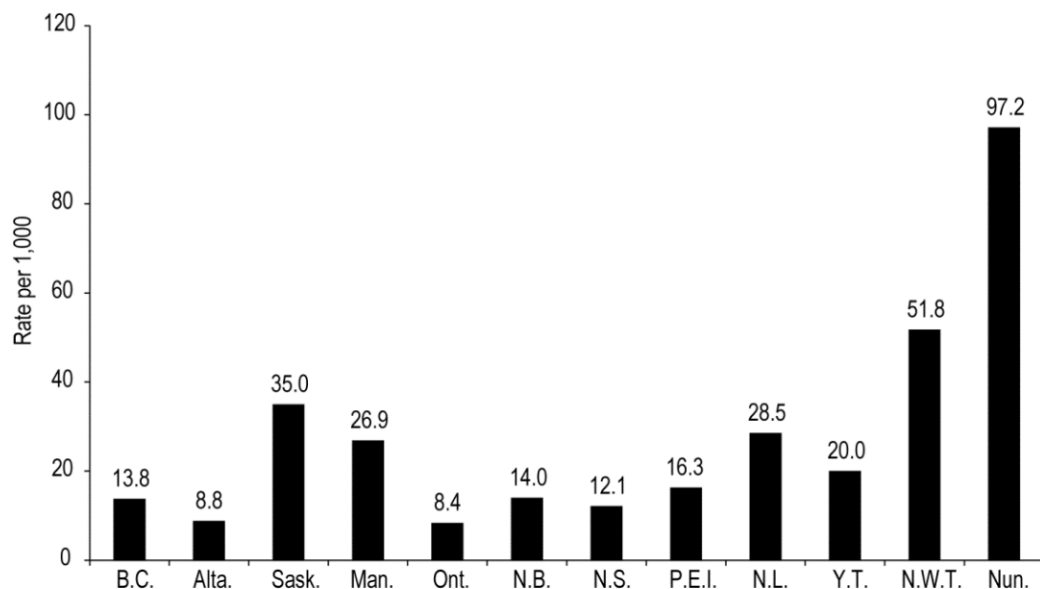
As for the early childhood caries (ECC) that require surgery, it is noted that the highest rate of surgery is found in the Aboriginal population and that our Local Health Integration Network (LHIN) is third highest. *This is consistent with economic data having the single, largest effect on dental health, as it is the main driver of frequency of dental visits.*

This is a map of the LHINs.



The rates were calculated from data collected between 2010 and 2012 and using census projections for 2010 and 2011 from Statistics Canada. (18)

Figure 4: Rate of Day Surgery for ECC by Location of Residence, Selected Provinces/Territories, Children Age 1 to Younger Than 5, Two-Year Pooled (2010–2011 to 2011–2012)



This figure shows that **BEFORE** fluoride was removed from the water in Windsor, LaSalle and Tecumseh, Ontario had an overall rate of 8.4 ECC related surgeries for every 1,000 children, and the WECHU health report states that in our LHIN, we had a rate of 21.2 for every 1,000 children.

According to the data in the cited report, the LHIN #14 had a rate of 60.9 and LHIN #13 had a rate of 25.0. Since the data for figure 4 was calculated from 2010 to 2012, **it is clear that the water fluoridation in Windsor, LaSalle and Tecumseh failed to bridge the gap between our LHIN and the rest of the province.** Also, as noted above, there has been a **decrease** in ED oral surgeries for 1-17 year olds since 2011 **AFTER** fluoride has been removed.

So, it would be disingenuous of the WECHU to suggest that this data in their report would be resolved by AWF. Is it likely an indication that the Windsor-Essex County dental caries rates are higher than much of the Province? Yes. However, the bulk of the Windsor-Essex County population was drinking fluoridated water when these figures were obtained, and it shows that water fluoridation is not the ‘great equalizer’ of dental health as many believe. Clearly, there are other major factors that are at play. According to the Canadian Dental Association’s (CDA) 2010 Position Paper on *Access to Oral Health Care for Canadians*, the biggest factor is having access to dental care, and consequently the lack of dental coverage the barrier, for both old and young. (19)

What are the barriers to good oral health?

The report states,

“There are direct links between poor oral health and poor overall health, so it is not surprising that oral diseases have many of the same social and economic determinants (e.g., income, employment, education, access to health services, social support and other factors that impact the health of people and communities) as other chronic diseases (College of Dental Hygienists of Ontario, 2014).” While the above may be true, the reference the report provided doesn’t actually support the above claim and is therefore misleading.

The WECHU report cites the College of Dental Hygienists of Ontario. In section 3.2 of the College’s report cites “*King, 2012*” which is the same *Ministry of Health and Long-Term Care (2012)* report that the WECHU report cited earlier. **We already know that it is discussing health problems that are related to periodontal disease and not tooth decay/cavities/caries.** We have already pointed out that AWF advocates only claim that AWF has a positive effect on dental caries. **We have already addressed that AWF, along with other topical fluorides, may actually worsen periodontal disease!**

In section 3.2.1, the College’s report also in turn cites the 2000 report by the US Surgeon General’s *Report on Oral Health* on the above claim. When looking to that report, the relevant information can be found in Chapters 5 and 6. (20) The pertinent information in Chapter 5 is related to the same health issues of respiratory infections, cardiovascular disease, diabetes, and low-birth weight that are **associated with periodontal disease and not dental caries.**

Chapter 6 is titled, “Effects on Well-being and Quality of Life”. It is discussing matters far beyond dental caries, but into craniofacial defects and systemic diseases that affect oral health, such as Parkinson’s disease, AIDS, cancer therapy, diabetes, and prescription drugs.

None of these issues addressed in the two chapters, cited by the College’s 2014 report and subsequently cited by the WECHU would be resolved by AWF.

The WECHU’s next point about common risk factors for diabetes, heart disease and cancer may also be risk factors in poor oral health ie. poor diet, alcohol use, and smoking. Again, remember oral health is much more than just dental caries, it includes periodontal disease, mouth cancer, ulcers in the mouth, anything causing pain in the mouth cavity. **AWF will not negate poor diet, drinking alcohol or smoking.**

Finally, the WECHU addresses a key issue, which is the cost of dental care and the lack of coverage. Also, the report states, *“immigrants receive less preventative services and more*

treatment, and experience more negative oral health outcomes (Canadian Academy of Health Science, 2014). This is important for Windsor-Essex County given the large immigrant population in the region. Furthermore, a recent systematic review found that newcomer families (refugees and immigrants) have poor oral health and face several barriers to using dental care services (Reza, et al., 2016)...” Unfortunately, **the WECHU didn’t track any new refugee or immigrant family when assessing the data on the rate of dental caries** in JK, SK or Grade 2 since Windsor, LaSalle and Tecumseh stopped AWF in 2013.

The report then discusses the cost to the province because people are having their dental problems fester until it has become an emergency and they seek treatment at the hospital. A wise policy decision for the provincial government would be to allocate more funding into dental coverage for at risk populations. **AWF will not resolve this issue, but may only delay some of the visits to the ED.**

Objectives of the report

1. The WECHU intends to frame this report in light of the 5-year moratorium of AWF.
2. This point is straight forward in the report.
3. It purports that the recommendations are based upon the data. However, we will see that it is leaping to the conclusion that even the most modest of data hinting at the correlation of removal of fluoride and caries increasing the WECHU would consider that causation, even though they discount that it was **worsening BEFORE fluoride was removed.** Also, the recommendations ignore the serious relationship between fluoride possibly aggravating periodontal disease, which is arguably more serious than dental caries.

Data Sources

RRFSS – only 18 years of age or older and only landlines in residential homes. It has a measure of variability between 0 and 16.5 if the results are to be released without qualification. However, if the variation is between 16.6 and 33.3, it can only be release with caution (denoted with a superscript'E’).

NACRS – straight forward

Population Data – straight forward

OHISS – Upon review of Appendix A: Oral Health Core Indicators in the report, there are serious concerns as outlined below:

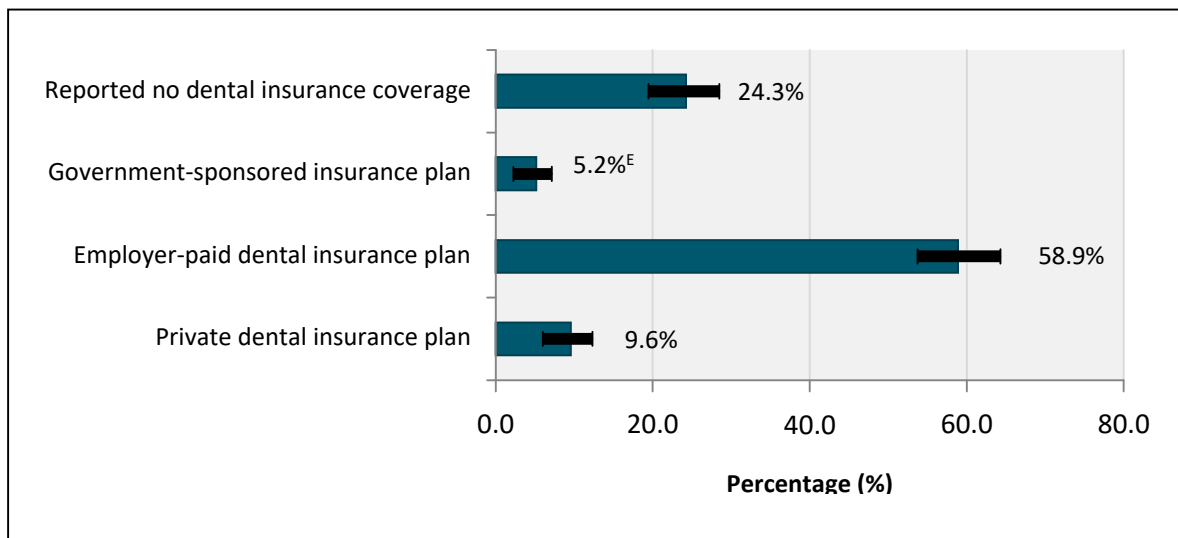
1. The last row of “Fluorosis Index – Moderate or Severe (using the Dean’s index). Only moderate or severe dental fluorosis is being monitored and that is not keeping with the standards.
2. Only kindergarten children are measured and probably mostly JK at that! **Dental Fluorosis is only properly assessed in permanent teeth and should have been examined at the senior elementary grades at the very least. Therefore, the conclusions in this category are meaningless.**
3. “Children with decay and urgent dental needs” for clarity’s sake should read, “Children with decay or urgent dental needs”. The “Children with decay” in this category are the “Non-urgent care required” in Table 7.
4. The few children ‘assessed’ were not professionally (by dental standards) or scientifically (by epidemiological standards) examined.
5. Methods of ‘assessment’ were extremely cursory (**10 to 30 seconds**), conducted by dental hygienists (who are not allowed to diagnose dental decay in Ontario), without even touching the student beyond a mouth mirror. This clearly is both unprofessional and unscientific.
6. **The reporting that dental decay had increased using this crude ‘assessment’ technique is not only flawed, but scientifically fraudulent to insinuate that the increase was due to the cessation of fluoridation.** The report presents no data to support that. In fact, the report does show that the crude data shows no difference between never fluoridated areas in the County versus fluoridation ended Windsor. There was no correction for socioeconomic status so these **data are not reliable.**

Core Indicators

There may be standardized indicators so that various regions can compare data, but that doesn’t resolve the variables from a non-professional examination of the teeth of the children at school.

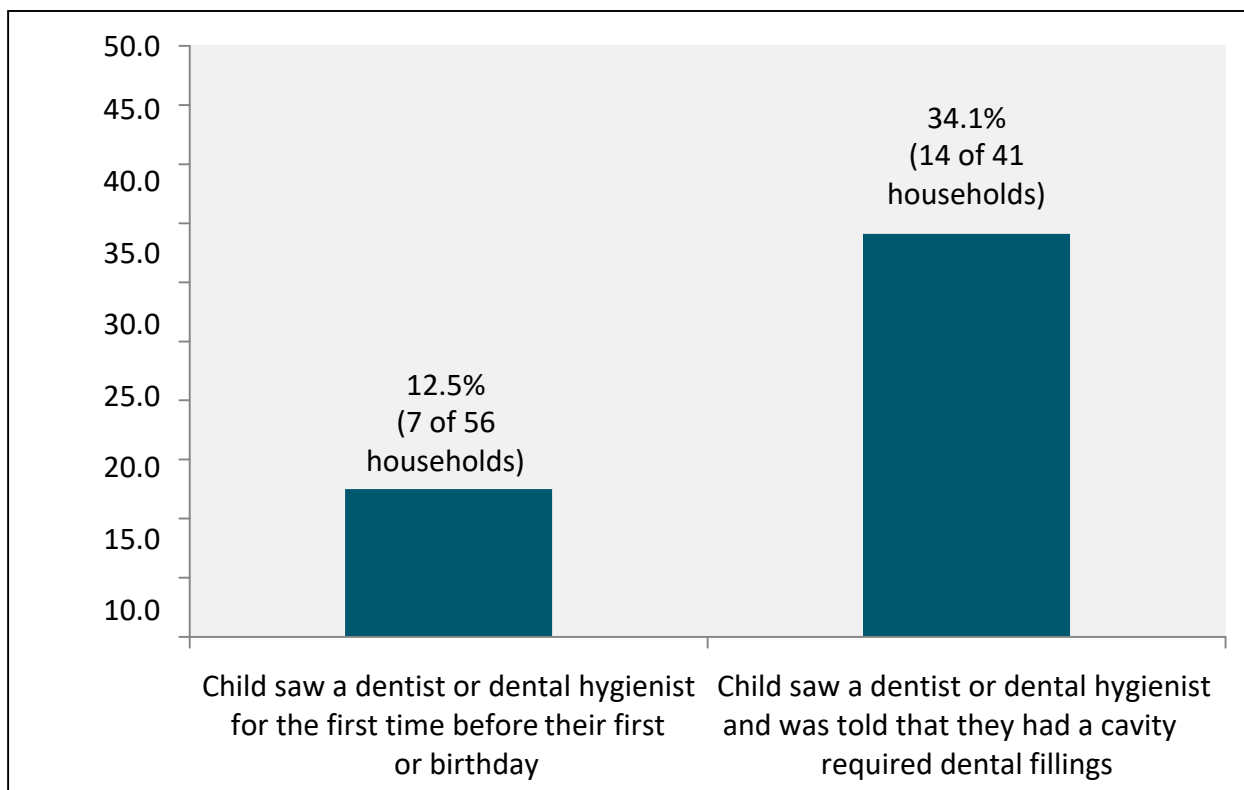
Oral Health Profile of Windsor-Essex County

Dental Insurance



The numbers in Figure 1 in the report are to be interpreted with caution and have a **variable rate of 16.6 to 33.3**.

Early Childhood Dental Habits



Source: Rapid Risk Factor Surveillance System (RRFSS), Jan-Apr 2016 and Jan-Apr 2017, Windsor-Essex County Health Unit

When looking at the previous graph, the obvious question is how many of the families that did take their child to the dentist before they were one year suspected their child had a cavity? Not to mention that this data obtained by RRFSS has a **margin of error up to 16.5**.

Why does it matter if a child saw a dentist before they turned one? Is it a valid predictor of long-term dental health? **Does fluoridating the water cause people to take their child to the dentist before they turn one?** The WECHU's point is that then a dental health professional can then give information to caregivers on proper oral hygiene. Why not make this information available as part of the 'baby health & wellness' information provided to mothers before they leave the hospital? Why not work with doctors and midwives to encourage them to give information to parents during wellness checkups? According to its report, the WECHU is now administering a Baby Oral Health Program that is showing promise (without AWF).

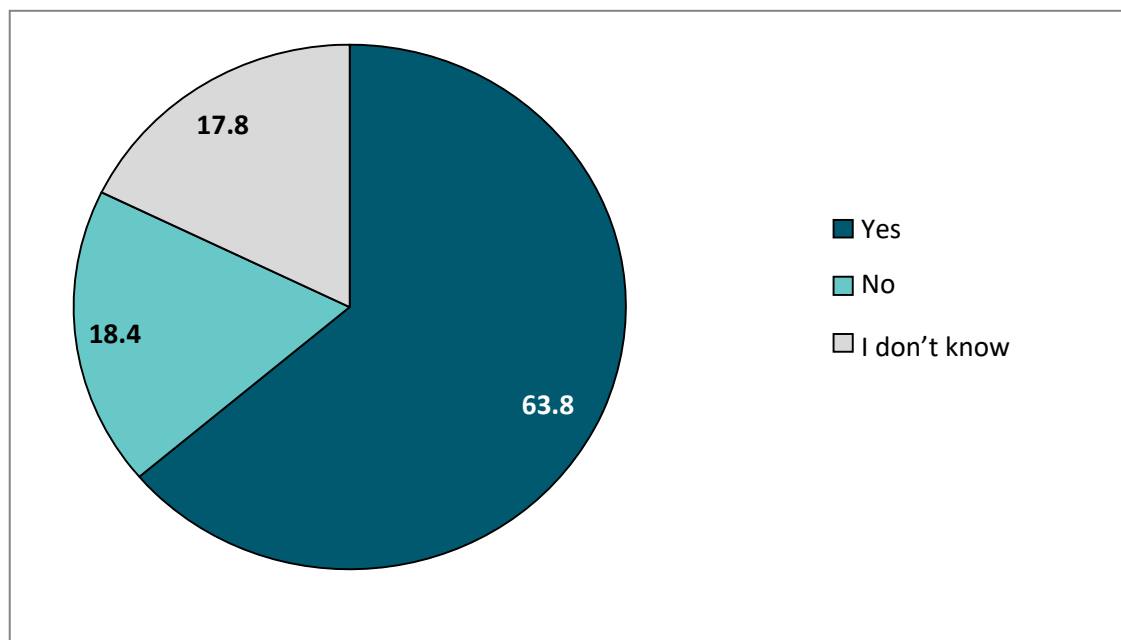
Community Support for Water Fluoridation

The WECHU states, "According to the survey results, the vast majority of adult residents in Windsor-Essex County support community water fluoridation (75% according to RRRFS, and 78% according to the Community Needs Assessment Survey)."

The claim that 4 out of 5 adult residents support AWF is a **not an accurate figure**, but has been **heavily manipulated**. For instance, the data for the actual Community Needs Assessment Survey, which was not a random survey, but was highly susceptible to bias given the means of deployment, had the result to their polling question as follows: Yes: 63.8%, No: 18.4% and I Don't Know: 17.8%. **This is NOT 4 out of 5 people supporting AWF!**

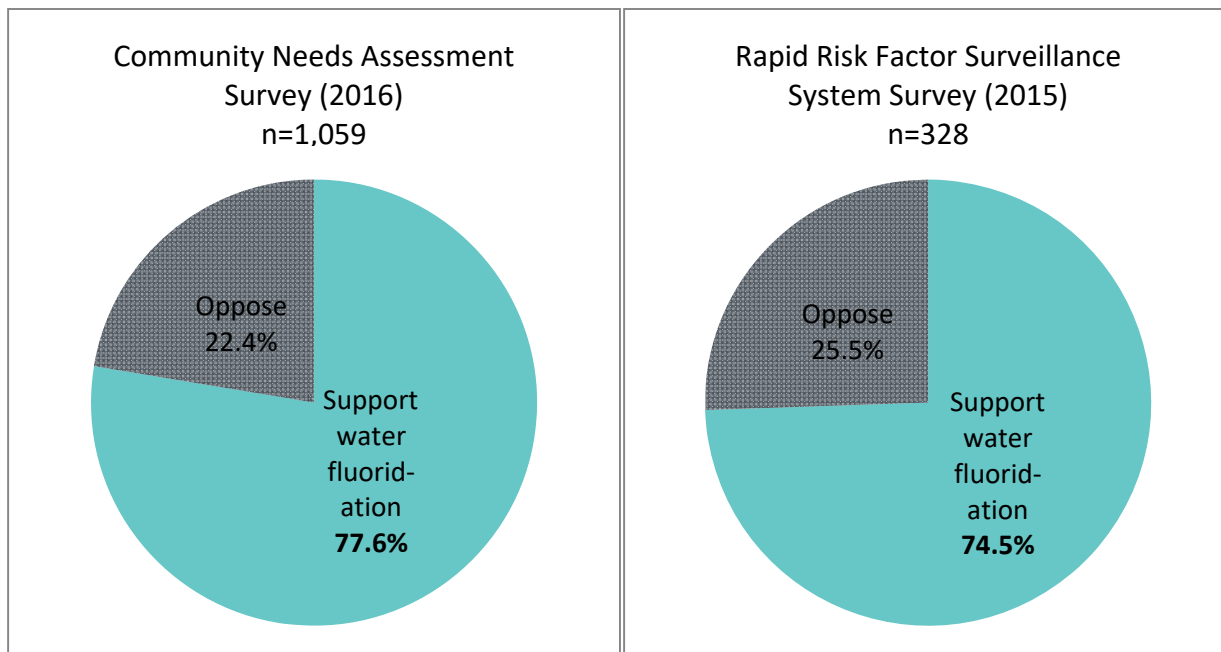
This is the chart from the Community Needs Assessment Survey (21):

Figure 36. Support for adding fluoride to public drinking water (N=1,289)



When you add 63.8 and 18.4 and then divide each amount with the total 82.2, then you come up with the WECHU's **incorrect statistics**. **This is direct manipulation of the statistics in an effort to mislead the reader at large, and public policy makers specifically.**

This is Figure 4 from the 2018 report:



The WECHU withheld from respondents critical information about the serious health risks of fluoride ingestion and the unlawful nature of water fluoridation, and WECHU posed their survey question in a blatantly leading fashion: *“Do you support adding fluoride to public drinking water to help prevent tooth decay?”* A proper poll wouldn’t be limited to one leading question, but would ask a variety of qualifying questions in order to accurately determine the opinion of the respondent. Such as, *“If there were a risk to the health of some residents, would you still support artificial water fluoridation?”*

An entire category of response was also removed from the RRFSS survey! You cannot derive your 100% response rate outcome only from the people that made one out of three choices for the purpose of the survey. In theory, for the RRFSS survey it is possible that 75% of the people surveyed said “Don’t know/Unsure” and the remaining 25% of people were divided into “Support” and “Oppose”. You cannot represent the ratio of just two of the three possible answers as percentages of “support” and “oppose”. It is ‘statistical malpractice’! Note the small sample sizes for the surveys and also consider that at best, the RRFSS survey has a **margin of error of at least 16.5%**.

Despite requests to the WECHU, they have refused to release the raw data from the RRFSS survey.

Emergency Department Visits for Oral Health Issues

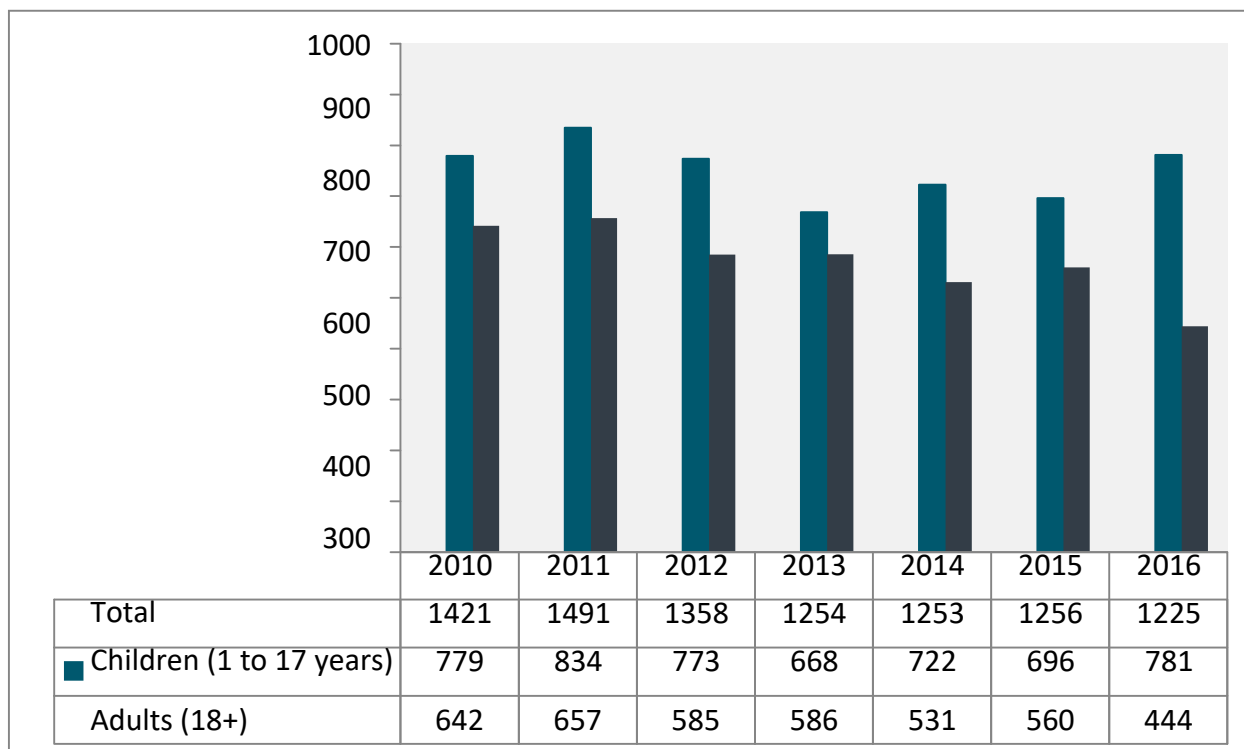
As noted at the beginning of this rebuttal, the trend is **decreasing after removing fluoride** from the water. There are fewer people of all ages going to the ED for oral health related concerns from the peak totals.

Day Surgeries for Oral Health (Caries-Related) Issues

Figures 7 & 9. The number and rate of day surgeries for oral health (caries related) issues among children (1 to 17 years) had its peak in **2011** and has been less than that amount for each year since. *Therefore, the rate of day surgeries for children does not appear to be negatively affected by removal of artificial fluoride from the water supply.*

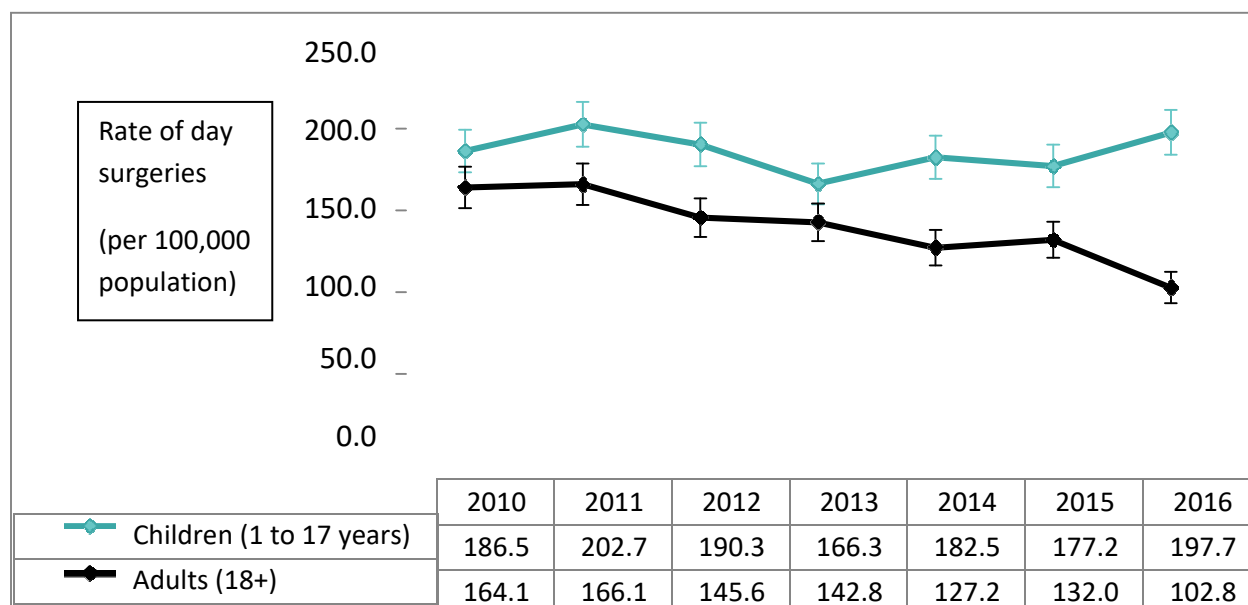
Figures 7 & 9. The number and rate of day surgeries for oral health (caries related) issues among adults 18+ had its peak in 2011 and has been less than that amount each year since. **The rate of day surgeries has decreased 38.1% from 2011 to 2016.** *Therefore, the rate of day surgeries for adults does not appear to be negatively affected by removal of artificial fluoride from the water supply.*

Figure 7. The number of day surgeries for oral health (caries-related) issues among children (1 to 17 years old) and adults (≥ 18 years old) in Windsor-Essex County (WEC), 2010-2016.



Source: Ambulatory Emergency External Cause [2010-2016], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: [March 19, 2018].

Figure 9. The rate of day surgeries for oral health (caries-related) issues among children (1 to 17 years) and adults (≥ 18 years old) in Windsor-Essex County (WEC), 2010-2016.



Source: Ambulatory Emergency External Cause [2010-2016], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: [March 19, 2018].

Oral Health Programs in Windsor-Essex County

School Screening

Windsor-Essex County was close to the rest of the Province when it comes to how many schools were considered ‘high intensity’, meaning that at least 14% of the grade 2 children screened had at least one cavity in a primary tooth and at least one cavity in a permanent tooth. Windsor-Essex County had **16% of schools in the ‘high intensity’** category and the rest of the Province has **15% of schools in the same category**.

The ‘high intensity’ school percentage has both increased and decreased after AWF was stopped.

Table 6. The number of school facilities screened in Windsor-Essex County (2011-2015) and the intensity of tooth decay among Grade 2 students at those facilities.

School Year	Facilities Screened	High Intensity Facilities	Medium Intensity Facilities	Low Intensity Facilities
2011-2012	120	13 (10.8%)	12 (10.0%)	95 (79.2%)
2012-2013	116	10 (8.6%)	13 (11.2%)	93 (80.2%)
2013-2014	114	16 (14.0%)	13 (11.4%)	85 (74.6%)
2014-2015	116	11 (9.5%)	18 (15.5%)	87 (75.0%)
2015-2016	115	24 (20.9%)	14 (12.2%)	77 (67.0%)
2016-2017	119	19 (16.0%)	11 (9.2%)	89 (74.8%)

Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long-Term Care (Accessed April 12, 2018).

On page 28, the report alarming states,

*"The screening outcomes for Windsor-Essex County children are reported in **Table 7**. From 2011/2012 to 2016/2017, the percentage of children that did not require any care decreased substantially by 43% and the percentage of children with decay or requiring urgent care has increased by 51% over this period of time. The most alarming trend was the 3-fold increase in the proportion of children eligible for topical fluorides (a change of 236%) over this time period."*

1. First and foremost, the screenings cannot be considered accurate for the purposes of assessing dental health on a scientific basis. They are done by dental hygienists for 10-30 seconds using a 'no-touch' method with only a dental mirror. Many children, especially in JK, will be uncooperative. These are not thorough exams stretching the cheeks, taking all of the time required to carefully visually exam the teeth and then take x-rays. Dental hygienists are not permitted in Ontario to diagnose cavities, so why is this extremely limited method even considered to be reliable for the purpose of important public policy?

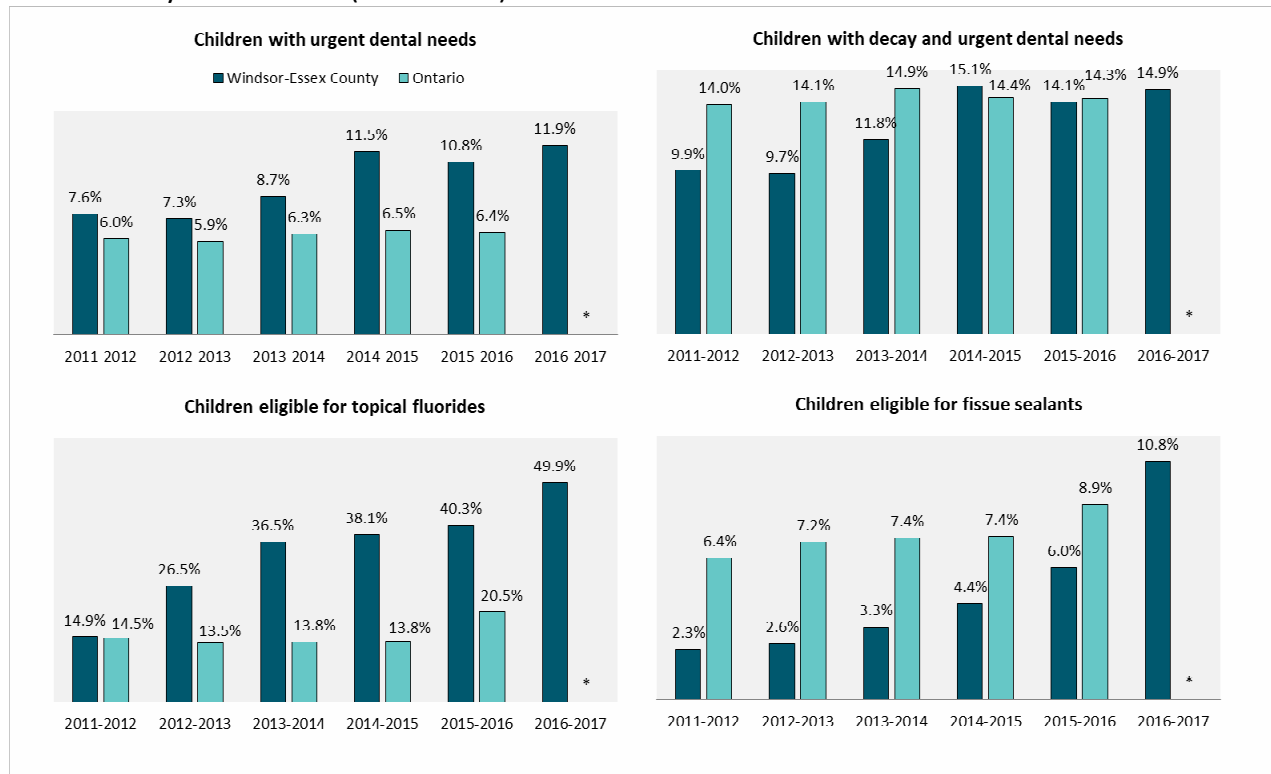
2. It is important to note that if a child is recommend for topical fluorides, fissure sealants or for scaling, then they are not put into this category of 'no care required'. This category is only meant for children that do not have an apparent cavity AND are not recommend for topical fluorides. According to the WECHU, if a child does not have a cavity, but they have had a cavity in the past, then the WECHU will recommend that they have topical fluoride and will not be put into this category. Therefore, there are children that could have been put into this category, but were not. Therefore, this data is not reliable as a basis for public policy.

3. Keep in mind that a 50% increase can sound like a large amount and to those not paying close attention to the figures can make it seem like we have entered into an emergency crisis situation. Upon review of Table 7 of the 2018 report, what this means is that in 2011-2012 there were 9.9 out of 100 children with dental decay or urgent care required. That amount decreased to 9.7 in 2012-2013, increased to 11.8 in 2013-2014, increased to 15.1 in 2014-2015, decreased to 14.1 in 2015-2016 and then increased to 14.9 in 2016-2017.

So, to understand this alarmist statistic: **five more children out of 100** have a sign of dental decay (a sign or hint of a cavity) OR urgent care required than we did in 2011-2012.

It is important to note that London, Ontario also has increased in the amount of children requiring urgent care and they have remained fluoridated. (3) Which is yet another indicator that Windsor-Essex County continues to move in the same direction as other parts of Ontario, whether they are fluoridated or not.

Figure 11. Comparison of school screening outcomes between Windsor-Essex County and Ontario (2011-2017).



Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long- Term Care (Accessed April 12, 2018). * Comparison data for Ontario (2016/2017) was not available at the time of data extraction. Denoted by an asterisk in the figure.

When the top two graphs are compared to each other, the big question that has to be asked is this, “Are the WECHU hygienists categorizing children with decay as having ‘urgent dental needs’ more often than they should be?”

Also telling is that by the years 2014-2015 and 2015-2016, we were right in line with the provincial average of percentage of screened children with decay and urgent dental needs

As for the bottom two graphs, the WECHU makes another **misleading** statement. This increase in the amount of children that qualify is meaningless because the eligibility is a child meeting two out of the three criteria, namely 1. Community water fluoride concentration is less than 0.3 ppm, 2. A past history of smooth surface decay and 3. A presence of smooth surface decay. So before 2013, a child from Windsor, LaSalle and Tecumseh needed to have a history of smooth surface decay **and** a presence of smooth surface decay. Now, all children in Windsor, LaSalle, and Tecumseh that have a history, **or** currently have smooth surface decay qualify. Naturally, there will be a significant increase.

Further, note that the new eligibility criteria in the MOHLTC’s Oral Health Protocol, 2018 are such that most children will now qualify for *both* Professionally Applied Topical Fluoride and Pit and Fissure Sealants. (22)

The graph below shows that the rate of the percentage of caries-free children was decreasing BEFORE fluoride was removed from the water. The rate actually INCREASED AFTER fluoride was removed for SK and Grade 2. **This data does NOT reinforce the notion that the removal of fluoride from the water is the cause of increased dental decay.**

Figure 12. The percentage of caries-free children in the screening program by school grade and school year, Windsor-Essex County (2011-2017).

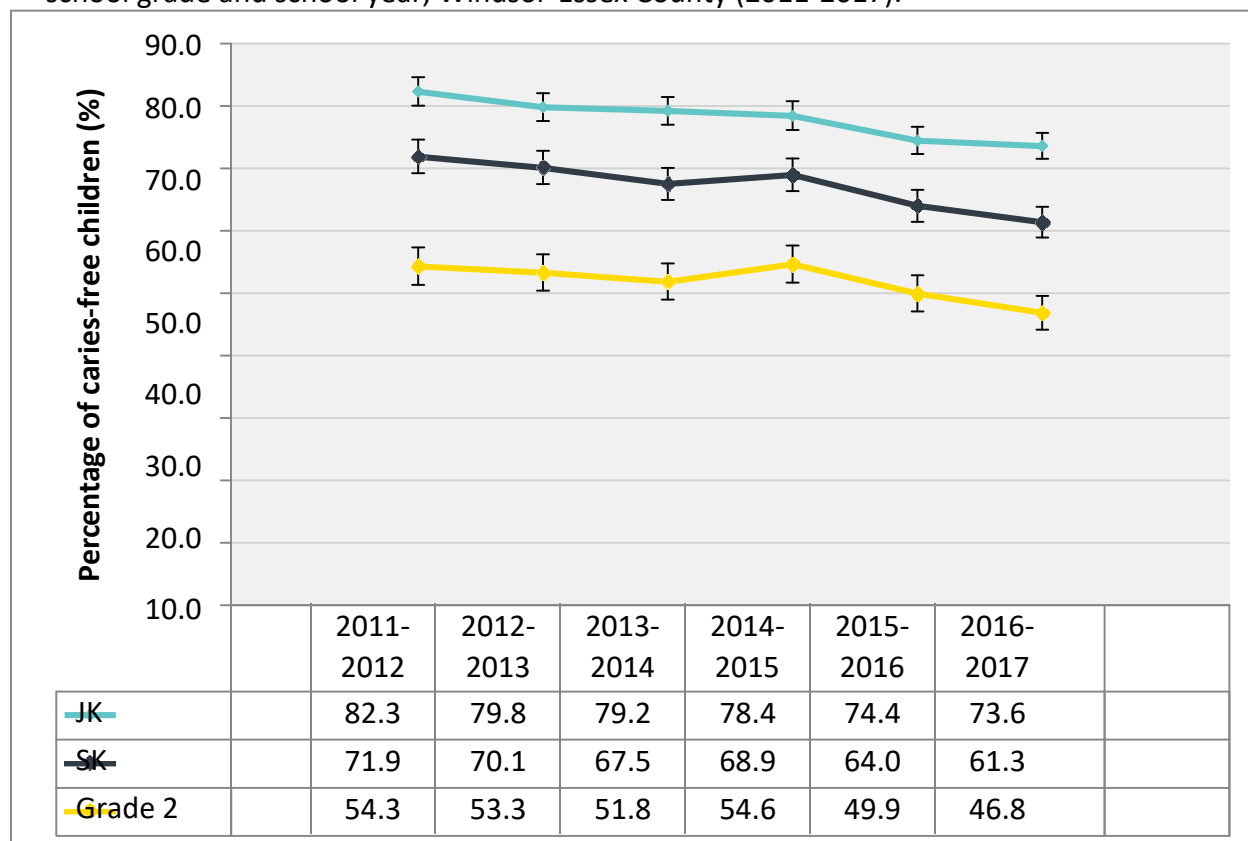
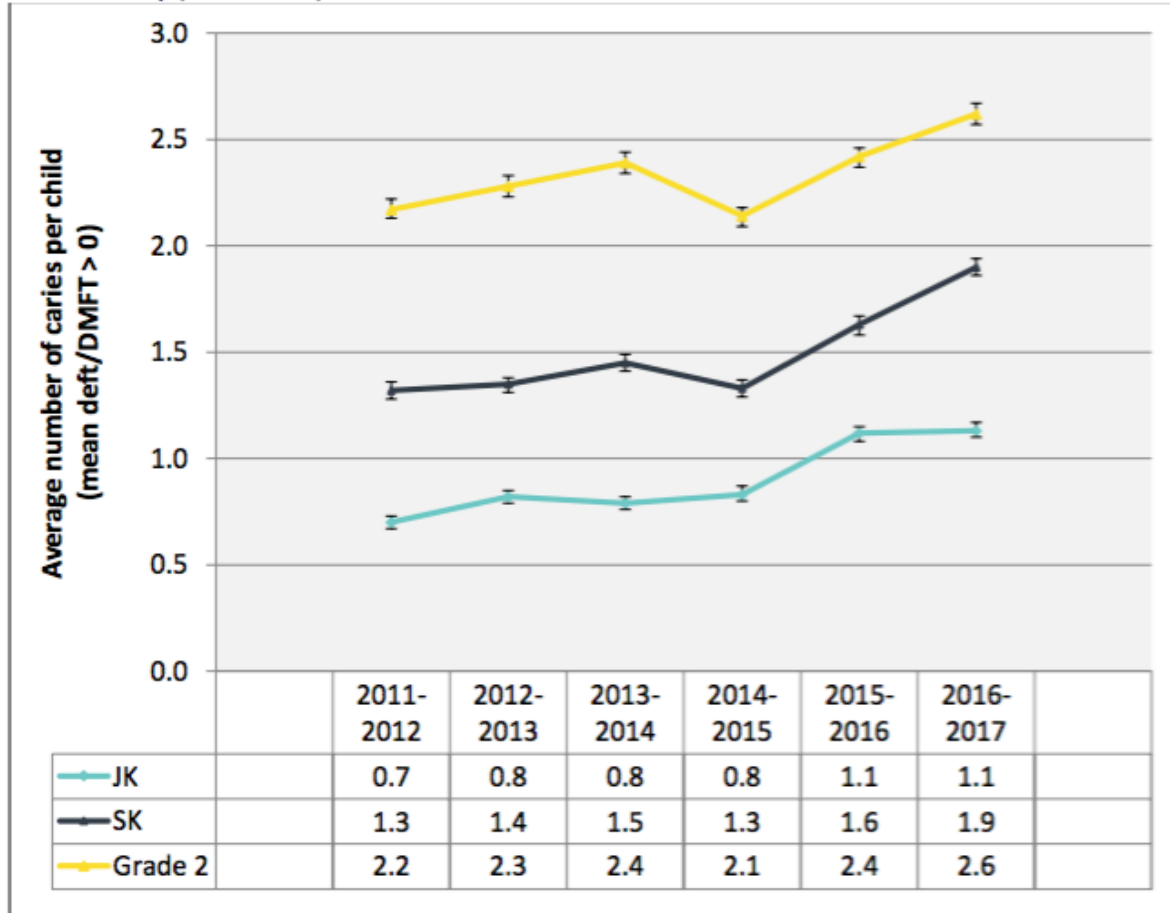


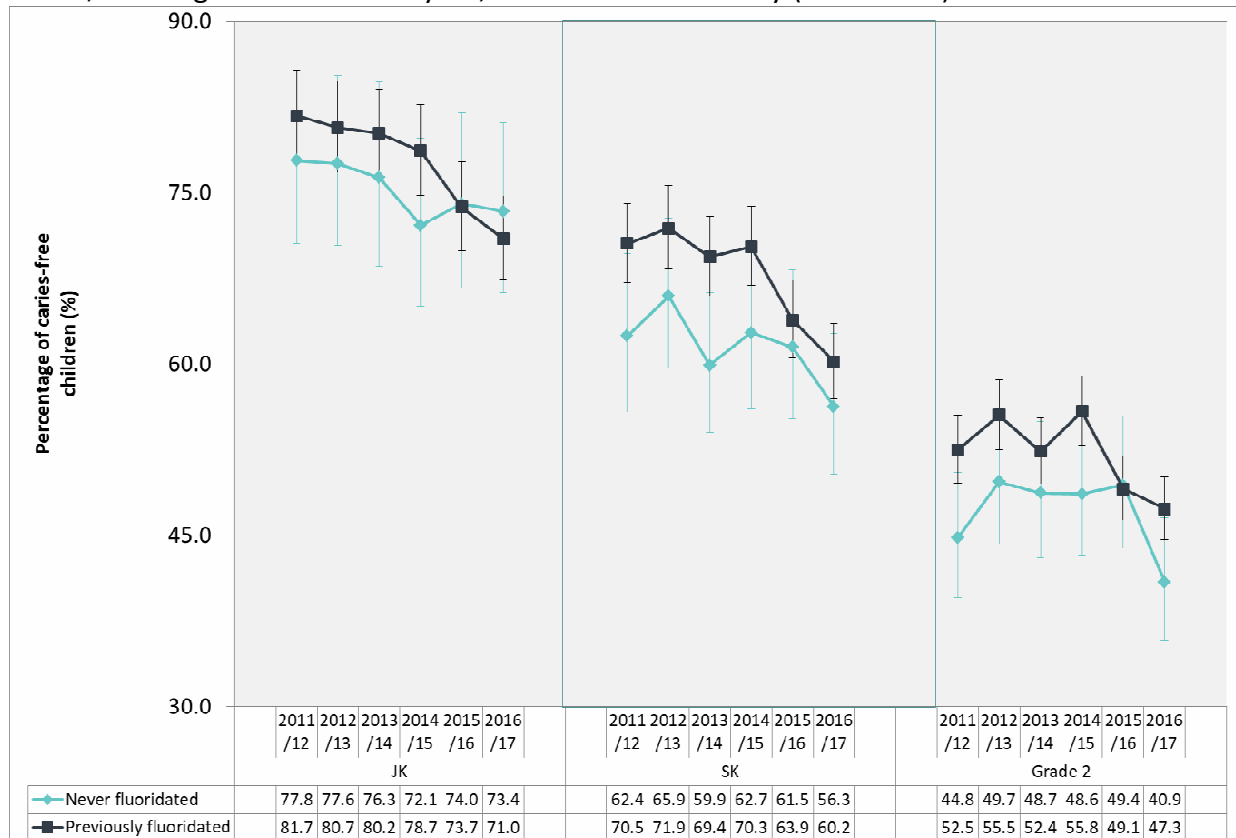
Figure 13. The deft/DMFT index of screened children by school grade and school year, Windsor-Essex County (2011-2017).



Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long-Term Care (Accessed April 12, 2018).

The above graph shows that there was an **INCREASE BEFORE** fluoride was removed from the water. The amounts actually **DECREASED AFTER** fluoride was removed for SK and Grade 2. **This data does NOT reinforce the notion that the removal of fluoride from the water is the cause of increased dental decay.**

Figure 14. The percentage of caries-free children in public schools by community fluoridation status, school grade and school year, Windsor-Essex County (2011-2017).



Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long-Term Care (Accessed April 12, 2018).

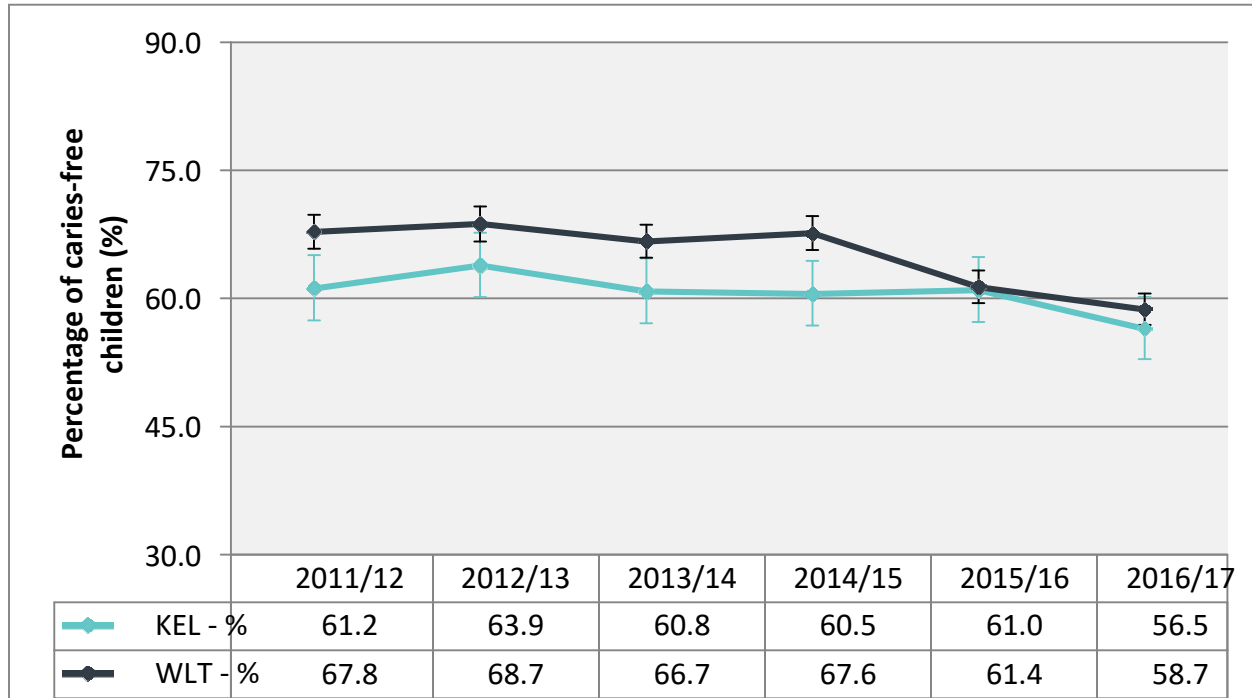
Note: KEL refers to Kingsville, Essex, and Leamington; WLT refers to Windsor, LaSalle, and Tecumseh. Pelee was excluded to low sample size.

This above graph shows that the percentage of caries-free children were **decreasing BEFORE fluoride was removed** from the water in WLT. It also shows that there were some years when the percentage **increased AFTER fluoride was removed**.

This graph also shows that the data trends are consistent whether in Windsor, LaSalle and Tecumseh before and after AWF and in never fluoridated communities. The data also shows that the percentage increases some years in the never fluoridated communities as well.

This data does NOT reinforce the notion that the removal of fluoride from the water is the cause of increased dental decay.

Figure 15. The percentage of caries-free children in public schools by community fluoridation status and school year, Windsor-Essex County (JK, SK and Grade 2 - 2011-2017)



Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long- Term Care (Accessed April 12, 2018).

This is just an average of the data from Figure 14 and doesn't inform us of anything. However, it is important to note that the KEL line is consistent with province-wide data that rural communities and residents are higher rates of dental decay than urban residents. So, it would be an error to read this graph that the difference between the two data sets is AWF.

This data does NOT reinforce the notion that the removal of fluoride from the water is the cause of increased dental decay.

Table 8. Trends of the core indicators for oral health as identified by the Association of Public Health Epidemiologists in Ontario, Windsor-Essex County (2011-2017).

Indicator	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	Overall Trend
deft/DMFT index*	1.02	1.09	1.13	1.10	1.38	1.52	49% ↑
Caries-free children* (%)	77%	75%	73%	73%	69%	67%	13% ↓
Children with urgent dental needs (%)	7.6%	7.3%	8.7%	11.5%	10.8%	11.9%	57% ↑
Children with decay and urgent dental needs (%)	9.9%	9.7%	11.8%	15.1%	14.1%	14.9%	51% ↑
Children eligible for topical fluorides (%)	14.9%	26.5%	36.5%	38.1%	40.3%	49.9%	235% ↑
Children eligible for fissure sealants (%)	2.3%	2.6%	3.3%	4.4%	6.0%	10.8%	370% ↑
Fluorosis Index – moderate or severe fluorosis ** (%)	0	0	0	0	0	0	0% -

Source: Oral Health Information Support System [2011-2015], Ministry of Health and Long-Term Care (Accessed April 17, 2018).

*At school entry (kindergarten).

*This indicator refers to children with a score of 3 (moderate) or 4 (severe) on the 0-4 score (Dean's) fluorosis index. It's a modified version of the APHEO indicator.

Don't be fooled by this chart. Overall percentages either may seem like a lot, but an increase of 49% in the deft/DMFT index is **half a cavity**.

The percentage increases for the eligibility categories are misleading. The criteria has changed for sealants, and all children in Windsor-Essex County automatically meet one of the three criteria for topical fluorides since we don't have fluoridated water. So, now a child just needs to qualify when they show any hint of surface decay, OR they had surface decay in the past. So, every child in Windsor-Essex County that has ever had a cavity now qualifies for topical fluoride. The WECHU is misleading the uninformed by this alarmist statistic!

The final misleading statistic– the data of moderate to severe fluorosis. **Fluorosis can ONLY be measured AFTER ALL of the PERMANENT teeth are fully erupted.** By only examining kindergarten children, you are guaranteeing that you will not find any fluorosis.

Baby Oral Health Program

This new program sounds promising and this effort, and other similar, should continue.

Recommendations and Conclusions (page 41)

The WECHU recommends AWF for the prevention of dental caries. Again, take note that **there isn't a claim that AWF prevents periodontal disease**, which is linked to serious, systemic health risks.

The WECHU is summarizing the data in its report as though 'correlation equals causation'. **However, the data actually doesn't even show a strong correlation, as there are years that dental decay improves AFTER AWF was stopped and worsened BEFORE AWF was removed.** There is plenty to note that the correlation is more closely tied to economics and the state of oral health in Windsor-Essex-County, whether previously fluoridated or never fluoridated, is moving on trend with other areas of the province.

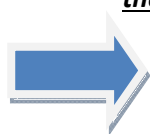
The WECHU relies upon rhetoric rather than sound science that AWF will even benefit dental decay. In 2015, the Cochrane Collaboration, the gold standard of comprehensive scientific reviews, set out to ascertain the efficacy of water fluoridation. Newsweek reported on this landmark review, "*These papers determined that **fluoridation does not reduce cavities to a statistically significant degree in permanent teeth**, says study co-author Anne-Marie Glenny. "From the review, we're unable to determine whether water fluoridation has an impact on caries levels in adults," Glenny says". Newsweek further reports, that, "...Thomas Zoeller, a scientist at UMass-Amherst uninvolved in the work stated, "**This study does not support the use of fluoride in drinking water.**" Trevor Sheldon is the dean of the Hull York Medical School in the UK who led the advisory board that conducted a systematic review of water fluoridation in 2000, that came to similar conclusion as the Cochrane review. The lack of good evidence of effectiveness has shocked him. "I had assumed because of everything I'd heard that water fluoridation reduces cavities, but **I was completely amazed by the lack of evidence.**" he says. "**My prior view was completely reversed**" (23)*

Any potential benefits from fluoride are from topical application and not systemic. In 1999, the Center for Disease Control stated, "*fluoride prevents dental caries predominately after eruption of the tooth into the mouth, and its actions primarily are topical for both adults and children.*" (24).

The National Research Council has concurred, stating in 2006 that "*the major anticaries benefit of fluoride is topical and not systemic.*" (25)

Finally, we would be remiss if we failed to address another misleading statement by Dr. Ahmed at the City of Windsor Council meeting on December 17, 2018. In response to Councillor Bortolin's question about the validity of health concerns raised by delegates opposing AWF, Dr. Ahmed said,

*"So ... I'll start off with that there's overwhelming evidence in decades of research ... that shows the effectiveness of community water fluoridation and the safety. This is a recently conducted document that is ... in the package which is conducted by **Public Health Ontario** which is the ... scientific body provides all the scientific evidence ... for political departments in Ontario. We take everything seriously as a scientist. We want to look at the evidence what is out there. Every evidence, every research paper that is published. We try to look at it and make sure that the research is conducted properly and if conclusions that are being drawn by those scientist are valid and it is applicable everywhere. **Based on this ... recent document there is no evidence to support any of the claims that was made.**"*



However, on page 15, Public Health Ontario's report (26) refers to Health Canada's 2010 report on page 39 (27), which in turn acknowledges that there are risks to the thyroid and refers to the National Research Council's 2006 report. The NRC report states,

*"In humans, effects on thyroid function were associated with fluoride exposures of 0.05-0.13 mg/kg/day when iodine intake was adequate and **0.01-0.03 mg/kg/day when iodine intake was inadequate.**" p.262-3 [Emphasis added] (25)*

Shockingly, both Health Canada and then Public Health Ontario **dismiss these concerns of iodine deficiency with an astounding lack of logic.** Heath Canada writes,

*"**More severe effects on thyroid function were seen in populations with low-iodine intake** (NRC, 2006). In Canada, iodized salt is mandatory and the iodine intakes for Canadians were estimated to be in excess of 1 mg/day (IOM, 2001), which is above the adequate intake recommended by the Institute of Medicine (2001) to avoid iodine deficiency. **Hence, low-iodine situations are unlikely to occur in the Canadian population**" [Emphasis added]*

Public Heath Ontario writes,

*"As per the 2010 Health Canada fluoride document, **fluoride may adversely affect endocrine glands such as the thyroid.** The effects of fluoride on thyroid function might **depend on the intake of iodine**, as there is an association of thyroid dysfunction with low iodine intake; however, in Canada, this is unlikely to occur because **iodized salt is mandatory.**" [Emphasis added] (26)*

The lack of due diligence by Health Canada, Public Health Ontario, and WECHU for not reviewing the actual data on iodine deficiency is appalling. **According to Statistics Canada, from 2009 to 2011, 29% of Canadians were iodine deficient!** This is an absolute glaring error in assessing the health risks for a great many Canadians. (28)

A study published on October 2018 states the following,

“Conclusions

Adults living in Canada who have moderate-to-severe iodine deficiencies and higher levels of urinary fluoride may be at an increased risk for underactive thyroid gland activity.”(29)

The above study observed that **18%** of the weighted sample, representing just under seven million adults in Canada, were **moderately to severely deficient in iodine**.

As you can plainly see, it is incorrect to make assertions that there isn't any negative effect on the thyroid at the 'optimal level' of 0.7ppm.

Based upon the above analysis of the WECHU Report on Oral Health, we concur in the opinion that resuming AWF in this jurisdiction is not justified.

To all the members of the council because the quality of our water supply impacts every man, women and child living in this region we urge you to demonstrate due diligence in weighing carefully all the arguments above and carefully balancing them with the analysis provided you in the WECHU report.

Gilles Parent, ND.A.

Author of "L'Inconséquence de la Fluoration" 1975

Coauthor with Pierre Jean Morin, Ph.D. in experimental medicine, and John Remington Graham, lawyer, of "La Fluoration: autopsie d'une erreur Scientifique" 2005 and of its English version "Fluoridation: Autopsy of a Scientific Error" 2010.

Paul Connett, PhD,

Retired professor of environmental chemistry,

co-author of The Case Against Fluoride (Chelsea green, 2010)

Executive Director of the Fluoride Action Network (www.FluorideALERT.org)

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Professor Emeritus and Former Head, Preventive Dentistry

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Author of Fluoride fatigue. Fluoride poisoning: is fluoride in your drinking water—and from other sources—making you sick. Revised 3rd printing. Dunedin, New Zealand: Paua Press; 2008.

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de Grood, Anna

From: Judy Hughes <jlynn2@shaw.ca>
Sent: Monday, July 15, 2019 10:16 AM
To: Public Submissions
Cc: City Clerk
Subject: [EXT] Submission for the Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda. July 24,2019
Attachments: Dear Letter to city councillors and Mayor.docx

Please accept this letter as I am unable to personally speak at the public hearing in council chambers next week.

The deadline is July 17 so I trust that my letter will be part of the documents presented on July 24 to the committee that is re-evaluating adding fluoride to our drinking water.

I have emailed my concerns to my Council Representative. I will also send a written (snail mail copy) for my own peace of mind :)

Thank you for your assistance in giving voice to my concerns.

Thank you for ALL that you people do to manage our city in a healthy way ...I am grateful for the work required.

Respectfully submitted:
Judy Hughes
119-550 Prominence Rise SW
Calgary, AB T3H 5J1

jlynn2@shaw.ca
403-991-1059

July 14, 2019

Dear Council Representatives and Mayor,

***I reside in the community of Patterson Heights
I ask you to NOT vote for water fluoridation to be reintroduced in Calgary.***

I've lived in Calgary since 1971 and I am a retired public health nurse.
I know that sometimes policies are implemented for the health of a population but I struggle with City Council trying to re-evaluate adding fluoride to our Calgary water in July when families are on vacations.

Many Calgarians will have no opportunity for any input so I am speaking up.

Please hear my concerns as a grandmother!

1. When chemical fluoride is delivered by water there is no control of the dosage for it depends on the person's water intake and weight.
Low income families may be feeding kids reconstituting skim milk powder to make food dollars stretch
Small premature babies who are bottle fed formula will receive much more fluoride than breast-fed babes (see page 2 chart)
2. There seems to be confusion in messaging because when I was babysitting my grandsons they used fluoride -free toothpaste because "they could swallow too much fluoridated toothpaste! " Why the push for fluoridation in water when there are fluoridated rinses, mouthwashes, foams, gels and supplements for my grandkids to get fluoride topically for their teeth?
3. How can one equate fluoridation directly with reduced dental caries??
I notice presently children's diets seem have a high sugar content i.e. read the sugar levels in healthy granola bars! There are many variables related to dental caries such as oral hygiene, bottle mouth, sticky fruit roll ups in their lunch box and slurpies for snacks.

Calgarians have beautiful clean glacier fed mountain water. Why add to city budget costs by buying chemical fluoride?

I, Judy Hughes DO NOT believe that there is a public health cost-benefit to adding fluoride to Calgary water.

Respectfully submitted by:

Judy Hughes

119 -550 Prominence Rise SW

Calgary AB T3H 5J1

**Calculating Daily Fluoride Ingestion
from**

Baby Formula Mixed with Fluoridated Water
highlights at bottom show amounts
exceeding set limits by CDA and average fluoride levels in breast milk

AGE	0 months	6 months	1 year	2 year
WEIGHT	3.45 kg	8 kg	9.85 kg	12.5 kg
FORMULA / DAY	.44 litre	1.04 litre	1.28 litre	1.63 litre
AVG. H2O / DAY	.37 l	.87 l	1.07 l	1.35 l
Fluoride / Day Formula + Fluoridated Water	.26 mg / day	.61 mg / day	.75 mg / day	.95 mg / day
Daily Limit set by CDA .05 mg / kg / day	.17 mg	.4 mg	.49 mg	.63 mg
Exceeding CDA limit	.09 mg / day	.21 mg / day	.26 mg / day	.32 mg / day
Avg. Fluoride in Breast Milk = .003 mg / l	0.001 mg / day	0.003 / day	0.004 / day	0.004 / day
Exceeding fluoride in Breast Milk .003 mg / l	.26 mg / day	.607 mg / day	.746 mg / day	.946 mg / day

Note: Excessive amounts of fluoride listed apply when formula is mixed with fluoridated water

(fluoridated water = .7 ppm = .7 mg/l = .23 mg fluoride in a regular glass of water (333 ml))

Eventually the child's fluoride levels will further increase if fluoridated toothpaste is used and if child consumes industrially grown foods and processed foods as these foods now contain significant levels of fluoride from the widespread use of phosphate fertilizer, fluoride based pesticides and processing with fluoridated water in Ontario, Alberta and many US states.

de Grood, Anna

Subject: FW: [EXT] Say not to Water Fluoridation in Calgary

From: Luticia Miller [<mailto:luticiamiller@gmail.com>]

Sent: Monday, July 15, 2019 9:54 AM

To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk

Subject: [EXT] Say not to Water Fluoridation in Calgary

Dear Mayor and Council,

As a member of Nolan Hill, I urge you to say no to water fluoridation in Calgary, for the following reasons:

1. The science does not back it as an effective anti cavity/anti carrie solution
2. It is a proven toxin
3. Builds up in the body causing brittle bones and (ironically,) weak, brittle teeth
4. It's a huge cost additive annually, at a time the city is looking for ways to cut
5. The start-up infrastructure cost investment is being ignored/under-reported
6. It represents mass-medicating a population with no control over dosage

It's a non-sensical, non-solution.

I look forward to your response,

Luticia Miller

de Grood, Anna

From: jsv@shawbiz.ca
Sent: Tuesday, July 16, 2019 8:51 AM
To: Public Submissions
Cc: City Clerk
Subject: [EXT] Submission for the Standing Policy Committee on Community and Protective Services hearing on Water Fluoridation
Attachments: Standing Committe.pdf

To whom it may concern:
I am including a submission to the above committee.
I thank you in advance for your consideration.

Jeannette Soriano MD

Dr. Jeannette Soriano MD
Integrative Medicine
Vein Clinic

212, 1011 Glenmore Trail SW
Calgary, AB T2V 4R6
Phone: 403-202-0003
Fax: 403-202-0034

3rd Floor, 201 Bear St. Box 2651
Banff, AB T1L 1C4
Phone: 403-762-4950
Fax: 403-762-4970

July 15 ,2019

To the Standing Committee on Fluoridation
City of Calgary

Dear Sir/ Madam:

I am writing to express my concern about the return to fluoridation of the water in Calgary.

To try to medicate the population at large in order to provide fluoridation that perhaps can benefit a few makes no sense to me. We already have lots of contaminants to our water and fluoride is not innocuous it can cause fluorosis and permanent damage to teeth but for other people also systemic bone disease is a concern.

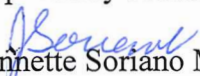
Why not have a campaign to encourage people to obtain fluoride topically at their dentist office and with the use of fluoridated toothpaste, tablets etc.?

The rates of tooth decay in the western world have decreased over the past decades. Most countries in Europe do not fluoridate their water yet their populations have rates of tooth decay similar to other countries that fluoridate.

At a time where the city finances are in distress and council has been forced to increase taxes overall, why the urgency to add more expenses and what is the justification?

I know that all of you are well meaning individuals that strive to make sound decisions based on good information for the benefit of all, yet this time I think as a group you will be making the wrong decision by returning to fluoridation.

Respectfully submitted,


Jeannette Soriano MD

de Grood, Anna

From: Rhonda Usenik <rhonda.usenik@gmail.com>
Sent: Friday, July 12, 2019 3:23 PM
To: Public Submissions
Cc: Rhonda Usenik
Subject: [EXT] Speaker Registration re: Water Fluoridation Analysis & Review in Calgary

Hello,

I am the parent of a nine year old child plagued with dental caries despite frequent cleanings, varnishes and checkups as well as twice daily dental brushing (x2 each time), flossing and fluoride rinsing. I am certain this is partially due to genetics as well as the absence of fluoridated water throughout her lifetime. Her diet is strictly monitored to support dental health as well as her overall health. Fortunately, my daughter is a "good eater"; she loves fruits and vegetables and has a keen interest in nutrition.

I would like to speak to Council as a concerned Calgarian about the impact of all this on my daughter's life as well as mine. I work full time and must juggle a very busy schedule as a health care professional to ensure she receives the care needed. As well, my daughter's attendance at school has been impacted by the frequent appointments required.

My daughter is also passionate about this, despite her tender age, and had hoped to present to Council herself. Unfortunately, she will be out of town on July 24.

Thank you for this opportunity. Please let me know if you require any other information.

Respectfully submitted,

Rhonda Usenik

de Grood, Anna

From: Nestor Shapka <nestor_shapka@hotmail.com>
Sent: Tuesday, July 16, 2019 9:04 AM
To: Public Submissions; Maria Castro
Subject: [EXT] Submission for the Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda.

Dear Mayor and Council,

The one and only question in the debate on the issue of water fluoridation, is;

"Is anyone hurt or injured as a result of "intentionally" adding fluoride as a medication to a cities water supply?

Unless you can say with 100% certainty that the answer to that question is NO, then the "intentional" practice of adding water is not the correct way to manage the issue of dental caries. There are many great ways to manage caries without this being an issue for elected officials to decide and manage. I myself am a practicing dentist in the small town community of Bonnyville, Alberta. I have been practicing dentistry for over 36 years now and have come to learn the truth on fluoride as my career and experience and knowledge on this subject has grown. The truth as it is being discovered by science and the more recent peer reviewed studies is **100% unequivocal** - fluoride is **NOT A BENIGN** substance. Fluoride is a known **POISON**, that does affect many processes in the body and which exhibits many negative health effects. Whereas many of us who are already developed and or mature in our growth/development, fluoride can potentially be tolerated at small concentrations as suggested by health authorities. But the fact remains that fluoride is 100% toxic to the human body and especially for our most precious resource, the undeveloped human, i.e. our babies, infants, small children. For any exposure, fluoride has a far greater impact on the health of these individuals, at any concentration. **Science**, in the form of **hundreds of studies**, has proven that for infants and small children, fluoride is definitely damaging to the undeveloped human body and mind. All health authorities agree that for these populations, no fluoride is ever recommended as a supplement. The only correct amount of fluoride to be **INGESTED** for these populations is **ZERO**. THERE IS **NO KNOWN SAFE LIMIT**.

To answer "the question" then, the scientific answer is of course YES, citizens of your community will be hurt by the fluoride that is intentionally added to the water supply and so council should be prepared to assume all of the consequences and all of the liabilities of such an act, should you decide to re-instate this practice.

The issue as I see it is not so much the debate on the scientific benefits or harms of fluoride. The issue is whether any establishment has the right to decide that some small benefits outweigh the very real risks that are known to exist, and then go on to *"impose the forced involuntary medication of an entire population"*. In the case of fluoridation, the dental and medical establishment has made opposing fluoridation seem to be in opposition to health. But that is the exact opposite of the truth. That is not science and that is very much not ethical, that is medical tyranny, because fluoride does not equal health - fluoride equals harm. These very real health consequences must not be ignored

"for the greater good", thus sacrificing some members of society so that others can benefit. That is just sad.

Yours truly, Nestor B Shapka, BSc, DDS, FIAOMT.

de Grood, Anna

From: Kristen Johnson (MD) <Kristen.Johnson@albertahealthservices.ca>
Sent: Wednesday, July 10, 2019 12:54 PM
To: Schmick, Andrea M.
Subject: [EXT] Water fluoridation meeting July 24th

To whom it may concern,

I understand that the City Council Committee will be meeting on July 24th to discuss fluoridation of city water. I am unable to attend this meeting but I do want the committee to know that as a mother and as a pediatric emergency physician, I am fully supportive of fluoridation of Calgary water. When I initially moved from Edmonton, I was shocked to hear that Calgary does not fluoridate its water supply. This makes me nervous about my own children's dental health, but I also see the negative effects of this in my place of work. The number of children I see in the emergency department with poor dentition is quite frankly shocking. Not all of these children are from lower socioeconomic groups who have poor access to dentists/dental hygienists either, although one could argue that in these populations with poor access to dentists the fluoridation of water is even more integral to maintaining dental health. At my place of work, it is also not uncommon to see dental infections and abscesses that require IV antibiotics for a number of days to treat. In addition to this, many children with caries are subjected to anesthesia (and the inherent risks that go along with this) just to treat caries that perhaps could have been avoided if fluoridation of water existed. Finally, it is well known that poor dental health is associated with poor overall health so if we can do everything within our power to keep kids' teeth healthy, their overall health and well-being will also benefit.

The evidence is clear. 1. Fluoridation of the water supply is the safest, most effective, and most cost-effective way to deliver fluoride to an individual child and improve dental health. 2. Fluoridation of the water supply has been shown to be completely safe. This is why organizations such as Alberta Health Services, Health Canada, the Public Health Agency of Canada, the United States Centers for Disease Control, and the World Health Organization continue to support water fluoridation. I believe the City of Calgary should join and agree once again to fluoridate our water supply.

Sincerely,

Kristen Johnson
Pediatric Emergency Medicine Physician
Alberta Children's Hospital
403-993-8405

Kristen Johnson
Pediatric Emergency Medicine Physician
Alberta Children's Hospital

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de Grood, Anna

From: Stephen Wainer <wainers@gmail.com>
Sent: Sunday, July 14, 2019 6:27 PM
To: Schmick, Andrea M.; Office of the Mayor; Sutherland, Ward; Magliocca, Joe; Gondek, Jyoti; Chu, Sean; Chahal, George; Davison, Jeffrey R.; Farrell, Druh; Woolley, Evan V.; Carra, Gian-Carlo S.; EAWard10 - Lesley Stasiuk; Farkas, Jeromy A.; Keating, Shane; Colley-Urquhart, Diane; Demong, Peter
Subject: [EXT] Fluoridation of Calgary City Water

As a community paediatrician with over 30 years of clinical experience, and as the past Section Head of Community Paediatrics in Calgary for more than 10 years, I was appalled by the decision of Council to remove fluoride from drinking water in 2011. The Council forged ahead with this decision with complete disregard for the scientific evidence (the evidence in support of fluoridation is overwhelming and well documented in the Alberta Health Position Statement [here](#)) and to appease a small but vociferous group of entitled individuals with a narrow and misguided agenda. It is Council's responsibility and obligation to make decisions based on the best available information and with the interests of the community it serves at heart - in removing fluoride it utterly failed on both counts. The resumption of water fluoridation is a way for Council to that it does indeed wish to practice evidence-based policy and for it to exhibit leadership, integrity and responsibility.

Sincerely

Stephen Wainer MD, FRCPC
Children's Health Clinic
4715 8 Ave SE
Calgary, AB
T2A 3N4

de Grood, Anna

From: Wendyhall123@gmail.com
Sent: Monday, July 15, 2019 10:46 AM
To: Schmick, Andrea M.
Subject: [EXT] Please Put fluoride back in Calgary water

I am writing in whole hearted support of adding fluoride to the municipal water in Calgary. Since the addition of fluoride was stopped in 2011, we are seeing more and more dental carries - particularly in children in our city. As an emergency room physician at the Alberta Children's Hospital, I am also seeing more serious dental infections as a result of these increased carries, many of which require IV antibiotics and multiple hospital visits. While health care is not a municipal issue, drinking water certainly is. The City takes pride in other public health initiatives (such as the Mental Health and Addiction Strategy) recognizing the benefit for the population.

Dental carries are particularly difficult for low income families and severely developmentally disabled children to cope with. The cost of dental care is not covered by provincial health care, and often when it falls to individual families they simply cannot afford what is needed. Adding fluoride to the water to therapeutic levels will reduce the additional burden placed on low income families from increased dental carries.

Dental carries have been linked to poor growth, behavioural problems, learning problems, and poor self-esteem among other things. Putting children on IV antibiotics in increasing numbers because of increased carries is not acceptable when there is a clear simple alternative: adding fluoride back into the water.

There is no evidence that therapeutic levels of fluoride in municipal water has any deleterious effect, despite what the anti-fluoride activists would have you believe (they are not basing their arguments in science, and are sadly uninformed about the actual benefits and risks of fluoridation). Not adding fluoride into the water clearly has had significant health effects on Calgarian children. The number of carries in Calgary is nearly double that of Edmonton (where they continue to add fluoride to their water). (Study by Dr. L McLaren, showed an increase in tooth surface decay in Calgary by 3.8 compared with 2.1 in Edmonton during a similar time frame)

I ask you to seriously consider the health of Calgarians, particularly our younger generation, as you debate adding fluoride back into the water. For me the science is very clear, there are no risks to the population, and the benefit is a significant reduction in carries. I would love to have less patients in my department requiring interventions for horrible tooth, gum, abscesses, and skin and bone infections which have resulted from dental carries.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Sent from my iPad

de Grood, Anna

From: Jennifer Graham Wedel <jn334770@gmail.com>
Sent: Sunday, July 14, 2019 8:57 PM
To: Schmick, Andrea M.
Subject: [EXT] Letter in support of fluoridation of the water in Calgary

Dear Ms. Schmick,

I am writing in whole hearted support of adding fluoride to the municipal water in Calgary. Since the addition of fluoride was stopped in 2011, we are seeing more and more dental carries - particularly in children in our city. As an emergency room physician at the Alberta Children's Hospital, I am also seeing more serious dental infections as a result of these increased carries, many of which require IV antibiotics and multiple hospital visits. While health care is not a municipal issue, drinking water certainly is. The City takes pride in other public health initiatives (such as the Mental Health and Addiction Strategy) recognizing the benefit for the population.

Dental carries are particularly difficult for low income families and severely developmentally disabled children to cope with. The cost of dental care is not covered by provincial health care, and often when it falls to individual families they simply cannot afford what is needed. Adding fluoride to the water to therapeutic levels will reduce the additional burden placed on low income families from increased dental carries.

Dental carries have been linked to poor growth, behavioural problems, learning problems, and poor self-esteem among other things. Putting children on IV antibiotics in increasing numbers because of increased carries is not acceptable when there is a clear simple alternative: adding fluoride back into the water.

There is no evidence that therapeutic levels of fluoride in municipal water has any deleterious effect, despite what the anti-fluoride activists would have you believe (they are not basing their arguments in science, and are sadly uninformed about the actual benefits and risks of fluoridation). Not adding fluoride into the water clearly has had significant health effects on Calgarian children. The number of carries in Calgary is nearly double that of Edmonton (where they continue to add fluoride to their water). (Study by Dr. L McLaren, showed an increase in tooth surface decay in Calgary by 3.8 compared with 2.1 in Edmonton during a similar time frame)

I ask you to seriously consider the health of Calgarians, particularly our younger generation, as you debate adding fluoride back into the water. For me the science is very clear, there are no risks to the population, and the benefit is a significant reduction in carries. I would love to have less patients in my department requiring interventions for horrible tooth, gum, abscesses, and skin and bone infections which have resulted from dental carries.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Dr Jennifer Graham Wedel
MD, MSc, FRCPC
Pediatric Emergency Medicine
Alberta Children's Hospital
Clinical Instructor, University of Calgary

de Grood, Anna

From: Michelle Jung <michelle.jung@ucalgary.ca>
Sent: Monday, July 15, 2019 12:09 PM
To: Schmick, Andrea M.
Subject: [EXT] Please add fluoride to the municipal water in Calgary.

Dear Ms. Schmick,

I am writing in whole hearted support of adding fluoride to the municipal water in Calgary. Since the addition of fluoride was stopped in 2011, we are seeing more and more dental carries - particularly in children in our city. We are also seeing more serious dental infections as a result of these increased carries, many of which require IV antibiotics and multiple hospital visits. While health care is not a municipal issue, drinking water certainly is. The City takes pride in other public health initiatives (such as the Mental Health and Addiction Strategy) recognizing the benefit for the population.

Dental carries are particularly difficult for low income families and severely developmentally disabled children to cope with. The cost of dental care is not covered by provincial health care, and often when it falls to individual families they simply cannot afford what is needed. Adding fluoride to the water to therapeutic levels will reduce the additional burden placed on low income families from increased dental carries.

Dental carries have been linked to poor growth, behavioural problems, learning problems, and poor self-esteem among other things. Putting children on IV antibiotics in increasing numbers because of increased carries is not acceptable when there is a clear simple alternative: adding fluoride back into the water.

There is no evidence that therapeutic levels of fluoride in municipal water has any deleterious effect, despite what the anti-fluoride activists would have you believe (they are not basing their arguments in science, and are sadly uninformed about the actual benefits and risks of fluoridation). Not adding fluoride into the water clearly has had significant health effects on Calgarian children. The number of carries in Calgary is nearly double that of Edmonton (where they continue to add fluoride to their water). (Study by Dr. L McLaren, showed an increase in tooth surface decay in Calgary by 3.8 compared with 2.1 in Edmonton during a similar time frame)

I ask you to seriously consider the health of Calgarians, particularly our younger generation, as you debate adding fluoride back into the water. The science is very clear, there are no risks to the population, and the benefit is a significant reduction in carries. As a physician and mother of two young children, I would love to have less patients in the city requiring interventions for horrible tooth, gum, abscesses, and skin and bone infections which have resulted from dental carries.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Michelle Jung, MD FRCPC
Division of Rheumatology
RRDTC - 1820 Richmond Rd. SW
Calgary, AB T2T 5C7

Tel: 403-955-8957
Fax: 403-955-8984

de Grood, Anna

From: Brian Lowry <brian.lowry@shaw.ca>
Sent: Friday, July 12, 2019 11:27 AM
To: Schmick, Andrea M.
Subject: [EXT] Fwd: fluoridation

Hi Andrea, am resending because I was given the wrong spelling for you,

Brian

From: "brian lowry"
To: "andrea schimick"
Sent: Friday, 12 July, 2019 10:12:29
Subject: Fwd: fluoridation

Good morning Andrea,

I am forwarding a comment I sent to the Mayor and a couple of Councillors regarding the upcoming debate on fluoridation. I would like to have been able to be there in person but will be away at the date of the hearing.

Yours sincerely,

Brian Lowry

From: "brian lowry"
To: "ward08"
Cc: "Ward 11 Councillor Jeromy Farkas", "the"
Sent: Friday, 12 July, 2019 10:00:18
Subject: fluoridation

Hello Evan, Jeromy and Naheed,

I hope City Council will not be swayed by the non scientific arguments by the anti fluoridation people in the forthcoming discussion. Council made a bad mistake in removing fluoride from the city water. I speak as both a pediatrician and medical geneticist that children's teeth in Calgary have suffered because of your decision some years ago. Adding fluoride does not cause birth defects nor is there any evidence that it causes behavioural disorders. The biggest cause of birth malformations is smoking and for behavioural disorders - alcohol.

Brian Lowry, MD; Medical Consultant Alberta Congenital Anomalies Surveillance System-AHS
2210, 27 ST SW
T3E 2G1
403-246-2875

de Grood, Anna

From: se_mullin@yahoo.com
Sent: Sunday, July 14, 2019 10:09 PM
To: Schmick, Andrea M.
Subject: [EXT] Fluoridation of Calgary water

Dear Ms. Schmick,

I am writing in support of adding fluoride back to the municipal water in Calgary. Since fluoridation was stopped in 2011, we are seeing more and more dental carries - particularly in children in our city, which is concerning as a family medicine physician and a mom of three young children. While health care is not a municipal issue, drinking water certainly is. The City takes pride in other public health initiatives (such as the Mental Health and Addiction Strategy) recognizing the benefit for the population.

Dental carries are particularly difficult for low income families and severely developmentally disabled children to cope with. The cost of dental care is not covered by provincial health care, and often when it falls to individual families they simply cannot afford what is needed. Adding fluoride to the water to therapeutic levels will reduce the burden placed on low income families from increased dental carries.

There is no evidence that therapeutic levels of fluoride in municipal water has any deleterious effect, despite what the anti-fluoride activists would have you believe (they are not basing their arguments in science, and are sadly uninformed about the actual benefits and risks of fluoridation). Not adding fluoride into the water clearly has had significant health effects on Calgarian children. The number of carries in Calgary is nearly double that of Edmonton (where they continue to add fluoride to their water). (Study by Dr. L McLaren, showed an increase in tooth surface decay in Calgary by 3.8 compared with 2.1 in Edmonton during a similar time frame). Dental carries have also been linked to poor growth, behavioural problems, learning problems, and poor self-esteem among other things.

I ask you to seriously consider the health of Calgarians, particularly our younger generation, as you debate adding fluoride back into the water. For me the science is very clear, there are no risks to the population, and the benefit is a significant reduction in carries.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Dr Stephanie Mullin

de Grood, Anna

From: Diana Grainger <dianagrainger@gmail.com>
Sent: Monday, July 15, 2019 12:50 PM
To: Schmick, Andrea M.
Subject: [EXT] Water fluorination

Dear Ms. Schmick,

I understand that the city is considering adding fluoride to the municipal water again. As both a physician and mother of three I whole hearted support addressing this important public health concern.

I am thrilled to hear that the city is willing to consider science rather than the biased lobby of the anti-fluoride activist and realign water fluorination standards with other cities.

Thank you for your consideration of this important health initiative.

Sincerely,

Dr Diana Grainger

MD, CCFP

Clinical Instructor, University of Calgary

de Grood, Anna

From: Lee Darichuk <ldarichuk@shaw.ca>
Sent: Saturday, July 13, 2019 1:27 AM
To: Schmick, Andrea M.
Subject: [EXT] Water Fluoridation Analysis and Review
Attachments: DARICHUK Fluoride Submission.pdf

Hello Andrea,

Please accept my written submission to the community and protective services committee.

Many thanks,

Lee Darichuk

July 12, 2019

City of Calgary
Community and Protective Services Committee
800 Macleod Trail SE
Calgary, AB T2P 2M5

Re: Water Fluoridation

Dear Committee Members,

Thank you for the opportunity to provide input on the public health success that should exist with fluoridation of the municipal water supply in Calgary.

I am a born and raised Calgarian who was fortunate to benefit from fluoridated water as a child (I have no missing teeth). I am also a registered dental specialist in oral & maxillofacial surgery practicing in northwest Calgary. I perform greater than 10,000 procedures on more than 3,000 patients per year. The vast majority of these procedures are dental extractions. I witness first-hand the reality that severe dental disease has on Calgarians.

Today I treated a 15 year-old girl with severe dental decay. I removed 9 permanent teeth. Nine. These were her adult teeth. They do not grow back. One was her upper central incisor (front tooth). Two more were her upper first bicuspid (immediately behind the canine/eye teeth). One of these had a large granuloma (essentially a sack of tissue containing an abscess) attached to it. The other four were her lower first and second molars. These were decayed so badly they were broken off to the gumline. They were black and brown. The gum tissue had partially grown overtop of them and was inflamed and swollen. There were sharp fragments sticking up. Her upper first molars have already been removed. The upper second molars have tilted forward by 45 degrees. You can't clean properly underneath them. Even a hygienist would struggle.

Imagine being 15 and trying to fit in at school missing 3 front teeth. She is insured through the provincial ADSC program, which means her family is of low socio-economic status. She cannot afford to have these teeth replaced like you could with your MEBAC extended health benefits. Imagine trying to eat a healthy diet without any molars. Could you eat a carrot? Celery? Broccoli? Any other vegetable you enjoy? Of course not. This young person is a dental tragedy. The most sad part of this real-life story? She is going to be back to see me one day. She will have to have more teeth removed.

I cannot prove to you definitively that this young person would not have had decay with fluoridation in the water. On an individual basis, there is little you or I can do to prevent this child from ending up in this situation. What we do know, very clearly, is that on a population level people just like this child have fewer decayed (as of today, missing) teeth if there is fluoride in the water they are drinking when their adult teeth develop. What would that have meant to this child? Maybe we got her through the teenage years when our diets degenerate despite our caregivers' best efforts and into adulthood and an awareness of diet, topical fluoride, and access to preventive dental care. Maybe fewer teeth needed to come out. Maybe none did.

This is the human side to the Fluoride debate. It isn't, "so some kids can have fewer cavities," as some anti-fluoride opinions may attempt to minimize away our experiences as dental health care providers. We can provide endless stories like this. Last week I removed all 4 permanent

first molars from a 7 year-old boy. They were “bombed out” (severely decayed). They don’t grow back.

I can contribute to the science side of the debate, too. Prior to my transition to full-time private practice, I held an Associate Professor appointment at the University of Manitoba. I supervised Masters’ degree-level research projects for graduate oral & maxillofacial surgeons in training.

Some basics:

Dental Caries is a dietary disease. It is primarily related to how frequently one consumes food with any fermentable carbohydrate. This includes obvious foods like pop, candy, etc, but also includes less obvious things like bread, crackers, milk, etc. I counsel patients that in between your major meals, the only safe foods are water, vegetables and cheese (black tea and black coffee are okay, too). Changing diets on a population level is not achievable by a municipal council.

Dental caries is health inequality in Calgary. It is far more prevalent in Calgarians of lower socio-economic status.

Fluoridation of the community water supply is an effective method to reduce dental caries in children, but it has to be present in the water we consume while our teeth are developing to be effective. We have a limited window to act. The protection offered by incorporation of fluoride into our developing teeth can be lifelong.

PRO-FLUORIDE SCIENCE

I have read that the pro-fluoride research is primarily old and doesn’t reflect today’s lifestyles, diets, etc. This is false.

A very recent (June 2019, DOI: 10.3390/ijerph16111970) epidemiological study out of Australia found:

- Children in the lowest quintile of socio-economic position and living in an area with water fluoride levels below the guidelines had a 4 times higher risk of having dental caries than children living in fluoridated areas and in a high socio-economic position.
- This study had an N of more than 5000 people. This is enormous scientific power.

A May, 2009 epidemiological study, (DOI: 10.1001/jamanetworkopen.2019.3466) again from Australia, found:

- 40% of inequality in elevated rates of tooth decay between indigenous and non-indigenous children was attributable to residing in an area with non-fluoridated water.
- This study had an N of over 30,000 children.

July, 2018 (DOI: 10.1177/2380084418764312):

- Children residing in postcodes without CWF (community water fluoridation) on average had 59% higher rates than those with access

ANTI-FLUROIDE SCIENCE

The scientific arguments against fluoridation of the water supply are based on poor science, and twisting the words of the majority of the “studies” that they cite into something that these

studies don't actually say. I will try to address some of the key points raised by anti-fluoridation groups:

The Science Behind “Low IQ” Claims

The bulk of these studies do come from China. The problems I have with these “Studies”:

- The N is too low. There aren't enough participants in the study to show sufficient power. An N of 30 participants, or even 200, is not sufficiently powered to show a true population level adverse effect. There is too much possibility for bias. This would be like comparing 30 kids from Mount Royal in Calgary to 30 kids from Arviat, Nunavut. There are too many confounding factors to explain the differences. I have read these studies, they do not control for variables such as socio-economic status, dietary sugar intake, topical fluoride, access to dental care, etc.
- “IQ” is not an accurate measure of injury or lack thereof to brain tissue.
- The fluoride in the “control” or “baseline” groups are equivalent or HIGHER than what the proposed level of fluoridation would be in Calgary. (0.89 ppm, 0.73 ppm, 1 ppm, 0.8 ppm, 0.5 ppm, 1 ppm, 1 ppm, 0.91 ppm, 0.75 ppm, 0.5 ppm, 0.76 ppm...)
- The anti-fluoride groups would have you believe that these baseline groups are in areas where there is no fluoride. THIS IS FALSE.
- The fluoride levels in the “high” fluoride groups are many times higher than what is proposed in Calgary (4.55 ppm, 7.6 ppm, 31.6 ppm, 1.8 ppm, 2.97 ppm, 8.6 ppm, 11 ppm, 4.12 ppm, 3.15 ppm, 4.5 ppm, 5.54 ppm...). This is not an analogous situation. This argument must fall.

Anti-Fluoride Talking Point: There are no “Randomized Controlled Trials” supporting community water fluoridation

Of course there aren't. There never will be. You can't design one. This isn't like looking at whether aspirin prevents heart attacks or whether bypass grafting is better than a stent after you have had a heart attack. The lag period between exposure to fluoride and decayed, missing, or filled teeth is too long, the numbers you need to show significance are too high. and dentistry is much more fragmented than central institutionalized medicine. The logistics are impossible.

But we don't need one. A report from the [Cochrane Collaboration](#) in 2014 came to the conclusion that observational studies are very similar in results reported by similarly conducted [randomized controlled trials](#). Large numbers of study participants help to overcome bias or other potential weaknesses. And the numbers on recent epidemiological studies concluding in favour of community water fluoridation are incredible. 5,000 people. 15,000 people. THIS is science. THIS is evidence.

Bones and Fracture Risk

Reviewing this one made me laugh. One of the studies quoted actually took toenail clippings from nurses and tried to analyze the fluoride levels in the toenails. There was no assessment based on the level of fluoride in drinking water, just an assumption that if there was more fluoride in your toenails you must be exposed to more fluoride.

What the anti-fluoride groups don't tell you:

- Many of the studies they claim support an elevated risk of bone fracture actually state the opposite.
- Any study which “suggested” an elevated risk of fracture had fluoridation levels between 2-4 ppm.

- Most studies use phrases such as, “There was a non-significant trend,” or, “no statistically significant difference.” This means there is essentially no difference in fracture rates between fluoridated and non fluoridated areas.
- The Finnish study often quoted used **estimates** of fluoride concentrations from **well water**.

Fluoride and the Thyroid Gland

This one was fun to look at. I spent a year doing thyroid surgery.

Summary: “Studies investigating fluoride’s impact on thyroid hormone levels have produced divergent findings.”

One of the larger epidemiological studies from the UK defined elevated fluoride levels as above 0.7 ppm. 0.7 ppm and below did NOT have an elevated rate of hypothyroidism.

Fluoride and Osteosarcoma

This is straight from the articles on fluoridealert.com:

- No significant association between bone fluoride levels and osteosarcoma risk was detected in our case-control study
- Our ecological analysis suggests that the water fluoridation status in the continental U.S. has no influence on osteosarcoma incidence rates during childhood and adolescence.
- No association was found between potential exposure to fluoridated drinking water and osteosarcoma.

CONCLUSION

The evidence in favour of fluoridation for reducing the inequality in the burden of dental disease in Calgarians is overwhelming. Fluoridation of the city water is in your control. No other policy initiative can have as broad and as significant of an effect.

I have an 11 month old son. I want the water he drinks to be fluoridated. Do the right thing for our kids. For my kids. For the kids who shouldn’t have to come to see me to have permanent teeth removed due to caries while they are still children.

If I can be of assistance in making a decision on this important matter, please contact me:

ldarichuk@shaw.ca
(403) 374-6977



Dr. Lee Darichuk
BSc, DMD, MDent, FRCDC
Oral & Maxillofacial Surgeon

de Grood, Anna

From: Christine Kang <cykang87@gmail.com>
Sent: Monday, July 15, 2019 9:37 AM
To: Schmick, Andrea M.
Subject: [EXT] Support for fluoride

Dear Ms. Schmick,

I am writing in support for adding fluoride back into water. As a physician, I see the detrimental effects of dental cavities especially in lower income and marginalized populations. Fluoride has been proven to reduce cavities. I ask that the City reviews the evidence for fluoride and help make changes for the better lives of Calgarians.

Thank you.

Christine Kang
Family Physician

--

Christine Kang, MD

de Grood, Anna

From: Christine Massey <cmssyc@gmail.com>
Sent: Wednesday, July 17, 2019 5:00 AM
To: Public Submissions; City Clerk
Subject: [EXT] Submission for Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda: evidence shows O'Brien Institute's entrenched position on fluoridation
Attachments: O'Brien on FB science settled June 2018.jpg; O'Brien claims unbiased.jpg; O'Brien FB July 12 2017 great achievement.jpg; O'Brien Inst Ebulletin Chemophobes.jpg; OBrien Ins haters.jpg

Dear Members of the Standing Policy Committee,

Subject: evidence of the O'Brien Institute's firmly entrenched, pro-water-fluoridation position.

On Feb. 25th Dr. William Ghali, Scientific Director of the O'Brien Institute, insisted that the Institute will provide Council an unbiased dossier on water fluoridation.

Yet the following examples from the Institute's social media posts, newsletters and other documents clearly demonstrate a firmly entrenched, pro-fluoridation position.

Dozens of examples, along with screenshots, are compiled [here](#). Several screenshots are attached for you.

[June 24, 2018](#), O'Brien Institute on Facebook. ***"Fluoride remains safe and effective. This is settled science... We are seeing the effects of Calgary's decision to cease water fluoridation, and it isn't pretty."***

July 12 2017: O'Brien Institute [claimed](#) on Facebook that ***"Adding fluoride to tap water to prevent tooth decay is one of our greatest public health achievements..."***

January 2 2018: O'Brien Institute tweeted a [biased](#) and disrespectful news article from the National Post, wherein safe water advocates were framed as ***"haters"*** and ***"combative naysayers"***. The O'Brien Institute repeated the "haters" term in [several tweets](#).

June 27, 2018 [tweet](#): is this what you would expect from a respectful, unbiased scientific organization?

February 2016, the O'Brien Institute condescendingly [insinuated](#) on Facebook that decisions not to fluoridate (made by most of the world) are based only on "ideology". Their featured Calgary Herald [article](#) begins: ***"Calgary's medical health officer says council should reconsider its "fundamentally" ideological decision to remove fluoride..."***

Fluoridation defending/promoting Juliet Guichon was an O'Brien Institute member until she resigned (apparently sometime since Jan. 22 2019), which enabled her to more aggressively promote fluoridation and attack the freedoms of safe drinking water advocates who disagree with her. Guichon [opposes freedom of speech](#) for safe water advocates who disagree with her chosen fluoridation experts, and [admits](#) she is not qualified to discuss the science of water fluoridation.

[Sept. 26, 2017](#): Guichon on Twitter while she was still a member of the O'Brien Institute.

[June 23, 2018](#): O'Brien Institute and Guichon, working together to promote and defend water fluoridation while Guichon was still a member of the Institute.

[June 2018](#) O'Brien Institute O'Bulletin: "*The price Calgary kids are paying for fluoride cessation*"

October 31 2018: O'Brien Institute [shared](#) on Facebook a pro-fluoridation post citing their member, Guichon.

January 22 2019: O'Brien Institute [shared](#) on Facebook their member Guichon's pro-fluoridation Calgary Herald OpEd.

O'Brien Institute E-BULLETIN, [February 26, 2016 Issue 88](#). The Institute referred to safe water advocates as "**chemophobes**", and frames McLaren's weak study as "**hard evidence that the perfectly predictable has indeed come to pass**".

O'Brien Institute's [Research Impact Assessment May 2017](#) "Prepared for O'Brien Institute's International Scientific Advisory Group", on page 27 claims that McLaren's study showed "**for the first time the real-life ramifications of fluoride cessation**".

CBC, Feb 17, 2016:

"McLaren said the study is clear about the cause and effect at play.

"We designed the study so we could be as sure as possible that [the increased tooth decay] was due to [fluoride] cessation rather than due to other factors," she told the CBC.

*"We systematically considered a number of other factors ... and in the end, **everything pointed to fluoridation cessation being the most important factor.**"*

<https://www.cbc.ca/news/canada/calgary/tooth-decay-calgary-fluoride-water-1.3450616>

The unfounded claims made by the O'Brien Institute (and member McLaren) that McLaren's research has demonstrated a causal link between cessation of fluoridation and an increase in cavities were later denied by McLaren herself.

National Post, [January 2, 2018](#):

"...much of the media coverage suggested McLaren had found slam-dunk proof, something she notes frankly could only come from a randomized clinical trial where scientists create a controlled experiment. Hers was an observational study, which can never demonstrate a causal link."

McLaren, published in the [Fall 2017 newsletter](#) of Canadian Association of Public Health Dentistry:

..... we concluded that findings observed are consistent with an adverse effect of fluoridation cessation for dental caries, but that additional monitoring would be needed to confirm the effects.

..Some of the [media] coverage was positive and accurate, but in other cases the study findings were mis-reported and the conclusions overstated; for example, suggesting that 'cavities spiked since fluoridation was stopped'. There was no spike but rather a gradual increase, and the trend observed was not since fluoridation was stopped, but rather over a time period during which cessation occurred...

Is it any surprise that "media" overstated the strength of the study, when McLaren and the O'Brien Institute (which headed the study) had been doing that exact thing themselves?

O'Brien Institute E-BULLETIN, [February 26, 2016 Issue 88](#). Note the causal link implied in the title of the featured article, page 1.

O'Brien Institute E-BULLETIN, [December 20, 2013 Issue 39](#). McLaren's study was already being framed as a likely source of evidence in favour of restarting water fluoridation. Their featured news article included a video in which Dr. James Talbot, who was Alberta's Chief Medical Officer of Health at the time, described unfluoridated water as representing "*a risk to people's teeth*":

Yours for Safe Water,
Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)



June 24, 2018 -

Fluoride remains safe and effective. This is settled science, confirmed most recently in massive systematic reviews by the Australian National Health and Medical Research Council and the Irish Government Food Safety Authority. Indeed, 5,600 studies support adding fluoride.

Experts at the Public Health Agency of Canada, the U.S. Centers for Disease Control and the World Health Organization recommend fluoridation; so do hundreds of leading global health and dental organizations, thereby attesting to its safety and efficacy.

We are seeing the effects of Calgary's decision to cease water fluoridation, and it isn't pretty.



CALGARYHERALD.COM

Opinion: Children's teeth are paying the price for the cancellation of fluoridation in Calgary

Calgary's O'Brien Institute insists they are not biased on water fluoridation.

CPS2019-0965
Attachment 2
Letter 39b

O'Brien Institute @OBrien_IPH · 27 Jun 2018

This is what the decision to remove fluoride looks like. The latest @calgaryherald editorial cartoon (and some context if you missed the piece co-written by Juliet Guichon of @OBrien_IPH: bit.ly/2tM9Bj5) #yyccc

O'Brien Institute @OBrien_IPH · 3 Jan 2018

Lindsay McLaren of @OBrien_IPH and @UCalgaryMed talks anti-fluoride haters and a broader, troubling trend in public health. Read more: nationalpost.com/health/why-the...



O'Brien Institute @OBrien_IPH · 23 Jun 2018

Children's teeth are paying the price for the cancellation of fluoridation in Calgary. The latest, co-written by Juliet Guichon of @OBrien_IPH #yyccc #fluoride



O'Brien Institute for Public Health

July 12, 2017 · 🌐

CPS2019-0965

Attachment 2

Letter 39c



Adding fluoride to tap water to prevent tooth decay is one of our greatest public health achievements, with evidence gathered over more than 60 years showing it works and is safe. A new review adds to that evidence.



THECONVERSATION.COM

Four myths about water fluoridation and why they're wrong

Myths that fluoridated water isn't natural, safe, doesn't work and shouldn't...

Why did Calgary cave to chemophobes over fluoridation?

When Calgary city council decided to end water fluoridation in 2011, one outcome was clear: The number of cavities in children was going to go up.

Five years later, we have the hard evidence that the perfectly predictable has indeed come to pass.

A study published in the journal Community Dentistry and Oral Epidemiology shows that Grade 2 students in Calgary had an average of 3.8 more cavities in 2013-14 than they did in 2004-05.

[Read more](#)



O'Brien Institute

@OBrien_IPH

CPS2019-0965

Attachment 2

Letter 39e

Unfollow



International Anti-Fluoride Haters Are
Attacking This @OBrien_IPH Researcher Over
An Impact Study of Calgary's Decision To End
Fluoridation. Read More: [nationalpost.com
/health/why-the ... #yyc](https://nationalpost.com/health/why-the-...#yyc)



de Grood, Anna

From: Christine Massey <cmssyc@gmail.com>
Sent: Tuesday, September 24, 2019 4:28 PM
To: Public Submissions; City Clerk; Schmick, Andrea M.
Subject: [EXT] Re: Re-Submission for Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda: FOIP response reveals Ministry's lack of safety studies
Attachments: AB Min of Healt FOIP request and response re pregnancy neurodev studies.pdf
Follow Up Flag: Follow up
Flag Status: Flagged

p.s. here is the attachment

On Tue, Sep 24, 2019 at 6:24 PM Christine Massey <cmssyc@gmail.com> wrote:
Hello,

Please include my submission (shown further below) that was originally submitted on July 17 2019 (on time for the last scheduled meeting) and again on Sept. 10 2019 (to which I received no response), for consideration by the Committee on Oct. 29 2019.

Please include the original submission date of July 17, 2019.

Please confirm receipt of this submission and whether it will be included in the agenda for the Oct. 29 2019 meeting.

Please note this is the 2nd of 2 different (re)submissions from me.

Thank you and best wishes,
Christine Massey, M.Sc.

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Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)

On Wed, Jul 17, 2019 at 8:00 AM Christine Massey <cmssyc@gmail.com> wrote:
Dear Members of the Standing Policy Committee,

Subject: FOIP response reveals that the **Alberta Ministry of Health's only studies on fluoride exposure during pregnancy suggest harm (lowered IQs), not safety**, with respect to neurodevelopment in offspring

Please find my information request and the Ministry's response provided in the attached pdf document.

Yours for Safe Water,
Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)

FOIP request to Alberta Ministry of Health for peer-reviewed papers on fluoride exposure during pregnancy

Submitted via email, date: Thu, Jun 6, 6:23 PM
From: Christine Massey <cmssyc@gmail.com>
To: Kristi York <kristi.york@gov.ab.ca>

Dear FOIP Coordinator,

This is a request for General Information, made under Alberta's *Freedom of Information and Protection of Privacy Act*.

Reason for Request

Two important studies examining total exposure to fluoride during pregnancy and neurodevelopmental effects in offspring, by Bashash et al., were published in late 2017 and late 2018. Both were funded by the U.S. National Institutes of Health and conducted by an international team that included researchers from the Harvard School of Public Health, the Dalla Lana School of Public Health at the University of Toronto and various other universities and institutions.

Both studies used data collected from mother-child pairs followed in Mexico City, with measurements of total fluoride exposure at various time points obtained from urine samples starting in pregnancy. Both studies found that higher total fluoride exposure in pregnancy is related to worse outcomes in children. Specifically, the researchers found lower IQs and increased ADHD symptoms in the children whose mothers had the higher total fluoride exposures.

A third study by Till et al. published in late 2018, also funded by the U.S. government, found that the total fluoride exposures of Canadian pregnant women in fluoridated cities are very similar to those of the mothers in the Bashash et al. studies. It also found that pregnant women in Canadian fluoridated cities have double the fluoride exposure as compared those in unfluoridated cities and that drinking water is the major source of fluoride exposure for pregnant women in Canada.

Public Health Ontario's review of the 2017 Bashash et al IQ study entitled Article Review on "Prenatal Fluoride Exposure and Cognitive Outcomes in Children at 4 and 6–12 Years of Age in Mexico" (<https://www.publichealthontario.ca/-/media/documents/fluroide-iq-mexico.pdf?la=en>) stated that:

- *"Previous research in the area of fluoride exposure and neurological outcomes during childhood has often been limited by small sample sizes and/or ecological study designs. The study by Bashash et al. is a considerable improvement over previous research given the large population size and the availability of individual level data to assess both exposure and outcome."*
- *"...a 0.5mg/L increase in maternal urinary fluoride was associated with a decrease in GCI of 3.15 points (95% CI: -5.42,-0.87), and a decrease in IQ of 2.50 points (95%CI: -4.12, -0.59)."*
- *"The authors used linear regression, adjusting for a number of potential confounders..."*
- *"Another strength of the study design is that exposure was measured during what is perhaps the most vulnerable window of neurological development in children, the prenatal period...."*

Description of Requested Records:

All primary, peer-reviewed scientific research studies on total fluoride exposure during pregnancy that provide evidence as to whether or not total fluoride exposure during pregnancy may cause, or is associated with, any developmental neurotoxicity in human offspring, in the possession of the Alberta Ministry of Health (Alberta Health) (for example:downloaded to a computer, printed in hard copy, etc.).

I am not interested in receiving any secondary or derivative works, such as article reviews, research reviews, or meta-analyses.

[If any records match the above description of requested records and are currently available to the public elsewhere, please provide enough information about each record so that the public may identify and access each record with certainty (i.e. title, author(s), date, journal, where the public may access it).]

Timeframe

January 1, 2000 until present.

Format:

Pdf documents sent to me via email; I do not want anything shipped to me.

Contact Information:

Last name: Massey

First name: Christine

Address: #221 - 93 George St. S., Brampton ON L6Y 1P4

Phone: 905-230-4155

Email: cmssyc@gmail.com

Relevant Keywords to Assist with the Search:

fluoride

fluoridation

pregnancy
fetal
prenatal
neurological
development
neurotoxicity
IQ
intelligence
children
offspring
brain
ADHD
behaviour
science
controlled
study

Fees

I live in Ontario and cannot possibly pick up any responsive records, if any exist, in person.

Old fashioned mail is costly and time consuming, while I am on a tight budget and in a hurry.

Printed files are much more difficult to share online with the concerned public.

Institutions I have dealt with in Ontario email records on a regular basis without any objection.

The requested record(s) relate to a matter of public interest including public health and safety.

Therefore, in the spirit of Section 10(1) (*"The head of a public body must make every reasonable effort to assist applicants ..."*), I am respectfully requesting:

- a waiver of the \$25 initial fee, and any other fees, as per section 93(4);
- unless the Alberta legislation prohibits the emailing of records, that any responsive record(s) be emailed to me in electronic format.

Best wishes,
Christine Massey, M.Sc.

Response from Alberta Ministry of Health re peer-reviewed papers on fluoride exposure during pregnancy

Date: Jun 7, 2019, 12:56 PM

From: Kristi York <Kristi.York@gov.ab.ca>

To: Christine Massey <cmssyc@gmail.com>

Good morning Ms. Massey,

I have queried various areas of the Ministry to see if there were records that could be proactive disclosed considering the type of records you have requested. The branch of the Chief Medical Officer of Health provided these two documents which I'm told are also publicly available.

I hope this satisfies your query.

Kristi York, CIAPP-P
FOIP/HIA Coordinator
Alberta Health

Screenshot of Attachments:

2 Attachments



The attached studies are:

1. Till C, Green R, Grundy JG, Hornung R, Neufeld R, Martinez-Mier EA, et al. Community water fluoridation and urinary fluoride concentrations in a national sample of pregnant women in Canada. Environ Health Perspect. 2018;126(10): 107001-1-13.

<https://ehp.niehs.nih.gov/doi/10.1289/EHP3546>

York University Press Release: <http://news.yorku.ca/2018/10/10/study-fluoride-levels-in-pregnant-women-in-canada-show-drinking-water-is-primary-source-of-exposure-to-fluoride/>

2. Bashash M, Thomas D, Hu H, Martinez-Mier EA, Sanchez BN, Basu N, et al. Prenatal fluoride exposure and cognitive outcomes in children at 4 and 6-12 years of age in Mexico. Environ Health Perspect. 2017;125(9):097017.

<https://ehp.niehs.nih.gov/doi/10.1289/ehp655>

University of Toronto Press Release: <https://www.utoronto.ca/news/higher-levels-fluoride-pregnant-woman-linked-lower-intelligence-their-children-u-t-research>

Request that Alberta Ministry of Health clarify their response

Sat, Jul 13, 1:18 PM

From: Christine Massey <cmssyc@gmail.com>

To: Kristi York <kristi.york@gov.ab.ca>

Dear Kristi,

Thank you for these attachments and response.

It isn't clear to me whether your response is an official one based on a thorough search of Ministry records. I have requested copies of, or at least citations for, all responsive records. Are these 2 attachments the only responsive records at the Ministry? Also, there is no mention of my request for a fee waiver.

In Ontario I'm used to receiving responses that contain a file number, that make clear whether access is denied for any records, advise on how to appeal an institution's decision, etc. I see that section 12(1) of the Alberta legislation has similar requirements.

Could you please clarify the response for me so that I can be certain whether or not the Ministry has any other responsive records?

Thank you and best wishes,

Christine

Clarification from Alberta Ministry of Health

Date: Jun 15, 2019, 1:31 PM

From: Derek Sklepowich <Derek.Sklepowich@gov.ab.ca>

To: Christine Massey <cmssyc@gmail.com>

Hi Ms Massey,

In response to your questions from your email:

We actioned your request for information outside of the regular FOIP process by conducting a procedure that we call Proactive Disclosure. This procedure is derived from our FOIP Act under section 88. As such, there is no file number attached to this request and the Alberta FOIP Act does not apply to the records we supplied to you.

A search for records was conducted by several program areas, essentially those program areas that could reasonably be expected to deal with the topic you put forward.

The two documents sent to you were the only documents that were located during the search.

Regarding your fee waiver, we do not intend on collecting a fee for this particular request, as we conducted this request as a Proactive Disclosure procedure.

For your own information, should you make future information requests to Alberta Health or to the Government of Alberta, a request for information is not considered to be officially received until fees are received. As this would have been considered a General Request and not a Personal Request (which is a request for one's own personal information, for which there is no fee), the procedure is that the government collects the \$25 fee at the time the request is made. If a case for a fee waiver is presented and subsequently approved, then it is at that point that the fee is reimbursed to the applicant.

In the future, we would recommend submitting requests for information through the Government of Alberta online portal which can be found here:

<https://eservices.alberta.ca/foip-request.html>

Unless you have additional questions, we now consider this matter closed.

Sincerely,

Derek Sklepowich
FOIP/HIA Advisor
Alberta Health
780-415-1309

Palaschuk, Jordan

From: Christine Massey <cmssyc@gmail.com>
Sent: Tuesday, September 24, 2019 4:28 PM
To: Public Submissions; City Clerk; Schmick, Andrea M.
Subject: [EXT] Re: Re-Submission for Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda: FOIP response reveals Ministry's lack of safety studies
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[Fluoride Free Peel](#)

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Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)

From: [Hardy Limeback](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Fwd: Submission for Fluoridation Hearing
Date: Wednesday, October 16, 2019 6:05:00 AM
Attachments: [Calqafy re-submission-Limeback-Oct.15.2019.pdf](#)

Hello:

Last summer I made a submission in time for distribution to council when fluoridation was going to be discussed.

It was not included.

I did not receive acknowledgement that you received it, nor an explanation for why it was left out.

The Feb. 25 motion to consider fluoridation <https://pub-calgary.escrimeetings.com/filestream.ashx?DocumentId=83461> even mentioned me by name in the amendment as one of those "key stakeholders" to be consulted.

Please REMOVE any submission from me from the past that you plan to post for council and replace it with the attached revised re-submission.

I am NOT requesting to present at the October. 29 meeting (I cannot fly to Calgary for the meeting).

I understand that the deadline for submission is Oct. 21.

Please advise receipt of this email, that you were able to download and view my submission and that you plan to substitute the attached with anything I previously sent.

Also, please let me know if it will be included in the materials to be distributed to council before the Oct. 29 meeting.

Thank you

Dr. Hardy Limeback BSc PhD DDS
Professor Emeritus, University of Toronto, Faculty of Dentistry

73 Rein's Way, McKellar ON Canada, P2A 0B4
landline: 705 389-1544 email: hardy.limeback@gmail.com

19-10-15

Re-Submission to Calgary Council

For Oct. 29,2019

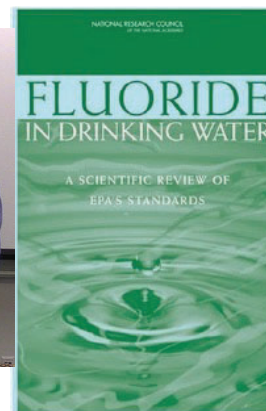
(this replaces the June 2019 submission
which was not posted)

Dr. Hardy Limeback BSc PhD (Biochem) DDS
Professor Emeritus, University of Toronto
Former Head of Preventive Dentistry
Member of the 2006 NRC Committee
on Fluoride in Drinking Water

Dr. Limeback was a member of the
2003-2006 Committee on Fluoride in Drinking Water
US National Academies of Sciences (National Research Council)

-which was completely ignored by the CADTH reports

Jay Kumar, Tom Webster, Hardy Limeback, Judith Klotz, Bob Isaacson
Ruby Reed, John Doull, Barb Farishian, Susan Martel,, Kim Boekelheide, Ed Puzas



"Fluoride appears to have the potential to
initiate or promote cancers, particularly of
the bone, but the evidence to date is
tentative and mixed." p.286

**Published
Mar.2006**

19-10-15

**This re-submission by Dr. H. Limeback
to Calgary Council summarizes:**

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
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- a realistic cost-benefit estimate of fluoridation
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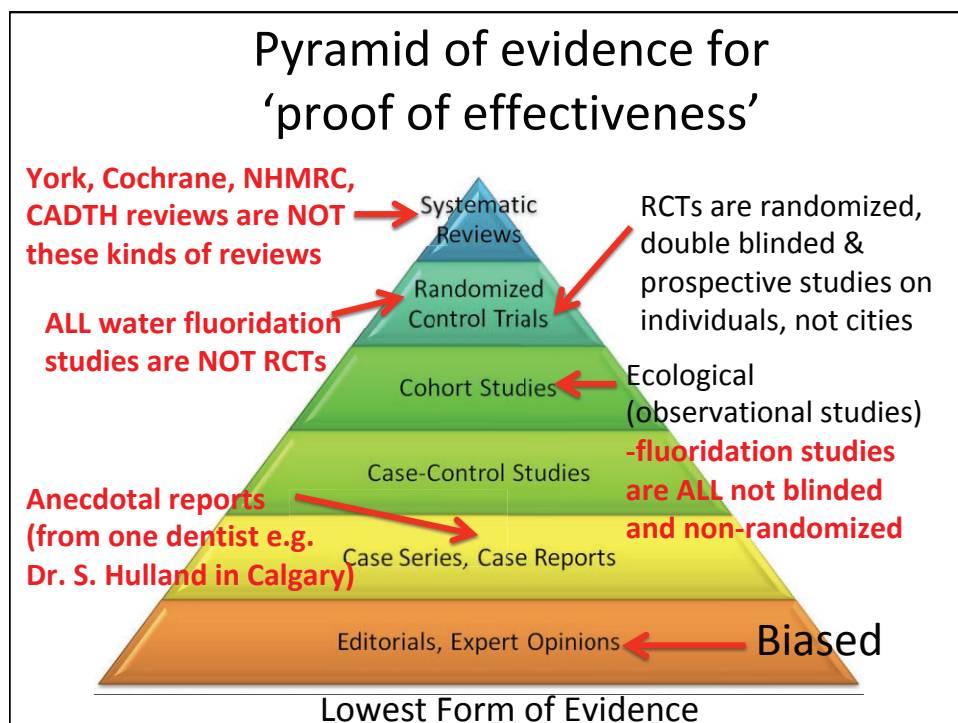
19-10-15

WHAT IS THE EVIDENCE THAT FLUORIDATION IS EFFECTIVE? if there are NO RCTs?

There is **not a single** prospective randomized (double-blinded) controlled trial (RCT) on fluoridation

-this is the usual evidence needed for approval of medications

-ALL the evidence of 'safe and effective' comes from weak UNBLINDED cross-sectional studies or non-randomized before and after studies



19-10-15

Even if there were benefits from
 fluoridation they are very minor
from 2012 textbook by Dr. H. Limeback

Table 16-4 A summary of recent publications on surveys of the dental decay rates in children

Study author	Country	Number of subjects	Age of subjects (years)	Surfaces saved with optimum fluoridation
Heller <i>et al.</i> 1997	US	18,755	12	0.5*
Brunelle and Carlos 1990	US	16,498	12	0.5*
Angelillo <i>et al.</i> 1990	Italy	643	12	0.6
Selwitz <i>et al.</i> 1998	US	495	8–16	1.2
Ismail 1991	Canada	219	10–12	0.7
Clark 1991	Canada	1131	6–14	0.8
Slade <i>et al.</i> 1995	Australia	9,690 vs 10,195	5–15	0.2 1.1
Jackson <i>et al.</i> 1995	US	243	7–14	2.0*
Kumar <i>et al.</i> 1998	US	1,493	7–14	–0.2
Armfield and Spencer 2004	Australia	5129 4803	4–9 10–15	1.5 NS
Komarek <i>et al.</i> 2005	Belgium	4468	7–12	NS
Spencer <i>et al.</i> 2008	Australia	8183 (SA)	5–15	NS
Nyvad <i>et al.</i> 2009	Lithuania	300	12–15	NS
Ekstrand 2010	Denmark	191 municipalities	15	1.0–2.0
Armfield 2010	Australia	128,990	5–15	0.5

* Difference was statistically significant.

“They always use % reduction, but
 what does that really mean?”

- *IF* fluoridation reduces dental decay by 25%
 how many teeth are saved per person from
 decay?
- recent studies suggest that **at most** 40 years
 of fluoridation saves *maybe* 1 tooth from
 dental decay (Slade, 2014; Do, 2017: Slade,
 2018)

19-10-15

The 'benefit' of fluoridation can be explained
almost entirely by biased *un-blinded* examiners

Holman L, Head ML, Lanfear R, Jennions MD (2015) Evidence of Experimental Bias in the Life Sciences: Why We Need Blind Data Recording. PLoS Biol 13(7): e1002190. doi:10.1371/journal.pbio.1002190

"Our meta-analysis thus shows that a lack of blindness is associated with an increase in effect size of approximately 27%.... This figure is comparable to estimates from all past meta-analyses on clinical trials of which we are aware. These meta-analyses suggested that a lack of blinding exaggerates the measured benefits of clinical intervention by 22% [11], 25% [12], 27% [10], 36% [8], and even 68% [9]."

8. Hróbjartsson A, et al (2012). BMJ 344: e1119.
9. Hróbjartsson A, et al. (2013) CMA Journal 185: E201–E211.
10. Hróbjartsson A, et al. (2014) Int J Epidemiol 43: 937–948.
11. Savović J, et al. (2012) Ann Intern Med 157: 429–438.
12. Wood L, et al. (2008) BMJ 336: 601–605.

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- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

19-10-15



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HEALTHJune 1, 2019 4:40 pmReports exaggerating the benefits of fluoridationUpdated: June 2, 2019 12:03 pm

Should Calgary bring fluoridated water back? Council expected to review new study this month



By Carolyn Kury de Castillo
Reporter Global News

“[The] money that it will save people is about \$64 for every dollar invested. So it’s a minor budget matter that will promote and protect the health of Calgarians,” Guichon said.

2014: Anecdotal reports (no studies) of increase in dental decay after Calgary ended fluoridation makes national news



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Calgary

Dental decay rampant in Calgary children, pediatric dentist says



Dentist says cavities in kids on the rise 3 years after Calgary stopped adding fluoride to drinking water

CBC News · Posted: Dec 08, 2014 11:19 AM MT | Last Updated: December 8, 2014

19-10-15

News reports showing rampant dental decay unrelated to lack of fluoride was irresponsible

Reports exaggerating the benefits of fluoridation

These pictures provided to the CBC are designed to instill fear: no amount of fluoride in the the drinking water can stop rampant dental decay like this.



CBC News
Dec. 8, 2014

CBC Journalist failed to uphold standards

"In matters of human health we will take particular care to avoid arousing unfounded hopes or fears in persons living with or close to those living with serious illnesses. **We will also avoid suggesting unproven benefits or risks to health related to changes in habits of consumption of food or pharmaceutical products.**" CBD Journalistic Standards and Practices.

Scaremongering re: lack of fluoridation -used by Medical Officers of Health across Canada

The great fluoride debate

By Denis Langlois, Sun Times, Owen Sound
Friday, January 31, 2014 10:18:40 EST AM

Dr. Hazel Lynn,
Medical officer of health
Owen Sound, Ontario



Medical officer of health Dr. Hazel Lynn holds up a picture of a child's teeth. Lynn said water fluoridation prevents tooth decay and is a safe practice. Others disagree. (JAMES MASTERS/QMI AGENCY)

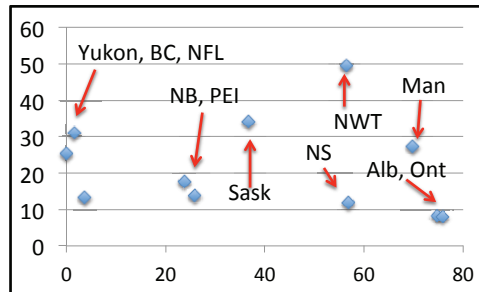
This kind of dental decay is not caused by a "fluoride deficiency" in the drinking water.

This is scaremongering!

19-10-15

Fluoridation in Canada DOES NOT reduce day surgeries required to treat rampant dental decay

Day
surgeries
per 1000
(2011)



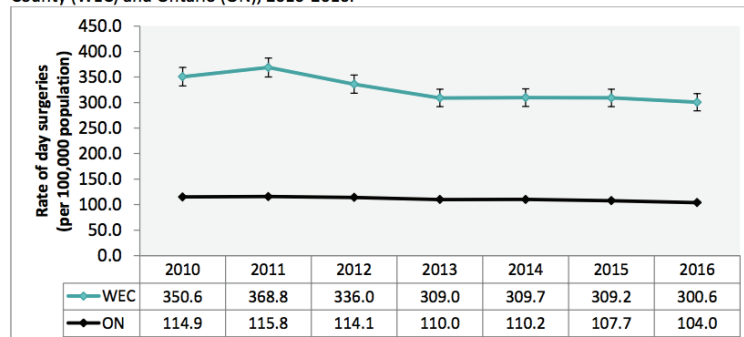
% fluoridation in each province (2007)

http://www.hc-sc.gc.ca/ahc-asc/alt_formats/pacrb-dgapcr/pdf/branch-dirgen/wfc-efc-eng.pdf
<https://www.cihi.ca/en/access-data-reports/results?query=surgeries%2C+dental%2C+province&Search+Submit=>

Day surgeries in Windsor for oral health issues related to dental decay actually declined when fluoridation stopped

from the Windsor Essex County 2018 Oral Health report

Figure 8. The rate of day surgeries for oral health (caries-related) issues in Windsor-Essex County (WEC) and Ontario (ON), 2010-2016.



Source: Ambulatory Emergency External Cause [2010-2016], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: [March 19, 2018].

19-10-15

O'Brien's Institute Lindsay McLaren's Study: What was claimed? What was actually shown?

Huffington Post Feb. 17, 2016

**Bold
claim**

"We systematically considered a number of other factors ... and in the end, everything pointed to fluoridation cessation being the most important factor," she said.

O'Brien Institute for Public Health website:

**Bold
claim**

"This study points to the conclusion that tooth decay has worsened following removal of fluoride from drinking water, especially in primary teeth, and it will be important to continue monitoring these trends," says Lindsay McLaren, PhD, from the University of Calgary's Cumming School of Medicine, and O'Brien Institute for Public Health.

**McLaren
admission
of what
was
actually
shown**

cheminst.ca/magazine/article/the-great-fluoride-debate/

"We were not able to answer the question, 'what has happened since cessation?' We were able to answer the question, 'what has happened between 2004-05 and 2013-14?' when cessation happened in one community and not the other." (McLaren)

Calgary Herald, Licia Corbella: The science is not settled –Oct.12, 2017

"For all tooth surfaces among permanent teeth, there was a statistically significant **decrease** in Calgary . . . which was not observed in Edmonton." (study)

Admissions in an article McLaren wrote for the Canadian Association of Public Health Dentistry 2017 Fall Newsletter



McLaren: " Some of the coverage was positive and accurate, but in other cases the study findings were misreported and the conclusions overstated; for example, suggesting that 'cavities spiked since fluoridation was stopped'. There was no spike but rather a gradual increase, **and the trend observed was not since fluoridation was stopped, but rather over a time period during which cessation occurred: 2004/05 to 2013/14 (cessation occurred in 2011).**"

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What was actually shown by McLaren

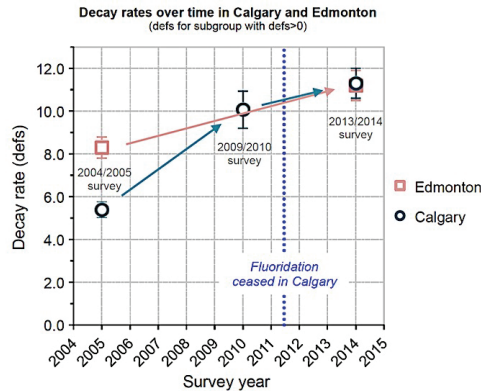


FIGURE 2 Dental decay rates for subgroup of those children with at least one defs (defs>0). Data for 2004/2005 and 2013/2014 from CDOE paper. Data for 2009/2010 from IJEH paper, but converted from deft to defs using conversion method described in text. Error bars indicate 95% CIs.

Neurath C, Beck JS, Limeback H, et al. Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada. Community Dent Oral Epidemiol. 2017;00:1–7

Neurath: “In summary due to the omission of key data that contradict the authors’ conclusion, inadequate control of confounding factors, and limitations in the design of the study that were largely unacknowledged, we believe that the claim by McLaren et al that their study supports the hypothesis that fluoridation cessation causes an increase in decay, is unjustified.”

What Calgary’s Juliet Guichon (a lawyer who admitted she doesn’t understand the science) is willing to say to see fluoridation reinstated

“Decayed primary tooth surfaces had risen 145% 3 years after fluoridation cessation.”

-The McLaren study was debunked by Neurath et al, 2017

“\$1 spent on fluoridation (including capital equipment and annual operating costs) saves between \$68 and \$140 in dental care”

-that’s impossible –that’s up to \$4700 saved per tooth

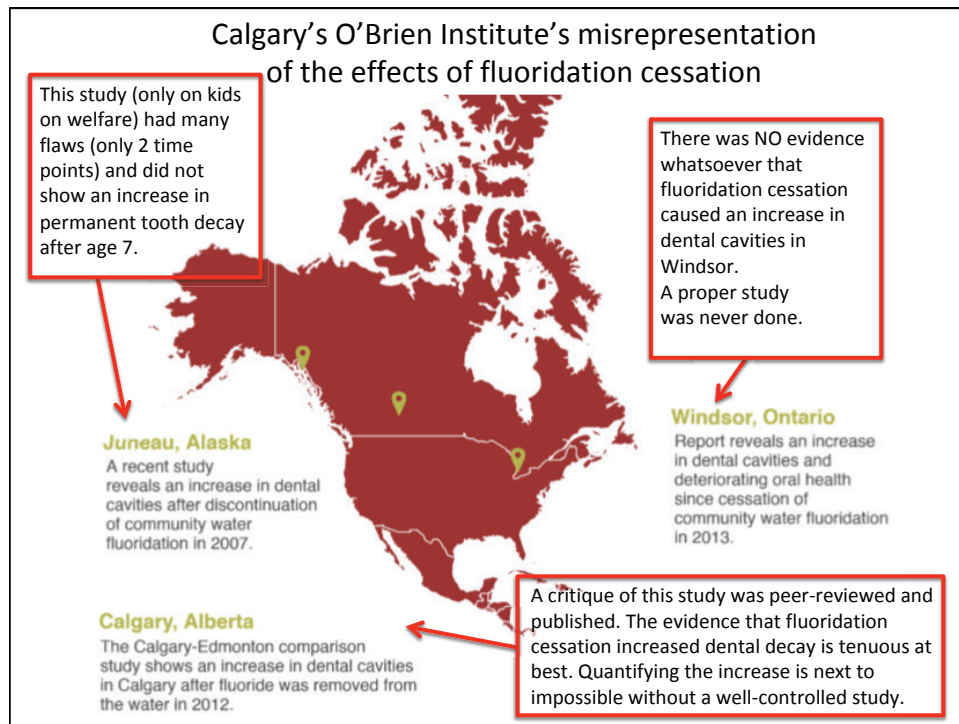
“No evidence of harm at 4.0 ppm (fluoride) and below”

- complete fabrication and does not reflect our 2006 NRC report

“Dental fluorosis produced from water fluoridation is seen as mild while flecks on teeth that can only be seen by the dentist. It does not affect the form and function of the tooth”

-this FALSE and it is an insult to those families who can clearly see the dental fluorosis damage from fluoridation

19-10-15



Why the Juneau AK Medicaid study failed to show effect of fluoridation cessation

- only 2 time points chosen; before (2003) and after (2012) the year fluoridation ended (2006)
- almost a decade between points: too long (anything could have happened)
- year to year variation was not known –the increase seen could have occurred during fluoridation
- 6 yrs of fluoridation cessation did not affect > 7 yr olds. That was plenty of time to see an effect
- other explanations:
 - dentists were NOT blinded to fluoridation status and could have treated more aggressively because fluoridation halted
 - dentists could have been maximizing dental treatment in Medicaid patients to maintain income and Medicaid reimbursement could have increased
 - decline in oral home care in the younger children (older children not affected)
 - worsening of sugar abuse (this seems to be worldwide trend)
 - there could have been more Medicaid fraud (it happened in Anchorage)

Study: Meyer J, et al. BMC Oral Health. 2018 Dec 13;18(1):215

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Why the Windsor-Essex County Health Unit report failed to show fluoridation cessation increased dental decay

- hygienists were not trained to properly measure dental decay rates (10- 30 sec., no-touch exam –mouth mirror and a light source at school)
- survey was unscientific, no adjustments for confounders like socio-economic status (the population of poor increased during the time of no fluoridation)
- before and after fluoridation based only on % caries free with no statistical analysis
- report was not peer-reviewed or published in a journal
- numerous mistakes were found including reporting of zero fluorosis where no permanent teeth existed

Calgary's O'Brien Institute's misrepresentation of the effects of fluoridation cessation

"we are aware of two other North American studies on cessation of water fluoridation" (referring to the Juneau study and the Windsor survey)

This is evidence of *bias* ("cherry picking" only helpful studies)

Why did they miss these fluoridation cessation studies?

1. Comox/Courtney and Campbell River BC

"The prevalence of caries (assessed in 5,927 children, grades 2, 3, 8, 9) *decreased* over time in the fluoridation-ended community while remaining unchanged in the fluoridated community."

-cavities DROPPED after fluoridation cessation

Maupomé et al.CDOE, 2001, 29(1):37-47.

2. Durham NC

"It was concluded that *while the break had little effect on caries*, dental fluorosis is sensitive to even small changes in fluoride exposure from drinking water, and this sensitivity is greater at 1 to 3 years of age than at 4 or 5 years."

-fluorosis dropped but cavities did not change after fluoridation cessation

Burt et al. J Dent Res. 2000,79(2):761-9.

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The O'Brien report to Calgary incorrectly states that fluoridation benefits adults

"Again, drawing most heavily from the CADTH Report (Sub-Report on Dental Caries and Other Health Outcomes) we find evidence that community water fluoridation is also beneficial to adult populations. The extent of research evidence is somewhat less than for children, but studies of adults still show benefit:

♣ Systematic reviews suggest a 35% relative reduction in the number of teeth affected by decay and cavities."

More "cherry picking" (the CADTH report ignored the conclusion of the Cochrane systematic review in 2015)

"Within the 'before and after' studies we were looking for, we *did not find any on the benefits* of fluoridated water for adults."

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- **how humans react to swallowing fluoridated water**
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

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Where does fluoridated water go?

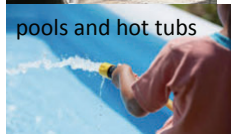
outdoor uses
 (storm runoff added to sewage?)



gardens & lawns



car washing



pools and hot tubs



Water main losses

personal hygiene
 (added to sewage)



bathroom



laundry



kitchen



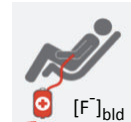
drinking, cooking =
 only 1% of fluoridated
 household water

(a VERY small
 amount is filtered
 through humans but
 eventually ends
 up in the environment)

How humans deal with fluoride



Example: drink 1.0L of H_2O with
 0.7 mg fluoride/L (or 0.7 ppm)
 means 0.7 mg F^- is ingested



$[F^-]_{bid} < 0.01ppm$

F^- is converted to HF
 (at pH 1.5 in the stomach)
 90% (0.63 mg) F^- is absorbed into blood

≈ 1% is excreted by
 breast milk,
 sweat,
 saliva



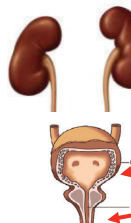
10% (0.07 mg) F^- is excreted in the feces

40% (0.28 mg) F^- ACCUMULATES in teeth
 and bones

45% (0.32 mg) F^- is filtered in kidneys

then stored in the bladder

and finally excreted in the urine



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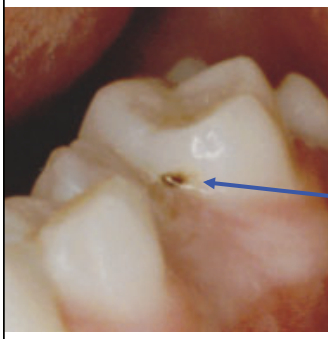


Fig (2): Non cavitated white spot caries

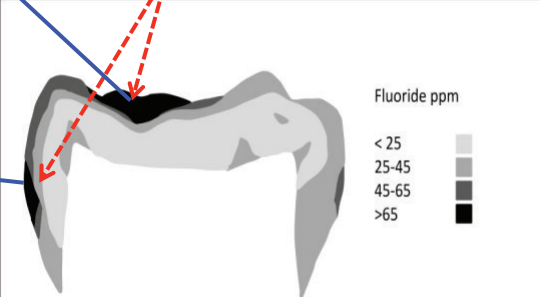


How fluoride works (it's topical !!)

Fluorapatite builds up in areas of demineralization-remineralization

-swallowing fluoride only causes tissue damage

$$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2 \text{ (hydroxyapatite)} + 2\text{F}^- \rightarrow \text{Ca}_{10}(\text{PO}_4)_6(\text{F})_2 \text{ (fluorapatite)} + 2(\text{OH}^-)$$



Fluoride ppm


- < 25
- 25-45
- 45-65
- > 65

Cross-sectional fluoride profile of a molar

Fluoridation does not protect babies fed infant formula made with tap water!


The Canadian Dental Association recommends "the total daily fluoride intake from all sources should not exceed 0.05 -0.07 mg/kg/day"

infant formula
0.5 ppm



+


Fluoridated water
0.7 ppm



=

400% higher

0.20 mg/kg/day



Who monitors my fluoride intake?

19-10-15

Fluoride from tap water

-babies fed formula made with fluoridated tap water are overdosed on fluoride

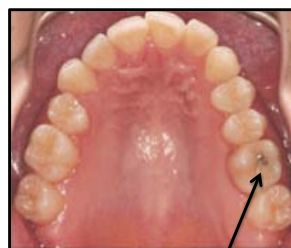
subject	volume fluid intake	fluoride concentration in liquid consumed	fluoride DOSAGE* (µg/ kg per day)
5 kg baby fed breast milk	up to 1 L	≈ 0.005 ppm	1
70 kg adult	1 L	0.7 ppm	10
70 kg adult	4 L	0.7 ppm	40
70 kg adult	2 L	2.0 ppm	57
70 kg adult	1 L	4.0 ppm	57
5 kg baby fed infant formula made with tap water	up to 1 L	0.7 ppm	140

*A **dose** refers to a specified amount of medication taken at one time.
 By contrast, **dosage** is the prescribed administration of a specific amount, number, and frequency of doses over a specific period of time. AMA Manual of Style

Fluoridation- a poor tradeoff from 40 years of exposure

One tooth might have been saved from dental decay

.....but look at the dental fluorosis that children have to deal with



A lifetime of fluoridation
 MIGHT save one
 tooth from
 dental decay

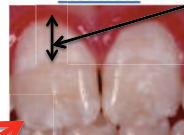
10%
 -if only
 front
 scored

Mild



This is ONLY
 from excess
 fluoride during
 first 6 mo. -NOT
 added toothpaste
 exposure

Moderate



This is where
 F-toothpaste
 swallowing starts
 to show up
 (age 1.5 – 3 yrs)
 -it's additive

Severe



This is from excess
 fluoride that was
 in the child's bone
 from birth and
 from external sources
 (water, toothpaste,
 supplements, pollution)

Cochrane Review, 2015

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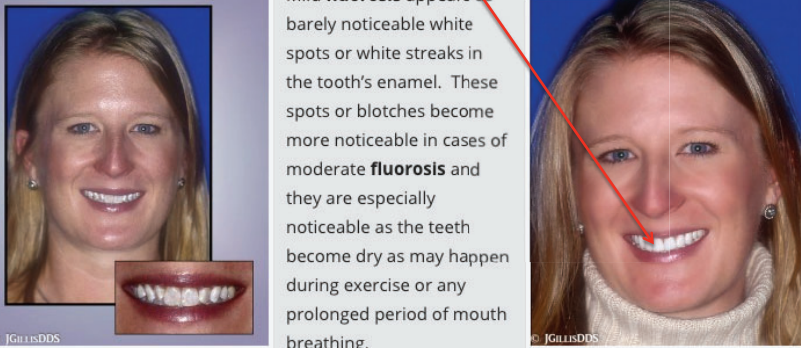
Published studies (Canada vs elsewhere): prevalence of fluorosis of esthetic concern

Study	fluoridated	% esthetically objectionable dental fluorosis	non-fluoridated	% esthetically objectionable dental fluorosis
Clark 1997	BC cities	up to 5%		
Brothwell 1999	Ontario towns	19%	Ontario towns	5%
Leake 2002	Toronto	14%		
Ito 2007	Brampton	9%	Caledon	3.6%
Cochrane 2015	worldwide data	12%		
Neurath 2019	NHANES (US)	10%		

CADTH: "the prevalence of dental fluorosis of "any level" at 0.7 ppm and 1.0 ppm was 40% and 48%, respectively, while the prevalence of dental fluorosis of "aesthetic concern" was 12.0% and 12.5%, respectively."

The cost to treat dental fluorosis was not considered by CADTH

Many studies show fluoridation increases the risk of getting porcelain veneers at the dentist



Mild **fluorosis** appears as barely noticeable white spots or white streaks in the tooth's enamel. These spots or blotches become more noticeable in cases of moderate **fluorosis** and they are especially noticeable as the teeth become dry as may happen during exercise or any prolonged period of mouth breathing.

Fluorosis stains prior to treatment.

A much more attractive smile after treatment of fluorosis with porcelain veneers.

1190 BOOKCLIFF AVENUE #201, GRAND JUNCTION, CO 81501



Julie M. Gillis
 DDS PC

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**Research ignored by CADTH
 ...may induce malignant tumours!**

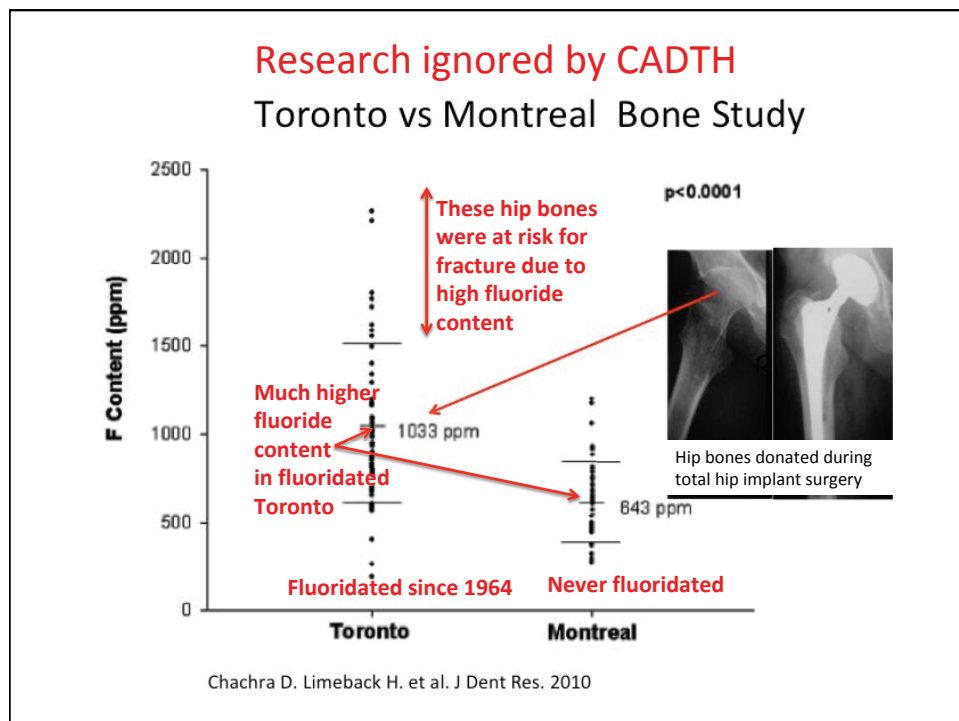
[AREA OF CONCERN]

IS FLUORIDE WEAKENING BONE?

Scientists have focused on fluoride's effects on bone because so much of the chemical is stored there. Studies have shown that high doses of fluoride can stimulate the proliferation of bone-building osteoblast cells, raising fears that the chemical may induce malignant tumors. Fluoride also appears to alter the crystalline structure of bone, possibly increasing the risk of fractures.

Normal Bone Formation **Effects of Excessive Fluoride**

Fagan, D. Second thoughts about fluoride. Sci. Amer Jan, 2008, 74-81.



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- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

Realistic Cost-Benefit analysis of fluoridation in Calgary for 40 years

Equipment upgrade = \$6 million

Cost to fluoridate for 40 years (assuming equipment lasts)
≈ \$50 million

Claimed savings ≈ \$50 million X **\$64** ≈ \$3.2 BILLION

Population of Calgary = 1.2 million

Claimed savings ≈ \$2,670/person

If one tooth is saved by fluoridation, then \$2670 to fix
ONE tooth in EVERY SINGLE Calgarian is CLEARLY

FALSE

One must deduct the cost to treat dental fluorosis, and
the costs of the OTHER ill-health consequences of fluoridation
(brain problems, endocrine effects, side effects in kidney
patients etc.)

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The cost of treating dental fluorosis if Calgary re-instates fluoridation

1. in 40 yrs., 650,000 children under age 6 will be exposed to fluoridated water
2. 1 in 10 (65,000) will end up with objectionable dental fluorosis
3. if half (32,500) get microabrasion and or bleaching, this will cost \$32.5 - \$50 million
4. if 40% (26,000) get bleaching/microabrasion PLUS some cosmetic fillings, this will cost up to \$75 million
5. if the remaining 10% elect to have porcelain veneers the cost is up to \$130 million

Total cost to treat dental fluorosis = \$255million

6. The ACTUAL cost savings of fluoridation is (AT MOST) is one tooth saved from dental decay/person after 40 yrs
-this costs \$175 to repair, so the total dental cost savings is $1.2 \text{ M} \times \$175 = \263 Million

It is cost prohibitive to fluoridate especially when dental fluorosis is considered

Sources:

1. www12.statcan.gc.ca/census
2. www.cochranelibrary.com, CDC
- 3, 4, 5. www.alberta.ca/dental-fees.aspx
6. Slade et al, 2013 J Dent Res

- the weak evidence of fluoridation's effectiveness
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CADTH Dismisses ALL Non-dental Side Effects of Ingested Fluoride

The evidence for EVERY side effect was dismissed by the un-named CADTH authors

Mortality
Atherosclerosis
Hypertension
Cancer
Hip Fracture
Osteoporosis
Musculoskeletal Pain
Neonatal Height and Weight
Down Syndrome

IQ and Cognitive Function
Thyroid Function
Kidney Stones
Chronic Kidney Disease
Gastric Discomfort
Headache
Insomnia
Reproduction
Refractive Errors
Diabetes
Myocardial Infarction

SUMMARY

"There was **insufficient evidence** for an association between water fluoridation at the current Canadian levels and all-cause mortality, atherosclerosis, hypertension, skeletal fluorosis, osteoporosis, musculoskeletal pain, newborns' height and weight, thyroid function, CKD, self-reported health outcomes (gastric discomfort, headache, insomnia), reproduction (fertility, abortion), refractory errors, diabetes, and myocardial infarction."

CADTH completely ignored the 2006 NRC Report and studies that were published after it

Effects of low dose chronic fluoride exposure	what was reported in the 2006 NRC Report	examples of studies published since the 2006 NRC Report
contributing to skeletal fluorosis	-stage II skeletal fluorosis (arthritis) at < 2 ppm fluoride in drinking water	Chachra 2010
negative brain effects	"...IQ deficits in children exposed to fluoride at 2.5 to 4 mg/L in drinking water....the consistency of the results appears significant enough to warrant additional research on the effects of fluoride on intelligence."	Bashash 2017, 2018 NTP review 2018 Yu 2018 Russ 2018 Cao 2019 Green 2019
negative endocrine effects	-decreased thyroid activity, -impaired glucose metabolism, -increased Calcitonin, PTH, -changes in sexual maturity	Malin 2018 Liu 2019
cancer	"Fluoride appears to have the potential to initiate or promote cancers, particularly of the bone, but the evidence to date is tentative and mixed"	Bassin 2006 Alarcón-Herrera, 2019

19-10-15

This slide from J. Johnson of the America Fluoridation Society, is a falsification. The CDATH reports did not bother to look at the original literature and relied on reviews since 2006

Was there evidence at 4.0 ppm showing that fluoride had an effect on ...?

- | | |
|-----------------------------|---------------------------------------|
| • Tooth enamel ✓ | • Cancer ✗ |
| • Liver ✗ | • Musculoskeletal system ✗ |
| • Kidneys ✗ | • Reproduction and development ✗ |
| • Endocrine system ✗ | • Neurotoxicity and neurobehavioral ✗ |
| • Gastrointestinal system ✗ | • Genetic damage ✗ |
| • Immune system ✗ | |



(Source: "Fluoride in Drinking Water: A Scientific Review of EPA's Standards," National Research Council of the National Academies Press, 2006)
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Conclusions of the 2006 NRC Report re: fluoride and stage II skeletal fluorosis

"The current MCLG (4 mg/L) was designed to protect against stage III skeletal fluorosis. As discussed above, the committee judges that stage II is also an adverse health effect, as it is associated with sporadic pain, stiffening of joints, and occasional osteophyte formation on articular joint surfaces. The committee found that bone fluoride concentrations estimated to be achieved from lifetime exposure to fluoride at 2 mg/L (4,000 to 5,000 mg/kg ash) ... fall within or exceed the ranges historically associated with (stage) II... skeletal fluorosis. This suggests that fluoride at 2 mg/L ...might not protect all individuals from the adverse stages of the condition."

Fluoride intake causing moderate dental fluorosis



can lead to Stage II skeletal fluorosis



Bone spurs

19-10-15

Research ignored by CADTH

Low level fluoride exposure can affect sexual development in humans

Study	subjects	fluoride exposure	effect on sexual development
Schlessinger et al, 1956	girls 7-18 yrs. (Newburgh NY)	1.2 ppm in drinking water	earlier menarche by 5 mo.
Farkas et al, 1983	girls 10-19 yrs. (Hungary)	1.09 ppm in drinking water	no significant difference
Liu et al, 2019	girls 10-17 yrs. (Mexico City)	mean urine F = 0.59 ppm	trend is earlier menarche but no significant difference
Liu et al, 2019	boys 10-17 yrs. (Mexico City)	mean urine F = 0.59 ppm	later pubertal development

Research ignored by CADTH

Studies shows teeth are more yellow in fluoridated areas

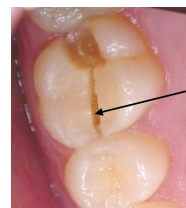
AND more prone to catastrophic fractures

Perceptions of desirable tooth color among parents, dentists and children

JAY D. SHULMAN, D.M.D., M.A., M.S.P.H.;
 GERARDO MAUPOMÉ, C.D., M.Sc., Ph.D.;
 D. CHRISTOPHER CLARK, D.D.S., M.P.H.;
 STEVEN M. LEVY, D.D.S., M.P.H.

(31.6 percent) were dissatisfied with their tooth color, and of those subjects, 552 (70.0 percent) felt that their teeth were too yellow.

JADA, Vol. 135, May 2004 **595**



vertical fracture of the 1st molar in a 14 yr. old

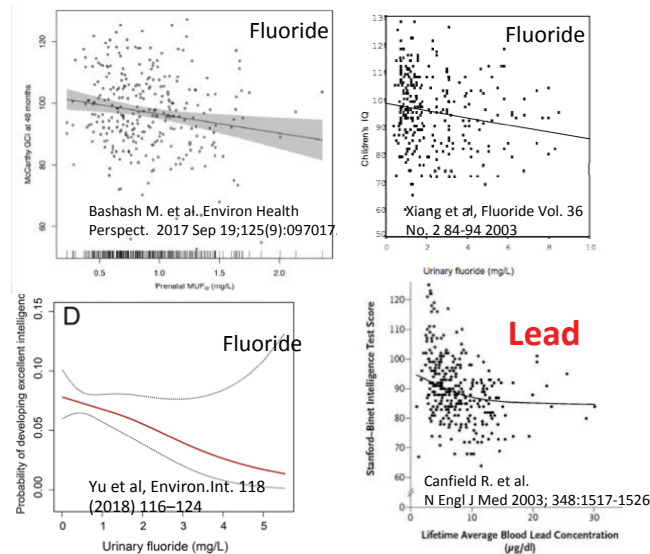


Expensive fracture repair

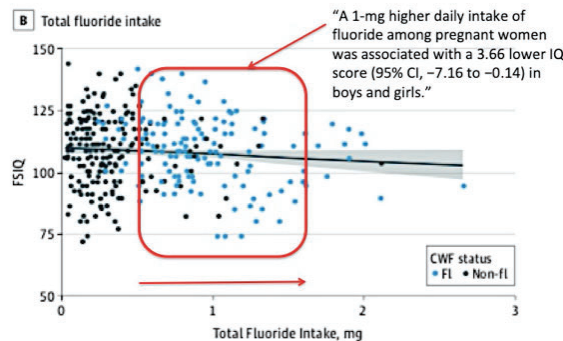
Vieira A et al. J. Dent Res. 2005, 84(10):951

19-10-15

Fluoride & IQ studies: **these studies were NOT reviewed by CADTH** (compare to the Lead-IQ studies that contributed to the banning of lead in drinking water, paint, gasoline etc.)

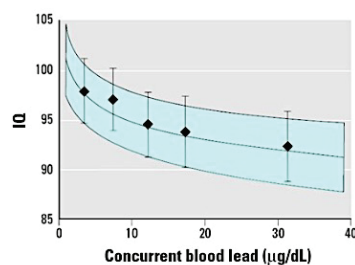


Fluoride is just as neurotoxic as lead according to recent studies



Green et al study the most recent one showing fluoride is as bad as lead

Prenatal Fluoride (from fluoridated water) = lowered IQ by 3.7 points (Green et al, JAMA Ped-2019)



- Low level lead exposure (<5 µg/L) has a more severe effect.
- The loss of about 5 to 10 IQ points has been attributed to the adverse effects of exposure to environmental lead during early childhood.

Environmental lead = lowered IQ by 5 to 10 points (Lanphear et al, EnvHealthPersp.2005)

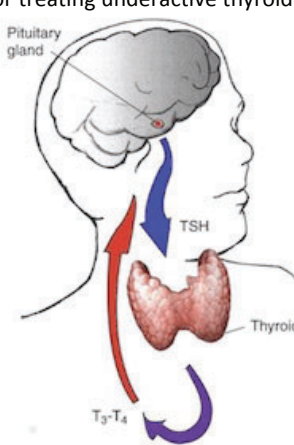
Figure 1: Full IQ vs Concurrent blood lead level (Lanphear et al., 2005)

19-10-15

Canadian Fluoride and Thyroid Study:

“Fluoride exposure among adults with moderate-to-severe iodine deficiencies living in Canada may **increase risk for underactive thyroid gland activity.”**

Synthroid (levothyroxin) is the most prescribed drug in the US (for treating underactive thyroid)



Underactive thyroid leads to


- higher cholesterol
- depression
- fatigue
- hair loss
- weight gain
- memory loss
- sensitivity to cold


In children:

- delayed puberty,
- delayed growth,
- delayed tooth development

Study: Malin AJ, Riddell J, McCague H, Till C. Fluoride exposure and thyroid function among adults living in Canada: Effect modification by iodine status. *Environ Int.* 2018 Dec;121(Pt 1): 667-674. **Not reviewed by CADTH**

Prenatal exposure from fluoridated water is now linked to increased ADHD in children





UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

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Not reviewed by CADTH

Higher levels of urinary fluoride associated with Attention Deficit Hyperactivity Disorder (ADHD) in children

October 10/2018

Higher levels of urinary fluoride during pregnancy are associated with more ADHD-like symptoms in school-age children, according to University of Toronto and York University researchers.

Study: Bashash M, Marchand M, Hu H, Till C, Martinez-Mier EA, Sanchez BN, Basu N, Peterson KE, Green R, Schnaas L, Mercado-García A, Hernández-Avila M, Téllez-Rojo MM. Prenatal fluoride exposure and attention deficit hyperactivity disorder (ADHD) symptoms in children at 6-12 years of age in Mexico City. *Environ Int.* 2018 Dec;121(Pt 1):658-666. doi: 10.1016/j.envint.2018.09.017.

19-10-15

BJPsych

The British Journal of Psychiatry (2018)
Page 1 of 6. doi: 10.1192/bjp.2018.287

Not reviewed by CADTH

Aluminium and fluoride in drinking water in relation to later dementia risk

Tom C. Russ, Lewis O. J. Killin, Jean Hannah, G. David Batty, Ian J. Deary and John M. Starr

“our findings suggest that even these relatively low levels of aluminium and fluoride are associated with deleterious effects on dementia risk, which should be weighed against their beneficial uses.”

**Fluoride is neurotoxic. So is Aluminum
Together they are associated with dementia!**

New Study Links Low Fluoride Exposure to Alzheimer’s Disease

“Fluoride raised the numbers of
senile plaque in (brains of) mice carrying
APP/PS1 double-transgenic mutation”

“long-term exposure to fluoride may be considered a risk
factor in the development of Alzheimer’s Disease.”

...the doses of fluoride exposed to mice were equivalent to 1.5 ppm
(close to the drinking water standard set by WHO) and 15 ppm,
respectively, in drinking water for humans.

CADTH did not review ANY animal research


open access paper

<https://alzres.biomedcentral.com/articles/10.1186/s13195-019-0490-3>

Cao K, et al. Exposure to fluoride aggravates the impairment in learning and memory and neuropathological lesions in mice carrying the APP/PS1 double-transgenic mutation. *Alzheimers Res Ther.* 2019 Apr 22;11(1):35

19-10-15


- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading



Posted on CADTH.ca Apr.2019

EVIDENCE HIGHLIGHTS Highlighting the Evidence

Community Water Fluoridation Programs



Bottom Line

There is consistent evidence to support CWF's benefits in reducing dental caries, and insufficient or no evidence to suggest that it leads to adverse health outcomes.

This is more of a political statement than a scientific one since so much science was ignored.

CADTH's fluoridation report cannot be trusted. It DOES NOT protect Canadians.

19-10-15

Promotion of fluoridation but advising to limit fluoride swallowing from toothpaste makes no sense

Advice: **Limit fluoride toothpaste to avoid swallowing fluoride.**

But encourage toddlers to drink fluoridated water?

What kind of a mixed message is that?



Summary

Why the CADTH reports are biased and not scientific

- the authors (still un-named) relied heavily on previous biased government reviews
- they “cherry picked” studies that only focused on showing safety (e.g. citing Broadbent IQ study as high quality without citing the published critique showing that it was not)
- when the studies were claimed irrelevant to the Canadian setting they were ignored but when they deemed important (e.g. hospital admissions in the UK due to dental decay) they were included
- rigorous studies on fluoride and lowered IQ were ignored (see IQ studies in previous slides of this submission)
- CADTH completely ignored the 2006 NRC report and ALL animal evidence
- CADTH authors made numerous serious errors (e.g. claiming the Peckham study did not cover the entire country when it did, or misinterpreting the results of the Choi fluoride and IQ studies.)
- when there were studies of concern (e.g. 2 studies showing a link to diabetes) they were dismissed as not providing enough proof
- the CADTH’s entire cost analysis was based on ONE weak study in Australia (Arrow et al, 2016) and did not include the cost to treat dental fluorosis
- **In my opinion, the CADTH reports are biased and designed to promote fluoridation, not look at the fluoride science rigorously**

19-10-15

Bottom Line for Calgary Council

- the CADTH reports (and the O'Brien Institute report which is based on CADTH reports) are biased and flawed to promote fluoridation
- the evidence for fluoridation benefit is very weak, and the benefit is incredibly minor if there is one
- it will cost Calgary a lot of money to restart fluoridation and continue it for years; that will NOT be cost effective
- the evidence is mounting that children will be harmed by fluoridation
- if the O'Brien Institute for Public Health wants to protect Calgarians, it should recommend the status quo (no fluoridation). This would mean Calgary will continue to stand with BC, Quebec and most of the rest of the world outside of the US (+ New Zealand, Ireland & Australia) in NOT adding industrial waste fluoride to drinking water

de Grood, Anna

From: Lazic, Sanja on behalf of City Clerk
Sent: Wednesday, August 07, 2019 9:55 AM
To: Public Submissions
Subject: FW: [EXT] Please Note: I say NO to the addition of fluoride to our water supply

From: Brenda Gibbs [mailto:brendahpgibbs@gmail.com]
Sent: Tuesday, August 06, 2019 4:16 PM
To: City Clerk
Subject: [EXT] Please Note: I say NO to the addition of fluoride to our water supply

To those whom it may concern at the office of the City Clerk of Calgary,

I am writing this email to you today to inform you that I absolutely, unequivocally, do not agreed to the fluoridation of our municipal water supply.

For all of the reasons given on the SafeWaterCalgary.com website, which I have reviewed, my answer to fluoridation, as one of your municipal constituents, whom you so faithfully serve, is an emphatic "No."

As noted on the Safe Water Calgary website:

when municipalities fluoridate their water they do not use pharmaceutical grade chemicals which are used in dental products & prepared in laboratories to ensure high levels of purity. The vast majority of municipalities who still fluoridate actually [add industrial grade fluoridation chemicals from the phosphate fertilizer industry that come with trace amounts of arsenic, lead and other contaminants.](#)

It is also noted that it is very difficult to remove fluoride from water once added. It is against the law to add this industrial waste product to natural water supplies because of it's toxic effects, yet, most of the fluoridated water goes into our waste water supply and ends up in the natural water ways.

Those who choose to use pharmaceutical grade fluoride can freely choose to do so. The City of Calgary could consider providing fluoride drops, toothpastes and mouth rinses to those in need who require financial assistance in obtaining such desired fluoridated products.

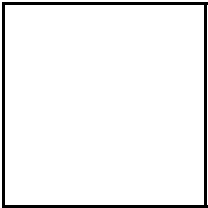
This option would not violate my right as a citizen who says 'No', to having an industrial waste chemical added to my drinking and bathing water, and honour the rights of those who do want to consume such products into their body, as a right of choice.

Thank you, for your time in receiving my opinion on this matter. Thank you, for your dedication in serving our city.

With kind regards,
Brenda H.P. Gibbs

7 Cougarstone Park S.W.
Calgary AB
T3H 4Z9
Canada

mobile number 403 880 0398



de Grood, Anna

From: Ian Mitchell <ianfromcalgary@me.com>
Sent: Tuesday, October 01, 2019 10:32 AM
To: Public Submissions
Subject: [EXT] Community and Protective Services Committee
Attachments: Fluoride letter Sept 30.pdf

TO
Libbey McDougall
Acting Legislative Coordinator
Governance & Legislative Services,
City Clerk's Office
The City of Calgary

Dear Ms. McDougall,

On behalf of medical colleagues and myself, I have sent the attached letter to all members of City Council.

Would you kindly ensure that this letter forms part of the record of the Community and Protective Services Committee's deliberation record for its meeting on October 29, 2019?

Yours sincerely,

Ian Mitchell, Clinical Professor, Paediatrics, Cumming School of Medicine



Cumming School of Medicine
2500 University Drive NW
Calgary, AB, Canada T2N 1N4
ucalgary.ca

His Worship, Mayor Naheed Nenshi, and
Calgary City Councillors
800 Macleod Trail SE,
Calgary, AB T2P 2M5

Dear Members of City Council,

As professors of the University of Calgary Cumming School of Medicine, we write to express our serious concerns with O'Brien Institute's Report¹ (the "O'Brien Report").

Our concerns, discussed in greater detail below, are that:

1. There is no evidence that fluoridation causes harm to the brain, even in the studies referenced by the O'Brien Report;
 - A. Data from countries like China, India and Mexico are not applicable to North America;
 - B. The significance of the August 2019 York University study is overstated; one of the study's coauthors, Christine Till, has even said: "I think this message could be easily misconstrued as us saying, don't drink fluoridated water — we're not saying that."²
2. Public health agencies have reviewed such studies and continue to recommend fluoridation;
3. The Report gives no consideration to the adverse effects of dental pain on normal child development;
4. The Report errs in trying to find a "middle ground" when one of the "sides" (pro-fluoridation) is overwhelmingly supported by robust, high-quality science;
5. The Report fails to acknowledge that Canadian trial and appellate courts have affirmatively decided that fluoridation is lawful, and Calgarians have voted for fluoridation in two plebiscites;
6. We ask you please to seek advice from the people responsible for the health of Calgary's population: the Lead Medical Officer of Health for Calgary and the Provincial Dental Public Health Officer

1. No solid evidence that fluoridation causes harm to the brain

When a study comments on an association between A and B, what the study is saying is that A and B have been seen together, but not that A causes B. For example, cowboy hats are commonly seen in Calgary parades, but the hats do not cause the parades.

Deciding causation requires a much more complex series of decisions, based on a variety of different types of evidence and reasoning, often summarised as the “Hill criteria”. None of the “association” studies have been accepted by the scientific community as evidence for harm from fluoridation.

a. China, India, Mexico association studies not applicable here

Many studies that associate fluoride with potential harm to the brain were conducted in countries like China,³ India⁴ and Mexico.⁵ The Chinese and Indian studies were done in areas with high levels of fluoride in groundwater or in the air from burning coal in the home, and so are not applicable in Canada. Mexico fluoridates salt, which produces wide variation in intake, but fluoride levels seem to explain little of the variation, so the meaning is difficult to interpret. In addition, the “Fluoride” journal (see footnote 3) is a partisan publication that is neither peer reviewed nor scientifically rigorous. The O’Brien Report relies on these studies.

b. York University study has already been heavily critiqued by the medical and scientific community

The O’Brien Report focusses on an August 2019 study from York University.⁶ Unusually for a publication in a prestigious journal, that study has already been deeply criticized by the medical and scientific community.⁷ The York University study found no difference in average IQ among either boys or girls in fluoridated compared to non-fluoridated cities (108.21 v 108.07). The researchers appear to have looked at the data again to find a difference and eventually claimed to find a difference only on the reading test and only in boys. This outcome is contested, with several scientists claiming that the study does not show that children will have lower IQs if their mothers consume fluoride.⁸

In addition, the York University study’s authors made public health recommendations. Credible scientists do not make recommendations based on a single study that offers no plausible mechanism for its claim, or that is based on studies that have equally serious credibility issues.

As a whole, the studies that the O’Brien Report relies upon regarding cognitive effects have been soundly criticized and/or rejected by the scientific and medical community. Globe and Mail writer, André Picard, summarized the matter, “Fluoridation won’t make you dumber but the ‘debate’ about its safety will”.⁹

2. Public Health Agencies across Canada are already tracking these “association” studies and have not found them to be relevant to their fluoridation recommendations

The O'Brien Report surprisingly suggests that public health officers are not doing their job when it states, "new emerging studies on fluoride and cognition need to be tracked and carefully evaluated on an ongoing basis". But analysis of such studies does occur routinely and promptly whenever a new study is published. Within 20 days of the York University's study's publication, *Health Canada* had released its analysis that the study was unable "to confirm a causal relationship between prenatal fluoride and deficits in child IQ." *Health Canada* then reminded readers that it regularly reviews "the state of the science on the health effects of fluoride and has concluded the current available science indicates that fluoride at levels [below 1.5 parts per million] does not pose a health concern."

In other words, it is incorrect for the O'Brien Institute to suggest that claims about fluoride and the brain have not already been taken into account in making policy decisions. Public health agencies have and do consider such studies and continue to recommend fluoridation based on their expert assessment of the quality of studies, the overwhelming weight of the evidence favouring fluoridation and its prevention of harms from dental decay.

3. Missing aspects of O'Brien Report

The O'Brien Report fails to acknowledge or discuss the scientifically accepted fact that dental pain can prevent children from eating, sleeping, playing and attending school.^{10,11} In other words, by preventing dental decay by approximately 35%,¹² fluoridation helps children's brains to develop normally.

The Report makes no mention of the 2018 study¹³ led by the U.S. National Toxicology Program (NTP). The coauthors of this study reported that they "observed no exposure-related differences in motor, sensory, or learning and memory performance" testing.

4. False balance: the overwhelming weight of evidence finds fluoridation benefits and no significant harms

Because thousands and indeed most scientific studies report fluoride benefits and no significant harm, it is an error arbitrarily to assume that there are two equally legitimate "sides" to the fluoride dispute.

5. Canadian Courts have ruled on this issue and Calgarians have voted in favour of fluoridation twice

The "science" asserted by Canadian anti-fluoridationists has already been critically evaluated and rejected by multiple Canadian courts (the *Millership* decisions^{14,15,16}). Those court decisions also are in keeping with the rule that when plebiscites favour fluoridation, it is a lawful exercise of government power to fluoridate. When Calgary held

fluoridation plebiscites in 1989 and 1998, the majority of voters favoured fluoridation. Calgarians have not voted to remove fluoridation.

6. What we ask our Calgary City Council members to do

Infection, pain and cost result from dental decay, which is the most common chronic disease of childhood. Calgary children's decayed tooth surfaces increased by 146% within two years of fluoridation cessation.¹⁷ Calgary pediatric dentists, pediatric infectious disease specialists and anesthesiologist state that there is an alarming rise in dental decay in Calgary toddlers. Fluoridation reduces dental decay by from 26 to 44%¹⁸.

The anti-fluoridation camp wrongly places on you the burden of critically evaluating fluoridation science. It is true that Calgary City Council members must make a decision, but that decision should rely on the scientific advice provided by the public health officers whose mandate is the science of the health, safety and vitality of Calgary's population.

For that reason, we ask you please to consult with your advisors, the public health officers responsible for Calgary's population in this matter. They are your advisors on the science, safety and public health risks and benefits of fluoridation. They are responsible for evaluating the weight of the scientific evidence and scientific consensus on the known preventative benefits of community water fluoridation, against the claims that it causes harm.

As you might know, medical officers of health have five years of post-medical school training in public health and preventive medicine, and the Public Health Dental Officer has post dental school training in public health dentistry. Their contact information is

Dr. David Strong

Zone Lead Medical Officer of Health

Ph: 403-955-6706

Email: David.Strong@ahs.ca

Dr. Rafael Figueiredo

Provincial Dental Public Health Officer

Ph: 780-342-0265

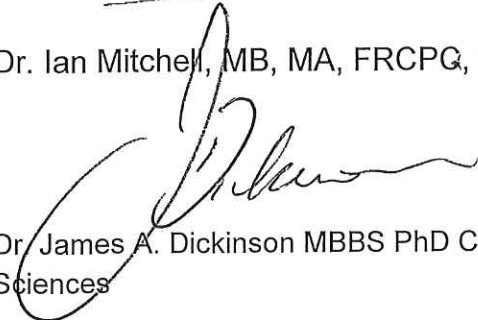
Email: Rafael.Figueiredo@ahs.ca

Thank you very much for your service to Calgary and Calgarians.

Respectfully submitted,



Dr. Ian Mitchell, MB, MA, FRCPQ, Clinical Professor, Department of Paediatrics



Dr. James A. Dickinson MBBS PhD CCFP. Professor of Family Medicine and Community Health Sciences



Dr. Christopher James Doig MD MSc FRCPC. Professor, Departments of Community Health Sciences, Critical Care Medicine, and Medicine



Dr. M. John Gill, BSc, MB, ChB, MSc, FRCPC, FACP, Professor, Departments of Medicine, Microbiology, Immunology and Infectious Disease

References

¹ University of Calgary O'Brien Institute for Public Health, 'Community Water Fluoridation: A Report for Calgary City Council, July 2019
<https://files.constantcontact.com/488316d6501/519f3901-3457-4f21-9fc4-D0a449c351a8.pdf>

² Christine Till, quoted by Nidhi Subbaraman, Buzzfeed, September 14, 2019,
<https://www.buzzfeednews.com/article/nidhisubbaraman/fluoride-water-iq-kids-debate>

³ Choi, Anna L., Guifan Sun, Ying Zhang, and Philippe Grandjean. "Developmental fluoride neurotoxicity: a systematic review and meta-analysis." *Environmental health perspectives* 120, no. 10 (2012): 1362-1368 <https://tinyurl.com/yyqtcgrm>

⁴ Trivedi, M. H., R. J. Verma, N. J. Chinoy, R. S. Patel, and N. G. Sathawara. "Effect of high fluoride water on intelligence of school children in India." *Fluoride* 40, no. 3 (2007): 178-183.
<https://tinyurl.com/y38f8bow>

⁵ Bashash, Morteza, Deena Thomas, Howard Hu, E. Angeles Martinez-Mier, Brisa N. Sanchez, Niladri Basu, Karen E. Peterson et al. "Prenatal fluoride exposure and cognitive outcomes in children at 4 and 6–12 years of age in Mexico." *Environmental health perspectives* 125, no. 9 (2017): 097017.
<https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP655>

⁶ Green, Rivka, Bruce Lanphear, Richard Hornung, David Flora, E. Angeles Martinez-Mier, Raichel Neufeld, Pierre Ayotte, Gina Muckle, and Christine Till. "Association between maternal fluoride exposure during pregnancy and IQ scores in offspring in Canada." *JAMA pediatrics* (2019).

⁷ Many organizations and individuals have criticized the York University study. Here is a sample:

- American Association for Dental Research, "AADR Comment on Effect of Fluoride Exposure on Children's IQ Study" August 20, 2019, <http://ga.dentalresearchblog.org/?p=3409>

"It must be emphasized that this study identifies an *association* between prenatal exposure and IQ and that the results cannot be extrapolated to imply a causative effect of fluoride on IQ."

- Science Media Centre, "Expert reaction to study looking at maternal exposure to fluoride and IQ in children", August 19, 2019 <https://www.sciencemediacentre.org/expert-reaction-to-study-looking-at-maternal-exposure-to-fluoride-and-iq-in-children/>

- Prof Grainne McAlonan, Professor of Translational Neuroscience, Sackler Centre for Translational Neurodevelopment, King's College London, said:
"if you look at average IQ in the children from fluoridated and non-fluoridated groups these are virtually the same: 108.07 vs. 108.21 respectively. I was therefore surprised that the study went on to look for a relationship between fluoridation and IQ, given these figures."
- Prof Thom Baguley, Professor of Experimental Psychology, Nottingham Trent University, said:
"First, the claim that maternal fluoride exposure is associated with a decrease in IQ of children is false. This finding was non-significant (but not reported in the abstract)."
- Prof Alastair Hay, Professor (Emeritus) of Environmental Toxicology, University of Leeds, said:
"A curious finding is that the link between maternal urine fluoride and IQ decrements is only seen in boys and not girls. And the IQ decrement is not present for verbal IQ in boys. Whilst the authors are just reporting what they found I find these sex differences difficult to explain. With a neurotoxicant you might expect both sexes to be affected."

- Science-Based Medicine, "New study purporting to show correlation between fluoride and IQ comes under heavy criticism", August 21, 2019, <https://sciencebasedmedicine.org/maternal-fluoride-and-iq/>

"We cannot, however, generalize from these findings or make any public recommendations. Overall the results are unconvincing and are most consistent with noisy data with the effects largely due to a few outliers."

-
- The American Council on Science, "No, Fluoride Doesn't Lower IQ. It Fails to Satisfy Hill's Criteria of Causality", August 19, 2019, <https://www.acsh.org/news/2019/08/19/no-fluoride-doesnt-lower-iq-it-fails-satisfy-hills-criteria-causality-14229>

"The results are very borderline in terms of statistical significance." Indeed, the reported drop in IQ for boys was about 4.5 points, but the confidence interval (-8.38 to -0.60) almost included zero. (In statistics, if a confidence interval includes zero, it means "nothing to see here.")

- Ken Perrott PhD, New Zealand "If at first you don't succeed . . . statistical manipulation might help", Open Parachute, August 22, 2019, <https://tinyurl.com/yxzh5gfu>

"So how did they manage to find an effect they could attribute to fluoride, or fluoridation, despite the mean values above? They basically resort to statistical manipulation – and this has opened up an intense controversy about the paper."

⁸ See for example, Steven Novella, "Maternal Fluoride and IQ", Science-Based Medicine, August 21, 2019, <https://sciencebasedmedicine.org/maternal-fluoride-and-iq/>; Rene Najera, "The Hijacking of Fluorine 18.998," Three parts, <https://epidemiological.net/2019/09/21/the-hijacking-of-fluorine-18-998-part-two/>

⁹ André Picard, "Fluoridation won't make you dumber but the 'debate' about its safety will", Globe and Mail, August 23, 2019. <https://www.theglobeandmail.com/opinion/article-fluoride-wont-make-you-dumber-but-the-debate-about-its-safety/>

¹⁰ Casamassimo, Paul S., Sarat Thikkurissy, Burton L. Edelstein, and Elyse Maiorini. "Beyond the dmft: the human and economic cost of early childhood caries." *The Journal of the American Dental Association* 140, no. 6 (2009): 650-657. https://www.mambaby.com/uploads/tx_ddownload/ECC1.pdf

¹¹ Blumenshine, Stephanie L., William F. Vann Jr, Ziya Gizlice, and Jessica Y. Lee. "Children's school performance: impact of general and oral health." *Journal of public health dentistry* 68, no. 2 (2008): 82-87. <https://tinyurl.com/y285ntld>

¹² Australian National Health and Medical Research Council, Water Fluoridation and Human Health in Australia, Public Statement 2017 <https://www.nhmrc.gov.au/sites/default/files/documents/reports/fluoridation-public-statement.pdf>

¹³ McPherson, Christopher A., Guozhu Zhang, Richard Gilliam, Sukhdev S. Brar, Ralph Wilson, Amy Brix, Catherine Picut, and G. Jean Harry. "An evaluation of neurotoxicity following fluoride exposure from gestational through adult ages in long-evans hooded rats." *Neurotoxicity research* 34, no. 4 (2018): 781-798. <https://www.ncbi.nlm.nih.gov/pubmed/29404855>

¹⁴ *Millership v. British Columbia*, 2003 BCSC 82 (CanLII), <http://canlii.ca/t/5dzw>

¹⁵ *Millership v. Her Majesty, the Queen*, 2004 BCCA 9 (CanLII), <http://canlii.ca/t/1g7hf>

¹⁶ *Millership v. Canada*, 2005 FC 1455 (CanLII), <<http://canlii.ca/t/1lwdf>>

¹⁷ McLaren, Lindsay, Steven Patterson, Salima Thawer, Peter Faris, Deborah McNeil, Melissa Potestio, and Luke Shwart. "Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices." *Community dentistry and oral epidemiology* 44, no. 3 (2016): 274-282. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/cdoe.12215>

¹⁸ Australian National Health and Medical Research Council, Water Fluoridation and Human Health in Australia, Public Statement 2017
<https://www.nhmrc.gov.au/sites/default/files/documents/reports/fluoridation-public-statement.pdf>

de Grood, Anna

From: Stevens, Jodie on behalf of City Clerk
Sent: Thursday, September 12, 2019 8:44 AM
To: Jean Welling Katayama; City Clerk; Public Submissions
Subject: RE: [EXT] Fluoridation

Follow Up Flag: Follow up
Flag Status: Completed

Good morning Public submissions,

Please see the below concern regarding Fluoride.

Thank you

Jodie

From: Jean Welling Katayama [mailto:jjeanwk@yahoo.ca]
Sent: Wednesday, September 11, 2019 9:41 PM
To: City Clerk
Subject: [EXT] Fluoridation

To the city clerk:

I believe we all have the right to safe, clean, unmedicated water.. I do NOT want the city water to be fluoridated. People who want fluoridation can easily supplement; however, people like me cannot take the fluoride out of the water. I do NOT want to be forced to drink fluoridated water. I have medical issues which fluoride will make worse. Please use the tax money on something that is necessary for our city.

Thanks.

Jean Welling Katayama

de Grood, Anna

From: Stevens, Jodie
Sent: Wednesday, September 11, 2019 7:53 AM
To: shiggy67@shaw.ca; City Clerk; Public Submissions
Subject: RE: [EXT] Fluoride

Follow Up Flag: Follow up
Flag Status: Completed

Good Morning Public Submission,

Please see the below feedback on the topic of Fluoride

Thank you

Jodie Stevens

Business & Logistics Liaison – Planning, Reporting, Finance, 311 & Safety
City Clerk's Office - Citizen and Corporate Services
313 – 7 Ave SE
P.O Box 2100, Stn M Mail Code #8007
Calgary, AB T2P 2M5
P: 403-268-5851
E: jodie.stevens@calgary.ca

One City, One Voice



ISC: Protected

From: Janet
Sent: Tuesday, September 10, 2019 12:14 PM
To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk
Subject: [EXT] Fluoride
Importance: High

Dear Mayor and Council,
I reside in the community of Crestmont, Calgary, AB.

I ask you do not favor water fluoridation to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function. I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone. Citizens have not given their consent to be mass medicated. For a handful of people to force this would be completely unethical. If people want fluoride, they can take it separately and on their own.

I look forward to your response,

Janet Shygera



Virus-free. www.avg.com

de Grood, Anna

From: Stevens, Jodie
Sent: Wednesday, September 11, 2019 7:55 AM
To: mshygera@shaw.ca; City Clerk; Public Submissions
Subject: RE: [EXT] Water Fluoridation

Follow Up Flag: Follow up
Flag Status: Completed

Good morning Public Submissions,

Please see the below concern regarding Fluoride.

Thank you

Jodie Stevens

Business & Logistics Liaison – Planning, Reporting, Finance, 311 & Safety
City Clerk's Office - Citizen and Corporate Services
313 – 7 Ave SE
P.O Box 2100, Stn M Mail Code #8007
Calgary, AB T2P 2M5
P: 403-268-5851
E: jodie.stevens@calgary.ca

One City, One Voice



ISC: Protected

From: Michael Shygera
Sent: Tuesday, September 10, 2019 12:50 PM
To: Office of the Mayor ; Sutherland, Ward ; Magliocca, Joe ; Gondek, Jyoti ; Chu, Sean ; Chahal, George ; Davison, Jeffrey R. ; Farrell, Druh ; Woolley, Evan V. ; Carra, Gian-Carlo S. ; EAWard10 - Lesley Stasiuk ; Keating, Shane ; Demong, Peter ; Colley-Urquhart, Diane ; Farkas, Jeromy A. ; City Clerk
Subject: [EXT] Water Fluoridation

Dear Mayor and Council,
I reside in the community of Crestmont, Calgary, AB.

I ask that you **do not favor water fluoridation** to be reintroduced in Calgary. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function. I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone. Citizens have not given their consent to be mass medicated. For a handful of people to force this would be completely unethical. If people want fluoride, they can take it separately and on their own.

I look forward to your response,

Warm regards,

Mick Shygera

de Grood, Anna

From: Habkirk, Bobbi
Sent: Tuesday, October 08, 2019 8:32 AM
To: Public Submissions
Cc: City Clerk
Subject: FW: [EXT] It's Not Your Right to Choose for Me/Notice of Liability

Bobbi Habkirk
Business & Logistics Liaison
City of Calgary
City Clerk's Office | Mail Code #8007
P.O Box 2100, Stn M
Calgary, AB T2P 2M5
P: 403-268-8885
E: bobbi.habkirk@calgary.ca

One City, One Voice

-----Original Message-----

From: Amanda Brown [mailto:becausejudo@gmail.com]
Sent: Monday, October 07, 2019 11:35 PM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] It's Not Your Right to Choose for Me/Notice of Liability

Calgary City Clerk

RE: It's Not Your Right to Choose for Me/Notice of Liability

null

Dear Mayor and Council,

I volunteer in Calgary on a weekly basis and don't want to have to drink fluoride-tainted water from municipal taps. I put you on notice that I will hold you personally liable for the stress/bodily injury you will cause me as a result of making a conscious decision to reintroduce fluoride to the Calgary municipal water supply, despite having free access to the wealth of studies that prove artificial fluoridation causes harm.

At a time when you are considering major cuts to the budget, including to fire and safety services, fluoridation makes no sense. You have bigger spending priorities.

Also, a recent study found that fluoridation does not save money. In fact, if you factor in dental fluorosis and corrosion to the water infrastructure caused by the acidic additive, it could cost our residents tremendously:

[https://urldefense.proofpoint.com/v2/url?u=https-](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ncbi.nlm.nih.gov_pmc_articles_PMC4457131_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=T4SyBiH0fKhsiW5ZZ1ZQIWZicZQzOnAnPNrgKYxncKg&m=c6K7T6pu9HXoqlRDOsYS7ETL6Wniq7-iS9E_dxbhtiU&s=T6CqhPFibQXpoPTKuGxa1EQ9o9zitfCE-CxbpQX3pQI&e=)

[3A__www.ncbi.nlm.nih.gov_pmc_articles_PMC4457131_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=T4SyBiH0fKhsiW5ZZ1ZQIWZicZQzOnAnPNrgKYxncKg&m=c6K7T6pu9HXoqlRDOsYS7ETL6Wniq7-iS9E_dxbhtiU&s=T6CqhPFibQXpoPTKuGxa1EQ9o9zitfCE-CxbpQX3pQI&e=](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ncbi.nlm.nih.gov_pmc_articles_PMC4457131_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=T4SyBiH0fKhsiW5ZZ1ZQIWZicZQzOnAnPNrgKYxncKg&m=c6K7T6pu9HXoqlRDOsYS7ETL6Wniq7-iS9E_dxbhtiU&s=T6CqhPFibQXpoPTKuGxa1EQ9o9zitfCE-CxbpQX3pQI&e=)

I don't believe you have the right to force what you consider a medical intervention on me, or my son who's a student at the U of C.

I find it reprehensible that you ignore the significant number of studies that demonstrate the harm to young and old when artificial fluoride is ingested.

Please vote against fluoridation. Fire, police, infrastructure, roads, etc. need to come first. Residents can brush their teeth, buy fluoridated bottled water, or get an annual dental cleaning inexpensively.

Sincerely,
- Amanda Brown
Okotoks

Sincerely,
Amanda Brown

Okotoks, AB

From: [Habkirk, Bobbi](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: FW: [EXT] No to Fluoridation!!! - Lots of Facts
Date: Wednesday, October 09, 2019 8:42:20 AM

Good Morning,

I think this should come to you folks...

Cheers,

Bobbi Habkirk

Business & Logistics Liaison
City of Calgary
City Clerk's Office | Mail Code #8007
P.O Box 2100, Stn M
Calgary, AB T2P 2M5
P: 403-268-8885
E: bobbi.habkirk@calgary.ca

One City, One Voice



From: Mike Gigliuk [mailto:mgigliuk@devencoreab.com]
Sent: Tuesday, October 08, 2019 7:27 PM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] No to Fluoridation!!! - Lots of Facts

SOME POINTS ABOUT ARTIFICIAL WATER FLUORIDATION

· Artificial water fluoridation, otherwise known as the addition of toxic industrial scrubber waste product from Florida and China to our public water, is a failing public health practice. Fluoride and water fluoridation are not safe, effective, or ethical.

- Fluoride is not needed for a single body function.
- There is no such thing as a fluoride deficiency.
- The latest studies showing neurotoxicity are the most alarming as the damage to our kids is essentially irreversible.
- Artificial water fluoridation is a form of mass medicating without informed consent. There is no personal freedom of choice. UNESCO: "In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent."
- Governments that institute artificial water fluoridation perform no monitoring or follow up ever on the population thus are unaware of the negative impacts.
- There is no control of dose or dosage for there is no control of the water people drink or adsorb transdermal.
- Only 5% of the world still participates in this antiquated practice.
- The fluoride ion is very small and very difficult to remove from water. It requires expensive reverse osmosis or distillation.
- 99% of water is not consumed but is used to flush toilets, water lawns, etc. and goes into our environment unchecked. The Canadian Environmental Protection Act classifies fluoridation products as persistent, bio-accumulative and toxic to the environment and nearly all of the water treated with fluoridation products ends up back in the environment with less than 1% used for drinking.
- Natural calcium fluoride in our rocks and rivers is very tightly bound and behaves very differently in our bodies than the industrial waste hydrofluosilicic acid which is the form used by cities adding fluoride to water.
- Voting whether or not to medicate other people by plebiscite is highly unethical.
- In Canada 98% of BC and Quebec are not fluoridated. BC boasts of having some of the best oral health in Canada.
- 97% of Europe is not fluoridated-much more progressive than us in many ways.
- Fluoride, for those who think it is a useful intervention, is available easily and cheaply with toothpaste, from an MD or pharmacist, from dentist as sealants, gels and rinses, and from a variety of bottled drinks, teas and processed foods.
- The pro fluoridationists seem to believe that repeating the words "safe and effective" many times over will actually make it so.
- There are now well over 2,000 studies showing harm and damage to virtually

all organs and body systems.

- Around 15 Nobel Laureates in Medicine have made strong statements about fluoridation, some calling it the biggest scam ever propagated against humanity.
- Fluoride breaches and crosses the placental and blood brain barriers, designed to protect us against such toxins. Some research highlights how fluoride easily displaces iodine in the body, iodine being indispensable to human health.
- The most harmed by side effects are the fetus, babies, children, the elderly, the chronically ill, and people of colour.
- People that want or need to avoid swallowing fluoride (to avoid dental fluorosis, those who suffer kidney or thyroid impairment, mixing baby formula etc.) deserve equitable access to safe drinking water and should not be burdened with finding and paying for an alternative source of water.

From: [Diane](#)
To: [Public Submissions](#); [City Clerk](#); [Office of the Mayor](#); [Farkas, Jeromy A.](#); [Sutherland, Ward](#); [Chu, Sean](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Colley-Urquhart, Diane](#); [Demong, Peter](#)
Cc: SafeWaterCalgary@gmail.com
Subject: [EXT] Oct 2019 Fluoride hearing - NO TO FLUORIDE
Date: Friday, October 11, 2019 8:32:28 AM

Re: Fluoride – we must take heed as a society and quit poisoning ourselves with fluoride. For the people who want to take fluoride, there are many choices for them to do so. The rest of us, animals, birds, plants, trees etc, do not if the city is trying to mandate this. Please concentrate your efforts on making decisions that ENHANCE a healthy lifestyle and clean environment. Why would you even consider entertaining something so antiquated and so damaging to babies, pets, the elderly, the sick, just to name a few? And at the same time, poison people who are already healthy. We need leaders that are much more progressive in their thinking.

Regards,
Diane Timothy

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: FW: [EXT] Our Kids Don't Want Dental Fluorosis
Date: Tuesday, October 15, 2019 9:14:58 AM

-----Original Message-----

From: Dr Simona Tibu [<mailto:sgabriela72@hotmail.com>]
Sent: Sunday, October 13, 2019 7:59 PM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Our Kids Don't Want Dental Fluorosis

Calgary City Clerk

RE: Our Kids Don't Want Dental Fluorosis

null

Dear Mayor and Council,

If you fluoridate our drinking water you will absolutely increase dental fluorosis rates significantly. Numerous studies show this, including the Cochrane Collaboration's review of water fluoridation.

The CDC reported that in 2010, the dental fluorosis rates in the U.S. were over 40% of teens. The CDC reported this year that the rate has increased to 61% as more children are already overexposed to fluoride from toothpaste:

Children with dental fluorosis can suffer significant embarrassment and anxiety over the appearance of their teeth. No matter how much they might brush and floss, the fluorosis stains do not go away. In cases of severe fluorosis, a child may be perceived as having “dirty” or “rotten” teeth, which can cause significant damage to a child's self esteem and emotional well-being. Even “mild” fluorosis — particularly when present on the front two teeth — can be highly objectionable.
https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_studies_dental-5Ffluorosis04b_&d=DwlFaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=T4SyBiH0fKhsiW5ZZ1ZQIWZicZQzOnAnPNrgKYxncKg&m=d-NJaFQHtQ6ULaJVh226cNwVBzMRWMFu3FYGtBRmfoM&s=cbBZNx_dE_KRPGb3Xb4VLct0_DGcgri4kV7dyHu6EU&e=

The teeth are not the only tissue in the body that accumulate fluoride (the bones, pineal gland, and arteries accumulate it as well). There is no apparent reason, therefore, why fluoride's effects on the body will be limited to the teeth.

As noted by Dr. Hardy Limeback, “it is illogical to assume that tooth enamel is the only tissue affected by low daily doses of fluoride ingestion.” According to the late Dr. John Colquhoun, “Common sense should tell us that if a poison circulating in a child's body can damage the tooth-forming cells, then other harm also is likely.”

Thank you.

Sincerely,
Dr Simona Tibu

Calgary, AB

From: [Barbaster, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] The Problem isn't lack of fluoridation, but high dental fees
Date: Tuesday, October 15, 2019 9:15:34 AM

-----Original Message-----

From: Dr Simona Tibu [<mailto:sgabriel72@hotmail.com>]
Sent: Sunday, October 13, 2019 8:02 PM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] The Problem isn't lack of fluoridation, but high dental fees

Calgary City Clerk

RE: The Problem isn't lack of fluoridation, but high dental fees

null

Dear Councilors,

There is no shortage of fluoride in Calgary. There are no access issues. Anyone can find fluoride toothpaste, rinse, floss, fluoridated bottled water, or fluoride supplements for cheap at any bodega, grocery store, or pharmacy (for supplements).

Any dental problem is not due to lack of fluoride, but high dental fees set by the lobbying organization that represents Alberta dentists: https://urldefense.proofpoint.com/v2/url?u=https-3A__www.theglobeandmail.com_opinion_the-2Dcorbitant-2Dcost-2Dof-2Ddentist-2Dvisits-2Din-2DAlberta-2Dcannot-2Dbe-2Dbrushed-2Doff_article36153690_&d=DwlCaQ&c=jdmIHby_BzoqwoYzPslUCHSCnNps9LuidNkyKDuvdq3M&r=T4SyBiH0fKhsiW5ZZIZQIWZicZQzOnAnPNrgKYxncKg&m=nVoQR00jMb6nwrpUEP3z8hn6fIP4cRQ157u3ryFIILQU&s=Ua8Cb1mN8cHorQ5wQR14JvCxCksMiO60Ubl7rOd8&e=

It's time for the government to step in an call for a revised fee schedule for basic dental services instead of paying the phosphate fertilizer industry for their waste to dump in our drinking water.

Please oppose fluoridation.

Thank you,

Sincerely,
Dr Simona Tibu

Calgary, AB

From: [IVOR GREEN](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission re fluoride hearing October 29
Date: Wednesday, October 16, 2019 9:43:31 AM
Attachments: [FLUORIDE SUBMISSION OCT 29 2019.docx](#)

Good morning

Attached is my submission.

Could you please acknowledge successful receipt

Thank you

Ivor

SUBMISSION REGARDING FLUORIDE HEARING OCTOBER 29 2019

Ivor Green
428 37th Avenue NW
Calgary T2K 0C5
403-971-9264

Submission to the Standing Policy Committee on Community and
Protective Services for October 29 2019.

I have lived in Calgary since 1975

EXECUTIVE SUMMARY

COUNCILLORS GUARDIANS OF OUR WATER

There are thousands of studies, surveys and reviews available. It is incumbent on Council to fully acquaint themselves with the subject and make an informed decision as the City will be held responsible for future outcomes. The City does not need a class action lawsuit in the future which will likely name individual councillors that voted for putting fluorosilicic acid back in our water.

“Element and MIREC studies are well done and well respected and are a big caution about fluoridation until we know more.” O’Brien Institute 2019

FLUOROSIS

Fluorosis is on the rise in Canada and has reached epidemic proportions in the USA. This is clear evidence that the children affected have too much fluoride in their bodies.

WHAT IS ADDED TO OUR WATER

Fluorosilicic acid is the additive of choice – a highly toxic chemical. This is not the same as the naturally occurring calcium fluoride that is found in the Bow and Elbow rivers.

DOSAGE

When fluorosilicic acid is added to drinking water there is no control over dosage. My research concludes if it is to help anyone it is only in the formative stages of teeth up to the age of 8 by which time all permanent teeth are formed although not all visible. Adults cannot receive a benefit. Fluoridation therefore medicates people unnecessarily and without their consent.

COLGATE WARNING

This warning is on the label of Colgate toothpaste sold in Calgary:
“For children under 6 years: Keep out of reach and to prevent swallowing provide adult supervision and use only a pea-sized amount. If more than is used for brushing is accidentally swallowed get medical help or contact a Poison Control Centre immediately.”

CADTH REPORT

The CADTH report suggests that fluoridation of City water will prevent two cavities per person over a 20 year span. Who knows if they are correct in their forecasting and is it worth the associated risks of which there are too many?

End of summary.

GUARDIANS OF OUR WATER

The subject of adding fluorosilicic acid to public drinking water has been a controversial subject for decades. There have been studies to review the studies and the conclusion is nearly all studies are flawed. The ultimate Committee / Council decision carries with it a huge responsibility as the City will be held liable for any future negative outcomes. Some recent studies have raised even more need for caution.

“Now, however, a key finding of this O’Brien Institute report is that this dental public health intervention (i.e., community water fluoridation) does need to be carefully reviewed and continuously tracked for its safety in the face of the very recent cognition studies appearing in the literature”

“we reiterate that new emerging studies on fluoride and cognition need to be tracked and carefully evaluated on an ongoing basis”
O’Brien Institute 2019.

FLUOROSIS

The Centre for Disease Control in the United States identifies over 50% of children as having dental fluorosis. Fluorosis is caused by an excess of fluoride in the body. Fluoride comes from the swallowing of toothpaste and is also contained in many food and beverage products. This statistic clearly indicates that children have **far too much fluoride in their bodies** and certainly do not need any more. The cost to restore teeth to a normal appearance has a median cost in excess of a thousand dollars **per tooth**. This treatment is temporary and needs to be repeated.

FLUOROSILICIC ACID

When we talk of adding fluoride what in fact are we adding to the water? The City has avoided this question and shown a lack of transparency. It is fluorosilicic acid, an industrial by-product that is not allowed to be released into the air or water but it is okay for it to be diluted and added to our drinking water. It sounds unbelievable but sadly it is true and here is the evidence.

This is a quote from the American Dental Association in their report of 2005, page 43

“fluorosilicic acid which today is the most commonly used fluoride additive in the United States.”

I also quote from polyprocessing.com who provide information on the storage of this dangerous acid which is scrubbed from two process gases.

<https://blog.polyprocessing.com/blog/proper-hydrofluorosilicic-acid-storage>

“In the past, the phosphate industry used to let these two gases vent freely into the atmosphere. This, however, caused severe environmental damage to downwind communities, including widespread cattle poisonings, scorched vegetation, and various human health complaints. the most commonly discussed application for this chemical is water fluoridation at water treatment plants”

So the two gases were scrubbed out of the smokestacks and rather than dispose of this toxic waste safely its primary market is public drinking water.

The company goes on to discuss the damage that can be done to storage containers from the lead and arsenic that is also contained in this acid.

If this product is to be re-introduced to City water then I request that the Safety Data Sheet be released to the public. In that Data Sheet they will find under the heading Synergistic Materials

“Product has a strong affinity for calcium and magnesium: increasing calcification of the bones and reducing calcium and magnesium levels in the blood”

DOSAGE

I am concerned about dosage. There is absolutely no control over how much is ingested by any individual person. This is of particular concern for babies, for people with some health issues and those with compromised organs like the thyroid and kidneys. The consequences for these groups of people go far beyond adding fluoride to water in order to prevent cavities. There are other options for providing fluoride treatment if people so choose without imposing fluoridated water on hundreds of thousands of Calgarians that do not want it and who do not benefit from it anyway.

COLGATE WARNING

The warning on toothpaste packaging is there because of the toxic nature of fluoride additives to young children. We are here to safeguard our

children as they have no voice in the decision making process but they suffer the brunt of any wrong decision that we make today.

Page 4

“During fetal life and early infancy, the blood-brain barrier only partially prevents entry of chemicals into the brain and the developing brain is known to be sensitive to injury from toxic chemicals.” O’Brien Report 2019

GENERAL

I expect proponents of putting fluoride back in our water will be citing the University of Calgary report of 2016, but only statistics that suit their platform. Once again a report has been written with information skewed in order to arrive at a pre-destined outcome.

I do not give the City of Calgary my consent to put a toxic chemical in my drinking water. If they do go ahead and do this then I expect them to find an alternative means whereby they supply me with clean drinking water.

I thank the Committee for providing this public opportunity for input.

Sincerely

Ivor Green
Ward 4

From: [Rick North](#)
To: [Public Submissions](#)
Cc: [Maria Castro](#); [City Clerk](#)
Subject: [EXT] Submission for Fluoridation Hearing and Presenting
Date: Wednesday, October 16, 2019 7:35:00 PM
Attachments: [Calgary PP - Rick North - 10-29-19.pptx](#)

Dear Sir or Madame:

Attached please find my Power Point for the Committee hearing on water fluoridation October 29.
I'm requesting:

1. This be submitted for pre-registration as part of the written record and agenda for the city councillors.
2. I present this Power Point orally to the committee at the hearing October 29.

I'll be travelling from Portland, Oregon to make this presentation in person and am very much looking forward to meeting the councillors and answering any questions they may have.

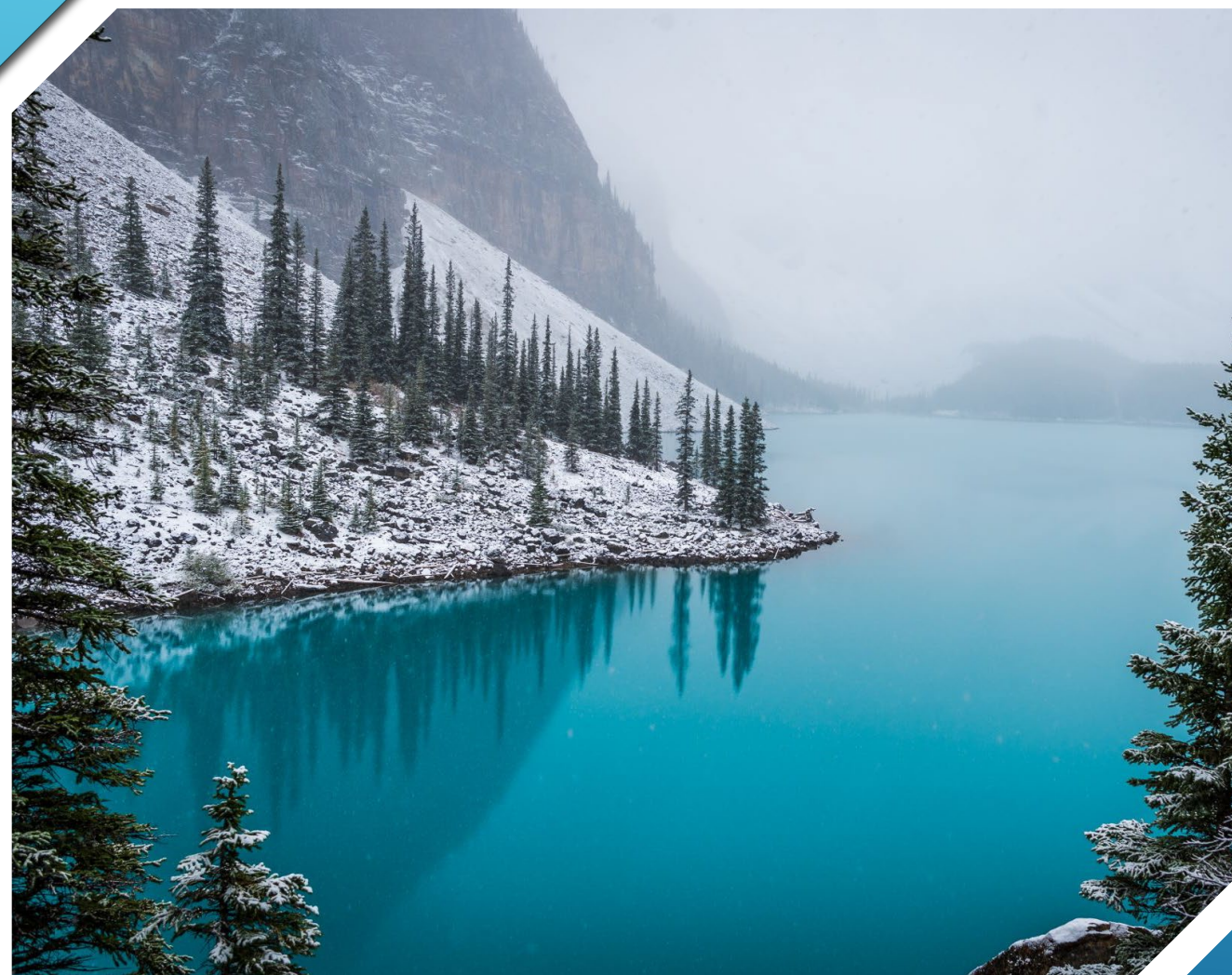
Thank you for the opportunity and I'd appreciate it if you could acknowledge receipt of my submission by e-mail.

Best wishes,

Rick North
Portland, OR
503-968-1520
503-706-0352 – c
hrnorth@hevanet.com



This email has been checked for viruses by Avast antivirus software.
www.avast.com



THE DOCTOR WHO SAVED THE NETHERLANDS

Presenter:
Rick North,
Oregon Volunteer



MY STORY: WHY AM I HERE?

Work history – Non-profit management

- American Cancer Society
- Oregon Physicians for Social Responsibility
- Not a physician, scientist or dentist

Favored fluoridation most of my life

Asked to review it

I changed my mind – science, scientists, history



**HANS MOOLENBURGH,
MD 1925-2018**

**AND THE DUTCH
REJECTION OF
FLUORIDATION**



HANS MOOLENBURGH'S PATIENTS

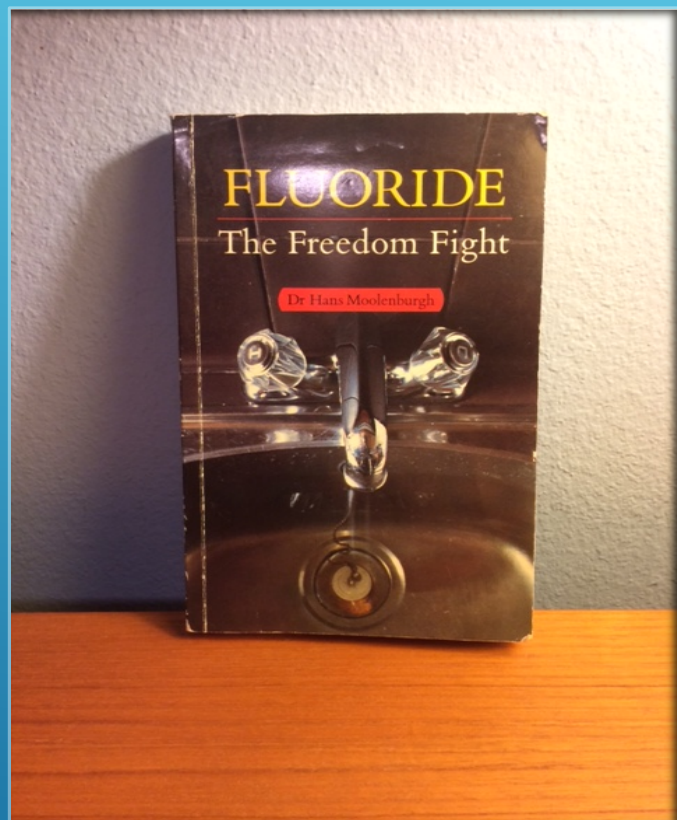
AMSTERDAM FLUORIDATES - MARCH 20, 1972

Heemstede
fluoridated

Haarlem stays
unfluoridated



WHEN HEEMSTEDDE FLUORIDATED . . .



“The adverse health effects began almost at once, with people, especially children . . .”

“These sudden changes only took place in fluoridated Heemstede, and the cure was easy: non-fluoridated water.”



FLUORIDATION HARMS TO HYPERSENSITIVE PEOPLE IN HEEMSTEDE (EST. 1% - 5%)

- Stomach and intestinal pains
- Mouth ulcers
- Excessive thirst
- Skin irritation and eczema
- Migraine-like headaches
- Blurred vision
- Worsening of known allergic complaints
- Joint pains



MOOLENBURGH'S TEAM

“... 12 medical doctors, two biologists and a lawyer ... many did not believe in the existence of the side-effects ...

The group voted in favor of a **double blind study**. These tests proved that fluoridated water caused the side effects we had identified and the results have been published.”



Study	City	Fluoride type	Design
Waldbott 1956	Detroit	Water	Case reports, some blinded, double-blinded
Feltman/Kosel 1961	Passaic, New Jersey	Tablets	Experimental, blinded – 1% of pregnant women, children
Petraborg 1977	Milwaukee	Water	Case reports

(FROM NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES
FLUORIDE IN DRINKING WATER – 2006)

SEVERAL STUDIES, SAME RESULTS
FLUORIDATED – SICK; STOPPING FLUOR. = WELL

MOOLENBURGH'S BATTLE FOR THE NETHERLANDS





WHAT HE WAS UP AGAINST

- Official response from the Dutch Ministry of Health to his study results: *“The experts we asked for advice . . . do not see any grounds for changing their position regarding (favoring) water fluoridation.”*



MOOLENBURGH – AND OTHERS - FIGHT ON . . . THE NETHERLANDS ENDS FLUORIDATION

June 22, 1973 – High Court rules against fluoridation without legal foundation

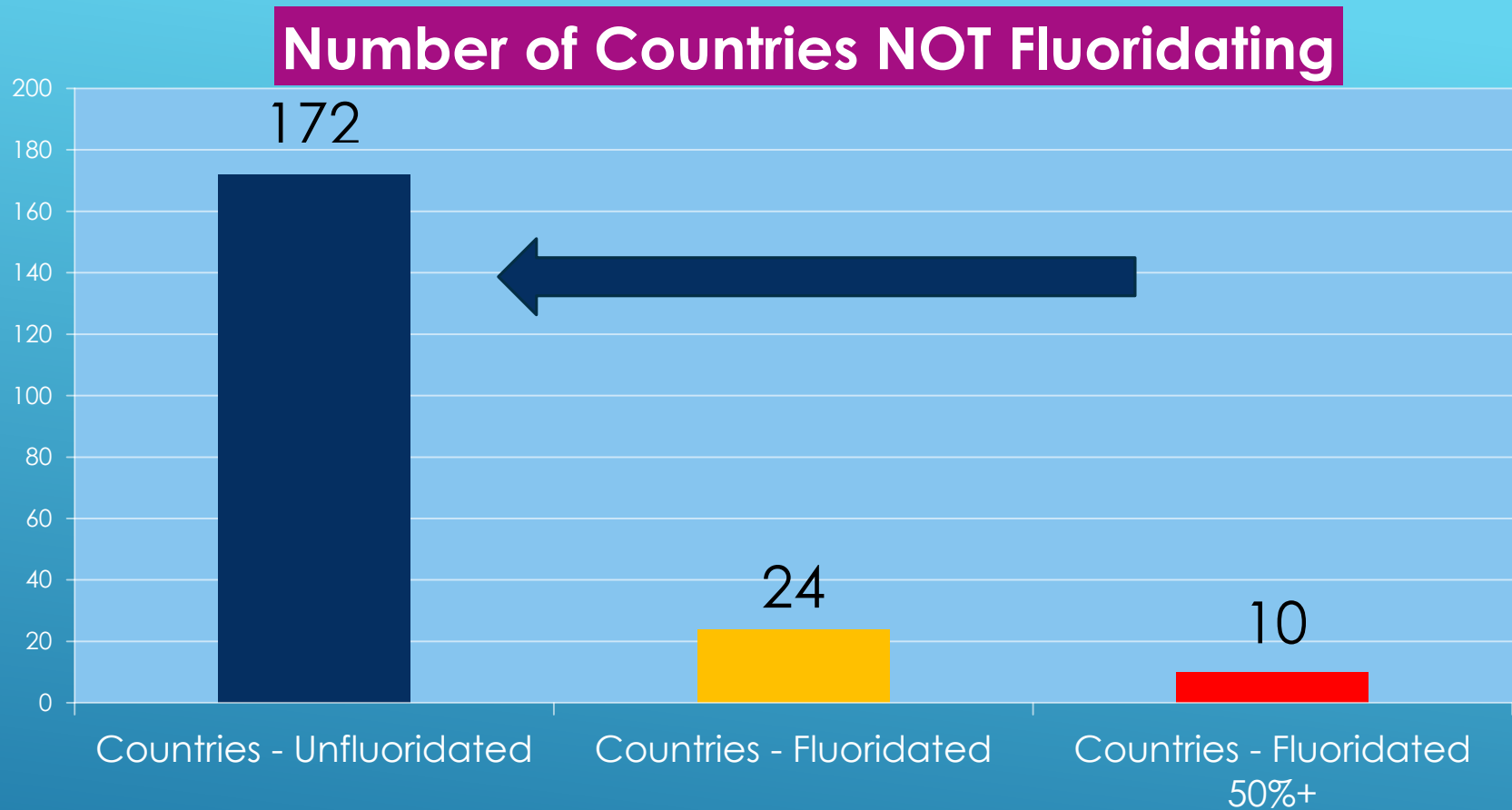
April 27, 1975 – Bill to legalize it defeated in House of Commons



DUTCH MINISTRY OF HEALTH - TODAY

“... the addition of (fluoridation) chemicals to drinking water is prohibited by law in the Netherlands. This law came into effect because it was widely perceived that drinking water should not be used as a vehicle for pharmaceuticals. Furthermore, fluoridation of drinking water would conflict with the freedom to choose for natural drinking water.”





WORLDWIDE REJECTION OF ARTIFICIAL FLUORIDATION

REFERENCES

Table on U.S. studies and quotes taken from: National Research Council: Fluoride in Drinking Water, 2006, <https://www.nap.edu/catalog/11571/fluoride-in-drinking-water-a-scientific-review-of-epas-standards>

Hardy Limeback quote: Fluoride Free New Zealand <https://fluoridefree.org.nz/statement-dr-hardy-limeback/>

Robert Isaacson quote: Fluoride Free Water <http://ffwireland.blogspot.com/2014/10/water-fluoridation-by-professor-robert.html>

Kathleen Thiessen quote: Comments to Health Canada <http://www.fluoridealert.org/wp-content/uploads/thiessen.canada.2009.pdf>

Kathleen Thiessen information: Oak Ridge Center for Risk Analysis https://www.orrisk.com/thiessen_bio.html

Hans Moolenburgh/Netherlands information:

Hans Moolenburgh, Fluoride: The Freedom Fight, Mainstream Publishing, 1987.

Affidavit, Hans Moolenburgh, M.D., Safe Water Association vs City of Fond du Lac, March 1993, <https://fluorideinformationaustralia.files.wordpress.com/2013/01/affidavit-moolenburgh.pdf>

George Waldbott information:

George Waldbott, Albert Burgstahler, H. Lewis McKinney, Fluoridation: The Great Dilemma, Coronado Press, 1978.

The Preskeletal Phase of Chronic Fluoride Intoxication, <http://www.fluoridation.com/waldbot.htm>

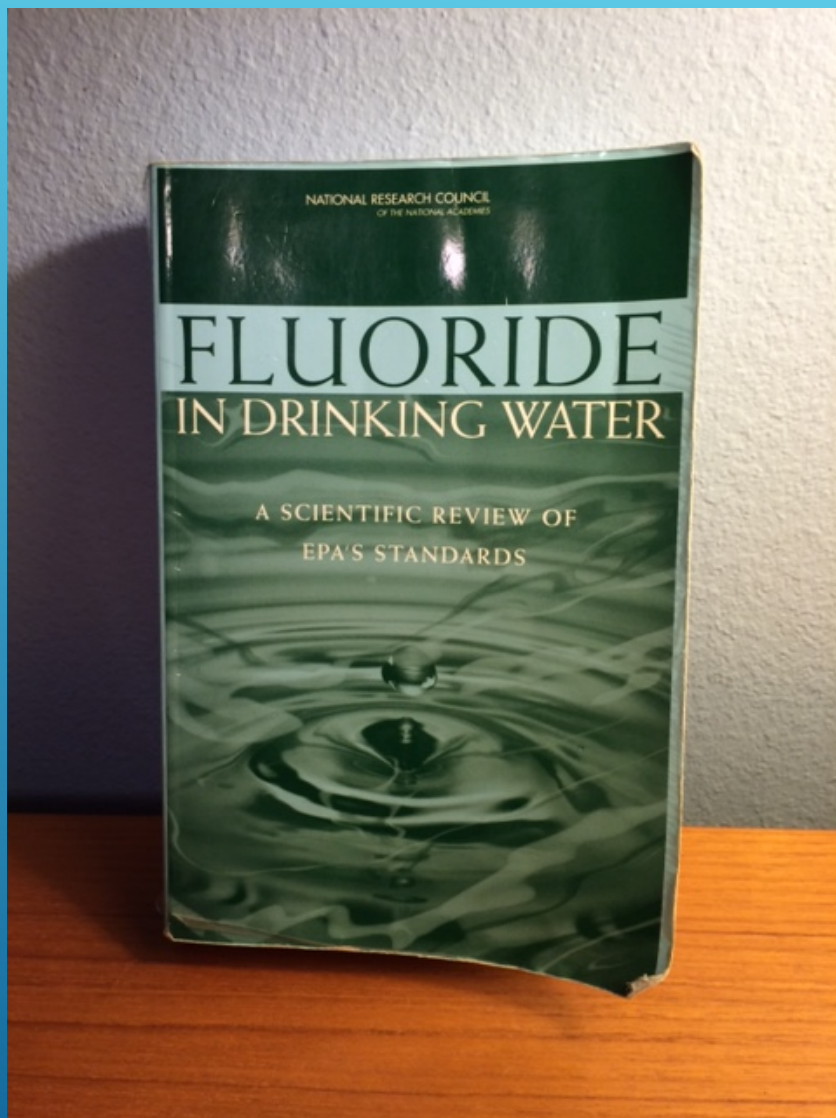
Reuben Feltman/George Kosell study, Journal of Dental Medicine, 1961, excerpt cited in Second Look, <https://slweb.org/feltman-kosel.1961.html>

Dutch Ministry of Health Statement, cited in Fluoride Action Network, <https://fluoridealert.org/content/europe-statements/>

Worldwide Rejection of Fluoridation information from British Fluoridation Society <https://www.bfsweb.org/> and Fluoride Action Network <https://fluoridealert.org/content/bfs-2012/>

SUPPLEMENTARY SLIDES

Several thin, white, parallel diagonal lines are positioned in the bottom right corner of the slide, extending from the right edge towards the center.



I CHANGED MY MIND

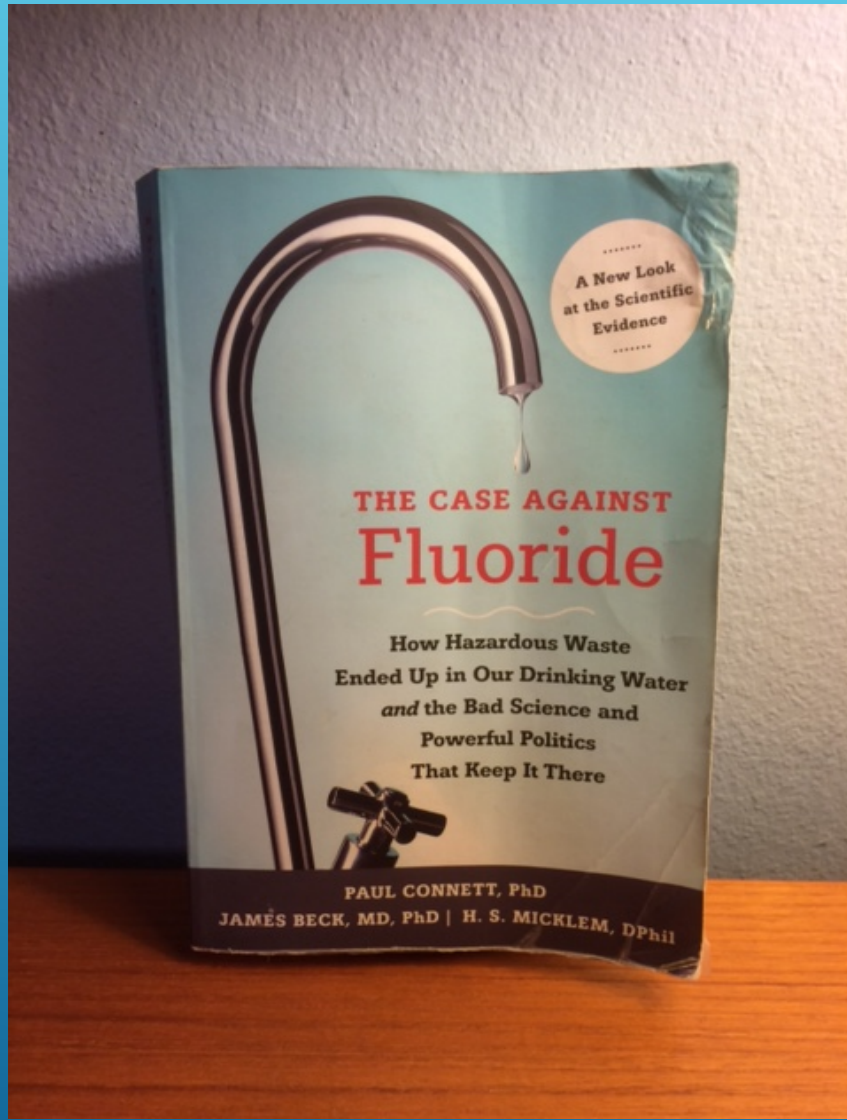
**My major source
– the National
Research
Council's 2006
review**

- ▶ “. . . it is apparent that fluorides have the ability to interfere with the functions of the brain and the body by direct and indirect means.”
- ▶ “Fluoride is therefore an endocrine disruptor . . .”
- ▶ “The chief endocrine effects of fluoride include decreased thyroid function . . .”
- ▶ “. . . Sufficient fluoride exposure appears to bring about increases in blood glucose or impaired glucose intolerance in some individuals and to increase the severity of some types of diabetes.”

NRC REPORT QUOTES – OUT OF MANY

- ▶ “In my opinion, the evidence that fluoridation is more harmful than beneficial is now overwhelming.” – Hardy Limeback, PhD, DDS
- ▶ “I had no fixed opinion . . . The more I learned the more I became convinced that the addition of fluorides to drinking water was, and is, a mistake.” – Robert Isaacson, PhD (dec.)
- ▶ “A fluoride concentration of 0.7 mg/L, let alone 1.5 mg/L (Canadian standards), will not protect all members of the population from adverse health effects.” – Kathleen Thiessen, PhD

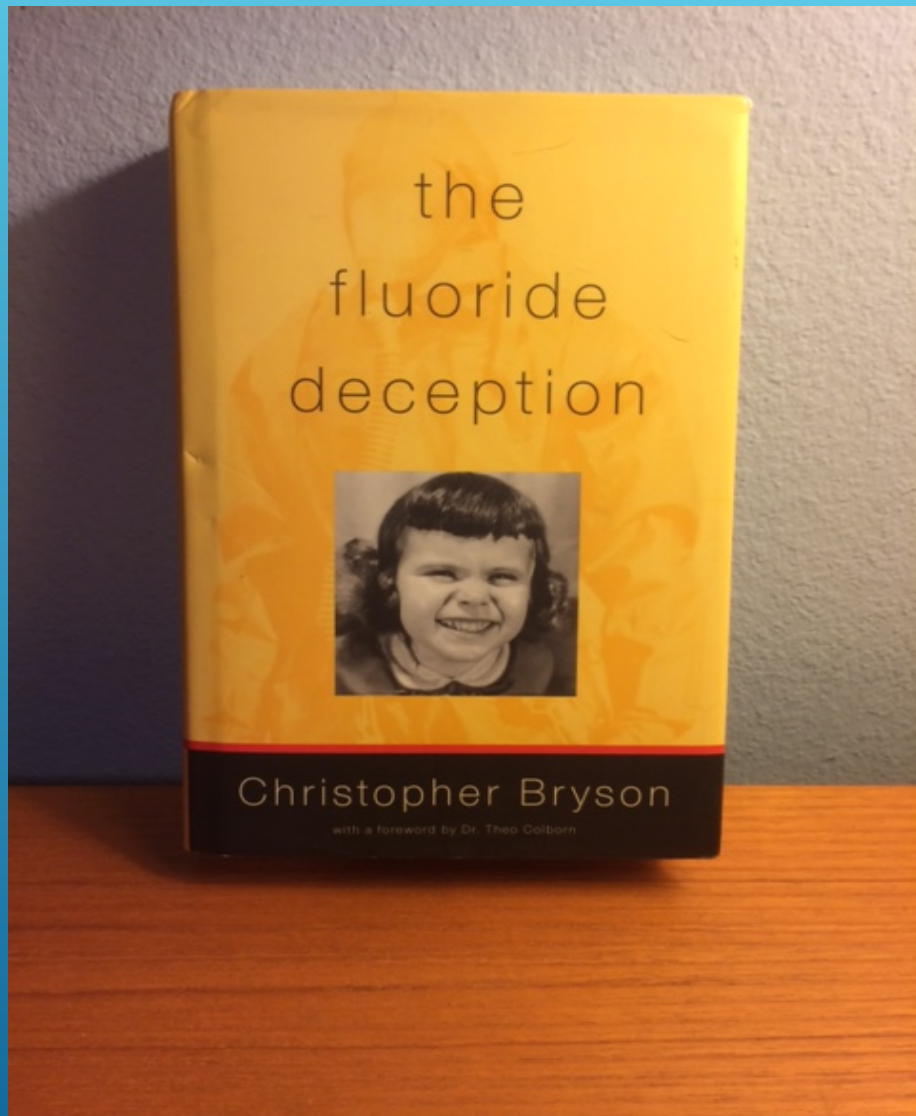
NRC SCIENTISTS SPEAK OUT



PAUL CONNETT, PHD
H. SPEDDING MICKLEM, DPHIL
JAMES BECK, MD, PHD (U. OF
CALGARY)

THE CASE AGAINST FLUORIDE
– THE BEST LAY-FRIENDLY
BOOK I'VE READ ON THE:

- Science
- History
- Politics



CHRIS BRYSON, AUTHOR THE FLUORIDE DECEPTION –

THE BEST INVESTIGATIVE BOOK I'VE READ

Investigative reporter and TV producer

- BBC World Service
- National Public Radio
- Atlanta Constitution
- ABC News

Multiple award winner

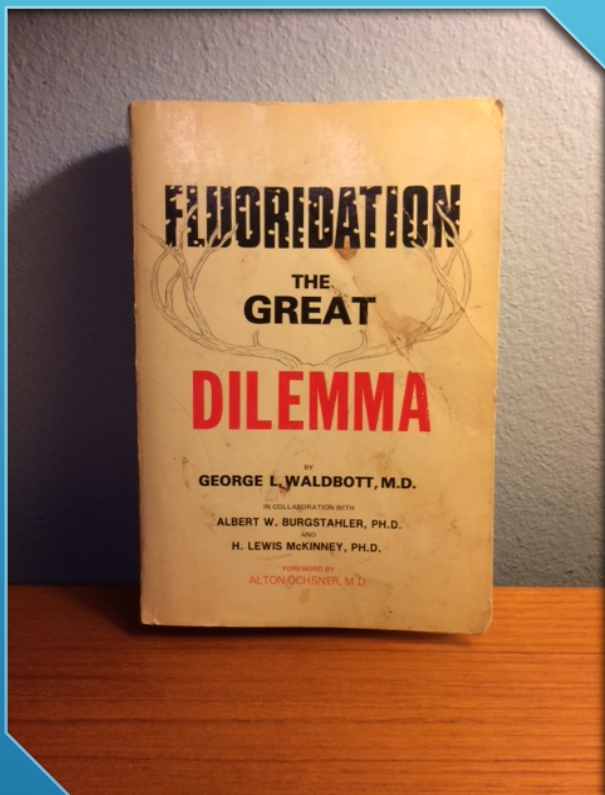
- George Polk Award
- National Headliner Award
- Project Censored Award



GEORGE WALDBOTT, MD -1898-1982

- Nationally known allergy physician and scientist
- Vice president of American College of Allergists
- Author of widely used textbook Health Effects of Environmental Pollutants
- First to demonstrate some people are sensitive to penicillin

WALDBOTT'S EVIDENCE



- From 1953 – 1970's, treated more than 400 cases of toxic reactions to fluoride
- Published dozens of papers documenting success of eliminating fluoridated water and relieving patients of their harmful health conditions
- “Surely it is time for the curtain to fall on this human tragedy.”

REUBEN FELTMAN, DDS/GEORGE KOSEL, BS, MS – NEW JERSEY

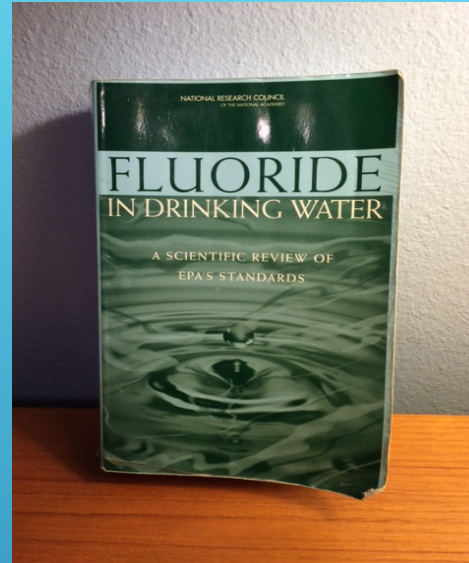
12-year study of pregnant women and their children –
1949-1961:

“One percent of our cases reacted adversely to the fluoride. It was definitely established that the fluoride and not the binder was the causative agent . . . (the harmful health effects) have all occurred with the use of fluoride and disappeared upon the use of placebo tablets, only to recur when the fluoride tablet was, unknowingly to the patient, given again.”



THE TEAM'S CONCLUSION

Fluoridation caused **a low grade intoxication of the whole population,** with 1%-5% of the most sensitive persons showing acute symptoms.



MOOLENBURGH – 1993: “THE WHOLE POPULATION BEING SUBJECTED TO LOW GRADE POISONING MEANS THAT THEIR IMMUNE SYSTEMS ARE CONSTANTLY OVERTAXED.”

NRC – 2006: “THERE IS NO QUESTION THAT FLUORIDE CAN AFFECT THE CELLS INVOLVED IN PROVIDING IMMUNE RESPONSES.”

THE INESCAPABLE LOGIC

“The dose makes the poison.”

If you put fluoride, a known toxin, in drinking water, you can't control the dose.

If you can't control the dose, you can't control the harm.



KATHLEEN THIESSEN, PHD SENIOR SCIENTIST OAK RIDGE CENTER FOR RISK ANALYSIS

- One of 12 scientists on 2006 NRC committee producing Fluoride in Drinking Water
- Author of U.S. EPA reports on contaminants
- Consultant for International Atomic Energy Agency
- Consultant for Japan's National Institute of Radiological Sciences
- Consultant for Korea Atomic Energy Research Institute

Thiessen's comments to Health Canada - 2009

- ▶ “A fluoride concentration of 0.7 mg/L, let alone 1.5 mg/L, will not protect all members of the population from adverse health effects.”
- ▶ “Clearly, Health Canada's "optimal" fluoride concentration of 0.7 mg/L is not protective of health for infants or persons with DI (diabetes insipidus).”
- ▶ “. . . the NRC (2006a) concluded that fluoride is an endocrine disruptor, and that exposure levels associated with endocrine effects are reached by people consuming fluoridated water, especially those with nutritional deficiencies.”

Health Canada position - Today

- ▶ “Canadian and international studies agree that properly fluoridated water is safe. The likeliest adverse effect is an increased risk of mild dental fluorosis.”
- ▶ “There is also no scientific evidence to suggest that children should avoid drinking fluoridated water at the accepted levels in Canadian drinking water.”
- ▶ Not a word on fluoridation-induced endocrine disruption.

HEALTH CANADA IGNORES NRC RESEARCH



ONE SAMPLE OF WHAT SCIENCE-BASED FLUORIDATION
OPPONENTS FACED IN A CITY-WIDE ELECTION – PORTLAND, OR

- PORTLAND OREGONIAN – AUGUST 17, 2012

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Can You Guarantee Fluoridation is Safe for ALL?
Date: Thursday, October 17, 2019 8:36:57 AM

-----Original Message-----

From: Saba Asad [<mailto:Saba.jahangir85@gmail.com>]
Sent: Thursday, October 17, 2019 7:40 AM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Can You Guarantee Fluoridation is Safe for ALL?

Calgary City Clerk

RE: Can You Guarantee Fluoridation is Safe for ALL?

null

Dear Mayor and Council,

If you cannot guarantee that adding fluoridation chemicals to our drinking water is safe for pregnant women, infants on formula reconstituted with tap water, people with hypothyroidism or kidney issues, or those who already have dental fluorosis from overexposure to toothpaste, THEN DON'T MANDATE IT IN OUR DRINKING WATER.

Citizens should have clean and safe drinking water. This ought to be the top priority. Adding additional contaminants, chemicals, or hazardous waste products to our drinking water makes no sense.

Choose to represent citizens rather than lobbyists and corporate polluters. We don't need to buy their pollution for our drinking water. Vote against fluoridation.

Thank you.

Sincerely,
Saba Asad

Calgary, AB

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Please keep fluoride out of Calgary's water. Thank you.
Date: Thursday, October 17, 2019 8:37:21 AM

From: Marnie Shaw [mailto:marniejuel@gmail.com]
Sent: Thursday, October 17, 2019 1:35 AM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Please keep fluoride out of Calgary's water. Thank you.

Please keep fluoride out of Calgary's water. Thank you.

Fluoridation is wrong. Fluoride is not safe, effective, cost-effective, or ethical.

There are far better uses for Calgary's scarce monetary resources than something like fluoridation which so many of Calgary's citizens do not want.

More busing, more snow removal, and more housing for the homeless are just a few of the many possibilities.

Sincerely, Marnie Shaw

4625 Varsity Drive North West, Unit # 305, Suite # 59, CALGARY, Alberta, Canada T3A 0Z9

From: [Marjorie Shapiro](#)
To: [Public Submissions](#)
Subject: [EXT] Artificial Water Fluoridation --Reasons to say NO!
Date: Thursday, October 17, 2019 11:16:54 AM

Dear Calgary City Council:

We commend you for forming a committee to study chemical water fluoridation and hope that you will say no to fluoridation based on the evidence.

There is no actual science documenting any systemic benefit from ingesting fluoride and not a single study demonstrating the safety of ingesting fluoride. Yet in spite of the fact that citizens are barraged by fluoride from toothpaste, mouthwashes, dental products, pesticides, fluorinated pharmaceuticals, deboned meats (e.g., chicken fingers, nuggets etc.), tea, Teflon pans and workplace exposures, toxic fluoridation chemicals are added to most water municipalities in the US.

Fluoride is highly toxic. Thus, the warning on fluoridated toothpaste tubes to call poison control if more than the recommended amount for brushing is swallowed. For children that amount is no more than a pea size. Children under 5 years of age in Calgary, like children everywhere, swallow toothpaste. It makes no sense to add to their exposure by giving them fluoridated water.

Indeed, it is a little known but stunning fact that sodium fluoride is an EPA registered pesticide. The exact same chemical used to fluoridate the water our children drink, 98% sodium fluoride, is an EPA registered pesticide used as a fungicide on railroad ties. By definition, a pesticide is toxic, not safe for ingestion, never studied for toxic

effects on anyone particularly children. Who in their right mind would add a pesticide to drinking water?

You are most likely considering adding the liquid hydrofluorosilicic acid (HFS) which is highly corrosive and no less poisonous. Sodium fluoride is a powder that is derived from HFS. The chemicals are equally toxic. Fluoridation chemicals are all unpurified toxic industrial waste products that contain traces of lead and arsenic.

Public health policy must be safe and effective and not cause harm to people and the environment. Artificial water fluoridation is an archaic policy that harms people and the planet. Water is life and clean unadulterated water is a basic human right. Please say no to water fluoridation in Calgary.

To learn more please reach out to MomsAgainstFluoridation.org.

and watch the 20 minute film on water fluoridation. "OurDailyDoseFilm.com"

Sincerely yours,

Marjorie Shapiro

Moms Against Fluoridation

Communications Director - (Volunteer)

202-446-1084

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Fluoride accumulates in the body
Date: Thursday, October 17, 2019 2:28:54 PM

-----Original Message-----

From: Desi Kle [mailto:very_divine@yahoo.ca]
Sent: Thursday, October 17, 2019 11:43 AM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Fluoride accumulates in the body

Calgary City Clerk

RE: Fluoride accumulates in the body

null

Dear Councilors,

Say NO to fluoridation chemicals!

Healthy adult kidneys excrete only 50 to 60% of the fluoride ingested each day (Marier & Rose 1971). The remainder accumulates in the body, largely in calcifying tissues such as the bones and pineal gland (Luke 1997, 2001). Infants and children excrete less fluoride from their kidneys and take up to 80% of ingested fluoride into their bones (Ekstrand 1994). The fluoride concentration in bone steadily increases over a lifetime (NRC 2006).

Please don't force residents to avoid our drinking water.

Vote No!

Sincerely,
Desi Kle

Chestermere, AB

From: [Guenter Doerfler](#)
To: [Public Submissions](#)
Subject: [EXT] FLUORIDATION SUBMISSION
Date: Thursday, October 17, 2019 5:43:00 PM

PUBLIC SUBMISSION

RE: FLUORIDATION SUBMISSION

Dear PUBLIC SUBMISSION,

Dear Mayor and Council,

how often do we have to oppose the fluoridation of our drinking water in Calgary ? It is a scandal that with all the knowledge we have now about fluoride we still have to deal with this subject every few years. It is undemocratic and impertinent to ignore a majority of people who disapprove of adding fluoride to drinking water for a reason. Why are city councillors engaging in the same issue again and again, only because the same greedy lobbyists try to sell a toxic product to avoid paying a lot of money for disposing this toxin ? Do you start a referendum again and again until those irresponsible people get the outcome they wish for ? Hopefully not. Close this demand once and for all, please.

Guenter Doerfler

Sincerely,
Guenter Doerfler

Calgary, AB

From: [David Crowe](#)
To: [Public Submissions](#)
Cc: [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Submission for October 29th Hearing on Water Fluoridation
Date: Thursday, October 17, 2019 6:29:40 PM
Attachments: [201910-Fluoridation-signed.pdf](#)

Dear City Councillors and Mayor Nenshi:

Attached is my submission for the October 29th public hearing on water fluoridation. Unfortunately I will not be able to attend and present in person, but please distribute to all the city councillors at the meeting, and others who would normally get copies of public submissions.

Best regards,
David Crowe
102 Point Drive NW
403-861-2225

David R. Crowe
102 Point Drive, NW
Calgary, Alberta T3B 5B3, Canada
Phone +1•403•289•6609
Fax +1•403•206•7717
email David.Crowe@cnp-wireless.com

October 17, 2019

Submission for the Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda (October 29, 2019)

Dear Members of the Community and Protective Services Committee, Mayor Nenshi, and members of Calgary City Council:

My name is David Crowe, and I have been a resident of Calgary since 1981. I currently reside in Ward 7.

I understand that some members of Calgary City Council would like to once again start adding fluoride to city water supplies, and I would like to register my opposition.

One of the reasons to oppose water fluoridation is new research showing lowered IQs in children whose mothers have higher fluoride levels or who consume more fluoride (a JAMA Pediatrics study from August is only one of several such studies). While some have pointed out that the average difference in IQ is small, if the impact of fluoride on children is non-uniform, this could mean that a small percentage of children will be seriously disabled by water fluoridation.

Not just IQ, but other adverse effects of water fluoridation will greatly affect a minority of people, such as those with kidney or thyroid problems. There is really no practical way to identify these people, and no practical way to ensure that they do not drink city tap water, at least not without an expensive filter or distillation system.

Ethically, water fluoridation is mandatory medication, at least for people who cannot afford to drink only bottled water. Not only that, but it is impossible to control the dose. While the concentration in the water can be precisely controlled, some people will drink large quantities of water and get a large dose, while others will drink very little. The actual dose is uncontrolled.

Fluoridation will increase the number of people drinking bottled water, which is a wasteful practice, and increases the burden on Calgary's recycling and garbage disposal system.

There is only very weak evidence that water fluoridation is effective at reducing cavities, and then by only a small amount. There are no double-blind, placebo-controlled, randomized studies, for example. So we may well find that re-fluoridating the water produces only harms and no benefits.

I urge City Council to continue with the current policy of providing unfluoridated water to myself and other citizens of Calgary. I want to continue to enjoy one of the purest sources of municipal water in the world.

Best Regards



David R. Crowe

From: [Alina Muresan](#)
To: [Public Submissions](#)
Subject: [EXT] HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees
Date: Thursday, October 17, 2019 8:13:21 PM

PUBLIC SUBMISSION

RE: HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees

Dear PUBLIC SUBMISSION,

Dear Councilors,

There is no shortage of fluoride in Calgary. There are no access issues. Anyone can find fluoride toothpaste, rinse, floss, fluoridated bottled water, or fluoride supplements for cheap at any bodega, grocery store, or pharmacy (for supplements).

Any dental problem is not due to lack of fluoride, but high dental fees set by the lobbying organization that represents Alberta dentists:
https://urldefense.proofpoint.com/v2/url?u=https-3A__www.theglobeandmail.com_opinion_the-2Dexorbitant-2Dcost-2Dof-2Ddentist-2Dvisits-2Din-2Dalberta-2Dcannot-2Dbe-2Dbrushed-2Doff_article36153690_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=hT9dtDCxIS3Ss8lwErkBMSTa0NE0HJq_dLR8Df_yUm8&s=bp6XEEliZhW_SXLCbHmPeLmHPX0zktisjzUmTdoRd4&e=

It's time for the government to step in an call for a revised fee schedule for basic dental services instead of paying the phosphate fertilizer industry for their waste to dump in our drinking water.

Please oppose fluoridation.

Thank you,

Sincerely,
Alina Muresan

Calgary, AB

From: [David Wood](#)
To: [Public Submissions](#)
Subject: [EXT] HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees
Date: Thursday, October 17, 2019 8:16:06 PM

PUBLIC SUBMISSION

RE: HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees

Dear PUBLIC SUBMISSION,

Dear Councilors,

There is no shortage of fluoride in Calgary. There are no access issues. Anyone can find fluoride toothpaste, rinse, floss, fluoridated bottled water, or fluoride supplements for cheap at any bodega, grocery store, or pharmacy (for supplements).

Any dental problem is not due to lack of fluoride, but high dental fees set by the lobbying organization that represents Alberta dentists:
https://urldefense.proofpoint.com/v2/url?u=https-3A__www.theglobeandmail.com_opinion_the-2Dexorbitant-2Dcost-2Dof-2Ddentist-2Dvisits-2Din-2Dalberta-2Dcannot-2Dbe-2Dbrushed-2Doff_article36153690_&d=DwICaQ&c=jdmIHby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=_V9SjTYmXKXBltLpC8XvoVlC82RncJ_HQKl5S0l4zM&s=VBr0yH3xAoJ87gVmxCMShmpVOBgA4UEN3QztdjSE3A8&e=

It's time for the government to step in and call for a revised fee schedule for basic dental services instead of paying the phosphate fertilizer industry for their waste to dump in our drinking water.

Please oppose fluoridation.

Thank you,

Sincerely,
David Wood

Calgary, AB

From: [Erminia Muresan](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoride: Brush, Don't Swallow - Submission for Public Hearing
Date: Thursday, October 17, 2019 8:17:02 PM

PUBLIC SUBMISSION

RE: Fluoride: Brush, Don't Swallow - Submission for Public Hearing

Dear PUBLIC SUBMISSION,

Dear Mayor and Council,

I don't want my drinking water to include artificially high fluoride levels. Simply read the back of a toothpaste container to see that you shouldn't swallow a pea-sized amount (estimated to be 0.25mg), the same as two 8oz glasses of fluoridated water.

Any benefit from fluoride comes from topical application: https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_issues_caries_topical-5Fsystemic_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=XMSMhVQ0sheOz8y28hJ08-Ya6Pdh1_BC4hn5ZXHYXME&s=irh8RgjSIFS1O5-u4k4yq6-PVX83tcy4LFWD4-OEZKw&e=

All of the risk comes from ingestion: https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_issues_health_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=XMSMhVQ0sheOz8y28hJ08-Ya6Pdh1_BC4hn5ZXHYXME&s=pJPomyCrXi7HmXsQ7NKhfit-iHXUwpMTHfgnzqlRQek&e=

Fluoride is readily available in topical form. Are Calgary citizens having trouble accessing fluoride? Is it difficult to find? NO, it's easy to find and cheap. There is no fluoride shortage.

Please use common sense. Citizens can buy fluoride toothpaste for \$1, but if they want fluoride-free water they would need to spend either hundreds of dollars on bottled water or even thousands on a reverse osmosis filtration system.

Thank you.

Sincerely,
Erminia Muresan

Calgary, AB

From: [Scott Bykowski](#)
To: [Public Submissions](#)
Subject: [EXT] Submission on Water Protection & Ethics Hearing
Date: Thursday, October 17, 2019 9:11:41 PM

To Whom It May Concern:

I do not give my consent to increase the dose of Fluoride into Calgary's public drinking water system.

There is *no* one dose fits all situation, to medicate our water. I strongly encourage those with the powers that be to review the new studies from Mexico to Canada on the affects it has on a baby's brain.

Fluoride is topical, it says do not swallow on the back of our toothpaste.

You can repair a cavity but not a brain – let's educate not fluoridate.

Please put my name on the speakers list for the water fluoridation hearing set October 29th, 2019.

Thank you for allowing us citizens to speak, as **safe drinking water is a human right**.

I am located within Ward 8 in the City of Calgary.

Please confirm that my submission has been successfully received.

Thank you kindly,

-Scott Bykowski

From: [Chris Gupta](#)
To: [Public Submissions](#)
Cc: [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#); [safewatercalgary@gmail.com](#); [pat.fule@strathmore.ca](#); [lorraine.bauer@strathmore.ca](#); [tari.cockx@strathmore.ca](#); [denise.peterson@strathmore.ca](#); [melanie.corbiell@strathmore.ca](#); [bob.sobol@strathmore.ca](#); [jason.montgomery@strathmore.ca](#); [jthackray@strathmore.ca](#); [Peter.brown@airdrie.ca](#); [darrell.belyk@airdrie.ca](#); [tina.petrov@airdrie.ca](#); [al.jones@airdrie.ca](#); [candice.kolson@airdrie.ca](#); [Kelly.hegg@airdrie.ca](#); [ron.chapman@airdrie.ca](#); [mchalmers@chestermere.ca](#); [lbold@chestermere.ca](#); [cburness@chestermere.ca](#); [mfoat@chestermere.ca](#); [mraayan@chestermere.ca](#); [ywagner@chestermere.ca](#); [myoung@chestermere.ca](#)
Subject: [EXT] Water Fluoridation
Date: Thursday, October 17, 2019 10:19:25 PM

Dear Mayor and Councilors,

Fluoridation schemes are dishonest and misleading as they don't inform the residents that the chemical to fluoridate their water is Hydrofluorosilicic Acid (HFSA)*, an industrial toxin. Constituents think, and/or are led to believe, that the fluoride used will be pharmaceutical grade like what the dentists use. It is illegal for dentists to use HFSA. Clearly no one in their right mind will vote to agree on adding traces of lead, arsenic, mercury etc. as found in HFSA to their municipal drinking water!

*HFSA does not meet Good Manufacturing Practices (GMP).

NSF60 certification for this chemical, used to justify the addition of this additive, does not have any safety studies for its intended use. NSF60 Standards rely on third party certification from agencies such as Health Canada and FDA. Health Canada and FDA have not approved HSFA, nor the pharmaceutical grade fluoride, as a Natural Health Product, they also do not have safety studies for HFSA, in fact, even the pharmaceutical grade fluoride cannot be sold in health food stores - it is only available by prescription!

The above clearly shows non-compliance with National Sanitation Foundation regulatory statute Standard 60 to which the Utilities are subject. Further it violates food and drug regulations.

Dumping HFSA in the environment is already illegal (per the federal Hazardous Waste and Species At Risk Acts) so how is it OK (without safety studies) to dump truck loads of this industrial waste via our water supply year after year?

Public health officials and water treatment plant engineers/technicians know that they can control neither dosage nor dose. Simply, it cannot be regulated by setting a fixed level of a substance in water as need for water depends from person to person especially when other sources of ingested fluoride and health conditions are not known. Thus many are chronically overdosed. This is yet another deception that is not commonly understood by the public and the councilors.

This yet again, violates medical ethics. Dosing without knowing patient history and/or vulnerability can only be done under medical supervision. This is particularly significant for children.

A pole suggesting that people decide whether to violate our basic laws on water safety, the environment, the fisheries, medical ethics, drugs and food under the pretense of democracy is

hardly democratic or ethical!

?Where is the physician who will impose a lifelong prescription for an untested potentially toxic substance, without proven clinical benefit, on a patient he/she has never met, interviewed or examined? Such dubious behavior would extract appropriate censure from the licensing authority of the physician involved, on the basis that it is unscientific, unscrupulous, unethical, and therefore unacceptable."

~Dr. Neville Wilson

To propose that the deliberately mislead be asked to decide to violate or not to violate our basic right to clean water is immoral and unethical unless there are ulterior motives.

Despite dental pressure, 99% of western continental Europe has rejected, banned, or stopped fluoridation due to environmental, health, legal, or ethical concerns...

One can see that the whole issue of water fluoridation can be resolved by simply complying with our laws. Why is there no accountability for such violations? If this is not done then what is the point of having these laws?

The mandate of City water department is to clean the water - not to deliberately contaminate it and hence violate the said laws.

As conscientious, moral and ethical Councilors it behooves you to stop this fraudulent practice.

I look forward to your response.

Thank you,

Chris Gupta, P. Eng.
919 Plantation Rd
London, Ont.
N6H 2Y1

From: [Daniel Leal](#)
To: [Public Submissions](#)
Subject: [EXT] Can You Guarantee Fluoridation is Safe for ALL?
Date: Thursday, October 17, 2019 11:50:48 PM

PUBLIC SUBMISSION

RE: Can You Guarantee Fluoridation is Safe for ALL?

Dear PUBLIC SUBMISSION,

****Submission for Fluoridation Hearing****

Dear Mayor and Council,

If you cannot guarantee that adding fluoridation chemicals to our drinking water is safe for pregnant women, infants on formula reconstituted with tap water, people with hypothyroidism or kidney issues, or those who already have dental fluorosis from overexposure to toothpaste, THEN DON'T MANDATE IT IN OUR DRINKING WATER.

Citizens should have clean and safe drinking water. This ought to be the top priority. Adding additional contaminants, chemicals, or hazardous waste products to our drinking water makes no sense.

Choose to represent citizens rather than lobbyists and corporate polluters. We don't need to buy their pollution for our drinking water. Vote against fluoridation.

Thank you.

Sincerely,
Daniel Leal

Calgary, AB

From: [Potter, William](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Friday, October 18, 2019 8:01:57 AM
Attachments: [Fluoride exposure and kidney and liver function NHANES Malin et al 2019a.pdf](#)

Dear Calgary City Council,

As a Biochemistry Professor who has also taught Environmental Chemistry, the issue of water fluoridation is not simple and raises many red flags.

I promote oral health and recognize the role that topical fluoride plays in these processes, but I would advise you to consider the evidence for rather disturbing trends regarding fluoride ingestion. I am sure you will be seeing the many article regarding neurological development processes, thyroid issues and kidney and liver issues.

I am attaching what I consider to be one of most significant recent articles from the Icahn School of Medicine, regarding NHANES based data and altered kidney function. I would ask you to please consider these newer paper very seriously.

Sincerely,
Bill Potter

<https://www.sciencedirect.com/science/article/pii/S0160412019309274>

Dr. William Potter
Department of Chemistry and Biochemistry
KEH M2225
The University of Tulsa
800 South Tucker Avenue
Tulsa, OK, 74104-3189
1-918-631-3027
william-potter@utulsa.edu



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Environment International

journal homepage: www.elsevier.com/locate/envint

Fluoride exposure and kidney and liver function among adolescents in the United States: NHANES, 2013–2016



Ashley J. Malin^{a,*}, Corina Lesseur^a, Stefanie A. Busgang^a, Paul Curtin^a, Robert O. Wright^{a,b},
Alison P. Sanders^{a,b}

^a Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, NY, USA

^b Department of Pediatrics, Icahn School of Medicine at Mount Sinai, New York, NY, USA

ARTICLE INFO

Handling Editor: Lesa Aylward

Keywords:

Fluoride

Kidney

Liver

United States

Adolescents

ABSTRACT

Background: Hepato- and nephrotoxicity of fluoride have been demonstrated in animals, but few studies have examined potential effects in humans. This population-based study examines the relationship between chronic low-level fluoride exposure and kidney and liver function among United States (U.S.) adolescents. This study aimed to evaluate whether greater fluoride exposure is associated with altered kidney and liver parameters among U.S. youth.

Methods: This cross-sectional study utilized data from the National Health and Nutrition Examination Survey (2013–2016). We analyzed data from 1983 and 1742 adolescents who had plasma and water fluoride measures respectively and did not have kidney disease. Fluoride was measured in plasma and household tap water. Kidney parameters included estimated glomerular filtration rate (calculated by the original Schwartz formula), serum uric acid, and the urinary albumin to creatinine ratio. Liver parameters were assessed in serum and included alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, blood urea nitrogen, gamma-glutamyl transferase, and albumin. Survey-weighted linear regression examined relationships between fluoride exposure and kidney and liver parameters after covariate adjustment. A Holm-Bonferroni correction accounted for multiple comparisons.

Results: The average age of adolescents was 15.4 years. Median water and plasma fluoride concentrations were 0.48 mg/L and 0.33 μ mol/L respectively. A 1 μ mol/L increase in plasma fluoride was associated with a 10.36 mL/min/1.73 m² lower estimated glomerular filtration rate (95% CI: –17.50, –3.22; p = 0.05), a 0.29 mg/dL higher serum uric acid concentration (95% CI: 0.09, 0.50; p = 0.05), and a 1.29 mg/dL lower blood urea nitrogen concentration (95% CI: –1.87, –0.70; p < 0.001). A 1 mg/L increase in water fluoride was associated with a 0.93 mg/dL lower blood urea nitrogen concentration (95% CI: –1.44, –0.42; p = 0.007).

Conclusions: Fluoride exposure may contribute to complex changes in kidney and liver related parameters among U.S. adolescents. As the study is cross-sectional, reverse causality cannot be ruled out; therefore, altered kidney and/or liver function may impact bodily fluoride absorption and metabolic processes.

1. Introduction

Approximately 74% of the United States (U.S.) population that relies on public water distribution systems receives chemically fluoridated water for the purpose of preventing tooth decay (Centers for Disease Control and Prevention, 2014). The most commonly used fluoridating chemical is hydrofluorosilicic acid, although sodium fluorosilicate and sodium fluoride are used in some water treatment

processes (Centers for Disease Control and Prevention, 2018). Until 2015, the recommended U.S. drinking water fluoride concentration range was 0.7–1.2 mg/L. However, this concentration was lowered in 2015 to 0.7 mg/L in part due to concerns about the rising prevalence of dental fluorosis – visually detectable changes in tooth enamel due to excess fluoride exposure during tooth development, among U.S. youth (U.S. Department of Health and Human Services Federal Panel on Community Water Fluoridation, 2015; Centers for Disease Control and

Abbreviations: eGFR, estimated glomerular filtration rate; ACR, urinary albumin to creatinine ratio; BUN, blood urea nitrogen; ALT, alanine aminotransferase; ALP, alkaline phosphatase; AST, aspartate amino transferase; GGT, gamma-glutamyl transferase; SUA, serum uric acid

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Prevention, 2010).

Among healthy adults, approximately 60% of absorbed fluoride is excreted in urine by the kidneys, while the corresponding percentage among children is approximately 45% (Buzalaf and Whitford, 2011; Villa et al., 2010). The kidneys, followed by the liver, accumulate more fluoride than any other organ system in the body (National Research Council, 2006; Whitford et al., 1979). Therefore, these organs and their intersectional processes may be especially vulnerable to effects of fluoride, even among healthy individuals. Additionally, fluoride is absorbed in calcified tissues – such as bones and teeth, as well as calcium-containing glands such as the pineal gland.

While fluoride exposure in adulthood has been associated with nephro- and hepatotoxicity in animals and humans (Jimenez-Cordova et al., 2018a; National Research Council, 2006; Sayanthooran et al., 2018), few studies have examined associations between fluoride exposure and kidney or liver function in youth. Three prior studies conducted in India, Japan and/or China found potential evidence of kidney and liver function decline in children and/or adolescents exposed to relatively high fluoride concentrations (Liu and Xia, 2005; Ando et al., 2001; Khandare et al., 2017; Xiong et al., 2007). Findings of a fourth study conducted in Mexico were inconsistent (Jimenez-Cordova et al., 2019). The few studies conducted among young animals also demonstrated adverse renal and hepatic effects of fluoride, even at low concentrations (Shashi and Thapar, 2002; Shashi, 2001; Cardenas-Gonzalez et al., 2013; Perera et al., 2013). Taken together these findings suggest that fluoride may be developmentally nephrotoxic and hepatotoxic. However, whether these findings apply to low-level fluoride exposures relevant to U.S. youth has not been investigated.

Our study aimed to examine the relationship between fluoride exposure, measured in blood plasma and drinking water, and kidney and liver parameters among adolescents in the U.S.. We hypothesized that higher blood plasma and water fluoride concentrations would be associated with altered kidney and liver parameters in this population.

2. Materials and methods

2.1. Participants

We utilized data from the National Health and Nutrition Examination Survey (NHANES) collected from 2013 to 2016, the years that publicly available fluoride biomonitoring data were collected and available at the time of analysis. NHANES is a program of studies conducted by the Centers for Disease Control and Prevention that is designed to assess health and nutrition status of a nationally representative, noninstitutionalized sample of people of all ages living in the U.S.. It employs questionnaires, in-home interviews and physical examinations at mobile examination centers where blood and urine are collected (Centers for Disease Control and Prevention, 2018). This study was exempted from review by the Icahn School of Medicine at Mount Sinai's (ISMMMS) Institutional Review Board (#1702145).

Plasma fluoride concentrations were measured among 4470 participants aged 6–19 years and tap water fluoride concentrations were measured among 8087 participants aged 0–19 years. Our analysis included adolescents aged 12–19 years because the renal and hepatic parameters examined herein were not measured in children under 12, except for the urinary albumin to creatinine ratio. Our sample included participants who had either plasma or water fluoride measurements and complete data for all covariates and outcomes. Missing data were < 15% for all outcome measures, and < 10% for covariates among participants who had all outcome measures. We excluded 2 participants with suggestive kidney disease, as indicated by estimated glomerular filtration rate < 60 mL/min/1.73m². Additionally, since protein intake can influence kidney and liver function test results, we excluded 1 participant with a reported daily protein intake of 0 g, and 3 participants with reported daily protein intakes > 400 g as these were considered likely to be erroneous values. There were 1985 adolescents

who met inclusion criteria for analyses. Of those, 1983 participants had plasma fluoride levels and were included in analyses. For analyses of water fluoride, 1942 participants had water fluoride levels and we excluded an additional 200 participants who reported that they did not drink tap water, resulting in a sample size of 1742. Participant selection is depicted in Fig. S1. Supplemental Table S1 compares demographic characteristics of the current overall study sample (n = 1985) and all adolescents ages 12–19 over the same years (NHANES 2013–2016). We applied sampling weights to account for the complex NHANES survey design as recommended by the National Center for Health Statistics (NCHS) (Centers for Disease Control and Prevention, 2013). The weighted samples for plasma and water fluoride analyses represented 25,930,302 and 23,287,332 adolescents in the U.S. respectively.

2.2. Fluoride measures

Fluoride concentrations were measured in blood plasma and household tap water samples. Tap water and blood collection times were not standardized. Plasma fluoride concentrations reflect fluoride intake as well as individual differences in fluoride metabolism (Buzalaf and Whitford, 2011). Plasma fluoride was measured via an ion-specific electrode and hexamethyldisiloxane (HMDS) method, and household water samples were measured via an ion-specific electrode. Both plasma and water fluoride concentrations were measured at the College of Dental Medicine, Georgia Regents University, Augusta, GA. They were measured in duplicate (using the same sample) and the average of these values was released. The lower limit of detection (LLOD) for plasma fluoride was 0.25 nmol, while the LLOD for water fluoride was 0.10 mg/L (National Health and Nutrition Examination Survey, 2017a; National Health and Nutrition Examination Survey, 2016a). Approximately 89% and 100% (all) of participants, had values above the LLOD for water fluoride and plasma fluoride respectively (National Health and Nutrition Examination Survey, 2016b; National Health and Nutrition Examination Survey, 2017b).

2.3. Kidney and liver parameters

Serum was analyzed for markers of kidney and liver function at the Collaborative Laboratory Services, Ottumwa, Iowa as part of a standard biochemistry profile. From 2013 to 2016 a Beckman Coulter UniCel Dx C 800 Synchron chemistry analyzer was utilized; while from 2015 to 2016 a Beckman Coulter UniCel Dx C 660i Synchron Access chemistry analyzer was utilized as well. Urine samples were analyzed for albumin and creatinine at the University of Minnesota via a Turner Digital Fluorometer, Model 450 and Roche Cobas 6000 Analyzer respectively. Urine sample collection time was not standardized. All analytical results were at or above the LLOD.

2.3.1. Estimated glomerular filtration rate (eGFR)

Glomerular filtration rate is considered the gold standard index of kidney function (Levey and Inker, 2016). We calculated eGFR with serum creatinine concentrations using the original Schwartz formula (Schwartz et al., 1987):

$$eGFR = [(k \times \text{height in cm}) / \text{creatinine in mg/dL}].$$

This formula is appropriate when serum creatinine concentrations are measured via a Jaffe rate method, as the larger coefficients account for the potentially higher serum creatinine levels associated with this method. In the original formula, $k = 0.7$ for adolescent boys and $k = 0.55$ for adolescent girls or individuals < 13 years of age; whereas in the revised formula the coefficient $k = 0.413$. Among children, adolescents and young adults, eGFR values < 75 mL/min/1.73 m² are considered abnormal, and those < 60 mL/min/1.73 m² are reflective of chronic kidney disease (Pottel et al., 2015).

2.3.2. Serum uric acid (SUA)

Uric acid is a waste product of purine metabolism that is excreted in urine. Dysregulation of SUA levels are common in kidney and metabolic disorders. SUA was measured using a timed endpoint method. The LLOD was 0.5 mg/dL. The standard reference range for uric acid for children and adolescents aged 10–18 years is 3.5–7.3 mg/dL. For males and females over 18 years the reference ranges are 3.6–8.4 mg/dL and 2.9–7.5 mg/dL respectively (Collaborative Laboratory Services LLC, 2017b).

2.3.3. Albumin to creatinine ratio (ACR)

Increased levels of urinary albumin are present with various renal diseases, including chronic kidney disease and end stage renal disease, as well as subclinical glomerular dysfunction. Urinary creatinine correlates with urinary volume and excretion rate. The albumin to creatinine ratio is used to detect kidney disease or dysfunction (Fuhrman et al., 2017). Urinary albumin was measured via a solid-phase fluorescent immunoassay (Chavers et al., 1984) and urinary creatinine was measured via an enzymatic endpoint method (University of Minnesota, 2014a). The LLOD for urinary albumin was 0.3 µg/mL, while the reportable lower limit for urinary creatinine was 5 mg/dL (University of Minnesota, 2014a; University of Minnesota, 2014b). Among children and young adults, an ACR of < 10 mg/g is considered normal, an ACR of 20–30 mg/g is considered mildly increased, an ACR of 30 to 300 mg/g is moderately increased (termed “microalbuminuria”), and an ACR of > 300 mg/g is severely increased (termed “macroalbuminuria”) (KDIGO, 2012).

2.3.4. Blood urea nitrogen (BUN)

Urea is a waste product of nitrogen-containing compounds, such as amino acids, metabolized by the liver and excreted in urine. High BUN levels may reflect kidney dysfunction (e.g. reduced ability to excrete urea) whereas low BUN levels may reflect liver dysfunction (e.g. impaired protein metabolism) or malnutrition. BUN was measured using an enzymatic conductivity rate method (Collaborative Laboratory Services LLC, 2017d; Collaborative Laboratory Services, 2017a). The analytical measurement range measured via the Beckman UniCel DxC 800 Synchron was 1–150 mg/dL (or up to 300 mg/dL with ORDAC enabled). When measured with the Beckman Coulter UniCel DxC 660i Synchron it was 5–100 mg/dL (or up to 300 mg/dL with ORDAC enabled). The standard reference range for BUN for people aged 5–15 years is 7–18 mg/dL. For those over 15 years it is 6–23 mg/dL (Collaborative Laboratory Services LLC, 2017d; Collaborative Laboratory Services, 2017a).

2.3.5. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT)

Serum aminotransferases are enzymes present in liver and cardiac tissue. Elevations can reflect hepatocyte and myocardial cell damage or disease states. AST and ALT were measured via enzymatic rate and kinetic rate methods respectively. The LLOD for both was 5.0 IU/L. The standard reference range for serum or plasma AST for people ages 10–20 years is 13–38 IU/L (Collaborative Laboratory Services LLC, 2017f). The standard reference ranges for serum or plasma ALT are 8–29 IU/L and 8–36 IU/L for 10–20 year-old females and males respectively (Collaborative Laboratory Services, 2017c).

2.3.6. Alkaline phosphatase (ALP)

ALP is an enzyme present in bone and liver cells and can be used to diagnose liver, bone and parathyroid disease. ALP was measured via a kinetic rate method. The LLOD was 5.0 IU/L. The standard reference range for serum or plasma ALP for individuals ages 12–16 is 67–382 IU/L, while for those > 16 years of age it is 36–113 IU/L (Collaborative Laboratory Services LLC, 2017e).

2.3.7. Serum albumin

Albumin is synthesized in the liver and is a major component of plasma where it plays a key role in maintaining oncotic pressure. Serum concentrations can be used to assess kidney and/or liver disease or dysfunction. Serum albumin concentrations were measured via a timed endpoint method. The analytic range was 1.0–7.0 g/dL. The standard reference range for serum or plasma albumin for healthy children and adolescents aged 1–18 years is 3.1–4.8 g/dL. For individuals over 18 years it is 3.5–5.0 mg/dL when measured with the Beckman Coulter UniCel DxC 660i Synchron Access chemistry analyzer and 3.7–4.7 mg/dL when measured with the Beckman Coulter UniCel DxC 800 Synchron analyzer (Collaborative Laboratory Services, 2017g; Collaborative Laboratory Services LLC, 2017h).

2.3.8. Gamma-glutamyl transferase (GGT)

GGT is an enzyme present in hepatocytes, a sensitive indicator of liver disease and more specific to liver function than AST/ALT. Serum GGT was measured via an enzymatic rate method. The analytical range was 5–750 IU/L or up to 3000 IU/L with ORDAC enabled. The reference ranges for males and females aged 10–15 years are 7–26 IU/L and 8–23 IU/L respectively. The reference ranges for males and females > 15 years are 10–65 IU/L and 8–36 IU/L respectively (Collaborative Laboratory Services LLC, 2017i).

2.4. Covariates

Covariates were selected a priori based on prior empirical evidence associated with fluoride exposure and kidney/liver function. They included: age, sex, body mass index, race/ethnicity, the ratio of family income to poverty, and daily protein intake (Villa et al., 2010; Martinez-Mier and Soto-Rojas, 2010; Jain, 2017; Boyde and Cerklewski, 1987; Moxey-Mims, 2018). Additionally, we adjusted for serum cotinine level as a biomarker of tobacco smoke exposure in sensitivity analyses including only the 2013–2014 NHANES cycle, since cotinine was only assessed in the 2013–2014 cycle (see analysis Section 2.5). The ratio of family income to poverty was calculated by dividing annual family income by the poverty guidelines specific to the survey year. Daily protein intake was obtained from a 24-hour dietary recall. Although, two 24-hour dietary recalls were conducted (one in person and one via telephone), we only used protein intake estimates from the in-person interview because most of the study sample did not complete the telephone interview. Only participants whose recall estimates were determined by the NCHS to be reliable were included in this study.

2.5. Statistical analyses

All analyses applied survey weights from the mobile exam center visit (i.e. MEC weights) to account for the clustered sample design, survey non-response, over-sampling, post-stratification, and sampling error, and to permit generalization to the U. S. population (National Center for Health Statistics, 2013). Given that we utilized dietary variables as covariates and/or exclusion criteria (i.e. protein intake; tap water consumption) we applied reweighted MEC weights to our dietary sample prior to analyses according to NCHS guidance. The MEC weights were recalculated based on our dietary subsample using an adjustment factor (see Appendix A). Descriptive statistics and regression analyses were performed using SAS (V.9.4) software. We used Pearson correlation to examine the relationship between plasma and water fluoride concentrations (both log₂-transformed).

Survey-weighted linear regression was used to model kidney and liver parameters as a function of plasma or water fluoride concentrations while adjusting for covariates. For regression analyses, we included laboratory generated values for water fluoride values below the LLOD; however, we imputed water fluoride values below the LLOD as LLOD/√2 in our calculation of descriptive statistics. We note that imputation (or lack thereof) did not appreciably change the results of

regression analyses. We explored potentially influential values using a Cook's Distance estimate; none were identified. Assumptions pertaining to normality, homogeneity of variance and linearity were satisfied for models testing the relationship between plasma fluoride and eGFR, SUA, BUN, serum albumin or GGT, as well as for models testing the relationship between water fluoride and BUN, serum albumin or SUA. For remaining models, linear regression assumptions were not satisfied. Therefore, a \log_2 transformation was applied to skewed fluoride variables, and skewed outcome variables, including: ACR, ALT, AST, ALP, and GGT, to satisfy assumptions. The relationship between plasma fluoride and ALP remained nonlinear after the transformation, and thus, we tested a quadratic relationship in the regression model. We also included a fluoride*sex interaction term in our models to test for sex-specific effects; however, it was not significant in any of the models, and therefore was removed. We also conducted sensitivity analyses to examine whether adjusting for cotinine exposure or removing participants with serum cotinine levels ≥ 10 ng/mL (Kim, 2016) influenced the relationship between plasma fluoride concentrations and kidney/liver parameters for participants in NHANES 2013–2014 (the only years in which both plasma fluoride and cotinine were measured). A two-tailed alpha of 0.05 was the criteria for statistical significance for regression analyses. We applied a Holm-Bonferroni correction to account for multiple comparisons for each fluoride variable.

3. Results

Demographic characteristics are presented in Table 1. Table S1 compares demographics between current study participants and all adolescents in NHANES 2013–2016. The average age of participants was 15.4 years.

Descriptive statistics for fluoride and kidney and liver parameters are presented in Table 2. The mean household water fluoride concentration among participants who drank tap water fell below the recommended level (mean = 0.48 mg/L); however, values between the 75th and 95th percentiles were above this level ranging from 0.71 to 1.00 mg/L. Participants generally had normal kidney and liver function (i.e. eGFR ranged between 84 and 212 mL/min/1.73 m²). However, SUA and BUN measurements at the 5th percentile were below their respective reference ranges. Additionally, ACR values at the 95th

percentile (98 participants) fell in the microalbuminuria range. Fluoride concentrations in plasma and tap water were moderately positively correlated ($r = 0.42$, $p < 0.001$).

3.1. Plasma fluoride regression results

In linear regression models adjusted for covariates, higher plasma fluoride concentrations were associated with lower eGFR, higher SUA, and lower BUN (B: -10.36 , 95%CI: -17.50 , -3.22 , $p = 0.05$; B: 0.29 , 95%CI: 0.09 , 0.50 , $p = 0.05$; and B: -1.29 , 95%CI: -1.87 , -0.70 , $p < 0.001$ respectively). Therefore, a 1 $\mu\text{mol/L}$ increase in plasma fluoride was associated with a 10.36 mL/min/1.73 m² lower eGFR, a 0.29 mg/dL higher SUA concentration, and a 1.29 mg/dL lower BUN concentration. Plasma fluoride concentrations were not associated with the remaining kidney or liver parameters examined herein (Table 3) (Fig. 1).

3.2. Water fluoride regression results

In linear regression models adjusted for covariates, higher water fluoride concentrations were associated with lower BUN (B = -0.93 , 95%CI: -1.44 , -0.42 , $p = 0.007$). Therefore, a 1 mg/L increase in household tap water fluoride concentration was associated with a 0.93 mg/dL lower BUN concentration. Water fluoride concentrations were not significantly associated with the remaining kidney or liver parameters examined herein (Table 4) (Fig. 2).

3.3. Sensitivity analysis

Associations between plasma fluoride and kidney and liver measures separated by NHANES cycle are presented in Table S2. Cotinine-adjusted associations between plasma fluoride and kidney and liver measures for NHANES 2013–2014 are presented in Table S3 (Note: 2013–2014 was the only cycle in our study with available serum cotinine data). Compared to the 2013–2014 results without cotinine adjustment (Table S2), our findings did not change appreciably when cotinine was included as a covariate in the survey-weighted covariate-adjusted regression model (Table S3). When participants with serum cotinine levels ≥ 10 ng/mL were excluded from the regression analysis

Table 1
Demographic characteristics according to sample participating in NHANES 2013–2016.

Demographic characteristic	Overall sample n = 1985 N = 25,942,026	Plasma fluoride sample n = 1983 N = 25,930,302	Water fluoride sub-sample ^a n = 1742 N = 23,287,332
Age (yrs.); mean (SE)	15.38 (0.07)	15.37 (0.07)	15.32 (0.07)
Sex; N (%)			
Male	13,672,321 (52.7)	13,665,854 (52.7)	12,494,779 (53.7)
Female	12,269,705 (47.3)	12,264,448 (47.3)	10,792,553 (46.3)
BMI; mean (SE)	24.34 (0.24)	24.34 (0.24)	24.21 (0.25)
BMI categories ^b ; N (%)			
Underweight	841,241 (3.3)	834,774 (3.2)	724,010 (3.1)
Normal weight	14,660,261 (56.8)	14,660,261 (56.8)	13,422,456 (57.9)
Overweight	4,698,550 (18.2)	4,698,550 (18.2)	4,144,842 (17.9)
Obese	5,608,569 (21.7)	5,603,312 (21.7)	4,901,026 (21.1)
Race/ethnicity			
Mexican American; N (%)	3,806,271 (14.7)	3,801,014 (14.7)	3,160,150 (13.6)
Other Hispanic	1,953,725 (7.5)	1,953,725 (7.5)	1,635,251 (7.0)
Non-Hispanic White	14,544,657 (56.1)	14,544,657 (56.1)	13,382,896 (57.5)
Non-Hispanic Black	3,220,902 (12.4)	3,220,902 (12.4)	2,871,360 (12.3)
Non-Hispanic Asian	1,069,372 (4.1)	1,069,372 (4.1)	967,296 (4.2)
Other race-including multi-racial	1,347,100 (5.2)	1,340,634 (5.2)	1,270,379 (5.5)
Daily protein intake (gm)	75.52 (1.21)	75.53 (1.21)	75.86 (1.30)
Ratio of family income to poverty	2.47 (0.10)	2.47 (0.10)	2.51 (0.10)

Note. Sampling weights were applied for calculation of demographic descriptive statistics and therefore Ns for frequencies represent the *weighted* sample size. Re-weighting for the dietary sample was not applied for calculation of descriptive statistics above.

^a Participants who reported that they did not drink the tap water were excluded.

^b n = 1972 for entire sample, n = 1970 for plasma F sample and n = 1732 for water F subsample due to missing data for this variable.

Table 2
Descriptive statistics of fluoride exposure and kidney and liver measures.

Measure	Arithmetic mean (Standard error)	Median	5th percentile	95th percentile
Plasma fluoride ($\mu\text{mol/L}$) ^a	0.40 (0.01)	0.33	0.16	0.81
Tap water fluoride (mg/L) ^b	0.48 (0.03)	0.48	0.07	1.00
eGFR ($\text{mL}/\text{min}/1.73\text{ m}^2$)	147.98 (1.21)	143.55	106.25	203.66
SUA (mg/dL)	5.07 (0.04)	4.92	3.07	7.21
Albumin/creatinine ratio (mg/g)	24.63 (1.93)	7.49	3.03	67.08
BUN (mg/dL)	11.25 (0.17)	10.41	5.80	16.59
ALT (IU/L)	19.57 (0.38)	15.72	10.15	38.57
ALP (IU/L)	134.26 (2.91)	96.70	48.41	323.58
AST (IU/L)	23.81 (0.37)	21.62	15.25	35.01
Serum albumin (g/dL)	4.51 (0.01)	4.46	3.96	4.96
GGT (IU/L)	14.35 (0.28)	11.88	7.15	27.48

Note. Sampling weights were applied for calculation of all descriptive statistics. N = 25,942,026 (unweighted n = 1985).

^a N = 25,930,302 (unweighted n = 1983).

^b N = 23,287,332 (unweighted n = 1742); Samples were reweighted to the dietary sample prior to calculating these descriptive statistics as these were the values utilized in regression analyses. Only standard errors changed following reweighting.

Table 3
Associations between plasma fluoride and kidney and liver measures.

Outcomes	Unstandardized beta (95% CI)	Uncorrected <i>p</i>	Holm-Bonferroni corrected <i>p</i>
eGFR	-10.36 (-17.50, -3.22)	0.01	0.05*
SUA	0.29 (0.09, 0.50)	0.01	0.05*
ACR ^a	0.08 (-0.04, 0.19)	0.20	> 0.99
BUN	-1.29 (-1.87, -0.70)	< 0.001	< 0.001*
ALT ^a	0.03 (-0.02, 0.08)	0.27	> 0.99
ALP ^{a,b}	0.00 (-0.01, 0.01)	0.95	> 0.99
AST ^a	0.00 (-0.04, 0.04)	> 0.99	> 0.99
Serum albumin	-0.03 (-0.09, 0.03)	0.29	> 0.99
GGT	-0.71 (-1.92, 0.50)	0.24	> 0.99

Note. Regression analyses were adjusted for age, sex, race/ethnicity, body mass index, ratio of family income to poverty and daily protein intake. Sampling weights were applied to these regression analyses; N = 25,930,302; unweighted n = 1983; MEC weights were re-weighted to our dietary sample for regression analyses.

^a Plasma fluoride exposure and outcome variables were \log_2 transformed.

^b Model included a quadratic term.

* Significant at $p \leq 0.05$ after Holm-Bonferroni correction; Regression results remained consistent regardless of whether MEC weights or re-weighted MEC weights were applied.

(n = 949), the association between plasma fluoride and eGFR had a greater magnitude of effect, but did not reach statistical significance (B: -5.50, 95%, CI: -13.77, 2.77, uncorrected $p = 0.18$) (Table S3). In the association between plasma fluoride and BUN, the magnitude of association was attenuated and marginally statistically significant (uncorrected $p = 0.06$). The association between plasma fluoride and SUA was relatively unchanged in magnitude or significance level (Table S3).

4. Discussion

To our knowledge, this study represents the first population-based study in the U.S. to examine the relationship between chronic low-level fluoride exposure and kidney and liver related parameters among adolescents. We included a breadth of kidney and liver measures to examine these relationships. Furthermore, we adjusted for factors that can influence fluoride exposure or absorption, kidney and liver function, or access to healthcare, such as socioeconomic status, as well as multiple comparisons. We utilized plasma fluoride concentrations as they account for both fluoride intake and individual differences in fluoride absorption and metabolism (Buzalaf and Whitford, 2011). Conversely, household tap water fluoride concentrations are unaffected

by individual differences in fluoride metabolism; yet, water fluoride constitutes the primary source of U.S. fluoride exposure (Health and Ecological Criteria Division. Office of Water, 2010).

Higher plasma fluoride concentrations were associated with changes in kidney and liver related parameters. Most notably, a 1 $\mu\text{mol/L}$ increase in plasma fluoride was associated with a 10.36 $\text{mL}/\text{min}/1.73\text{ m}^2$ lower eGFR. This is consistent with previous studies in which higher urinary fluoride and dental fluorosis were associated with lower eGFR among youth in China and India (Ando et al., 2001; Khandare et al., 2017). However, it is inconsistent with a recent cross-sectional study in Mexico that found an association between higher urinary fluoride and increased eGFR among 374 children (Jimenez-Cordova et al., 2018). Differing results could reflect eGFR measurement, participant age, and/or fluoride biomarkers utilized (i.e. urine vs. blood fluoride assessment). Specifically, in the study conducted in Mexico eGFR was determined from a single serum measure with the creatinine-cystatin C-based CKiD equation (Schwartz et al., 2012), children were 5–12 years old, and fluoride was assessed in urine adjusted for specific gravity. We also found that adolescents with higher plasma fluoride tended to have higher SUA and lower BUN which can reflect altered kidney and liver function respectively; although, lower BUN levels can also reflect nutritional deficiencies (Kumar et al., 1972). Consistently, among adolescents who consumed tap water, those with higher household tap water fluoride concentrations tended to have lower BUN, which may indicate impaired protein metabolism.

Given the cross-sectional nature of this study, there are several possible interpretations for the findings. First, fluoride exposure may contribute to complex changes in kidney and liver parameters among U.S. adolescents. This possibility is supported by the consistency of our findings with research demonstrating a dose-response relationship between water fluoride levels above 2 mg/L and enzyme markers of liver and kidney dysfunction (Xiong et al., 2007). Although in the current study, tap water fluoride concentrations were generally below 1 mg/L . There are several mechanisms by which fluoride exposure may contribute to kidney dysfunction. First, studies with adult rats have shown that chronic low-level fluoride exposure can lead to glomerular hypercellularity and mesangial cell proliferation (Varner et al., 1998), reduced kidney enzyme activity (Sullivan, 1969), interstitial nephritis, and renal tubule hypertrophy and hyperplasia (McCay et al., 1957). Increased apoptosis and tubular epithelial damage, including necrosis, have also been observed among children with high fluoride exposures (Quadri et al., 2018). Chronic low-level fluoride exposure is also associated with decreased thyroid gland activity among children (Lin et al., 1991; Singh et al., 2014; Khandare et al., 2018) and adults (Kheradpisheh et al., 2018; Malin et al., 2018). Moreover, reduced thyroid gland function, within the clinically normal range, is associated

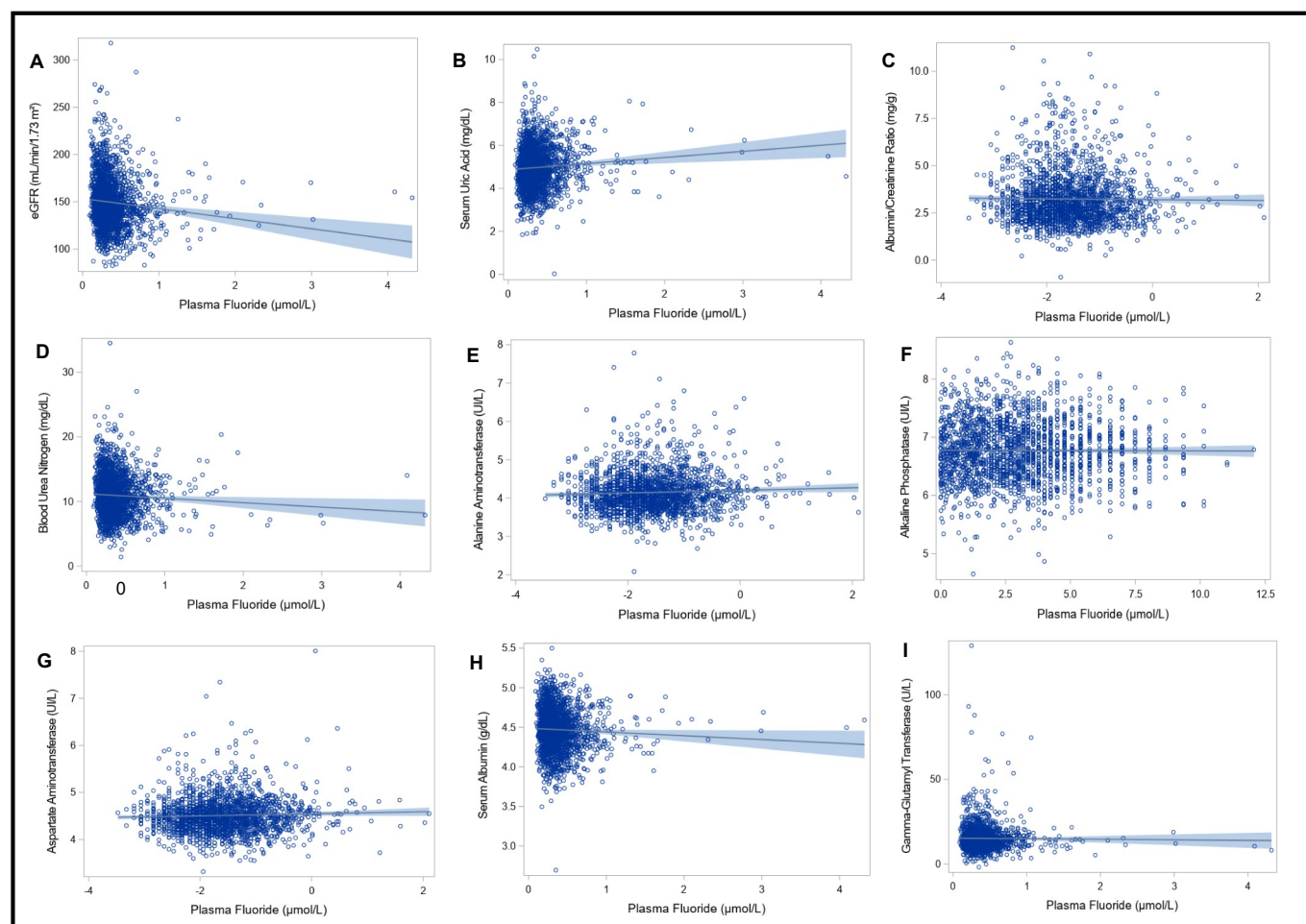


Fig. 1. Associations between plasma fluoride and kidney and liver measures.

Each figure depicts a regression line with 95% confidence intervals; circles represent individual data points. Sample weighted regressions were adjusted for age, sex, race/ethnicity, body mass index, ratio of family income to poverty and daily protein intake ($N = 25,930,302$; unweighted $n = 1983$). Plasma fluoride and outcome variables were log2 transformed for analyses with albumin/creatinine ratio, alanine aminotransferase, alkaline phosphatase (ALP) and aspartate amino transferase. The model with ALP included a quadratic term. Cook's distance estimates were used to test for influential data points; none were identified.

Table 4
Associations between water fluoride and kidney and liver measures^a.

Outcomes	Unstandardized beta (95% CI)	Uncorrected p	Holm-Bonferroni corrected p
eGFR ^b	-1.03 (-2.93, 0.87)	0.28	> 0.99
SUA	0.05 (-0.07, 0.18)	0.47	> 0.99
ACR ^c	-0.01 (-0.07, 0.06)	0.79	> 0.99
BUN	-0.93 (-1.44, -0.42)	< 0.001	0.007 [*]
ALT ^c	0.01 (-0.02, 0.03)	0.62	> 0.99
ALP ^c	-0.02 (-0.04, 0.00)	0.02	0.16
AST ^c	-0.00 (-0.02, 0.01)	0.68	> 0.99
Serum albumin	-0.06 (-0.12, 0.00)	0.07	0.47
GGT ^c	-0.01 (-0.04, 0.02)	0.60	> 0.99

Note. Regression analyses were adjusted for age, sex, race/ethnicity, body mass index, ratio of family income to poverty and daily protein intake. Sampling weights were applied to these regression analyses; $N = 23,287,332$; unweighted $n = 1742$; MEC weights were re-weighted to our dietary sample for regression analyses.

^a Participants who reported not drinking tap water were excluded from these analyses.

^b Water fluoride was log2 transformed in this model.

^c Water fluoride and outcome variables were log2 transformed.

* Significant at $p \leq 0.05$ after Holm-Bonferroni correction; Regression results remained consistent regardless of whether MEC weights or re-weighted MEC weights were applied.

with decreased eGFR (Anderson et al., 2018; Asvold et al., 2011). Thus, fluoride exposure could potentially compromise kidney function via glomerular damage, or indirectly via suppression of the thyroid gland. However, this study did not aim to determine whether fluoride exposure is associated with clinical decrements in kidney function among U.S. adolescents. Rather, this study aimed to examine subclinical changes in kidney or liver parameters associated with fluoride exposure among a generally healthy population. For example, the lowest GFR estimated in this study was 84 mL/min/1.73 m², and therefore none were below the < 75 mL/min/1.73 m² value considered reflective of abnormal kidney function. Future prospective studies including participants with and without kidney disease are needed to assess clinical changes in kidney or liver function. Additionally, if fluoride exposure does contribute to changes in kidney or liver parameters, future prospective studies are needed to examine critical windows of vulnerability for these effects; in particular, it is unknown whether these changes may result from early life exposures during vital stages of kidney and liver development, from cumulative exposure, or both.

An alternative interpretation for our findings is that poorer kidney function may contribute to increased plasma fluoride levels rather than resulting from them. This possibility is supported by our finding that water fluoride concentrations were not associated with kidney parameters. Furthermore, animals and humans with impaired renal function tend to have higher levels of bone and plasma/serum fluoride because

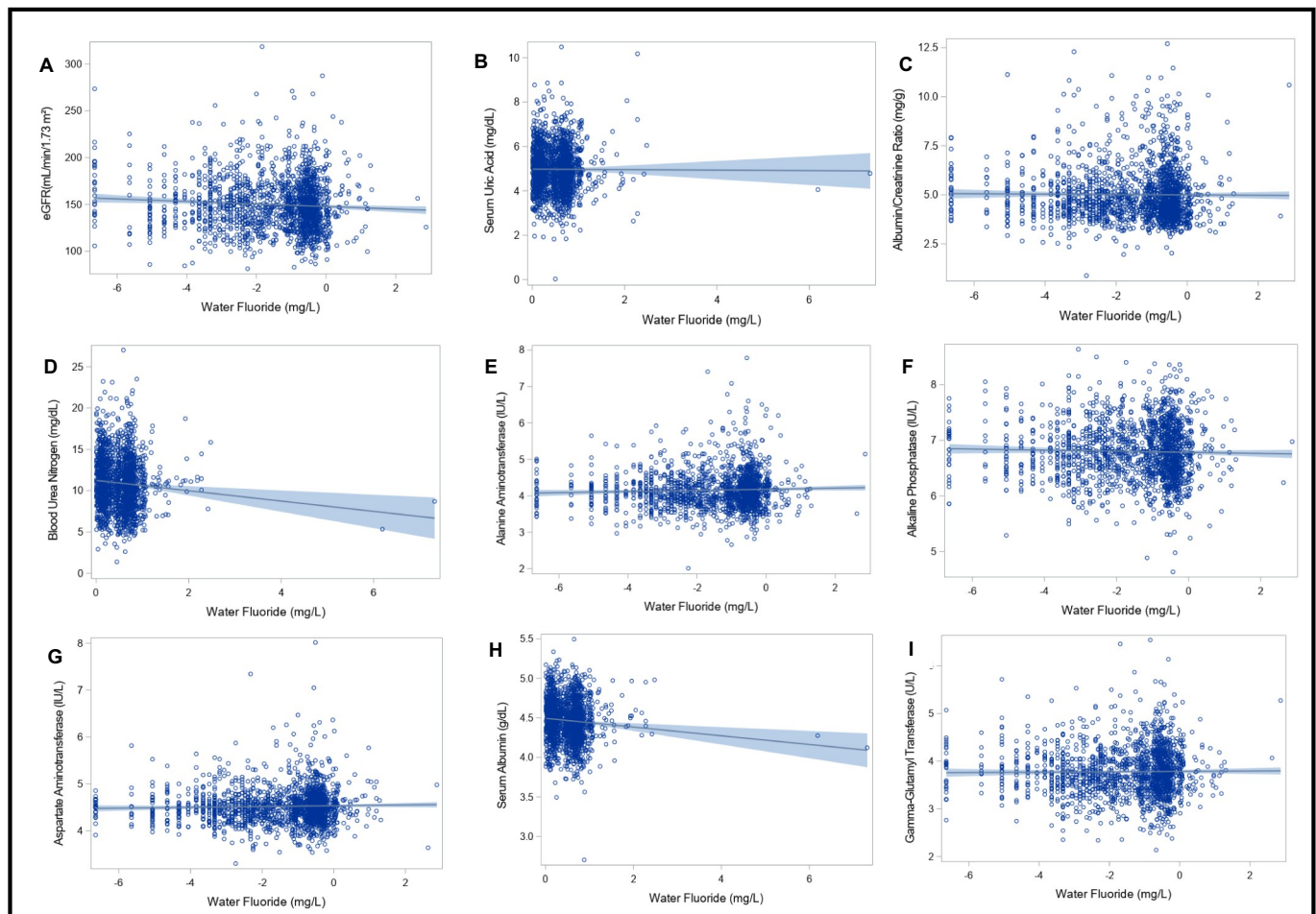


Fig. 2. Associations between water fluoride and kidney and liver measures.

Each figure depicts a regression line with 95% confidence intervals; circles represent individual data points. Sample weighted regression analyses were adjusted for age, sex, race/ethnicity, body mass index, ratio of family income to poverty and daily protein intake (Participants who reported not drinking tap water were excluded; $N = 23,287,332$; unweighted $n = 1742$). Water fluoride and outcome variables were log2 transformed for analyses with albumin/creatinine ratio, alanine aminotransferase, alkaline phosphatase, aspartate amino transferase and gamma-glutamyl transferase. Water fluoride was log2 transformed for the analysis with eGFR. Cook's distance estimates were used to test for influential data points; none were identified.

they do not excrete fluoride as readily (Turner et al., 1996; Waterhouse et al., 1980; Rao and Friedman, 1975). However, plasma fluoride, rather than water fluoride, may have been associated with kidney function parameters in this study because it may better reflect individual fluoride exposure.

A third possibility is that the relationship between fluoride exposure and kidney function is bidirectional or cyclical in nature; whereby fluoride hinders kidney function which contributes to decreased fluoride excretion, increased bodily fluoride absorption and further decrements in kidney function. Indeed, soluble fluoride that is not excreted in urine is ultimately absorbed in hard and soft tissues, such as bones or organ systems (including the kidneys) respectively (Buzalaf and Whitford, 2011). Moreover, fluoride urinary excretion rates tend to be lower among children (Buzalaf and Whitford, 2011; Villa et al., 2010) because more fluoride is absorbed in bone in the growing skeletal system (National Research Council, 2006b). Therefore, increases in plasma fluoride could render children more vulnerable to other health effects of fluoride exposure. Indeed, adults and children with kidney disease have been shown to be at an increased risk of bone disease and severe dental fluorosis respectively, due to increased skeletal fluoride absorption (Ibarra-Santana et al., 2007; Lucas and Roberts, 2005; Johnson and Jowsey, 1979).

Fluoride's effects on the liver are less well-characterized; however, animal studies have shown that low-level fluoride exposure can

increase fatty deposits in the liver (de Camargo and Merzel, 1980), affect liver protein expression (Pereira et al., 2013) and cause necrosis (Perera et al., 2018). High fluoride exposures can cause vacuolization of hepatocytes, dilated and hypertrophic liver tissue (Shashi, 2001), increased oxidative stress and oxidative damage (Atmaca et al., 2014; Xiao-ying and Sun, 2003), necrosis and altered liver enzyme activity (Perera et al., 2018). In this study, fluoride exposure was not associated with liver enzyme levels; however, higher concentrations of both water and plasma fluoride were associated with lower BUN. Taken together, these findings suggest that fluoride exposure may contribute to sub-clinical decrements in liver function. We speculate that this could potentially occur via interference by fluoride with liver amino acid metabolism or protein synthesis (Chattopadhyay et al., 2011). Additionally, since lower BUN levels may indicate protein malnutrition (Kumar et al., 1972), we also speculate that our findings may reflect subclinical interference of gastrointestinal processes by fluoride, although protein intake in our sample was within 'normal' ranges for adolescents on average. While high fluoride exposures have been shown to damage gastric mucosa (Spak et al., 1990), to our knowledge, no human studies have examined gastrointestinal effects of low fluoride exposures. Mechanistic studies are needed to understand underlying mechanisms of potential hepatotoxic and/or gastrointestinal effects of fluoride.

This study had several limitations. First, since this study is cross-

sectional, the directionality of relationships cannot be determined, particularly for associations of plasma fluoride and kidney/liver parameters. Therefore, additional longitudinal studies are needed to better understand the developmental nephro- and hepatotoxicological impacts of fluoride, and to parse directionality of these associations. Regardless, this study contributes important information regarding how plasma fluoride levels change in association with subclinical changes in kidney and liver parameters (or vice versa) in the U.S. population which was previously unreported. Second, blood sample collection time was not standardized; however, exposure misclassification based on collection time is more likely to bias estimates toward the null. Therefore, we consider it unlikely that lack of standardization for blood collection led to 'false positive' findings. Third, we did not have data on smoke exposure for participants in NHANES cycle 2015–2016 and therefore could not adjust for this in our main analyses. Still, we conducted sensitivity analyses adjusting for serum cotinine, a biomarker of nicotine exposure, and this did not change the findings. Therefore, even though smoking status may influence plasma fluoride levels (Jain, 2017) and kidney/liver function, it was likely not a confounder in this study. Still, we had a limited dataset with which to examine this possibility so we cannot rule it out completely. Fourth, we did not control for physical activity level or alcohol consumption in our analyses as data for these variables were not available for the majority of our sample. Lastly, we could not examine whether associations between fluoride exposure and kidney and liver parameters differed geographically as geographic locations of participants are not publicly available.

While the dental benefits of fluoride are widely established (O'Mullane et al., 2016), recent concerns have been raised (U.S. Department of Health and Human Services Federal Panel on Community Water Fluoridation, 2015; Centers for Disease Control and Prevention, 2010; Aguilar-Diaz et al., 2017) regarding the appropriateness of its widespread addition to drinking water or salt in North America. The current study suggests that there may be potential nephro- and hepatological health concerns to consider when evaluating fluoride use and appropriate levels in public health interventions. However, we emphasize that future studies are required to overcome the limitations of a single cross-sectional study.

4.1. Conclusion

Fluoride exposure may contribute to complex changes in kidney and liver related parameters among adolescents in the United States. However, as the study is cross-sectional, reverse causality is possible and altered kidney and liver function may impact bodily fluoride absorption and metabolic processes. Further studies are needed to examine the mechanisms by which chronic low-level fluoride exposure may impact kidney and liver related parameters during development and adolescent life stages, as well as the ways in which kidney and liver function influence bodily fluoride absorption.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

Acknowledgments

We would like to thank the Centers for Disease Control and Prevention (CDC) for conducting NHANES as well as the NCHS employees who provided us with consultation regarding the application of survey weights. We would also like to thank the participants of the 2013–2014 and 2015–2016 NHANES cycles, without whom this research would not have been possible.

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Appendix A

To better account for the reduced sample size of the dietary recall dataset used in analyses herein, mobile exam center (MEC) weights were re-weighted using an adjustment factor, as detailed below, according to NCHS guidance:

1. *Sum the MEC weights of the domain* = Σdomain , where 'domain' refers to the gender, race and/or age group of participants who meet inclusion criteria prior to reducing to the dietary sample.
2. *Sum the MEC weights for study participants (SPs) in dietary sample* = ΣSP
3. *Calculated adjustment factor* = $\Sigma \text{Domain} / \Sigma \text{SPs}$
4. *For SPs in the dietary sample, the new derived weights are equal to the MEC weight multiplied by the adjustment factor of the domain. For SPs not in the dietary sample, the new derived weight was set to missing.*

Appendix B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.envint.2019.105012>.

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From: Donna Westfall
To: Public Submissions
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Friday, October 18, 2019 8:35:57 AM

As a former city councilwoman, I was instrumental in investigating my constituents complaints about the harmfulness of water fluoridation. As a result I helped in getting an initiative to the ballot and we successfully voted in a moratorium on Nov 6, '12 to turn off the toxic industrial waste fluoride (HYDROFLUOSILICIC ACID OR HFSA) because our supplier UNIVAR, (formerly Basic Chemical Solutions) would not provide three things:

- 1.) Toxicological report**
- 2.) Listing of contaminants**
- 3.) Proof that their product was safe for all water consumers, infants to seniors.**

This absurd practice of adding HFSA is based more on politics than science. Why should a water department be given the power to medicate anyone when they don't take a health history, they don't pass out a listing of side effects or monitor the dose. This is tantamount to gross negligence. Water consumers started to send in their payment UNDER PROTEST so that when the class action lawsuits begin they would be covered.

After adding water fluoridation for 44 years, our town had 70% cavities in our childrens' teeth, (this figure was quoted from Dr. Susan Wellman, dentist who is pro-fluoride) high obesity rates and low test scores. Hardly an endorsement for continuing this unethical practice. We were also ranked 34th in the nation for cancer while Brookings, Oregon..... just 25 minutes north of us.... was ranked 765th in the nation for cancer for the same time period and Brookings never fluoridated their water.

We have high rates of not only cancer, but thyroid, diabetes and kidney disease all with links to HFSA. One constituent ended up in ER with seizures after showering for 10 minutes. Her doctor has subsequently written a letter describing her allergic reaction to water fluoridation. She was on a medication which contained fluoride and that in combination with absorbing this poison transdermally by showering put her in the Emergency Room.

Please do your homework! Study the reports on Fluoride Action Network as a starting point.

Donna Westfall
Crescent City, Calif.



Virus-free. www.avast.com

From: [Cal & Colleen Cran](#)
To: [Public Submissions](#)
Cc: ["Safe Water Calgary"](#)
Subject: [EXT] Preregistration to speak during fluoride hearing
Date: Friday, October 18, 2019 10:23:35 AM

Dear City Clerk,

I have been fighting water fluoridation in Calgary for over 30 years, and I am opposed to the Fluoridation Lobby forcing this industrial chemical from the Mosaic Phosphate Fertilizer Industry in Florida on all Calgarians. The Mosaic Company sells their industrial waste bi- product to cities in North America, under the guise of reducing tooth decay in children from low income families. Calgary Taxpayers have saved almost \$15 million dollars since 2011 by stopping W.F., and most Calgary taxpayers are unaware that W.F. is a multi million dollar program.

Colleen Cran

P.S. Please send me a reply that you received this email. Thankyou.

From: [Holistic Dental Hygiene Clinic & Mobile Care](#)
To: [Public Submissions](#)
Cc: safewatercalgary@gmail.com
Subject: [EXT] NO TO ARTIFICIAL WATER FLUORIDATION
Date: Friday, October 18, 2019 10:29:12 AM

Dear City council,

I do NOT support putting fluoride back into our water here in Calgary. It should be a matter of choice! NO amount of fluoride is going to STOP cavities if people are not taking care of their teeth and eating a proper diet.

Fluoride is just a band aid approach that cannot and will NOT stop cavities. I have been a dental hygienist for 20 years now. I do not want fluoride in my drinking water for myself and it SHOULD be a right of choice.

Regards, Corinne M. Strohman, RDH

This message is intended only for the use of the addressee and may contain information that is privileged and confidential. If you are not the intended recipient, you are hereby notified that any dissemination of this communication is prohibited. If you have received this communication in error, please notify us immediately by phone at 403-993-7031.

Holistic Dental Hygiene Clinic &
Dental Hygiene Connections - Mobile Care
Suite140, 4411 - 16 Avenue NW
Calgary, AB T3B 0M3
Phone:403-993-7031
Fax: 403-454-6893

www.healthyteeth4life.ca

From: [David Kennedy DDS](#)
To: [Public Submissions](#)
Cc: [Amanda Just](#)
Subject: [EXT] Fluoride position paper
Date: Friday, October 18, 2019 2:02:32 PM
Attachments: [IAOMT-Fluoride-Letter-for-Safe-Water.pdf](#)

Below please find attached the carefully scientific review of ingested fluoride and our position statement. We have defended this statement with carefully chosen peer reviewed references and can address any criticisms the inevitability arise when there are disagreements.

Sincerely

David Kennedy DDS

Sent from my iPhone

Begin forwarded message:

From: David Kennedy DDS <david.kennedy@emeramed.com>
Date: October 18, 2019 at 12:41:18 PM PDT
To: David Kennedy DDS <davidkennedy-dds@cox.net>

<https://iaomt.org/wp-content/uploads/IAOMT-Fluoride-Letter-for-Safe-Water.pdf>

Sent from my iPhone

The International Academy of Oral Medicine and Toxicology (IAOMT)
8297 ChampionsGate Blvd, #193 ChampionsGate, FL 33896
Phone (863) 420-6373; Website: www.iaomt.org



Dear Public Official,

This letter is being sent to you to establish that there is scientific evidence demonstrating the potential for harmful health effects caused by water fluoridation. Since you have been tasked with the responsibility of taking part in a decision about whether to fluoridate the water in your community, we urgently request that you take this opportunity to fairly and conscientiously evaluate the risks associated with fluoride use. We are aware that some dentists and health professionals will tout benefits of ingested fluoride; however, it is crucial that you also examine the most up-to-date body of facts relevant to hazardous impacts of fluoridation.

The International Academy of Oral Medicine and Toxicology (IAOMT) has been dedicated to its mission of protecting public health through the practice of biocompatible dentistry since it was founded in 1984. We are an organization of over 800 dentists, physicians, and research professionals in more than 14 countries, and the scientific activities of the IAOMT are overseen by a Scientific Advisory Board composed of leaders in Biochemistry, Toxicology, and Environmental Medicine. Our members have been expert witnesses about dental products and practices before the United Nations Environment Programme (UNEP), U.S. Congress, U.S. Food and Drug Administration (FDA), Health Canada, and other government bodies around the globe.

We recently reviewed hundreds of scientific studies and research articles and produced a detailed position paper against fluoridation that features over 500 citations supporting the potential for fluoride to cause adverse health outcomes. A summary of our official position is that **given the elevated number of fluoride sources and the increased rates of fluoride intake in the American population, which have risen substantially since water fluoridation began in the 1940's, it has become a necessity to reduce and work toward eliminating avoidable sources of fluoride exposure, including water fluoridation, fluoride-containing dental materials, and other fluoridated products.**

We implore you to read our full position paper, which can be found online at <https://iaomt.org/wp-content/uploads/IAOMT-Fluoride-Position-Paper.pdf>. Additional resources about fluoride from the IAOMT can also be located at <https://iaomt.org/resources/fluoride-facts/>. You might also be interested in the Fluoride Action Network (FAN)'s [Professionals Statement to End Water Fluoridation](#), which has been signed by over 4,000 medical, dental, scientific, and environmental professionals. Please feel free to contact us at info@iaomt.org or (863) 420-6373 if we can further assist you in understanding that fluoridation is an outdated, dangerous practice with the potential to harm your citizens and your community at large.

Sincerely,

A handwritten signature in black ink that reads 'David Kennedy DDS'.

David Kennedy, DDS, MIAOMT

A handwritten signature in black ink that reads 'John Kall DMD'.

John Kall, DMD, FAGD, MIAOMT

A handwritten signature in black ink that reads 'E. Griffin Cole'.

E. Griffin Cole, DDS, NMD, MIAOMT

From: [Stevens, Jodie](#) on behalf of [City Clerk](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Submission for Hearing on Water Fluoridation
Date: Friday, October 18, 2019 2:29:44 PM

Hello Public Submissions,

Please see the below concern,

Thank you

Jodie Stevens

Business & Logistics Liaison – Planning, Reporting, Finance, 311 & Safety
City Clerk's Office - Citizen and Corporate Services
313 – 7 Ave SE
P.O Box 2100, Stn M Mail Code #8007
Calgary, AB T2P 2M5
P: 403-268-5851
E: jodie.stevens@calgary.ca

One City, One Voice



ISC: Protected

From: Raymond White <rrweditha@yahoo.com>
Sent: Friday, October 18, 2019 2:21 PM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Submission for Hearing on Water Fluoridation

Dear Calgary City Council Member:

While I was working on my Ph.D. (1973) in Biol. Sciences at Stanford I met a fellow grad student working on water fluoridation issues, so I have paid the issue some attention ever since.

The recent publication of Green *et al.* in JAMA-Pediatrics (Aug 19, 2019) confirming previous work suggesting that fluoride is a developmental neurotoxin at least in humans made me contact my local water suppliers to ask them to issue a **caution** to pregnant women. I was

ignored. Letters to local papers were unpublished.

If you were to fluoridate your water supply, I suggest that you prominently publish a **caution** such as: **"Recent studies published in peer-reviewed journals suggest that a gestating mother's consumption of fluoridated water might reduce her child's IQ by 4.5 to 6 points. It is recommended that pregnant women might consider avoid ingesting fluoridated water and other unnecessary sources of fluoride. Infant formula should probably not be made with fluoridated water."**

In your consideration of the fluoride question, I suggest discounting statements that rely on authority (ADA, CDC, etc) and sarcasm rather than on published scientific evidence.

Sincerely yours,
Raymond R. White, Ph.D.
2468 Whitney Drive
Mountain View, CA, USA 94043
rrweditha@yahoo.com
650493-5070

From: [April Hurley](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation from a Seasoned Family Physician
Date: Friday, October 18, 2019 3:53:11 PM
Attachments: [Calgary Fluoridation Vote.pdf](#)

Dear Calgary Mayor and City Council members,

I am a family physician licensed in California, Vermont, and New Jersey and Board Certified in Family Medicine through 2026.

It comes to my attention that your municipality is reconsidering water fluoridation.
Please vote to forever end the practice of fluoride contamination of your city drinking water.

In numerous recent exemplary studies confirming decades of evidence, water fluoridation has been shown to cause devastating impacts on hormonal, skeletal, microbiome, and brain health of developing fetuses, children, adults, and animals. Many people are even more vulnerable to fluoride toxicity due to their medication, work and lifetime environments, compromising genetic defects, or health conditions.

During my 35 years serving families, I have witnessed epidemics of brain damage escalate every year while neurotoxic exposures have been tolerated or promoted (as in the case of water fluoridation):

- Lead was allowed in gasoline until 1996 due to well-funded industry lobbying and bribery.
- It was not until the mid-1980's, when second-hand smoke proved to be damaging, that the medical organizations finally took a stand against cigarette smoking.
- Vapor ingredients from e-cigarettes are threatening more preteen bodies each year while Juul and other vaping manufacturers are excused to do demonstrable harm.
- Fluoride based chemicals, such as sodium hexafluoroaluminate and sulfonyl fluoride, are commonly used in industrial farming of food crops and entering the meat supply as well.
- Many medications are fluorinated (organofluorine drugs) and research suggests that some fluorinated pharmaceuticals, pesticides, and herbicides increase everyone's body burden of inorganic fluoride.
- Ubiquitous pollutants glyphosate (from Monsanto/Bayer's Round-Up), lead, aluminum, and mercury further increase fluoride toxicity.
- Recently, Glide dental floss was shown to be problematic. Its resilient and slick component, a toxic perfluorinated compound (PFAS), was found to persist in the blood of those who use these products. Unless consumers are better informed, they cannot make wiser choices.

The dogma that water fluoridation is useful is archaic and dangerous. You can no longer pretend that any questionable water fluoridation benefit outweighs the neurotoxic and systemic health risks.

As elected city officials, you are responsible for the public health and safety of all city residents. Your voice and vote will be remembered as the stand you took in a critical time, the legacy you leave your community.

Sincerely,

April Hurley MD
Oceanport NJ, USA

www.AprilHurleyMD.com

707-528-4968 (24/7)



Virus-free. www.avast.com



APRIL M. HURLEY, MD
BOARD CERTIFIED FAMILY MEDICINE
ACTIVE LICENSES: NEW JERSEY, VERMONT, CALIFORNIA



CPS2019-0965
Attachment 2
Letter 70a

October 18, 2019

RE: Sanctioned neurotoxin pollution of your community's water supply

Dear Calgary Mayor and City Council members,

It comes to my attention that your municipality is reconsidering water fluoridation.
Please vote to forever end the practice of fluoride contamination of your city drinking water.

In numerous recent exemplary studies confirming decades of evidence, water fluoridation has been shown to cause devastating impacts on hormonal, skeletal, microbiome, and brain health of developing fetuses, children, adults, and animals. Many people are even more vulnerable to fluoride toxicity due to their medication, work and lifetime environments, compromising genetic defects, or health conditions.

During my 35 years serving families, I have witnessed epidemics of brain damage escalate every year while toxic exposures have been tolerated or promoted (as in the case of water fluoridation):

- Lead was allowed in gasoline until 1996 due to well-funded industry lobbying and bribery.
- It was not until the mid-1980s, and only when second-hand smoke proved to be damaging, that US medical organizations finally decided to officially discourage cigarette smoking.
- Vapor ingredients from e-cigarettes are threatening more preteen bodies each year while Juul and other vaping manufacturers are excused to do demonstrable harm.
- Fluoride based chemicals, such as sodium hexafluoroaluminate and sulfonyl fluoride, are commonly used in industrial farming of food crops and entering our meat supply as well.
- Many medications are fluorinated (organofluorine drugs) and research suggests that some fluorinated pharmaceuticals, pesticides, and herbicides increase everyone's body burden of inorganic fluoride.
- Ubiquitous pollutants glyphosate (from Monsanto/Bayer's Round-Up), lead, aluminum, and mercury further increase fluoride toxicity.
- Recently, Glide dental floss was shown to be problematic. Its resilient and slick component, a toxic perfluorinated compound (PFAS), was found to persist in the blood of those who use these dental products. Unless consumers are better informed, they cannot make wiser choices.

The dogma that water fluoridation is useful is archaic and dangerous. You can no longer pretend that any questionable water fluoridation benefit outweighs the neurotoxic and systemic health risks.

As elected city officials, you are responsible for the public health and safety of all city residents.
Your voice and vote will be remembered as the decision you made at this critical time, the legacy you leave your community.

Sincerely,

www.AprilHurleyMD.com

PHONE: 707.528.4968 FAX: 844.626.1326 ~ AprilHurley@sonic.net ~ 274 #5J EAST MAIN ST, OCEANPORT, NJ 07757



Public Submission

City Clerk's Office

Please use this form to send your comments relating to Public Hearing matters, or other Council and Committee matters, to the City Clerk's Office. In accordance with sections 43 through 45 of Procedure Bylaw 35M2017, as amended. The information provided may be included in written record for Council and Council Committee meetings which are publicly available through www.calgary.ca/ph. Comments that are disrespectful or do not contain required information may not be included.

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

Personal information provided in submissions relating to Public Hearing Matters before Council or Council Committees is collected under the authority of Bylaw 35M2017 and Section 33(c) of the Freedom of Information and Protection of Privacy (FOIP) Act of Alberta, and/or the Municipal Government Act (MGA) Section 636, for the purpose of receiving public participation in municipal decision-making. Your name, contact information and comments will be made publicly available in the Council Agenda. If you have questions regarding the collection and use of your personal information, please contact City Clerk's Legislative Coordinator at 403-268-5861, or City Clerk's Office, 700 Macleod Trail S.E., P.O. Box 2100, Postal Station 'M' 8007, Calgary, Alberta, T2P 2M5.

✓ * I have read and understand that my name, contact information and comments will be made publicly available in the Council Agenda.

* First name Blaine

* Last name Gardiner

Email blainegardiner@gmail.com

Phone 4038919556

* Subject Calgary Artificial Fluoridation - DO NOT DO IT

* Comments - please refrain from providing personal information in this field (maximum 2500 characters)

Knowing there is a public hearing October 29 that I will not be in attendance for, I wanted to make sure my voice is heard...

I'm still in disbelief that the city is even considering artificial fluoridation of the water supply. OBVIOUS health concerns aside, it is straight up UNETHICAL for an individual/group/etc. to force a chemical on me and the collective population of the city. The only reason this conversation is happening is to help a small segment of the population with their dental health. Here's some advice: FIGURE OUT A TARGETED APPROACH!

There are far too much ignorance on this issue simply because of the simple (and likely only) correlation people make between fluoride and dental health. No matter how many people 'think or feel' fluoridation may be a good idea, it does not make it the right decision.

I want, NEED, and HAVE A RIGHT to safe drinking water. The fact I need to communicate this to my municipal government is quite pathetic.

ISC:

1/1

Unrestricted

Oct 18, 2019

4:44:16 PM

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing
Date: Monday, October 21, 2019 10:58:56 AM

-----Original Message-----

From: Adrian Spielman [mailto:adrian_spielman@hotmail.com]
Sent: Monday, October 21, 2019 10:09 AM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing

Calgary City Clerk

RE: Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing

null

Dear Council,

I don't want fluorosilicic acid in my drinking water.

Fluoride is the only chemical added to water for the purpose of medical treatment. The U.S. Food and Drug Administration (FDA) classifies fluoride as a drug when used to prevent or mitigate disease (FDA 2000).

Informed consent is standard practice for all medication, and one of the key reasons why most of Western Europe (97%) has ruled against fluoridation. With water fluoridation we are allowing governments to do to whole communities (forcing people to take a medicine irrespective of their consent) what individual doctors cannot do to individual patients.

Vote No on fluoridation.

Thanks,

Sincerely,
Adrian Spielman

Calgary, AB

From: [Rukshana Engineer](#)
To: [Public Submissions](#)
Subject: [EXT] **Submission: Hearing on Water Fluoridation - **added full address
Date: Friday, October 18, 2019 7:34:15 PM

Added: first name and address

----- Forwarded Message -----

October 18th, 2019

Dear Calgary City Council,

I was alarmed to learn that the City of Calgary was considering re-initiating water fluoridation.

Contrary to the Tobacco Science claims of influential dental organizations, (e.g. de facto industry trade and lobby group\$) there's ample evidence definitively implicating fluoride in neurological, immunologic, carcinogenic and cardiotoxic disorders.

Sadly, for me as a child, my father fell for fluoride spin doctoring, and I was subjected to fluoride drops which resulted in **unbearable muscle aches, severe insomnia, headaches and teeth that were "hard" on the outside, but rotting on the inside...** All this, despite a very healthy diet, extremely low in sugar. When my fluoride prescription was accidentally forgotten for a while, *(the only change)* all my symptoms disappeared except for the lasting damage done to my teeth which I've paid for dearly, as an adult. Years later -- upon becoming literate as to the real hazards of fluoride -- Dad apologized profusely to me for buying hook, line and sinker slick industry peddled propaganda and PR (Programmed Rhetoric).

*In the middle and right columns below, you'll find a tiny sampling of scientific research -- **the tip of the tooth** -- re. the harm induced by fluoride.*

Regretfully, should Calgary politicians in folly, acquiesce to the powerful pro-fluoride lobby and forcibly subject its citizens to fluoride toxicity -- in violation of their individual health sovereignty -- I will no longer visit your city's wonderful Glenbow Museum etc... I trust you will do the right thing and keep Calgary's water supply free of toxic fluoride.

Sodium Fluoride

Sincerely,

Ms. Roxanne H. Enjjineer
504-360 E. 36th Avenue
Vancouver, BC
V5W 4B9

From: [Trish Braun](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewatercalgary@gmail.com
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Friday, October 18, 2019 8:13:41 PM

To whom it may concern,

This email is in regards to the addition of fluoride to Calgary's drinking water.

We are opposed to the addition of fluoride to Calgary's drinking water for the following reasons:

1. Medications should not be forced on anyone. My body, my choice. Please do not degrade our free society by taking away Canadian's rights.
2. Fluoride is difficult and expensive to remove from water. Individuals can easily and cost effectively add fluoride to drinking water if they so desire. Fluoride is readily available in most toothpastes and most bottled water. Water filters or systems that remove fluoride from the water are cost prohibitive.
3. Eating a healthy, whole food diet will result in healthy teeth. Fluoride is not necessary for healthy teeth. Too much fluoride can damage teeth. Our family has experienced the negative effects of dental fluorosis.
4. Fluoride is naturally present in Calgary's source water. It does not need to be added.
5. As home owners and Calgary tax payers, we do not want to pay for fluoride to be added to our water. If the City of Calgary **must** spend this money, then spend it on the *cause* of unhealthy teeth (ie: poor diet and lifestyles choices). Please do not raise taxes or cut more services to fund water fluoridation.

Thank you for your time.

Respectfully,
Trisha and Curtis Braun
Tuscany, Ward 1

From: [Angela Hair](#)
To: [Public Submissions](#)
Subject: [EXT] Submission on hearing on Water Fluoridation
Date: Friday, October 18, 2019 10:00:11 PM
Attachments: [Angela Hair - Fluoride Submissions.pdf](#)
[Screen Shot 2019-10-19 at 4.51.54 PM.png](#)

Please accept this submission on public health fluoridation. I am unable to attend but could be available by Vimeo or Face Time.
 Thankyou

Angela Hair
 Concordia Health
 @ Bay Wellness
 304 Lyndon Rd
 Hastings

E: angela@concordia.co.nz
 Ph: 027 4436 737

SUMMARY SERUM BLOOD TESTS OF FLUORIDATED HASTINGS, HAVELOCK NORTH 2013 N=13

Patient	Gender	Age	Years in F Area	Date of Test	Result umol/L	Result in mg/L	Lab Assessment	Retest umol/L
001300N	F	73		18/6/13	2.7	0.513	*	
002300N	M	73	59	17/6/13	1.8	0.036		
003300N	F	71	59	7/5/13	5	0.005	H	2.8*
001000N	M	63	59	19/5/13	2.1	0.039		
0000H	M	58	58	3/7/13	1.5	0.028		
0011H	M	55	55	30/5/09	2.8	0.058	*	
0040H	M	60	46	30/5/13	2.8	0.049	H/H	
00500N	F	61	45	2/7/13	5.9	0.112	*	
0000H	F	60	39	13/6/13	1.5	0.026		
001100N	F	60	39	27/6/13	1.8	0.034		
00600N	F	45	20	30/5/13	0.9	0.017		
0070H	F	49	10	12/11/10	1.2	0.022		
001200N	F	34	14.5	24/10/13	1.2	0.022		

I am a sufferer of too much fluoride, given to me as a 5 month old baby in the form of F-Tabs. It took 50 years to discover the problem. By the time my rare pineal brain tumour was discovered I was starting to have neurological symptoms that impacted my cognitive function, balance and legs. I developed hydrocephalus as a result of the tumour and have spent the past five years using conventional medicine and homeopathy to recover. Please remove fluoride from all water supplies in Canada. What your city chooses impacts the decision-making of other cities and countries that have fluoridated since the 1950s. The following blood test results demonstrate that fluoridation does accumulate in the blood and impact the health of residents.

FLUORIDATION

The industrial version of fluoride, called HFSA (hydrofluorosilicic acid) is a toxic chemical that has been put into our Hastings (NZ) water from 1954 until 2016. That year a gastroenteritis outbreak in Havelock North required the Hastings District Council to use the mixing tank for chlorine instead of fluoride - a benefit for all the urban people who rely on the Council to supply drinking water.

From 2016 onwards Hastings people may have observed that their rheumatoid arthritis and thyroid problems were not as problematic as they had been in previous years and the intelligence of children born to mothers not drinking fluoridated water, will have moved up a few points. Chronic fatigue, kidney problems and fluorosis will also have improved.¹

In 2013 I campaigned with a small but dedicated group of Hastings residents to stop HFSA being put into our Hastings water. As a way to draw attention to the possible accumulation of fluoride in the body, I invited Fluoride Free supporters to have blood tests carried out by Canterbury Research Laboratory. I wanted to understand how residents in Hastings were faring compared to the people in non-fluoridated communities where the accepted blood level of fluoride is 1 mg/L. Thirteen people took part in our blood test survey and paid \$100 each to have their test. Despite it being a public health policy, the Hawke's Bay District Health Board were not willing to allow doctors to order the blood test free of charge.

RESULTS OF THE FLUORIDE BLOOD RESEARCH

The people who lived in the fluoridated area the longest, had the highest fluoride result. The range was 0.9 - 5.9 umol/L.

The oldest person in my research was aged 81 years, and had a fluoride blood level of 5.9 umol/L. Her symptoms included general weakness, painful rheumatoid arthritis, a collapsed spine and as a result, a herniated gut. Whenever she was admitted to hospital because of pain, her symptoms improved over 1-2 weeks and she was discharged back into the community. The hospital was not fluoridated and this may have contributed to her

¹ Fluoride Action Network (FAN) www.fluoridealert.org

improvements. The risk of fluoride to kidney patients meant the hospital had its own non-fluoridated water supply.² This supply continues to be not fluoridated but now is chlorinated.

Another person with a 5 umol/L result, had hypothyroidism (low thyroxine levels) which had started two years after the fluoridation programme began in Hastings in 1954. Her fluoride level was five times higher than the acceptable normal and considerably higher than her husband's result (1.9 umol/L). He drank milk instead of water.

My own fluoride blood test was 1.2 umol/L which was not considered high but I do not drink fluoridated water as I live rurally. At the time of the blood test I didn't know I had a pineal gland tumour but I did know that I had been given fluoride since the age of 5 months old and that fluoride is stored in the teeth, bones and pineal gland.³

I am hopeful that the New Zealand Ministry of Health will quietly drop the fluoridation programme. It is an outdated public health policy that does more harm than good. Using fluoridated toothpaste, educating children about what foods are good for teeth and their health generally and having individualised consented dental care is the safest way to move forward.

² Fluoride Action Network <http://fluoridealert.org/search-results/?q=kidneys>

³ Hair, A., Blood Fluoride Test, supplied to the Ministry of Health, submission on Health Amendment Bill (Fluoridation of Drinking Water) January 2017

From: [Deborah Moore](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission for 10-29 Hearing on Water Fluoridation
Date: Saturday, October 19, 2019 10:22:09 AM
Attachments: [Submission for Calgary 10-29-19 fluoridation hearing.pdf](#)

P.O. Box 266 <<...>>
Montpelier, VT 05601

October 19, 2019

Dear Calgary Mayor and Councilors:

As someone who has been professionally studying and working with the science of fluoride toxicity for 23 years now, I am very concerned with the latest and very misguided efforts to force fluoridation on the residents of Calgary.

The basic argument for water fluoridation has not changed one iota in over 70 years. A big part of the argument for fluoridation is that there is no argument, that it is safe and effective, period. What that actually says is that the argument for water fluoridation is not based on science at all. The underlying and explicit premise of all science is that it must always be challenged, with information added to or replacing an original paradigm, so that scientific understanding can grow and meet the needs of humanity and the world ever more accurately. Fluoridation and the arguments to support it have never changed. The arguments posed by those in favor offer little, if any, scientific evidence to support the practice, and they completely ignore recent, peer-reviewed opposing science except to dismiss it outright as “junk science”. (If you don’t agree with something, just smear it as junk science, even if you haven’t even researched any of it.) Something is clearly wrong with this picture.

Since 2001, I have been Executive Director of a national non-profit organization that deals primarily with the science of fluoride toxicity, because fluoride IS toxic, IS bioaccumulative, and is now ubiquitous. Dental fluorosis (mottling of children’s teeth) now affects over 40% of all children in the US, and that is a statistic of the CDC itself. Dental fluorosis is the first visible sign of fluoride toxicity, so it is just the beginning of life-long vulnerabilities that an affected child may face.

I am contacted all the time by people who are very ill from fluoride and fluorinated compounds from many different sources. Compromised individuals such as these have no tolerance at all for fluoridated water, among other toxins, and life is hell for them if they are living in a fluoridated municipality.

The argument that water fluoridation is the only equitable method of avoiding tooth decay is specious at best. Poor oral health is associated with poverty, with lack of oral hygiene, with

absence of dentist visits, and with poor nutrition. It has nothing to do with lack of fluoride, which is not a nutrient and, if effective at all for tooth strength, is as a result of topical application, not ingestion. This is clear in recent dental literature, and for dentists and doctors to say otherwise is no more than willful ignorance on their part.

The argument for fluoridation has always been and continues to be about dental health. The argument against fluoridation takes on so much more: toxicity to the whole body, including teeth; unethical forced mass medication, (or “supplementation”) dosing an entire population by government officials rather than individuals’ doctors; no control whatever of appropriate dose per individual; no thought whatever to effects on vulnerable populations (infants, the elderly, kidney patients, allergic or ill individuals, etc.); environmental saturation with synthetic chemicals and other hazardous substances found in the unrefined industrial waste products put in our water for our “health”; fluoride’s synergistic effects with other chemicals and with drugs; and simply, allowing pure water to just stay pure for all who want it pure.

Fluoride is in your food, your drinks, the air, the soil, pharmaceuticals, dental products, and many industrial products. We don’t need it in the water, as we are all over-fluoridated as it is. To put it in the water is a quick fix by public health and dental officials who do not want to take responsibility for getting adequate dental care to people who can’t afford it, because dental care is off the charts expensive and simply not accessible for everyone. Mid-level dental care is a good idea, if it is made affordable and accessible to those who need it. Fluoridation is not safe, is not effective, and is harmful to many in the long term.

Those health professionals with an open mind who do honest research to really understand what the issue is about, are appalled at what they find and never support fluoridation again. If you don’t believe what you read on the internet, just get the peer-reviewed references that way and then go to the stacks of a medical or dental library and bear them out the old fashioned way. That internet excuse is just one more argument that makes no sense.

Fluoridation is not a panacea and never was. Please treat fluoride toxicity as the scientific reality that it is, do your homework with some humility, and realize that those who claim that there is no good argument against fluoridation have been practicing religion, not science.

Thank you for protecting the health of Calgary residents.

Sincerely,

Deborah E. Moore, PhD
Executive Director, *Second Look*
secondlook1@earthlink.net
<https://SLweb.org>

P.O. Box 266
Montpelier, VT 05601

October 19, 2019

Dear Calgary Mayor and Councilors:

As someone who has been professionally studying and working with the science of fluoride toxicity for 23 years now, I am very concerned with the latest and very misguided efforts to force fluoridation on the residents of Calgary.

The basic argument for water fluoridation has not changed one iota in over 70 years. A big part of the argument for fluoridation is that there is no argument, that it is safe and effective, period. What that actually says is that the argument for water fluoridation is not based on science at all. The underlying and explicit premise of all science is that it must always be challenged, with information added to or replacing an original paradigm, so that scientific understanding can grow and meet the needs of humanity and the world ever more accurately. Fluoridation and the arguments to support it have never changed. The arguments posed by those in favor offer little, if any, scientific evidence to support the practice, and they completely ignore recent, peer-reviewed opposing science except to dismiss it outright as “junk science”. (If you don’t agree with something, just smear it as junk science, even if you haven’t even researched any of it.) Something is clearly wrong with this picture.

Since 2001, I have been Executive Director of a national non-profit organization that deals primarily with the science of fluoride toxicity, because fluoride IS toxic, IS bioaccumulative, and is now ubiquitous. Dental fluorosis (mottling of children’s teeth) now affects over 40% of all children, and that is a statistic of the CDC itself. Dental fluorosis is the first visible sign of fluoride toxicity, so it is just the beginning of life-long vulnerabilities that an affected child may face.

I am contacted all the time by people who are very ill from fluoride and fluorinated compounds from many different sources. Compromised individuals such as these have no tolerance at all for fluoridated water, among other toxins, and life is hell for them if they are living in a fluoridated municipality.

The argument that water fluoridation is the only equitable method of avoiding tooth decay is specious at best. Poor oral health is associated with poverty, with lack of oral hygiene, with absence of dentist visits, and with poor nutrition. It has nothing to do with lack of fluoride, which is not a nutrient and, if effective at all for tooth strength, is as a result of topical application, not ingestion. This is clear in recent dental literature, and for dentists and doctors to say otherwise is no more than willful ignorance on their part.

The argument for fluoridation has always been and continues to be about dental health. The argument against fluoridation takes on so much more: toxicity to the whole body, including teeth; unethical forced mass medication, (or “supplementation”) dosing an entire population by government officials rather than individuals’ doctors; no control whatever of appropriate dose per individual; no thought whatever to effects on vulnerable populations (infants, the elderly, kidney patients, allergic or ill

individuals, etc.); environmental saturation with synthetic chemicals and other hazardous substances found in the unrefined industrial waste products put in our water for our “health”; fluoride’s synergistic effects with other chemicals and with drugs; and simply, allowing pure water to just stay pure for all who want it pure.

Fluoride is in your food, your drinks, the air, the soil, pharmaceuticals, dental products, and many industrial products. We don’t need it in the water, as we are all over-fluoridated as it is. To put it in the water is a quick fix by public health and dental officials who do not want to take responsibility for getting adequate dental care to people who can’t afford it, because dental care is off the charts expensive and simply not accessible for everyone. Mid-level dental care is a good idea, if it is made affordable and accessible to those who need it. Fluoridation is not safe, is not effective, and is harmful to many in the long term.

Those health professionals with an open mind who do honest research to really understand what the issue is about, are appalled at what they find and never support fluoridation again. If you don’t believe what you read on the internet, just get the peer-reviewed references that way and then go to the stacks of a medical or dental library and bear them out the old fashioned way. That internet excuse is just one more argument that makes no sense.

Fluoridation is not a panacea and never was. Please treat fluoride toxicity as the scientific reality that it is, do your homework with some humility, and realize that those who claim that there is no good argument against fluoridation have been practicing religion, not science.

Thank you for protecting the health of Calgary residents.

Sincerely,

Deborah E. Moore, PhD
Executive Director, *Second Look*
secondlook1@earthlink.net
<https://SLweb.org>

From: [James Reeves](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoridation is dangerous to hsealth
Date: Saturday, October 19, 2019 11:43:29 AM

I am a retired Professor of Civil Engineering and a Registered Professional Engineer.

I oppose fluoridation.

I recommend that Calgary continue the very wise decision to ban fluoride from drinking water.

Fluoride is available for those who wish it, but no one should be forced to consume it without consent.

Most world populations have read the many scientific studies in the last 30 years and now avoid fluoridation like the plague.. As with any drug, we all deserve freedom of choice.

Consider that 95% of the world rejects fluoridation:

In the US, 74 % fluoridated (more than the rest of the world combined).

In Europe, only 3%.

In the world, only 5%.

In Canada, now 30% --- down from 45% in seven to ten years.

China, India and Japan have rejected it years ago.

Fluoridation "science" will be corrected soon, just as the "science" of tobacco, asbestos, leaded gasoline, and some FDA approved drugs like Vioxx (which kille,d 36,000 people according to the FDA) were corrected.

Bring on that day.

**James W. Reeves, PhD, P.E. (retired)
tel: (337) 981-3255**

From: [Nestor Shapka](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Saturday, October 19, 2019 1:43:28 PM
Attachments: [IAOMT-Fluoride-Position-Paper.pdf](#)

Dear Council Members;

On behalf of the International Academy of Oral Medicine and Toxicology, a non-profit organization of over 1,000 health care professionals, toxicologists and researchers from around the world, and myself as a member of it's Executive Council and the current President of the Canadian Council of Oral Medicine and Toxicology, I as a practicing dentist in the Province of Alberta for the past 36 years, would like to submit *this email* and the attached document, "2017 IAOMT Position Paper Against the Use of Fluoride in Drinking Water" as a submission for your consideration.

This Position Paper is a "thorough" review of the documented science and research regarding fluoride and its effects on human health up to and including 2017 and is not, like many of the documents submitted on behalf of dental professional associations, and the dental professions who support the use of fluoride in water, a regurgitation of the same party mantra that basically ignores any contradictory science and research to that dogma. The average dentist is ignorant of toxicology and only parrots what they are told by their dental associations and therefore lacks the credibility to make an accurate statement on the subject of fluoride and which professional associations too are ignorant of, and for reasons unknown, unwilling to accept the simple fact that fluoride and all of its compounds are toxic at any concentration.

It was/is the purpose of this IAOMT Position Paper, to present "all" of the known science on the toxicity of fluoride and thus allow anyone, and not just health care professionals, to actually read "the science" regarding fluoridation, educate themselves, and then make a determination based on the "full science" rather than just believing what they are told and or only looking at science that supports a desired belief/outcome.

It should be important to council then, to not just listen to Alberta dentists or the dental profession at large, but to ask yourself, of these professionals, who among them has actually studied the science? Who among them has actually read the research? Who among them has started this discovery process from a place of concern for health and well being and not from a desire to maintain any entrenched beliefs/belief system?

Fluoride has many, many toxic effects on the human body but since 2017, three new landmark studies have confirmed what we "know" to be true, i.e. that fluoride is especially dangerous to the developing fetus, (see below). And so, respectfully, how can any "true" health care professional, or fellow human being for that matter, support a practice that then endangers

this vulnerable subset of our population, and the greatest legacy of any community or society, our "future" citizens and Canadians.

1). [Association Between Maternal Fluoride Exposure During Pregnancy and IQ Scores in Offspring in Canada.](#)

Author: Green R, Lanphear B, Hornung R, Flora D, Martinez-Mier EA, Neufeld R, Ayotte P, Muckle G, Till C.

Journal Name: JAMA Pediatrics, August 19, 2019

Large study with 512 mother-offspring that shows lower IQ in children 3- 4 years of age.

• 2). [OP V - Prenatal Fluoride Exposure and Neurobehaviour among Children 1-3 Years of Age in Mexico](#)

•

Author: Thomas D, Sanchez B, Peterson K, Basu N, Martinez-Mier EA, Mercado-Garcia A, Hernandez-Avila M, Till C, Bashash M, Hu H, Tellez-Rojo MM. Abstract only published. *Occupational & Environmental Medicine*, March, 2018

Study that shows lower IQ in children age 1-3 years of age.

• 3). [Prenatal Fluoride Exposure and Cognitive Outcomes in Children at 4 and 6-12 Years of Age in Mexico.](#)

Morteza Bashash, Deena Thomas, Howard Hu, E. Angeles Martinez-Mier, Brisa N. Sanchez, Niladri Basu, Karen E. Peterson, Adrienne S. Ettinger, Robert Wright, Zhenzhen Zhang, Yun Liu Lourdes Schnaas, Adriana Mercado-García, Martha María Téllez-Rojo and Mauricio Hernández-Avila, 19 September 2017

•

Longest study. 299 mother-offspring pairs in Mexico. Lower IQ in children 4 and 6-12 years of age.

Thank you for your consideration of my submission on this very important subject matter.

Respectfully, Nestor B Shapka, BSc, DDS, FIAOMT.

**International Academy of Oral Medicine and Toxicology (IAOMT)
Position Paper against Fluoride Use
in Water, Dental Materials, and Other Products
for Dental and Medical Practitioners, Dental and Medical Students,
Consumers, and Policy Makers**

Originally Released on September 22, 2017
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Approved by the IAOMT Scientific Review and Clinical Practice Guideline Committee
on March 25, 2017
Approved by the IAOMT Board of Directors
on July 3, 2017



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Section 1: Summary of the IAOMT's Position against Fluoride Use in Water, Dental Materials, and Other Products

Other than its natural existence in minerals, as well as in soil, water, and air, fluoride is also chemically synthesized for use in community water fluoridation, dental products, fertilizers, pesticides, and an array of other consumer items. For example, hydrogen fluoride is used to make aluminum, electrical components, fluorescent light bulbs, herbicides, high-octane gasoline, plastics, refrigerants, and etched metal and glass (such as that used in some electronic devices). Additionally, fluorinated compounds are present in a significant quantity of pharmaceutical drugs, and perfluorinated chemicals are used in carpets, cleaners, clothing, cookware, food packaging, paints, paper, and other products.

Unfortunately, all of these applications were introduced before the health risks of fluoride, safety levels for its use, and appropriate restrictions were adequately researched and established. Compounding this dangerous status quo is the fact that the National Research Council concluded the maximum contaminant level goals for fluoridated drinking water should be lowered in 2006, but the Environmental Protection Agency has yet to lower the level.

Fluoride is not a nutrient and has no biological function in the body. Furthermore, hundreds of research articles published over the past several decades have demonstrated potential harm to humans from fluoride at various levels of exposure, including levels currently deemed as safe. Scientific research has examined fluoride's effect on the skeletal system in detail and has indicated a definitive link between fluoride exposure and skeletal fluorosis, as well as dental fluorosis (which is permanent damage to the developing tooth, is the first visible sign of fluoride toxicity, and is currently on the rise in the United States). Fluoride is also known to impact the cardiovascular, central nervous, digestive, endocrine, immune, integumentary, renal, and respiratory systems, and exposure to fluoride has been linked to Alzheimer's disease, cancer, diabetes, heart disease, infertility, and many other adverse health outcomes.

The need to update previously established fluoride guidelines is extremely urgent, as fluoride exposures have dramatically increased for all Americans since the 1940's, when community water fluoridation was first introduced. In the subsequent decades, fluoride was also introduced for use in dental products applied in the office and at home, such as toothpaste and mouth rinse, and during this time frame, it was also added to other consumer products. Understanding fluoride exposure levels from all sources is crucial because recommended intake levels for fluoride in water and food should now be based upon these common multiple exposures.

However, accurate data currently does not exist for either collective sources or singular sources of fluoride exposure. Another concern is that fluoride has a synergistic interaction with other elements. Fluoride is also known to impact each individual differently based on allergies to fluoride, nutrient deficiencies, genetic factors, and other variables. Additionally, susceptible populations with low body weights, such as infants and children, and individuals who consume increased amounts of water, such as athletes, military personnel, outdoor laborers, and those with diabetes or kidney dysfunction, can be more intensely effected by fluoride. Therefore, recommending an optimal level of fluoride or "one dose fits all" level is unacceptable.

It is obvious that risk assessments must consider the total fluoride exposure from all sources, as well as individual susceptibility. Furthermore, there is a significant gap, if not a major void, in scientific literature that includes fluoride releases from products administered at the dental office, such as dental filling materials and varnishes, as part of overall fluoride intake. Part of this is likely due to the fact that the research attempting to evaluate singular exposures from these dental products has demonstrated that determining any type of “average” release rate is virtually impossible.

Moreover, there is even doubt about fluoride’s efficacy in preventing tooth decay. For example, research has indicated that fluoride does not aid in preventing pit and fissure decay (which is the most prevalent form of tooth decay in the U.S.) or in preventing baby bottle tooth decay (which is prevalent in poor communities). Also, research has suggested that in malnourished children and individuals of lower socio-economic status, fluoride can actually increase the risk of dental caries due to calcium depletion and other circumstances.

An important consideration is that the trend of decreased decayed, missing, and filled teeth over the past several decades has occurred both in countries with and without the systemic application of fluoridated water. This suggests that increased access to preventative hygiene services and more awareness of the detrimental effects of sugar are responsible for these improvements in dental health. Research has also documented decreases of tooth decay in communities that have discontinued water fluoridation.

Additionally, ethical questions have been raised in regard to the use of fluoride, especially because of fluoride’s ties to the phosphate fertilizer and dental industries. Researchers have reported difficulties with getting articles published that are critical of fluoride, and an urgent need for an appropriate application of the precautionary principle (i.e. first, do no harm) related to fluoride usage has emerged.

The issue of consumer choice is vital to fluoride usage for a variety of reasons. First, consumers have choices when it comes to utilizing fluoride-containing products; however, many over-the-counter products do not offer appropriate labeling. Second, materials used at the dental office provide virtually no consumer informed consent because the presence of fluoride (and its risks) in these dental materials is, in many cases, never mentioned to the patient. Third, the only choice consumers have when fluoride is added to their municipal water is to buy bottled water or costly filters. Concerns have been raised that fluoride is added only for allegedly preventing tooth decay, while other chemicals added to water serve a purpose of decontamination and elimination of pathogens.

Educating medical and dental practitioners, students, consumers, and policy makers about fluoride exposures and the associated potential health risks is essential to improving the dental and overall health of the public. Since a scientific understanding of the health effects of fluoride has been limited to promoting its benefits, the reality of its overexposure and potential harms must now be conveyed to healthcare workers and students, such as those in the medical, dental, and public health fields.

Although informed consumer consent and more informative product labels would contribute to increasing public awareness about fluoride intake, consumers also need to take a more active role in preventing caries. In particular, a better diet (with less sugar), improved oral health practices, and other measures would assist in reducing tooth decay.

Finally, policy makers are tasked with the obligation of evaluating the benefits and risks of fluoride. These officials have a responsibility to acknowledge the dated claims of fluoride's alleged purposes, many of which are based on limited evidence of safety and improperly formulated intake levels that fail to account for multiple exposures, fluoride's interaction with other chemicals, individual variances, and independent (non-industry sponsored) science.

In summary, given the elevated number of fluoride sources and the increased rates of fluoride intake in the American population, which have risen substantially since water fluoridation began in the 1940's, it has become a necessity to reduce and work toward eliminating avoidable sources of fluoride exposure, including water fluoridation, fluoride-containing dental materials, and other fluoridated products.

Section 2: Chemical Profile

Fluorine (F) is the ninth element on the periodic table and is a member of the halogen family. It has an atomic weight of 18.9984, is the most reactive of all of the elements, and forms strong electronegative bonds. It is particularly attracted to the divalent cations of calcium and magnesium. In its free state, fluorine is a highly toxic, pale yellow diatomic gas. However, fluorine is rarely found in its free state in nature because it almost always combines with other elements as a result of its high level of reactivity. Fluorine commonly occurs as the minerals fluor spar (CaF_2), cryolite (Na_3AlF_6), and fluorapatite ($3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{Ca}(\text{F},\text{Cl})_2$), and it is the 13th most abundant element on earth.

Fluoride (F^-) is a chemical ion of fluorine that contains an extra electron, thereby giving it a negative charge. Other than its natural existence in minerals, as well as in soil, water, and air, fluoride is also chemically synthesized for use in community water fluoridation, dental products, and other manufactured items. Fluoride is not essential for human growth and development.¹ In fact, it is not required for any physiological process in the human body; consequently, no one will suffer from a lack fluoride. In 2014, Dr. Philippe Grandjean of the Harvard School of Public Health and Dr. Philip J. Landrigan of Icahn School of Medicine at Mount Sinai identified fluoride as one of 12 industrial chemicals known to cause developmental neurotoxicity in humans.²

Section 3: Sources of Fluoride

Fluoride exposures in humans occur from both natural and anthropogenic sources. Table 1 is a listing of the most prevalent *natural* sources of fluoride exposure, while Table 2 is a listing of the most prevalent *chemically synthesized* sources of fluoride exposure.

Table 1: Natural sources of fluoride³

NATURAL SOURCE	ADDITIONAL INFORMATION
Volcanic activity	This often occurs in the form of hydrogen fluoride.
Water (including groundwater, streams, rivers, lakes, and some well and drinking water) <i>The naturally occurring form of fluoride in water, which varies by geographic location, is different than community water fluoridation, which is done using a chemically synthesized form of fluoride.</i>	Naturally, this occurs when water run-off is exposed to fluoride containing rock. However, fluoride in water can also occur due to human activity through industrial emissions, such as releases from coal-fired power plants, and community water fluoridation.
Food	While negligible levels of fluoride in food can occur naturally, significant levels of fluoride in food occur due to human activity, especially through the use of pesticides.
Soil	While fluoride in soil can occur naturally, increased levels of fluoride in soil can occur due to human activity through the use of fertilizers, pesticides and/or industrial emissions.

Table 2: Chemically synthesized sources of fluoride

CHEMICALLY SYNTHESIZED SOURCE	ADDITIONAL INFORMATION
Water: fluoridated municipal drinking water ⁴	Most of the fluoride added to drinking water is in the form of fluorosilicates, also known as fluosilicic acid (fluorosilicic acid, H_2SiF_6) and sodium salt (sodium fluorosilicate, Na_2SiF_6). ⁵
Water: bottled water ⁶	The levels of fluoride in bottled water vary depending on manufacturer and the source of the water. ⁷
Water: perfluorinated compounds ⁸	Concerns about health risks have led over 200 scientists from 38 countries to sign the Madrid Statement calling for government and manufacturer action on poly- and perfluoroalkyl substances (PFASs), which can be found in drinking water due to contamination in ground and surface water. ⁹

Beverages: made with fluoridated water and/or made with water/ingredients exposed to fluoride-containing pesticide ¹⁰	Significant levels of fluoride have been recorded in infant formula, tea, and commercial beverages, such as juice and soft drinks. ¹¹ Significant levels of fluoride have also been recorded in alcoholic beverages, especially wine and beer. ^{12 13}
Food: general ¹⁴	Fluoride exposure can occur in food prepared with fluoridated water and/or food exposed to fluoride-containing pesticide/fertilizer. ¹⁵ Significant fluoride levels have been recorded in grapes and grape products. ¹⁶ Fluoride levels have also been reported in cow's milk due to livestock raised on fluoride-containing water, feed, and soil, ^{17 18} as well as processed chicken ¹⁹ (likely due to mechanical deboning, which leaves skin and bone particles in the meat). ²⁰
Food: perfluorinated compounds ²¹	Food can also be contaminated by perfluorinated compounds during preparation in certain types of cookware (i.e. non-stick coating) ²² and/or by exposure to grease/oil/water resistant packaging (i.e. fast food wrappers, pizza boxes, and popcorn bags). ²³
Pesticides ²⁴	Cryolite (insecticide) and sulfuryl fluoride (fumigant) have been regulated due to the inorganic fluoride levels they add to food. ²⁵
Soil: phosphate fertilizers and/or airborne emissions from industrial activities ²⁶	Releases from industrial activities can impact the levels of fluoride in food grown in the polluted soil. Soil contamination by fluoride is also relevant to children with pica (a condition characterized by an appetite for non-food items such as dirt). ²⁷
Air: fluoride releases from industry ²⁸	Anthropogenic sources of atmospheric fluoride can result from coal combustion by electrical utilities and other industries. ²⁹ Releases can also occur from refineries and metal ore smelters, ³⁰ aluminum production plants, phosphate fertilizer plants, chemical production facilities, steel mills, magnesium plants, and brick and structural clay manufacturers, ³¹ as well as copper and nickel producers, phosphate ore processors, glass manufacturers, and ceramic manufacturers. ³²

Dental product: toothpaste ³³	Fluoride added to toothpaste can be in the form of sodium fluoride (NaF), sodium monofluorophosphate (Na ₂ FPO ₃), stannous fluoride (tin fluoride, SnF ₂) or a variety of amines. ³⁴ Concerns have been raised about children's use of fluoridated toothpaste. ^{35 36}
Dental product: prophylaxis paste ³⁷	This paste, used during teeth cleanings (prophylaxis) at the dental office, can contain over 20 times more fluoride than toothpaste sold directly to consumers. ³⁸
Dental product: mouthwash/rinse ³⁹	Mouthwashes (mouth rinses) can contain sodium fluoride (NaF) or acidulated phosphate fluoride (APF). ⁴⁰
Dental product: dental floss ^{41 42}	Researchers have demonstrated that fluoride releases from dental floss are higher than those from fluoridated mouth rinses. ⁴³ Fluoridated dental floss is often associated with stannous fluoride (tin fluoride, SnF ₂), ⁴⁴ but flosses can also contain perfluorinated compounds. ⁴⁵
Dental product: fluoridated toothpicks and interdental brushes ⁴⁶	The amount of fluoride released from these products can be influenced by the saliva of the individual using the product. ⁴⁷
Dental product: topical fluoride gel and foam ⁴⁸	Used in a dental office or at home, these dental products are applied directly on the teeth and can contain acidulated phosphate fluoride (APF), sodium fluoride (NaF), or stannous fluoride (tin fluoride, SnF ₂). ⁴⁹
Dental product: fluoride varnish ⁵⁰	High-concentration fluoride varnish that is applied directly on the teeth by dental or healthcare professionals contains sodium fluoride (NaF) or difluorsilane. ⁵¹
Dental material for fillings: glass ionomer cements ⁵²	These materials, used for dental fillings, are made of fluoride-containing silicate glass and polyalkenoic acids that release an initial burst of fluoride and then a long-term lower release. ⁵³

Dental material for fillings: resin-modified glass ionomer cements ⁵⁴	These materials, used for dental fillings, are created with methacrylate components and release an initial burst of fluoride and then a long-term lower release. ⁵⁵
Dental material for fillings: giomers ⁵⁶	These newer hybrid materials, used for dental fillings, include pre-reacted glass ionomers and usually have lower amounts of fluoride released than glass ionomers but higher amounts than compomers and composites. ⁵⁷
Dental material for fillings: polyacid-modified composites (compomers) ⁵⁸	The fluoride in these materials, used for dental fillings, is in the filler particles, and while there is no initial burst of fluoride, fluoride is released continually over time. ⁵⁹
Dental material for fillings: composites ⁶⁰	Not all, but some of these materials, used for dental fillings, can contain different types of fluoride such as inorganic salts, leachable glasses, or organic fluoride. ⁶¹ The fluoride released is generally considered to be lower than that from glass ionomers and compomers, although releases vary depending on the commercial brand of the composites. ⁶²
Dental material for fillings: dental mercury amalgams ⁶³	Low levels of fluoride have been recorded in the types of dental mercury amalgam fillings that are lined with glass ionomer cement and other materials. ^{64 65 66}
Dental material for orthodontics: glass ionomer cement, resin-modified glass ionomer cement, and polyacid-modified composite resin (compomer) cement ⁶⁷	These materials, used for orthodontic band cements, can all release fluoride at varying levels. ⁶⁸
Dental material for pit and fissure sealants: resin-based, glass-ionomer, and giomers ⁶⁹	Commercially available fluoride-releasing sealants can contain sodium fluoride (NaF), fluoride-releasing glass material, or both. ⁷⁰
Dental material for tooth sensitivity/caries treatment: silver diamine fluoride ⁷¹	This material, recently introduced to the U.S. market, contains silver and fluoride and is being used as an alternative to conventional cavity treatment with dental fillings. ⁷²

Pharmaceutical/prescription drugs: fluoride tablets, drops, lozenges, and rinses ⁷³	These drugs, usually prescribed to children, contain varying levels of sodium fluoride (NaF). ⁷⁴ These drugs are not approved by the FDA because there is no substantial evidence of drug effectiveness. ^{75 76}
Pharmaceutical/prescription drugs: fluorinated chemicals ⁷⁷	20-30% of pharmaceutical compounds have been estimated to contain fluorine. ⁷⁸ Some of the most popular drugs include Prozac, Lipitor, and Ciprobay (ciprofloxacin), ⁷⁹ as well as the rest of fluoroquinolone family (gemifloxacin [marketed as Factive], levofloxacin [marketed as Levaquin], moxifloxacin [marketed as Avelox], norfloxacin [marketed as Noroxin], and ofloxacin [marketed as Floxin and generic ofloxacin]). ⁸⁰ The fluorinated compound fenfluramine (fen-phen) was also used for many years as an anti-obesity drug, ⁸¹ but it was removed from the market in 1997 due to its link with heart valve problems. ⁸²
Consumer products made with perfluorinated compounds such as Teflon ⁸³	Products made with perfluorinated compounds include protective coatings for carpets and clothing (such as stain-resistant or water-proof fabric), paints, cosmetics, non-stick coatings for cookware, and paper coatings for oil and moisture resistance, ⁸⁴ as well as leather, paper, and cardboard. ⁸⁵
Household dust: perfluorinated compounds ^{86 87}	Poly- and perfluoroalkyl substances (PFASs) can be found in household dust due to contamination from consumer products, ⁸⁸ especially textiles and electronics.
Occupational ⁸⁹	Occupational exposure can occur for workers at industries with fluoride emissions. This includes work that involves welding, aluminum, and water treatment, ⁹⁰ as well as work that involves electronics and fertilizers. ⁹¹ Additionally, fire-fighters are exposed to perfluorinated chemicals in foams applied to fires. ⁹² Warnings have been made that workers can carry fluorides home on clothing, skin, hair, tools, or other items and that this can contaminate cars, homes, and other locations. ⁹³

Cigarette smoke ⁹⁴	Significant levels of fluoride have been associated with heavy smokers. ⁹⁵
Fluoridated salt and/or milk ^{96 97}	Some countries have opted to use fluoridated salt and milk (instead of water) as a means to offer consumers the choice of whether they would like to consume fluoride or not. Fluoridated salt is sold in Austria, the Czech Republic, France, Germany, Slovakia, Spain, and Switzerland, ⁹⁸ as well as Colombia, Costa Rica, and Jamaica. ⁹⁹ Fluoridated milk has been used in programs in Chile, Hungary, Scotland, and Switzerland. ¹⁰⁰
Alumino fluoride exposure from ingesting a fluoride source <i>with</i> an aluminum source ¹⁰¹	This synergistic exposure to fluoride and aluminum can occur through water, tea, food residue, infant formulas, aluminum-containing antacids or medications, deodorants, cosmetics, and glassware. ¹⁰²
Nuclear reactors and nuclear weapons ¹⁰³	Fluorine gas is used to make uranium hexafluoride, which separates isotopes of uranium in nuclear reactors and weapons. ¹⁰⁴

Section 4: Brief History of Fluoride

Human knowledge of the mineral fluor spar dates back centuries.¹⁰⁵ However, the discovery of how to isolate fluorine from its compounds is an essential date in the history of humankind's use of fluoride: Several scientists were killed in early experiments involving attempts to generate elemental fluorine, but in 1886, Henri Moissan reported the isolation of elemental fluorine, which earned him the Nobel Prize in chemistry in 1906.^{106 107}

This discovery paved the way for human experimentation to begin with chemically synthesized fluorine compounds, which were eventually utilized in a number of industrial activities. Notably, uranium fluoride and thorium fluoride were used during the years of 1942-1945 as part of the Manhattan Project¹⁰⁸ to produce the first atomic bomb. Data from reports about the Manhattan Project, some of which were initially classified and unpublished, include mention of fluoride poisoning and its role in the hazards of the uranium industry.¹⁰⁹ As industry expanded during the 20th century, so did the use of fluoride for industrial processes, and cases of fluoride poisoning likewise increased.¹¹⁰

Fluoride was not widely used for any dental purposes prior to the mid-1940's,¹¹¹ although it was studied for dental effects caused by its natural presence in community water supplies at varying levels. Early research in the 1930's by Frederick S. McKay, DDS, correlated high levels of fluoride with increased cases of dental fluorosis (a permanent damage to the enamel of the teeth that can occur in children from overexposure to fluoride) and demonstrated that reducing levels

of fluoride resulted in lower rates of dental fluorosis.^{112 113} This work led H. Trendley Dean, DDS, to research fluoride's minimal threshold of toxicity in the water supply.¹¹⁴ In work published in 1942, Dean suggested that lower levels of fluoride might result in lower rates of dental caries.¹¹⁵

While Dean worked to convince others to test his hypothesis about adding fluoride to community water supplies as a means of reducing caries, not everyone supported the idea. In fact, an editorial published in the *Journal of the American Dental Association* (JADA) in 1944 denounced purposeful water fluoridation and warned of its dangers:

We do know the use of drinking water containing as little as 1.2 to 3.0 parts per million of fluorine will cause such developmental disturbances in bones as osteosclerosis, spondylosis, and osteopetrosis, as well as goiter, and we cannot afford to run the risk of producing such serious systemic disturbances in applying what is at present a doubtful procedure intended to prevent development of dental disfigurements among children.

[...] Because of our anxiety to find some therapeutic procedure that will promote mass prevention of caries, the seeming potentialities of fluorine appear speculatively attractive, but, in the light of our present knowledge or lack of knowledge of the chemistry of the subject, the potentialities for harm far outweigh those for good.¹¹⁶

A few months after this warning was issued, Grand Rapids, Michigan, became the first city to be artificially fluoridated on January 25, 1945. Dean had succeeded in his efforts to test his hypothesis, and in a landmark study, Grand Rapids was to serve as a test city, and its decay rates were to be compared with those of non-fluoridated Muskegon, Michigan. After only slightly more than five years, Muskegon was dropped as a control city, and the results published about the experiment only reported the decrease in caries in Grand Rapids.¹¹⁷ Because the results did not include the control variable from the incomplete Muskegon data, many have stated that the initial studies presented in favor of water fluoridation were not even valid.

Concerns were made to the United States Congress in 1952 about potential dangers of water fluoridation, the lack of evidence as to its alleged usefulness in controlling dental caries, and the need for more research to be conducted.¹¹⁸ Yet, in spite of these concerns and many others, experiments with fluoridated drinking water continued. By 1960, fluoridation of drinking water for alleged dental benefits had spread to over 50 million people in communities throughout the United States.¹¹⁹

The use of fluoride in pharmaceutical drugs appears to have begun at about the same time as water fluoridation. Prior to the 1940's, the use of fluoride in American medicine was virtually unknown, with the exception of its rare use as an externally applied antiseptic and antiperiodic.¹²⁰ There is a consensus among authors of scientific reviews about fluoride's addition to "supplements" that this pharmaceutical use was introduced no earlier than the mid-1940s and was not widely used until the late 1950s or early 1960s.¹²¹ Quinolones for clinical use were first discovered in 1962, and fluoroquinolones were created in the 1980's.^{122 123}

The production of perfluorinated carboxylates (PFCAs) and perfluorinated sulfonates (PFSA) for process aids and surface protection in products also began over sixty years ago.¹²⁴ Perfluorinated compounds (PFCs) are now used in a wide range of items including cookware, extreme weather military uniforms, ink, motor oil, paint, products with water repellent, and sports clothing.¹²⁵ Fluorotelomers, which consist of fluoride carbon foundations, are considered the most commonly used perfluorinated substances in consumer products.¹²⁶

Meanwhile, fluoridated toothpastes were introduced and their increase in the market occurred in the late 1960s and early 1970s.¹²⁷ By the 1980s, the vast majority of commercially available toothpastes in industrialized countries contained fluoride.¹²⁸

Other fluoridated materials for dental purposes were likewise promoted for more common commercial use in recent decades. Glass ionomer cement materials, used for dental fillings, were invented in 1969,¹²⁹ and fluoride-releasing sealants were introduced in the 1970s.¹³⁰ Studies on the use of salt fluoridation for reduction of caries took place from 1965-1985 in Colombia, Hungary, and Switzerland.¹³¹ Similarly, the use of fluoride in milk for caries management first began in Switzerland in 1962.¹³²

By reviewing the development of fluoride regulations provided in Section 5, it is apparent that these applications of fluoride were introduced before the health risks of fluoride, safety levels for its use, and appropriate restrictions were adequately researched and established.

Section 5: Overview of U.S. Fluoride Regulations

Section 5.1: Community Water Fluoridation

In western Europe, some governments have openly recognized hazards of fluoride, and only 3% of the western European population drinks fluoridated water.¹³³ In the United States, over 66% of Americans are drinking fluoridated water.¹³⁴ Neither the Environmental Protection Agency (EPA) nor the federal government mandate water fluoridation in America, and the decision to fluoridate community water is made by the state or local municipality.¹³⁵ ¹³⁶ However, the U.S. Public Health Service (PHS) establishes recommended fluoride concentrations in community drinking water for those who choose to fluoridate, and the Environmental Protection Agency (EPA) sets contaminant levels for public drinking water.

After water fluoridation in Grand Rapids, Michigan, began in 1945, the practice spread to locales across the country in the decades that followed. These efforts were encouraged by the Public Health Service (PHS) in the 1950s,¹³⁷ and in 1962, the PHS issued standards for fluoride in drinking water that would stand for 50 years. They stated that fluoride would prevent dental caries¹³⁸ and that optimal levels of fluoride added to drinking water should range between 0.7 to 1.2 milligrams per liter.¹³⁹ However, the PHS lowered this recommendation to the single level of 0.7 milligrams per liter in 2015 due to an increase in dental fluorosis (permanent damage to the teeth that can occur in children from overexposure to fluoride) and to the increase in sources of fluoride exposure to Americans.¹⁴⁰

Meanwhile, the Safe Drinking Water Act was established in 1974 to protect the quality of American drinking water, and it authorized the EPA to regulate public drinking water. Because of this legislation, the EPA can set *enforceable* maximum contaminant levels (MCLs) for drinking water, as well as *non-enforceable* maximum contaminant level goals (MCLGs) and *non-enforceable* drinking water standards of secondary maximum contaminant levels (SMCLs).¹⁴¹ The EPA specifies that the MCLG is “the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, allowing an adequate margin of safety.”¹⁴² Additionally, the EPA qualifies that community water systems exceeding the MCL for fluoride “must notify persons served by that system as soon as practical, but no later than 30 days after the system learns of the violation.”¹⁴³

In 1975, the EPA set a maximum contaminant level (MCL) for fluoride in drinking water at 1.4 to 2.4 milligrams per liter.¹⁴⁴ They established this limit to prevent cases of dental fluorosis. In 1981, South Carolina argued that dental fluorosis is merely cosmetic, and the state petitioned the EPA to eliminate the MCL for fluoride.¹⁴⁵ As a result, in 1985, the EPA established a maximum contaminant level goal (MCLG) for fluoride at 4 milligrams per liter.¹⁴⁶ Rather than dental fluorosis serving as the protective endpoint (which would have required lower safety levels), this higher level was established as a means to protect against skeletal fluorosis, a bone disease caused by excess fluoride. Using skeletal fluorosis as the endpoint likewise resulted in a change for the MCL for fluoride, which was raised to 4 milligrams per liter in 1986.¹⁴⁷ Yet, dental fluorosis was applied as the endpoint for the SMCL for fluoride of 2 milligrams per liter, which was also set in 1986.¹⁴⁸

Controversy ensued over these new regulations and even resulted in legal actions against the EPA. South Carolina argued that there was no need for any MCLG (maximum contaminant level goal) for fluoride, while the Natural Resources Defense Council argued that the MCLG should be lowered based on dental fluorosis.¹⁴⁹ A court ruled in the EPA’s favor, but in a review of fluoride standards, the EPA enlisted the National Research Council (NRC) of the National Academy of Sciences to re-evaluate the health risks of fluoride.^{150 151}

The report from the National Research Council, released in 2006, concluded that the EPA’s MCLG (maximum contaminant level goal) for fluoride should be lowered.¹⁵² In addition to recognizing the potential for risk of fluoride and osteosarcoma (a bone cancer), the 2006 National Research Council report cited concerns about musculoskeletal effects, reproductive and developmental effects, neurotoxicity and neurobehavioral effects, genotoxicity and carcinogenicity, and effects on other organ systems.¹⁵³

The NRC concluded that the MCLG for fluoride should be lowered in 2006, but the EPA has yet to lower the level.¹⁵⁴ In 2016, the Fluoride Action Network, the IAOMT, and a number of other groups and individuals petitioned the EPA to protect the public, especially susceptible subpopulations, from the neurotoxic risks of fluoride by banning the purposeful addition of fluoride to drinking water.¹⁵⁵ The petition was denied by the EPA in February 2017.¹⁵⁶

Section 5.2: Bottled Water

The United States Food and Drug Administration (FDA) is responsible for making sure that standards for bottled water are consistent with standards for tap water set by the EPA¹⁵⁷ and the recommended levels set by the U.S. Public Health Service (PHS).¹⁵⁸ The FDA permits bottled water that meets its standards¹⁵⁹ to include language claiming that drinking fluoridated water may reduce the risk of tooth decay.¹⁶⁰

Section 5.3: Food

The FDA ruled to limit the addition of fluorine compounds to food in the interest of public health in 1977.¹⁶¹ However, fluoride is still present in food as a result of preparation in fluoridated water, exposure to pesticides and fertilizers, and other factors. In 2004, the United States Department of Agriculture (USDA) launched a database of fluoride levels in beverages and food, and a report with detailed documentation was published in 2005.¹⁶² While this report is still significant, the levels of fluoride in food and beverages have likely increased over the past decade due to the use of fluoride in more recently approved pesticides.¹⁶³ Some indirect food additives currently used also contain fluoride.¹⁶⁴

Additionally, in 2006, the National Research Council recommended that to "assist in estimating individual fluoride exposure from ingestion, manufacturers and producers should provide information on the fluoride content of commercial foods and beverages."¹⁶⁵ However, this will not be happening anytime in the near future. In 2016, the FDA revised its food labeling requirement for Nutrition and Supplement Facts labels and ruled that declarations of fluoride levels are voluntary both for products with intentionally added fluoride and products with naturally occurring fluoride.¹⁶⁶ At that time, the FDA also did not establish a Daily Reference Value (DRV) for fluoride.¹⁶⁷

On the contrary, in 2016, the FDA prohibited perfluoroalkyl ethyl containing food-contact substances (PFCs), which are used as oil and water repellants for paper and paperboard.¹⁶⁸ This action was taken as a result of toxicological data and a petition filed by the Natural Resources Defense Council and other groups.

Other than these considerations for fluoride in food, establishing safe levels of fluoride in food due to pesticides is shared by FDA, EPA, and the Food Safety and Inspection Service of the U.S. Department of Agriculture.¹⁶⁹

Section 5.4: Pesticides

Pesticides sold or distributed in the U.S. must be registered with the EPA, and the EPA can establish tolerances for pesticide residue if exposures from food are deemed to be "safe."¹⁷⁰ In this regard, two fluoride-containing pesticides have been the subject of dispute:

1) Sulfuryl fluoride was first registered in 1959 for termite control in wood structures¹⁷¹ and in 2004/2005 for control of insects in processed foods, such as cereal grains, dried fruits, tree nuts, cocoa beans, coffee beans, as well as in food handling and food processing facilities.¹⁷² Cases of

human poisoning and even death, while rare, have been associated with sulfuryl fluoride exposure related to homes treated with the pesticide.¹⁷³ In 2011, due to updated research and concerns raised by the Fluoride Action Network (FAN), the EPA proposed that sulfuryl fluoride no longer meets safety standards and that the tolerances for this pesticide should be withdrawn.¹⁷⁴ In 2013, the pesticide industry mounted a massive lobbying effort to overturn EPA's proposal to phase-out sulfuryl fluoride, and the EPA proposal was reversed by a provision included in the 2014 Farm Bill.¹⁷⁵

2) Cryolite, which contains sodium aluminum fluoride, is an insecticide that was first registered with the EPA in 1957.¹⁷⁶ Cryolite is the major fluoride pesticide used in growing food in the U.S. (whereas sulfuryl fluoride is used as a fumigant on post-harvest food). Cryolite is used on citrus and stone fruits, vegetables, berries, and grapes,¹⁷⁷ and people can be exposed to it through their diet, as cryolite can leave fluoride residues on food to which it has been applied.¹⁷⁸ In its 2011 proposed order on sulfuryl fluoride, the EPA also proposed to withdraw all fluoride tolerances in pesticides.¹⁷⁹ This would therefore have included cryolite; however, as noted above, this proposal was overturned.

Section 5.5: Dental Products for Use at Home

The FDA requires labeling for "antidrug products" sold over-the-counter, such as toothpaste and mouthwash. Specific wording for the labeling is designated by the form of the product (i.e. gel or paste and rinse), as well as by the fluoride concentration (i.e. 850-1,150 ppm, 0.02% sodium fluoride, etc.).¹⁸⁰ Warnings also are divided by age groups (i.e. two years and older, under six, 12 years and older, etc.). Some warnings apply to all products, such as the following:

(1) For all fluoride dentifrice (gel, paste, and powder) products. "Keep out of reach of children under 6 years of age. [highlighted in bold type] If more than used for brushing is accidentally swallowed, get medical help or contact a Poison Control Center right away."¹⁸¹

(2) For all fluoride rinse and preventive treatment gel products. "Keep out of reach of children. [highlighted in bold type] If more than used for" (select appropriate word: "brushing" or "rinsing") "is accidentally swallowed, get medical help or contact a Poison Control Center right away."¹⁸²

A research article published in 2014 raised significant concerns about this labeling. Specifically, the authors established that over 90% of the products they evaluated listed the FDA warning for use only by children over the age of two on the back of the tube of toothpaste and in small font.¹⁸³ Similar circumstances were reported about warnings from the American Dental Association (ADA), which is a trade group and not a government entity. The researchers documented that all of the toothpastes with approval or acceptance by the ADA placed the ADA warning (that children should use a pea-sized amount of toothpaste and be supervised by an adult to minimize swallowing) on the back of the tube in small font.¹⁸⁴ Marketing strategies were further identified as promoting toothpaste as if it were a food product, which the researchers acknowledged was a tactic that could dangerously result in children swallowing the product.¹⁸⁵

Although dental floss is categorized by the FDA as a Class I device,¹⁸⁶ dental floss containing fluoride (usually stannous fluoride) is considered a combination product¹⁸⁷ and requires premarket applications.¹⁸⁸ Dental floss can also contain fluoride in the form of perfluorinated compounds;¹⁸⁹ however, no regulatory information about this type of fluoride in dental floss could be located by the authors of this position paper.

Section 5.6: Dental Products for Use at the Dental Office

A vast majority of the materials used in the dental office that can release fluoride are regulated as medical/dental devices, such as some resin filling materials,^{190 191} some dental cements,¹⁹² and some composite resin materials.¹⁹³ More specifically, most of these dental materials are classified by the FDA as Class II Medical Devices,¹⁹⁴ meaning that the FDA provides "reasonable assurance of the device's safety and effectiveness" without subjecting the product to the highest level of regulatory control.¹⁹⁵ Importantly, as part of the FDA's classification procedure, dental devices with fluoride are considered combination products,¹⁹⁶ and fluoride release rate profiles are expected to be provided as part of the pre-market notification for the product.¹⁹⁷ The FDA further states: "Claims of cavity prevention or other therapeutic benefits are permitted if supported by clinical data developed by an IDE [Investigational Device Exemption] investigation."¹⁹⁸ Moreover, while the FDA publicly mentions the fluoride-releasing mechanism of some dental restorative devices, the FDA does not publicly promote them on their website for use in caries prevention.¹⁹⁹

Similarly, while fluoride varnishes are approved as Class II Medical Devices for use as a cavity liner and/or tooth desensitizer, they are not approved for use in caries prevention.²⁰⁰ Therefore, when claims of caries prevention are made about a product that has been adulterated with added fluoride, this is considered by the FDA to be an unapproved, adulterated drug. In addition, FDA regulations make the physician/dentist personally liable for off-label use of approved drugs.²⁰¹

Additionally, in 2014, the FDA permitted the use of silver diamine fluoride for reducing tooth sensitivity.²⁰² In an article published in 2016, a committee at the University of California, San Francisco, School of Dentistry, recognized that, while the off-label use of silver diamine fluoride (such as in caries management) is now permissible by law, there is a need for a standardized guideline, protocol, and consent.²⁰³

Also essential to note is that fluoride-containing paste used during dental prophylaxis (cleaning) contains much higher levels of fluoride than commercially sold toothpaste (i.e. 850-1,500 ppm in standard toothpaste²⁰⁴ versus 4,000-20,000 ppm fluoride in prophylaxis paste²⁰⁵). Fluoride paste is not accepted by the FDA or the ADA as an efficient way to prevent dental caries.²⁰⁶

Section 5.7: Pharmaceutical Drugs (Including Supplements)

Fluoride is intentionally added to pharmaceutical drugs (drops, tablets, and lozenges often called "supplements" or "vitamins") that are routinely prescribed to children, allegedly to prevent cavities. In 1975, the FDA addressed the use of fluoride supplements by withdrawing the new drug application for ErnziFlur fluoride. After the FDA's actions on ErnziFlur lozenges were published in the *Federal Register*, an article appeared in *Drug Therapy* stating that the FDA

approval was withdrawn “because there is no substantial evidence of drug effectiveness as prescribed, recommended, or suggested in its labeling.”^{207 208} The article also stated: “The FDA has therefore advised manufacturers of combination fluoride and vitamin preparations that their continued marketing is in violation of the new drug provisions of the Federal Food, Drug, and Cosmetic Act; they have, therefore, requested that marketing of these products be discontinued.”^{209 210}

In 2016, the FDA sent yet another warning letter out about the same issue of unapproved new drugs in many forms including the fluoride supplements addressed in 1975. A letter, dated January 13, 2016, was sent to Kirkman Laboratories in regard to four different types of pediatric fluoride concoctions labeled as aids in the prevention of dental caries.²¹¹ The FDA warning letter offered the company 15 days to become compliant with law²¹² and serves as a yet another example of children hazardously receiving unapproved fluoride preparations, which has now been an issue in the U.S. for over 40 years.

Meanwhile, fluorine is also *permissibly* added to other pharmaceutical drugs. Some reasons that have been identified for its addition to drugs include claims that it can “increase the drug's selectivity, enable it to dissolve in fats, and decrease the speed at which the drug is metabolized, thus allowing it more time to work.”²¹³ 20-30% of pharmaceutical compounds have been estimated to contain fluorine.²¹⁴ Some of the most popular drugs include Prozac, Lipitor, and Ciprobay (ciprofloxacin),²¹⁵ as well as the rest of fluoroquinolone family (gemifloxacin [marketed as Factive], levofloxacin [marketed as Levaquin], moxifloxacin [marketed as Avelox], norfloxacin [marketed as Noroxin], and ofloxacin [marketed as Floxin and generic ofloxacin]).²¹⁶

In regard to fluoroquinolones, the FDA issued a new warning about disabling side effects in 2016, years after these drugs were first introduced to the market. In their July 2016 announcement, the FDA stated:

These medicines are associated with disabling and potentially permanent side effects of the tendons, muscles, joints, nerves, and central nervous system that can occur together in the same patient. As a result, we revised the Boxed Warning, FDA’s strongest warning, to address these serious safety issues. We also added a new warning and updated other parts of the drug label, including the patient Medication Guide.²¹⁷

Because of these debilitating side effects, the FDA advised that these drugs should only be used when there is no other treatment option available for patients because the risks outweigh the benefits.²¹⁸ At the time of this 2016 FDA announcement, it was estimated that over 26 million Americans were taking these drugs annually.²¹⁹

Section 5.8: Perfluorinated Compounds

Per- and polyfluoroalkyl substances (PFASs), also referred to as perfluorinated compounds or perfluorinated chemicals (PFCs), are substances used in carpets, cleaners, clothing, cookware, food packaging, paints, paper, and other products because they provide fire resistance and oil, stain, grease, and water repellency.^{220 221} For example, perfluorooctanoic acid (PFOA) is used to

make polytetrafluoroethylene (PTFE), which is used in Teflon, Gore-tex, Scotchguard, and Stainmaster.²²²

However, when over 200 scientists from 38 countries signed on to the “Madrid Statement” in 2015,²²³ concerns about such substances and their possible link to ill-health were publicized.²²⁴ Additionally, in 2016, the EPA stated of PFSA:

Studies indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breast-fed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), and other effects (e.g., cholesterol changes).²²⁵

Thus, in the U.S., efforts have only recently begun to decrease the use of these chemicals. For example, in 2016, the EPA issued health advisories for PFOA and PFOS in drinking water, identifying the level at or below which adverse health effects are not anticipated to occur over a lifetime of exposure as 0.07 parts per billion (70 parts per trillion) for PFOA and PFOS.²²⁶ As another example, in 2006, the EPA joined forces with eight companies through a stewardship program for these eight companies to reduce and eliminate PFOA by 2015.²²⁷ Yet, the EPA has also written that they “remain concerned” about the companies producing these products that did not participate in this program.²²⁸

Section 5.9: Occupational

Exposure to fluorides (fluoride, perfluoride) in the workplace is regulated by the Occupational Safety & Health Administration (OSHA). The health factor most taken into consideration for these standards is skeletal fluorosis, and the limit values for occupational exposure to fluorides are consistently listed as 2.5 mg/m³.²²⁹

In a 2005 article published in the *International Journal of Occupational and Environmental Health* and presented in part at the American College of Toxicology Symposium, author Phyllis J. Mullenix, PhD, identified the need for better workplace protection from fluorides.²³⁰ Specifically, Dr. Mullenix wrote that while fluoride standards have remained consistent:

Only recently have data become available suggesting not only that these standards have provided inadequate protection to workers exposed to fluorine and fluorides, but that for decades industry has possessed the information necessary to identify the standards’ inadequacy and to set more protective threshold levels of exposure.²³¹

Section 6: Health Effects of Fluoride

In a 2006 report by the National Research Council (NRC) of the National Academy of Sciences in which the health risks of fluoride were evaluated, concerns were raised about potential associations between fluoride and osteosarcoma (a bone cancer), bone fractures, musculoskeletal effects, reproductive and developmental effects, neurotoxicity and neurobehavioral effects, genotoxicity and carcinogenicity, and effects on other organ systems.²³²

Since the NRC report was released in 2006, a number of other relevant research studies have been published. In fact, in a 2016 citizen petition to the EPA from the Fluoride Action Network (FAN), the IAOMT, and other groups, Michael Connett, Esq., Legal Director of FAN, provided a list of the newer research demonstrating harm from fluoride, which is highly relevant, especially due to the number of additional human studies:²³³

In total, Petitioners have identified and attached 196 published studies that have addressed the neurotoxic effects of fluoride exposure subsequent to the NRC's review, including 61 human studies, 115 animal studies, 17 cell studies, and 3 systematic reviews.

The post-NRC human studies include:

- 54 studies investigating fluoride's effect on cognitive performance, including but not limited to IQ, with all but 8 of these studies finding statistically significant associations between fluoride exposure and cognitive deficits.²³⁴
- 3 studies investigating fluoride's effect on fetal brain, with each of the 3 studies reporting deleterious effects.²³⁵
- 4 studies investigating fluoride's association with other forms of neurotoxic harm, including ADHD, altered neonatal behavior, and various neurological symptoms.²³⁶

The post-NRC animal studies include:

- 105 studies investigating fluoride's ability to produce neuroanatomical and neurochemical changes, with all but 2 of the studies finding at least one detrimental effect in at least one of the tested dosage levels.²³⁷
- 31 studies investigating fluoride's effect on learning and memory, with all but one of the studies finding at least one deleterious effect in the fluoride-treated groups.²³⁸
- 18 studies investigating fluoride's impact on other parameters of neurobehavior besides learning and memory, with all but one of the studies finding effects.²³⁹

The post-NRC cell studies include:

- 17 studies, including 2 studies that investigated and found effects at fluoride levels that chronically occur in the blood of Americans living in fluoridated communities.²⁴⁰

In addition to the above studies, Petitioners are submitting three post-NRC systematic reviews of the literature, including two that address the human/IQ literature, and one that addresses the animal/cognition literature.²⁴¹

It is clear that numerous research articles have already identified potential harm to humans from fluoride at various levels of exposure, including levels currently deemed as safe. Although each of these articles merit attention and discussion, an abbreviated list is included below in the form of a general description of health effects related to fluoride exposure, which features highlights of pertinent reports and studies.

Section 6.1: Skeletal System

Fluoride taken into the human body enters the bloodstream through the digestive tract.²⁴² Most of the fluoride that is not released through urine is stored in the body. It is generally stated that 99% of this fluoride resides in the bone,²⁴³ where it is incorporated into the crystalline structure and accumulates over time.²⁴⁴ Thus, it is indisputable that the teeth and bones are tissues of the body that concentrate the fluoride to which we are exposed.

In fact, in its 2006 report, the National Research Council (NRC)'s discussion on the danger of bone fractures from excessive fluoride was substantiated with significant research. Specifically, the report stated: "Overall, there was consensus among the committee that there is scientific evidence that under certain conditions fluoride can weaken bone and increase the risk of fractures."²⁴⁵

Section 6.1.1: Dental Fluorosis

Exposure to excess fluoride in children is known to result in dental fluorosis, a condition in which the teeth enamel becomes irreversibly damaged and the teeth become permanently discolored, displaying a white or brown mottling pattern and forming brittle teeth that break and stain easily.²⁴⁶ It has been scientifically recognized since the 1940's that overexposure to fluoride causes this condition, which can range from very mild to severe. According to data from the Centers for Disease Control and Prevention (CDC) released in 2010, 23% of Americans aged 6-49 and 41% of children aged 12-15 exhibit fluorosis to some degree.²⁴⁷ These drastic increases in rates of dental fluorosis were a crucial factor in the Public Health Service's decision to lower its water fluoridation level recommendations in 2015.²⁴⁸

Figure 1: Dental Fluorosis Ranging from Very Mild to Severe
(Photos from Dr. David Kennedy and are used with permission from victims of dental fluorosis.)



Section 6.1.2: Skeletal Fluorosis and Arthritis

Like dental fluorosis, skeletal fluorosis is an undeniable effect of overexposure to fluoride. Skeletal fluorosis causes denser bones, joint pain, a limited range of joint movement, and in severe cases, a completely rigid spine.²⁴⁹ Although considered rare in the U.S., the condition does occur,²⁵⁰ and it has been recently suggested that skeletal fluorosis could be more of a public health issue than previously recognized.²⁵¹

As research published in 2016 noted, there is not yet a scientific consensus as to how much fluoride and/or how long levels of fluoride need to be taken in before skeletal fluorosis occurs.²⁵² While some authorities have suggested skeletal fluorosis only occurs after 10 years or more of exposure, research has shown that children can develop the disease in as little as six months,²⁵³ and some adults have developed it in as little as two to seven years.²⁵⁴ Similarly, while some authorities have suggested that 10 mg/day of fluoride is necessary to develop skeletal fluorosis, research has reported that much lower levels of exposure to fluoride (in some cases less than 2ppm) can also cause the disease.²⁵⁵ Furthermore, research published in 2010 confirmed that skeletal tissue response to fluoride varies by individual.²⁵⁶

In patients with skeletal fluorosis, fluoride has also been suspected of causing secondary hyperparathyroidism and/or causing bone damage resembling secondary hyperparathyroidism. The condition, which commonly results from kidney disease, is triggered when the levels of calcium and phosphorous in the blood are too low.²⁵⁷ A number of studies that have been collected by the Fluoride Action Network (FAN) examine the possibility that fluoride is one contributor to this health effect.²⁵⁸

Because arthritic symptoms are associated with skeletal fluorosis, arthritis is another area of concern in relation to fluoride exposures. Notably in this regard, research has linked fluoride to osteoarthritis, both with or without skeletal fluorosis.²⁵⁹ Additionally, temporomandibular joint disorder (TMJ) has been associated with dental and skeletal fluorosis.²⁶⁰

Section 6.1.3: Cancer of the Bone, Osteosarcoma

In 2006, the NRC discussed a potential link between fluoride exposure and osteosarcoma. This type of bone cancer has been recognized as “the sixth most common group of malignant tumors in children and the third most common malignant tumor for adolescents.”²⁶¹ The NRC stated that while evidence was tentative, fluoride appeared to have the potential to promote cancers.²⁶² They elucidated that osteosarcoma was of significant concern, especially because of fluoride deposition in bone and the mitogenic effect of fluoride on bone cells.²⁶³

While some studies have failed to find an association between fluoride and osteosarcoma, according to the research completed by Dr. Elise Bassin while at Harvard School of Dental Medicine, exposure to fluoride at recommended levels correlated with a seven-fold increase in osteosarcoma when boys were exposed between the ages of five and seven.²⁶⁴ Bassin’s research, published in 2006, is the only study about osteosarcoma that has taken age-specific risks into account.²⁶⁵

Section 6.2: Central Nervous System

The potential for fluorides to impact the brain have been well-established. In their 2006 report, the NRC explained: “On the basis of information largely derived from histological, chemical, and molecular studies, it is apparent that fluorides have the ability to interfere with the functions of the brain and the body by direct and indirect means.”²⁶⁶ Both dementia and Alzheimer’s disease are also mentioned in the NRC report for consideration as being potentially linked to fluoride.²⁶⁷

These concerns have been substantiated. Studies about water fluoridation and IQ effects were closely examined in research published in October of 2012 in *Environmental Health Perspectives*.²⁶⁸ In this meta-review, 12 studies demonstrated that communities with fluoridated water levels below 4 mg/L (average of 2.4 mg/L) had lower IQs than the control groups.²⁶⁹ Since the publication of the 2012 review, a number of additional studies finding reduced IQs in communities with less than 4 mg/L of fluoride in the water have become available.²⁷⁰ To be more precise, in a citizen petition to the EPA in 2016, Michael Connett, Esq., Legal Director of FAN, identified 23 studies reporting reduced IQ in areas with fluoride levels currently accepted as safe by the EPA.²⁷¹

Moreover, in 2014, a review was published in *The Lancet* entitled “Neurobehavioral effects of developmental toxicity.” In this review, fluoride was listed as one of 12 industrial chemicals known to cause developmental neurotoxicity in human beings.²⁷² The researchers warned: “Neurodevelopmental disabilities, including autism, attention-deficit hyperactivity disorder, dyslexia, and other cognitive impairments, affect millions of children worldwide, and some diagnoses seem to be increasing in frequency. Industrial chemicals that injure the developing brain are among the known causes for this rise in prevalence.”²⁷³

Section 6.3: Cardiovascular System

According to statistics published in 2016, heart disease is the leading cause of death for both men and women in the U.S., and it costs the country \$207 billion annually.²⁷⁴ Thus, recognizing the potential relationship between fluoride and cardiovascular problems is essential not only for safe measures to be established for fluoride but also for preventative measures to be established for heart disease.

An association between fluoride and cardiovascular problems has been suspected for decades. The 2006 NRC report described a study from 1981 by Hanhijärvi and Penttilä that reported elevated serum fluoride in patients with cardiac failure.²⁷⁵ Fluoride has also been related to arterial calcification,²⁷⁶ arteriosclerosis,²⁷⁷ cardiac insufficiency,²⁷⁸ electrocardiogram abnormalities,²⁷⁹ hypertension,²⁸⁰ and myocardial damage.²⁸¹ Additionally, researchers of a study from China published in 2015 concluded: “The results showed that, NaF [sodium fluoride], in a concentration dependent-manner and even at the low concentration of 2 mg/L, changed the morphology of the cardiomyocytes, reduced cell viability, increased the cardiac arrest rate, and enhanced the levels of apoptosis.”²⁸²

Section 6.4: Endocrine System

Fluoride's effects on the endocrine system, which consists of glands that regulate hormones, have also been studied. In the 2006 NRC report, it was stated: "In summary, evidence of several types indicates that fluoride affects normal endocrine function or response; the effects of the fluoride-induced changes vary in degree and kind in different individuals."²⁸³ The 2006 NRC report further included a table demonstrating how extremely low doses of fluoride have been found to disrupt thyroid function, especially when there was a deficiency in iodine present.²⁸⁴ In more recent years, the impact of fluoride on the endocrine system has been re-emphasized. A study published in 2012 included sodium fluoride on a list of endocrine disrupting chemicals (EDCs) with low-dose effects,²⁸⁵ and the study was cited in a 2013 report from the United Nations Environment Programme and the World Health Organization.²⁸⁶

Meanwhile, increased rates of thyroid dysfunction have been associated with fluoride.²⁸⁷ Research published in 2015 by researchers at the University of Kent in Canterbury, England, noted that higher levels of fluoride in drinking water could predict higher levels of hypothyroidism.²⁸⁸ They further explained: "In many areas of the world, hypothyroidism is a major health concern and in addition to other factors—such as iodine deficiency— fluoride exposure should be considered as a contributing factor. The findings of the study raise particular concerns about the validity of community fluoridation as a safe public health measure."²⁸⁹ Other studies have supported the association between fluoride and hypothyroidism,²⁹⁰ an increase in thyroid stimulating hormone (THS),²⁹¹ and iodine deficiency.²⁹²

According to statistics released by the Centers for Disease Control and Prevention (CDC) in 2014, 29.1 million people or 9.3% of the population have diabetes.²⁹³ Again, the potential role of fluoride in this condition is essential to consider. The 2006 NRC report warned:

The conclusion from the available studies is that sufficient fluoride exposure appears to bring about increases in blood glucose or impaired glucose tolerance in some individuals and to increase the severity of some types of diabetes. In general, impaired glucose metabolism appears to be associated with serum or plasma fluoride concentrations of about 0.1 mg/L or greater in both animals and humans (Rigalli et al. 1990, 1995; Trivedi et al. 1993; de al Sota et al. 1997).²⁹⁴

Research has also associated diabetes with a reduced capacity to clear fluoride from the body,²⁹⁵ as well as a syndrome (polydispsia-polyurea) that results in increased intake of fluoride,²⁹⁶ and research has also linked insulin inhibition and resistance to fluoride.²⁹⁷

Also of concern is that fluoride appears to interfere with functions of the pineal gland, which helps control circadian rhythms and hormones, including the regulation of melatonin and reproductive hormones. Jennifer Luke of the Royal Hospital of London has identified high levels of fluoride accumulated in the pineal gland²⁹⁸ and further demonstrated that these levels could reach up to 21,000 ppm, rendering them higher than the fluoride levels in the bone or teeth.²⁹⁹ Other studies have linked fluoride to melatonin levels,³⁰⁰ insomnia,³⁰¹ and early puberty in girls,³⁰² as well as lower fertility rates (including men) and reduced testosterone levels.³⁰³

Section 6.5: Renal System

Urine is a major route of excretion for fluoride taken into the body, and the renal system is essential for the regulation of fluoride levels in the body.^{304 305} Urinary excretion of fluoride is influenced by urine pH, diet, presence of drugs, and other factors.³⁰⁶ Researchers of a 2015 article published by the Royal Society of Chemistry explained: “Thus, plasma and the kidney excretion rate constitutes the physiologic balance determined by fluoride intake, uptake to and removal from bone and the capacity of fluoride clearance by the kidney.”³⁰⁷

The 2006 NRC report likewise recognized the role of the kidney in fluoride exposures. They noted that it is not surprising for patients with kidney disease to have increased plasma and bone fluoride concentrations.³⁰⁸ They further stated that human kidneys “have to concentrate fluoride as much as 50-fold from plasma to urine. Portions of the renal system may therefore be at higher risk of fluoride toxicity than most soft tissues.”³⁰⁹

In light of this information, it makes sense that researchers have indeed linked fluoride exposures to problems with the renal system. More specifically, researchers from Toronto, Canada, demonstrated that dialysis patients with renal osteodystrophy had high levels of fluoride in the bone and concluded that “bone fluoride may diminish bone microhardness by interfering with mineralization.”³¹⁰ Additionally, a study on workers exposed to cryolite by Philippe Grandjean and Jørgen H. Olsen published in 2004 suggested that fluoride be considered as a possible cause of bladder cancer and a contributory cause in lung cancer.³¹¹

Section 6.6: Respiratory System

The effects of fluoride on the respiratory system are most clearly documented in literature about occupational exposures. Obviously, workers in industries involving fluoride are at a much higher risk of inhaling fluoride than those who do not work in the industry; however industrial usage can also impact the respiratory systems of average citizens through a variety of exposure routes.

Inhalation of hydrogen fluoride serves as a prime example of the dually evidenced occupational and non-occupational health risk. Hydrogen fluoride is used to make refrigerants, herbicides, pharmaceuticals, high-octane gasoline, aluminum, plastics, electrical components, fluorescent light bulbs, and etched metal and glass (such as that used in some electronic devices),³¹² as well as uranium chemicals production and quartz purification.³¹³ The Centers for Disease Control and Prevention (CDC) has explained that in addition to exposures at the workplace, non-occupational exposures to hydrogen fluoride can also occur at retail locations and through hobbies involving items made with the substance, as well as the rare event of exposure to a chemical terrorism agent.³¹⁴

Health effects from hydrogen fluoride can damage multiple different organs, including those involved with the respiratory system. Breathing the chemical can harm lung tissue and cause swelling and fluid accumulation in the lungs (pulmonary edema).³¹⁵ High levels of exposure to

hydrogen fluoride can cause death from the buildup in the lungs,³¹⁶ while chronic, low level inhalation can cause irritation and congestion of the nose, throat, and lungs.³¹⁷

Strictly from an occupational standpoint, the aluminum industry has been the subject of an array of investigations into fluoride's impact on the respiratory systems of workers. Evidence from a series of studies indicates a correlation between workers at aluminum plants, exposures to fluoride, and respiratory effects, such as emphysema, bronchitis, and diminished lung function.³¹⁸

Section 6.7: Digestive System

Upon ingestion, including through fluoridated water, fluoride is absorbed by the gastrointestinal system where it has a half-life of 30 minutes.³¹⁹ The amount of fluoride absorbed is dependent upon calcium levels, with higher concentrations of calcium lowering gastrointestinal absorption.^{320 321} Also, according to research published in 2015 by the American Institute of Chemical Engineers, fluoride's interaction in the gastrointestinal system "results in formation of hydrofluoric [HF] acid by reacting with hydrochloric [HCL] acid present in the stomach. Being highly corrosive, the HF acid so formed will destroy the stomach and intestinal lining with the loss of microvilli."³²²

Another area of research related to fluoride's impact on the gastrointestinal tract is the accidental ingestion of toothpaste. In 2011, the Poison Control Center received 21,513 calls related to overconsumption of fluoridated toothpaste.³²³ The numbers of impacted individuals are likely to be much higher, however. Concerns have been raised that some gastrointestinal symptoms might not be readily considered as related to fluoride ingestion, as researchers explained in 1997:

Parents or caregivers may not notice the symptoms associated with mild fluoride toxicity or may attribute them to colic or gastroenteritis, particularly if they did not see the child ingest fluoride. Similarly, because of the nonspecific nature of mild to moderate symptoms, a physician's differential diagnosis is unlikely to include fluoride toxicity without a history of fluoride ingestion.³²⁴

Other areas of the digestive system are also known to be impacted by fluoride. For example, the 2006 NRC report called for more information about fluoride's effect on the liver: "It is possible that a lifetime ingestion of 5-10 mg/day from drinking water containing fluoride at 4 mg/L might turn out to have long-term effects on the liver, and this should be investigated in future epidemiologic studies."³²⁵ As another example, fluoride toothpaste may cause stomatitis, such as mouth and canker sores in some individuals.³²⁶

Section 6.8: Immune System

The immune system is yet another part of the body that can be impacted by fluoride. An essential consideration is that immune cells develop in the bone marrow, so the effect of fluoride on the immune system could be related to fluoride's prevalence in the skeletal system. The 2006 NRC report elaborated on this scenario:

Nevertheless, patients who live in either an artificially fluoridated community or a community where the drinking water naturally contains fluoride at 4 mg/L have all accumulated fluoride in their skeletal systems and potentially have very high fluoride concentrations in their bones. The bone marrow is where immune cells develop and that could affect humoral immunity and the production of antibodies to foreign chemicals.³²⁷

Allergies and hypersensitivities to fluoride are another risk component related to the immune system. Research published in 1950's, 1960's, and 1970's showed that some people are hypersensitive to fluoride.³²⁸ Interestingly, authors of research published in 1967 pointed out that while some still questioned the fact that fluoride in toothpaste and "vitamins" could cause sensitivities, the case reports presented in their publication established that allergic reactions to fluoride do exist.³²⁹ More recent studies have confirmed this reality.³³⁰

Section 6.9: Integumentary System

Fluoride can also impact the integumentary system, which consists of the skin, exocrine glands, hair, and nails. In particular, reactions to fluoride, including fluoride used in toothpaste, have been linked to acne and other dermatological conditions.^{331 332 333} Moreover, a potentially life-threatening condition known as fluoroderma is caused by a hypersensitive reaction to fluorine,³³⁴ and this type of skin eruption (a halogenoderma) has been associated with patients using fluoridated dental products.³³⁵ Additionally, hair and nails have been studied as biomarkers of fluoride exposure.³³⁶ Nail clippings are capable of demonstrating chronic fluoride exposures³³⁷ and exposures from toothpaste,³³⁸ and using fluoride concentrations in nails to identify children at risk for dental fluorosis has been examined.³³⁹

Section 6.10: Fluoride Toxicity

The first large scale case of alleged industrial poisoning from fluorine involved a disaster at Meuse Valley in Belgium in the 1930s. Fog and other conditions in this industrialized area were associated with 60 deaths and several thousand people becoming ill. Evidence has since related these casualties to fluorine releases from the nearby factories.³⁴⁰

Another case of industrial poisoning occurred in 1948 in Donora, Pennsylvania, due to fog and temperature inversion. In this instance, gaseous releases from zinc, steel, wire, and nail galvanizing industries have been suspected of causing 20 deaths and six thousand people to become ill as a result of fluoride poisoning.³⁴¹

Fluoride toxicity from a dental product in the United States occurred in 1974 when a three-year old Brooklyn boy died due to a fluoride overdose from dental gel. A reporter for the *New York Times* wrote of the incident: "According to a Nassau County toxicologist, Dr. Jesse Bidanset, William ingested 45 cubic centimeters of 2 percent stannous fluoride solution, triple an amount sufficient to have been fatal."³⁴²

Several major cases of fluoride poisoning in the United States have achieved attention in recent decades, such as the 1992 outbreak in Hooper Bay, Alaska, as a result of high levels of fluoride

in the water supply³⁴³ and the 2015 poisoning of a family in Florida as a result of sulfuryl fluoride used in a termite treatment on their home.³⁴⁴

While the examples provided above are cases of acute (high dose, short-term) poisoning, chronic (low dose, long-term) poisoning must also be considered. At least information about fluoride poisoning is becoming available to help form a better understanding of the issue. In work published in 2015, researchers reviewed the facts that the first sign of fluoride toxicity is dental fluorosis and that fluoride is a known enzyme disruptor.³⁴⁵ Additionally, a review published in 2012 provided a detailed account of the hazards of fluoride toxicity's effect on cells: "It activates virtually all known intracellular signaling pathways including G protein-dependent pathways, caspases, and mitochondria- and death receptors-linked mechanisms, as well as triggers a range of metabolic and transcription alterations, including the expression of several apoptosis-related genes, ultimately leading to cell death."³⁴⁶

The urgency for fluoride toxicity to be more widely recognized was explored in a 2005 publication entitled "Fluoride poisoning: a puzzle with hidden pieces." Author Phyllis J. Mullenix, PhD, began the article, which was presented in part at the American College of Toxicology Symposium, by warning: "A history of enigmatic descriptions of fluoride poisoning in the medical literature has allowed it to become one of the most misunderstood, misdiagnosed, and misrepresented health problems in the United States today."³⁴⁷

Section 7: Exposure Levels

Due to increased rates of dental fluorosis and increased sources of exposure to fluoride, the Public Health Service (PHS) lowered its recommended levels of fluoride set at 0.7 to 1.2 milligrams per liter in 1962³⁴⁸ to 0.7 milligrams per liter in 2015.³⁴⁹ The need to update previously established fluoride levels is extremely urgent, as fluoride exposures have obviously surged for Americans since the 1940's, when community water fluoridation was first introduced.

Table 2, provided in Section 3 of this document, helps identify just how many sources of fluoride exposure are relevant to modern-day consumers. Similarly, a history of fluoride, as provided in Section 4 of this document, helps firmly demonstrate the number of fluoride-containing products developed over the past 75 years. Furthermore, the health effects of fluoride, as provided in Section 6 of this document, offer details about the damages of fluoride exposures inflicted upon all systems of the human body. When viewed in context with the history, sources, and health effects of fluoride, the uncertainty of exposure levels described in this section provides overwhelming evidence of potential harm to human health.

Section 7.1: Fluoride Exposure Limits and Recommendations

Generally, the optimal exposure for fluoride has been defined as between 0.05 and 0.07 mg of fluoride per kilogram of body weight.³⁵⁰ However, this level has been criticized for failing to directly assess how intake of fluoride is related to the occurrence or severity of dental caries and/or dental fluorosis.³⁵¹ To elaborate, in a 2009 longitudinal study, researchers at the University of Iowa noted the lack of scientific evidence for this intake level and concluded: "Given the overlap among caries/fluorosis groups in mean fluoride intake and extreme variability in individual fluoride intakes, firmly recommending an 'optimal' fluoride intake is problematic."³⁵²

In light of this disparity, as well as the fact that the established levels directly influence the amounts of fluoride to which consumers are exposed, it is essential to evaluate some of the established limits and recommendations for fluoride exposures. While a detailed description of fluoride regulations is provided in Section 5 of this document, recommendations issued by other government groups are also important to consider. Comparing regulations and recommendations helps to exemplify the complexity of establishing levels, of enforcing levels, of utilizing them to protect *all* individuals, and of applying them to everyday life. To illustrate this point, Table 3 provides a comparison of recommendations from the Public Health Service (PHS), recommendations from the Institute of Medicine (IOM), and regulations from the Environmental Protection Agency (EPA).

Table 3: Comparison of PHS Recommendations, IOM Recommendations, and EPA Regulations for Fluoride Intake

TYPE OF FLUORIDE LEVEL	SPECIFIC FLUORIDE RECOMMENDATION/REGULATION	SOURCE OF INFORMATION AND NOTES
Recommendation for Fluoride Concentration in Drinking Water for the Prevention of Dental Caries	0.7 mg per liter	U.S. Public Health Service (PHS) ³⁵³ <i>This is a non-enforceable recommendation.</i>
Dietary Reference Intake: Tolerable Upper Intake Level of Fluoride	Infants 0-6 mo. 0.7 mg/d Infants 6-12 mo. 0.9 mg/d Children 1-3 y 1.3 mg/d Children 4-8 y 2.2 mg/d Males 9->70 y 10 mg/d Females 9->70 y* 10 mg/d (*includes pregnancy and lactation)	Food and Nutrition Board, Institute of Medicine (IOM), National Academies ³⁵⁴ <i>This is a non-enforceable recommendation.</i>
Dietary Reference Intake: Recommended Dietary Allowances and Adequate Intakes	Infants 0-6 mo. 0.01 mg/d Infants 6-12 mo. 0.5 mg/d Children 1-3 y 0.7 mg/d Children 4-8 y 1.0 mg/d Males 9-13 y 2.0 mg/d Males 14-18 y 3.0 mg/d Males 19->70 y 4.0 mg/d Females 9-13 y 2.0 mg/d Females 14->70 y* 3.0 mg/d (*includes pregnancy and lactation)	Food and Nutrition Board, Institute of Medicine (IOM), National Academies ³⁵⁵ <i>This is a non-enforceable recommendation.</i>
Maximum Contaminant Level (MCL) of Fluoride from Public Water Systems	4.0 mg per liter	U.S. Environmental Protection Agency (EPA) ³⁵⁶ <i>This is an enforceable regulation.</i>

Maximum Contaminant Level Goal (MCLG) of Fluoride from Public Water Systems	4.0 mg per liter	U.S. Environmental Protection Agency (EPA) ³⁵⁷ <i>This is a non-enforceable regulation.</i>
Secondary Standard of Maximum Contaminant Levels (SMCL) of Fluoride from Public Water Systems	2.0 mg per liter	U.S. Environmental Protection Agency (EPA) ³⁵⁸ <i>This is a non-enforceable regulation.</i>

By interpreting the selected examples above, it is obvious that the limits and recommendations for fluoride in food and water vary tremendously and, in their current state, would be nearly impossible for consumers to incorporate into daily life. It is also obvious that these levels do not consider a multitude of other fluoride exposures. This means that consumers are reliant upon policy makers to protect them by enacting *enforceable regulations* based upon accurate data. One issue is that accurate data does not exist for either collective sources or singular sources of fluoride exposure. Another issue is that fluoride is known to impact each individual differently.

Section 7.2: Multiple Sources of Exposure

Understanding fluoride exposure levels from *all sources* is crucial because recommended intake levels for fluoride in water and food should be based upon these common multiple exposures. However, it is clear that these levels are *not* based on collective exposures because the authors of this document could not locate a single study or research article that included estimates of combined exposure levels from all of the sources identified in Table 2 in Section 3 of this position paper.

The concept of evaluating fluoride exposure levels from multiple sources was addressed in the 2006 National Research Council (NRC) report, which acknowledged the difficulties with accounting for all sources and individual variances.³⁵⁹ Yet, the NRC authors attempted to calculate combined exposures from pesticides/air, food, toothpaste, and drinking water.³⁶⁰ While these calculations did not include exposures from other dental materials, pharmaceutical drugs, and other consumer products, the NRC still recommended to lower the MCLG for fluoride,³⁶¹ which has not yet been accomplished.

The American Dental Association (ADA), which is a trade group and not a government entity, has recommended that collective sources of exposure should be taken into account. In particular, they have recommended that research should “estimate the total fluoride intake from all sources individually and in combination.”³⁶² Furthermore, in an article about the use of fluoride “supplements” (prescription drugs given to patients, usually children, that contain additional fluoride), the ADA mentioned that all sources of fluoride should be evaluated and that “patient exposure to multiple water sources can make proper prescribing complex.”³⁶³

Several studies conducted in the U.S. have offered data about multiple exposures to fluoride, as well as warnings about this current situation. A study published in 2005 by researchers at the University of Illinois at Chicago evaluated fluoride exposures in children from drinking water, beverages, cow's milk, foods, fluoride "supplements," toothpaste swallowing, and soil ingestion.³⁶⁴ They found that the reasonable maximum exposure estimates exceeded the upper tolerable intake and concluded that "some children may be at risk for fluorosis."³⁶⁵

Additionally, a study published in 2015 by researchers at the University of Iowa considered exposures from water, toothpaste, fluoride "supplements," and foods.³⁶⁶ They found considerable individual variation and offered data showing that some children exceeded the optimal range. They specifically stated: "Thus, it's doubtful that parents or clinicians could adequately track children's fluoride intake and compare it [to] the recommended level, rendering the concept of an 'optimal' or target intake relatively moot."³⁶⁷

Section 7.3: Individualized Responses and Susceptible Subgroups

Setting one universal level of fluoride as a recommended limit is also problematic because it does not take individualized responses into account. While age, weight, and gender are *sometimes* considered in recommendations, the current EPA regulations for water prescribe one level that applies to everyone, regardless of infants and children and their known susceptibilities to fluoride exposures. Such a "one dose fits all" level also fails to address allergies to fluoride,³⁶⁸ genetic factors,³⁶⁹ 370 371 nutrient deficiencies,³⁷² and other personalized factors known to be pertinent to fluoride exposures.

The NRC recognized such individualized responses to fluoride numerous times in their 2006 publication,³⁷³ and other research has affirmed this reality. For example, urine pH, diet, presence of drugs, and other factors have been identified as relative to the amount of fluoride excreted in the urine.³⁷⁴ As another example, fluoride exposures of non-nursing infants were estimated to be 2.8-3.4 times that of adults.³⁷⁵ The NRC further established that certain subgroups have water intakes that greatly vary from any type of assumed average levels:

These subgroups include people with high activity levels (e.g., athletes, workers with physically demanding duties, military personnel); people living in very hot or dry climates, especially outdoor workers; pregnant or lactating women; and people with health conditions that affect water intake. Such health conditions include diabetes mellitus, especially if untreated or poorly controlled; disorders of water and sodium metabolism, such as diabetes insipidus; renal problems resulting in reduced clearance of fluoride; and short-term conditions requiring rapid rehydration, such as gastrointestinal upsets or food poisoning.³⁷⁶

Considering that the rate of diabetes is on the rise in the U.S., with over 9% (29 million) Americans impacted,³⁷⁷ this particular subgroup is especially essential to factor into account. Furthermore, when added to the other subgroups mentioned in the NRC report above (including infants and children), it is apparent that hundreds of millions of Americans are at risk from the current levels of fluoride added to community drinking water.

The American Dental Association (ADA), a trade-based group that promotes water fluoridation,³⁷⁸ has also recognized the issue of individual variance in fluoride intake. They have recommended for research to be conducted to “[i]dentify biomarkers (that is, distinct biological indicators) as an alternative to direct fluoride intake measurement to allow the clinician to estimate a person’s fluoride intake and the amount of fluoride in the body.”³⁷⁹

Additional comments from the ADA provide even more insight into individualized responses related to fluoride intake. The ADA has recommended to “[c]onduct metabolic studies of fluoride to determine the influence of environmental, physiological and pathological conditions on the pharmacokinetics, balance and effects of fluoride.”³⁸⁰ Perhaps most notably, the ADA has also acknowledged the susceptible subgroup of infants. In regard to infant exposure from fluoridated water used in baby formula, the ADA recommends following the American Academy of Pediatrics guideline that breastfeeding should be exclusively practiced until the child is six months old and continued until 12 months, unless contraindicated.³⁸¹

While suggesting to exclusively breastfeed infants is certainly protective of their fluoride exposures, it is simply not practical for many American women today. The authors of a study published in 2008 in *Pediatrics* reported that only 50% of women continued to breast feed at six months and only 24% of women continued to breast feed at 12 months.³⁸²

What these statistics mean is that, due to infant formula mixed with fluoridated water, millions of infants most certainly exceed the optimal intake levels of fluoride based on their low weight, small size, and developing body. Hardy Limeback, PhD, DDS, a member of a 2006 National Research Council (NRC) panel on fluoride toxicity, and former President of the Canadian Association of Dental Research, has elaborated: “Newborn babies have undeveloped brains, and exposure to fluoride, a suspected neurotoxin, should be avoided.”³⁸³

Section 7.4: Water and Food

Fluoridated water, including its direct consumption and its use in other beverages and food preparation, is generally considered the main source of fluoride exposure for Americans. The U.S. Public Health Service (PHS) has estimated that the average dietary intake (including water) of fluoride for adults living in areas with 1.0 mg/L fluoride in the water as between 1.4 to 3.4 mg/day (0.02-0.048 mg/kg/day) and for children in fluoridated areas as between 0.03 to 0.06 mg/kg/day.³⁸⁴ Additionally, the Centers for Disease Control and Prevention (CDC) has reported that water and processed beverages can comprise 75% of a person’s fluoride intake.³⁸⁵

The 2006 NRC report came to similar conclusions. The authors estimated just how much of overall fluoride exposures are attributable to water when compared to pesticides/air, background food, and toothpaste, and they wrote: “Assuming that all drinking-water sources (tap and non-tap) contain the same fluoride concentration and using the EPA default drinking-water intake rates, the drinking-water contribution is 67-92% at 1 mg/L, 80-96% at 2 mg/L, and 89-98% at 4 mg/L.”³⁸⁶ Yet, the levels of NRC’s estimated fluoridated water intake rates were higher for athletes, workers, and individuals with diabetes.³⁸⁷

It is important to reiterate, however, that the fluoride added to water is not only taken in through drinking tap water. The water is also used for growing crops, tending to livestock (and domestic pets), food preparation, and bathing. It is also used to create other beverages, and for this reason, significant levels of fluoride have been recorded in infant formula and commercial beverages, such as juice and soft drinks.³⁸⁸ Significant levels of fluoride have also been recorded in alcoholic beverages, especially wine and beer.^{389 390}

In the exposure estimates provided in the 2006 NRC report, fluoride in food consistently ranked as the second largest source behind water.³⁹¹ Increased levels of fluoride in food can occur due to human activity, especially through food preparation and the use of pesticides and fertilizers.³⁹² Significant fluoride levels have been recorded in grapes and grape products.³⁹³ Fluoride levels have also been reported in cow's milk due to livestock raised on fluoride-containing water, feed, and soil,³⁹⁴ as well as processed chicken³⁹⁵ (likely due to mechanical deboning, which leaves skin and bone particles in the meat.)³⁹⁶

An essential question about these levels of fluoride intake is just how much is harmful. A study about water fluoridation published in 2016 by Kyle Fluegge, PhD, of Case Western University, was conducted at the county level in 22 states from 2005-2010. Dr. Fluegge reported that his findings suggested that “a 1 mg increase in the county mean added fluoride significantly positively predicts a 0.23 per 1,000 person increase in age-adjusted diabetes incidence ($P < 0.001$) and a 0.17% increase in age-adjusted diabetes prevalence percent ($P < 0.001$).”³⁹⁷ This led him to reasonably conclude that community water fluoridation is associated with epidemiological outcomes for diabetes.

Other studies have produced equally concerning results. A study published in 2011 found that children with 0.05 to 0.08 mg/L of fluoride in their serum had a 4.2 drop in IQ when compared to other children.³⁹⁸ Meanwhile, a study published in 2015 found that IQ points dropped at urinary fluoride levels between 0.7 and 1.5 mg/L,³⁹⁹ and another study published in 2015 linked fluoride at levels >0.7 mg/L with hyperthyroidism.⁴⁰⁰ Additional research has established the threat of health effects of fluoride in the water at levels currently considered as safe.⁴⁰¹

Section 7.5: Fertilizers, Pesticides, and Other Industrial Releases

Exposures to fertilizers and pesticides have been associated with serious health effects. For example, the Toxics Action Center has explained: “Pesticides have been linked to a wide range of human health hazards, ranging from short-term impacts, such as headaches and nausea, to chronic impacts like cancer, reproductive harm, and endocrine disruption.”⁴⁰² Scientific studies have also associated exposure to pesticides with antibiotic resistance⁴⁰³ and loss of IQ.⁴⁰⁴

Fluoride is an ingredient in phosphate fertilizers and certain types of pesticides. The use of these fluoride-containing products, in addition to irrigating with fluoridated water and industrial fluoride emissions, can raise the level of fluoride in topsoil.⁴⁰⁵ What this means is that humans can be exposed to fluoride from fertilizers and pesticides both primarily and secondarily: a primary exposure can occur from the initial pollution emitted in a specific geographic area where the product was applied, and secondary exposures can occur from contamination brought to

livestock who feed in the area, as well as water in the area that takes on the contamination from the soil.

It is therefore apparent that pesticides and fertilizers can constitute a significant portion of overall fluoride exposures. The levels vary based upon the exact product and the individual exposure, but in the 2006 NRC report, an examination of *only* dietary fluoride exposure levels from two pesticides found: “Under the assumptions for estimating the exposure, the contribution from pesticides plus fluoride in the air is within 4% to 10% for all population subgroups at 1 mg/L in tap water, 3-7% at 2 mg/L in tap water, and 1-5% at 4 mg/L in tap water.”⁴⁰⁶ Furthermore, as a result of concerns raised about the dangers of these exposures, the EPA proposed to withdraw all fluoride tolerances in pesticides in 2011,⁴⁰⁷ although this proposal was later overturned.⁴⁰⁸

Meanwhile, the environment is contaminated by fluoride releases from additional sources, and these releases likewise impact water, soil, air, food, and human beings in the vicinity. Industrial releases of fluoride can result from coal combustion by electrical utilities and other industries.⁴⁰⁹ Releases can also occur from refineries and metal ore smelters,⁴¹⁰ aluminum production plants, phosphate fertilizer plants, chemical production facilities, steel mills, magnesium plants, and brick and structural clay manufacturers,⁴¹¹ as well as copper and nickel producers, phosphate ore processors, glass manufacturers, and ceramic manufacturers.⁴¹² Concerns about the fluoride exposures generated from these industrial activities, especially when combined with other exposures, led researchers to state in 2014 that “industrial safety measures need to be tightened in order to reduce unethical discharge of fluoride compounds into the environment.”⁴¹³

Section 7.6: Dental Products for Use at Home

Fluoride from dental products used at home likewise contribute to overall exposure levels. These levels are highly significant and occur at rates which vary by person due to the frequency and amount of use, as well as individual response. However, they also vary not only by the type product used, but also by the specific brand of the product used. To add to the complexity, these products contain different types of fluoride, and the average consumer is unaware of what the concentrations listed on the labels actually mean. Additionally, most of the studies that have been done on these products involve children, and even the Centers for Disease Control and Prevention (CDC) has explained that research involving adult exposures to toothpaste, mouth rinse, and other products is lacking.⁴¹⁴

Fluoride added to toothpaste can be in the form of sodium fluoride (NaF), sodium monofluorophosphate (Na₂FPO₃), stannous fluoride (tin fluoride, SnF₂) or a variety of amines.⁴¹⁵ Toothpaste used at home generally contains between 850 to 1,500 ppm fluoride,⁴¹⁶ while prophylactic paste used in the office during a dental cleaning generally contains 4,000 to 20,000 ppm fluoride.⁴¹⁷ Brushing with fluoridated toothpaste is known to raise fluoride concentration in saliva by 100 to 1,000 times, with effects lasting one to two hours.⁴¹⁸ The U.S. FDA requires specific wording for the labeling of toothpaste, including strict warnings for children.⁴¹⁹

Yet, in spite of these labels and directions for use, research suggests that toothpaste significantly contributes to daily fluoride intake in children.⁴²⁰ Part of this is due to swallowing toothpaste, and a study published in 2014 established that small fonts used for the required labeling (often

placed on the back of the tube), intentional food-like flavoring, and the way in which children's toothpastes are marketed intensify this hazard.⁴²¹ While the CDC has acknowledged that overconsumption of toothpaste is associated with health risks to children, researchers from William Paterson University in New Jersey have noted that no clear definition of "overconsumption" exists.⁴²²

Some research has even suggested that, due to swallowing, toothpaste can account for greater amounts of fluoride intake in children than water.⁴²³ In light of the significant fluoride exposures in children from toothpaste and other sources, researchers at the University of Illinois at Chicago concluded that their findings raised "questions about the continued need for fluoridation in the U.S. municipal water supply."⁴²⁴

Mouth rinses (and mouthwash) also contribute to overall fluoride exposures. Mouth rinses can contain sodium fluoride (NaF) or acidulated phosphate fluoride (APF),⁴²⁵ and a 0.05% sodium fluoride solution of mouth rinse contains 225 ppm of fluoride. Like toothpaste, accidental swallowing of this dental product can raise fluoride intake levels even higher.

Fluoridated dental floss is yet another product that contributes to overall fluoride exposures. Flosses that have added fluoride, most often reported as 0.15mgF/m,⁴²⁶ release fluoride into the tooth enamel⁴²⁷ at levels greater than mouth rinse.⁴²⁸ Elevated fluoride in saliva has been documented for at least 30 minutes after flossing,⁴²⁹ but like other over-the-counter dental products, a variety of factors influence the fluoride release. Research from the University of Gothenburg in Sweden published in 2008 noted that saliva (flow rate and volume), intra- and inter-individual circumstances, and variation between products impact fluoride releases from dental floss, fluoridated toothpicks, and interdental brushes.⁴³⁰ Additionally, dental floss can contain fluoride in the form of perfluorinated compounds, and a 2012 Springer publication identified 5.81 ng/g liquid as the maximum concentration of perfluorinated carboxylic acid (PFCA) in dental floss and plaque removers.⁴³¹

Many consumers utilize toothpaste, mouthwash, and floss in combination on a daily basis, and thus, these multiple routes of fluoride exposure are even more relevant when estimating overall intakes. In addition to these over-the-counter dental products, some of the materials used at the dental office can result in even higher fluoride exposure levels for millions of Americans.

Section 7.7: Dental Products for Use at the Dental Office

There is a significant gap, if not a major void, in scientific literature that includes fluoride releases from procedures and products administered at the dental office as part of overall fluoride intake. Part of this is likely due to the fact that the research attempting to evaluate singular exposures from these products has demonstrated that establishing any type of average release rate is virtually impossible.

A prime example of this scenario is the use of dental "restorative" materials, which are used to fill cavities. Because 92% of adults aged 20 to 64 have had dental caries in their permanent teeth,⁴³² and these products are also used on children, consideration of the fluoridated materials used to fill cavities is crucial to hundreds of millions of Americans. Many of the options for

filling materials contain fluoride, including *all* glass ionomer cements,⁴³³ *all* resin-modified glass ionomer cements,⁴³⁴ *all* giomers,⁴³⁵ *all* polyacid-modified composites (compomers),⁴³⁶ *certain types of* composites,⁴³⁷ and *certain types of* dental mercury amalgams.⁴³⁸ Fluoride-containing glass ionomer cements, resin-modified glass ionomer cements, and polyacid-modified composite resin (compomer) cements are also used in orthodontic band cements.⁴³⁹

Generally speaking, composite and amalgam filling materials release much lower levels of fluoride than the glass ionomer-based materials.⁴⁴⁰ Glass ionomers and resin-modified glass ionomers release an “initial burst” of fluoride and then give off lower levels of fluoride long-term.⁴⁴¹ The long-term cumulative emission also occurs with giomers and compomers, as well as fluoride-containing composites and amalgams.⁴⁴² To put these releases in perspective, a Swedish study demonstrated that the fluoride concentration in glass ionomer cements was approximately 2-3 ppm after 15 minutes, 3-5 ppm after 45 minutes, 15-21 ppm within twenty-four hours, and 2-12 mg of fluoride per ml of glass cement during the first 100 days.⁴⁴³

As with other fluoride products, however, the rate of fluoride release is impacted by a wide range of factors. Some of these variables include the media used for storage, the change rate for the storage solution, and the composition and pH-value of saliva, plaque, and pellicle formation.⁴⁴⁴ Other factors that can influence the release rate of fluoride from filling materials are the cement matrix, porosity, and composition of the filling material, such as the type, amount, particle size, and silane treatment.⁴⁴⁵

To complicate matters, these dental materials are designed to “recharge” their fluoride releasing capacity, thereby boosting the amounts of fluoride released. This increase in fluoride release is initiated because the materials are constructed to serve as a fluoride reservoir that can be refilled. Thus, by utilizing another fluoride-containing product, such as a gel, varnish, or mouthwash, more fluoride can be retained by the material and thereafter released over time. Glass ionomers and compomers are most recognized for their recharging effects, but a number of variables influence this mechanism, such as the composition of the material and the age of the material,⁴⁴⁶ in addition to the frequency of recharging and the type of agent used for recharging.⁴⁴⁷

In spite of the many factors that influence fluoride release rates in dental devices, attempts have been made to establish fluoride release profiles for these products. The result is that researchers have produced a vast array of measurements and estimations. Researchers from Belgium wrote in 2001: “However, it was impossible to correlate the fluoride release of materials by their type (conventional or resin-modified glass-ionomers, polyacid-modified resin composite and resin composite) except if we compared the products from the same manufacturer.”⁴⁴⁸

Other materials used at the dental office likewise fluctuate in fluoride concentration and release levels. Currently, there are over 30 products on the market for fluoride varnish, which, when used, is usually applied to the teeth during two dental visits per year. These products have different compositions and delivery systems⁴⁴⁹ that vary by brand.⁴⁵⁰ Typically, varnishes contain either 2.26% (22,600 ppm) sodium fluoride or 0.1% (1,000 ppm) difluorsilane.⁴⁵¹

Gels and foams can also be used at the dentist office, and sometimes even at home. The ones used at the dentist office are usually very acidic and can contain 1.23% (12,300 ppm) acidulated

phosphate fluoride or 0.9% (9,040 ppm) sodium fluoride.⁴⁵² Gels and foams used at home can contain 0.5% (5,000 ppm) sodium fluoride or 0.15% (1,000 ppm) stannous fluoride.⁴⁵³ Brushing and flossing before applying gel can result in higher levels of fluoride retained in the enamel.⁴⁵⁴

Silver diamine fluoride is now also used in dental procedures, and the brand used in the U.S. contains 5.0-5.9% fluoride.⁴⁵⁵ This is a relatively new procedure that was FDA approved in 2014 for treating tooth sensitivity but not dental caries.⁴⁵⁶ Concerns have been raised about risks of silver diamine fluoride, which can permanently stain teeth black.^{457 458} Additionally, in a randomized control trial published in 2015, the researchers concluded: “There are some lingering concerns as the authors do not suggest adequate safety information regarding this preparation or the potential toxicity levels for children, but it provides a basis for future research.”⁴⁵⁹

Section 7.8: Pharmaceutical Drugs (Including Supplements)

20-30% of pharmaceutical compounds have been estimated to contain fluorine.⁴⁶⁰ Fluorine is used in drugs as anesthetics, antibiotics, anti-cancer and anti-inflammatory agents, psychopharmaceuticals,⁴⁶¹ and in many other applications. Some of the most popular fluorine-containing drugs include Prozac and Lipitor, as well as the fluoroquinolone family (ciprofloxacin [marketed as Ciprobay],⁴⁶² gemifloxacin [marketed as Factive], levofloxacin [marketed as Levaquin], moxifloxacin [marketed as Avelox], norfloxacin [marketed as Noroxin], and ofloxacin [marketed as Floxin and generic ofloxacin]).⁴⁶³ The fluorinated compound fenfluramine (fen-phen) was also used for many years as an anti-obesity drug,⁴⁶⁴ but it was removed from the market in 1997 due to its link with heart valve problems.⁴⁶⁵

Fluoride accumulation in tissue as a result of exposure to these pharmaceuticals is one potential culprit in quinolone chondrotoxicity,⁴⁶⁶ and fluoroquinolones have received media attention as a result of their serious health risks. Reported side effects from fluoroquinolones include retinal detachment, kidney failure, depression, psychotic reactions, and tendinitis.⁴⁶⁷ In a *New York Times* article published in 2012 about the controversial family of drugs, writer Jane E. Brody revealed that more than 2,000 lawsuits have been filed over the fluoroquinolone Levaquin.⁴⁶⁸ In 2016, the FDA acknowledged “disabling and potentially permanent side effects” caused by fluoroquinolones and advised that these drugs only be used when there is no other treatment option available for patients because the risks outweigh the benefits.⁴⁶⁹

Defluorination of any type of fluorinated drug can occur, and this, among other risks, led researchers to conclude in a 2004 review: “No one can responsibly predict what happens in a human body after administration of fluorinated compounds. Large groups of people, including neonates, infants, children, and ill patients serve thus as the subjects of pharmacological and clinical research.”⁴⁷⁰

One other major type of prescription drug is essential to consider in regard to overall fluoride exposure levels. Many dentists prescribe fluoride tablets, drops, lozenges, and rinses, which are often referred to as fluoride “supplements” or “vitamins.” These products contain 0.25, 0.5, or 1.0 mg fluoride,⁴⁷¹ and they are **not approved** as safe and effective for caries prevention by the FDA.⁴⁷²

The dangers of these fluoride “supplements” have been made clear. The author of a 1999 publication warned: “Fluoride supplements, when ingested for a pre-eruptive effect by infants and young children in the United States, therefore, now carry more risk than benefit.”⁴⁷³ Similarly, the 2006 NRC report established that age, risk factors, ingestion of fluoride from other sources, inappropriate use, and other considerations should be taken into account for these products.⁴⁷⁴ The NRC report further included statistics that “all children through age 12 who take fluoride supplements (assuming low water fluoride) will reach or exceed 0.05-0.07 mg/kg/day.”⁴⁷⁵

Yet, these products continue to be prescribed by dentists and regularly used by consumers, especially children,⁴⁷⁶ even as concerns about fluoride “supplements” continue to be repeated. For example, researchers of a Cochrane Collaboration review published in 2011 advised: “No data were available concerning adverse effects related to fluoride supplementation in children aged less than 6 years. The ratio benefit/risk of fluoride supplementation was thus unknown for young children.”⁴⁷⁷ Moreover, in 2015, scientists conducting an analysis of fluoride in toothpaste and fluoride supplements wrote: “Taking into consideration the toxicity of fluorides, more strict control of fluoride content in pharmaceutical product[s] for oral hygiene is proposed.”⁴⁷⁸

Section 7.9: Perfluorinated Compounds

In 2015, over 200 scientists from 38 countries signed on to the “Madrid Statement,”⁴⁷⁹ a research-based call for action by governments, scientists, and manufacturers to address the signatories’ concerns about “production and release into the environment of an increasing number of poly- and perfluoroalkyl substances (PFASs).”⁴⁸⁰ Products made with perfluorinated compounds (PFCs) include protective coatings for carpets and clothing (such as stain-resistant or water-proof fabric), paints, cosmetics, insecticides, non-stick coatings for cookware, and paper coatings for oil and moisture resistance,⁴⁸¹ as well as leather, paper, and cardboard,⁴⁸² deck stains,⁴⁸³ and a wide variety of other consumer items.

In research published in 2012, dietary intake was identified as the major source of exposure to perfluorinated compounds (PFCs),⁴⁸⁴ and additional scientific investigation has supported this claim. In an article published in 2008, researchers stated that in North America and Europe, contaminated food (including drinking water) is the most essential exposure route of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).⁴⁸⁵ The researchers also concluded that children have increased uptake doses due to their smaller body weight, and they provided the following statistics for average consumers: “We find that North American and European consumers are likely to experience ubiquitous and long-term uptake doses of PFOS and PFOA in the range of 3 to 220 ng per kg body weight per day (ng/kg(bw)/day) and 1 to 130 ng/kg(bw)/day, respectively.”⁴⁸⁶

A chapter in *The Handbook of Environmental Chemistry* published in 2012 explored some of the other common exposures to PFCs. In particular, data was offered that commercial carpet-care liquids, household carpet and fabric-care liquids and foams, and treated floor waxes and stone/wood sealants had higher concentrations of PFCs when compared to other PFC-containing

products.⁴⁸⁷ The author also specified that the exact compositions of PFCs in consumer products are often kept confidential and that knowledge about these compositions is “very limited.”⁴⁸⁸

Section 7.10: Interactions of Fluoride with Other Chemicals

The concept of multiple chemicals interacting within the human body to produce ill-health should now be an essential understanding required for practicing modern-day medicine. Researchers Jack Schubert, E. Joan Riley, and Sylvanus A. Tyler addressed this highly relevant aspect of toxic substances in a scientific article published in 1978. Considering the prevalence of chemical exposures, they noted: “Hence, it is necessary to know the possible adverse effects of two or more agents in order to evaluate potential occupational and environmental hazards and to set permissible levels.”⁴⁸⁹

The need to study the health outcomes caused by exposures to a variety of chemicals has also been reported by researchers affiliated with a database which tracks associations between approximately 180 human diseases or conditions and chemical contaminants. Supported by the Collaborative on Health and the Environment, the researchers for this project, Sarah Janssen, MD, PhD, MPH, Gina Solomon, MD, MPH, and Ted Schettler, MD, MPH, clarified:

More than 80,000 chemicals have been developed, distributed, and discarded into the environment over the past 50 years. The majority of them have not been tested for potential toxic effects in humans or animals. Some of these chemicals are commonly found in air, water, food, homes, work places, and communities. Whereas the toxicity of one chemical may be incompletely understood, an understanding of the effect from exposures to mixtures of chemicals is even less complete.⁴⁹⁰

Clearly, the interaction of fluoride with other chemicals is crucial to understanding exposure levels and their impacts. While countless interactions have yet to be examined, several hazardous combinations have been established.

Aluminofluoride exposure occurs from ingesting a fluoride source *with* an aluminum source.⁴⁹¹ This synergistic exposure to fluoride and aluminum can occur through water, tea, food residue, infant formulas, aluminum-containing antacids or medications, deodorants, cosmetics, and glassware.⁴⁹² Authors of a research report published in 1999 described the hazardous synergy between these two chemicals: “In view of the ubiquity of phosphate in cell metabolism and together with the dramatic increase in the amount of reactive aluminum now found in ecosystems, aluminofluoride complexes represent a strong potential danger for living organisms including humans.”⁴⁹³

Examples of ingredients in dental products dangerously interacting with fluoride also exist in the scientific literature. Authors of a 1994 publication suggested avoiding oral treatment involving high fluoride ions concentration and dental mercury amalgam fillings due to increased corrosion.⁴⁹⁴ Similarly, a publication from 2015 found that certain orthodontic wires and brackets had increased levels of corrosion due to fluoride mouthwash.⁴⁹⁵ Essential to note is that galvanic corrosion of dental materials has been linked to other health effects such as oral lesions,⁴⁹⁶ as well as metallic tastes in the mouth, irritation, and even allergies.⁴⁹⁷

Furthermore, fluoride, in its form of hydrofluosilicic acid (which is added to many water supplies to fluoridate the water), attracts manganese and lead (both of which can be present in certain types of plumbing pipes). Likely because of the affinity for lead, fluoride has been linked to higher blood lead levels in children,⁴⁹⁸ especially in minority groups.⁴⁹⁹ Lead is known to lower IQs in children,⁵⁰⁰ and lead has even been linked to violent behavior.^{501 502} Other research supports the potential association of fluoride with violence.⁵⁰³

Section 8: Lack of Efficacy, Lack of Evidence, and Lack of Ethics

Upon reading the preceding Section 7 about exposures to fluoride, it becomes glaringly obvious just how much additional research is required before any “safe” level for fluoride exposures can be adequately established. This lack of evidence reaches far beyond what is currently *unknown*, however. The lack of evidence is also predominant in what is already known about humankind’s use of fluoride, especially in regard to its alleged “benefit” of preventing caries.

Section 8.1: Lack of Efficacy

The fluoride in toothpastes and other consumer products is added because it allegedly reduces dental caries. The suggested benefits of this form of fluoride are related to its activity on teeth of inhibiting bacterial respiration of *Streptococcus mutans*, the bacterium that turns sugar and starches into a sticky acid that dissolves enamel.⁵⁰⁴ In particular, the interaction of fluoride with the mineral component of teeth produces a fluorohydroxyapatite (FHAP or FAP), and the result of this action is said to be enhanced remineralization and reduced demineralization of the teeth. While there is scientific support for this mechanism of fluoride, it has also been established that fluoride primarily works to reduce tooth decay *topically* (i.e. scrubbing it directly onto to teeth with a toothbrush), as opposed to *systemically* (i.e. drinking or ingesting fluoride through water or other means).⁵⁰⁵

Although the *topical* benefits of fluoride have been distinctly expressed in scientific literature, research has likewise questioned these benefits. For example, researchers from the University of Massachusetts Lowell explained several controversies associated with topical uses of fluoride in an article published in the *Journal of Evidence-Based Dental Practice* in 2006. After citing a 1989 study from the National Institute of Dental Research that found minimal differences in children receiving fluoride and those not receiving fluoride, the authors referenced other studies demonstrating that cavity rates in industrialized countries have decreased without fluoride use.⁵⁰⁶ The authors further referenced studies indicating that fluoride does not aid in preventing pit and fissure decay (which is the most prevalent form of tooth decay in the U.S.) or in preventing baby bottle tooth decay (which is prevalent in poor communities).⁵⁰⁷

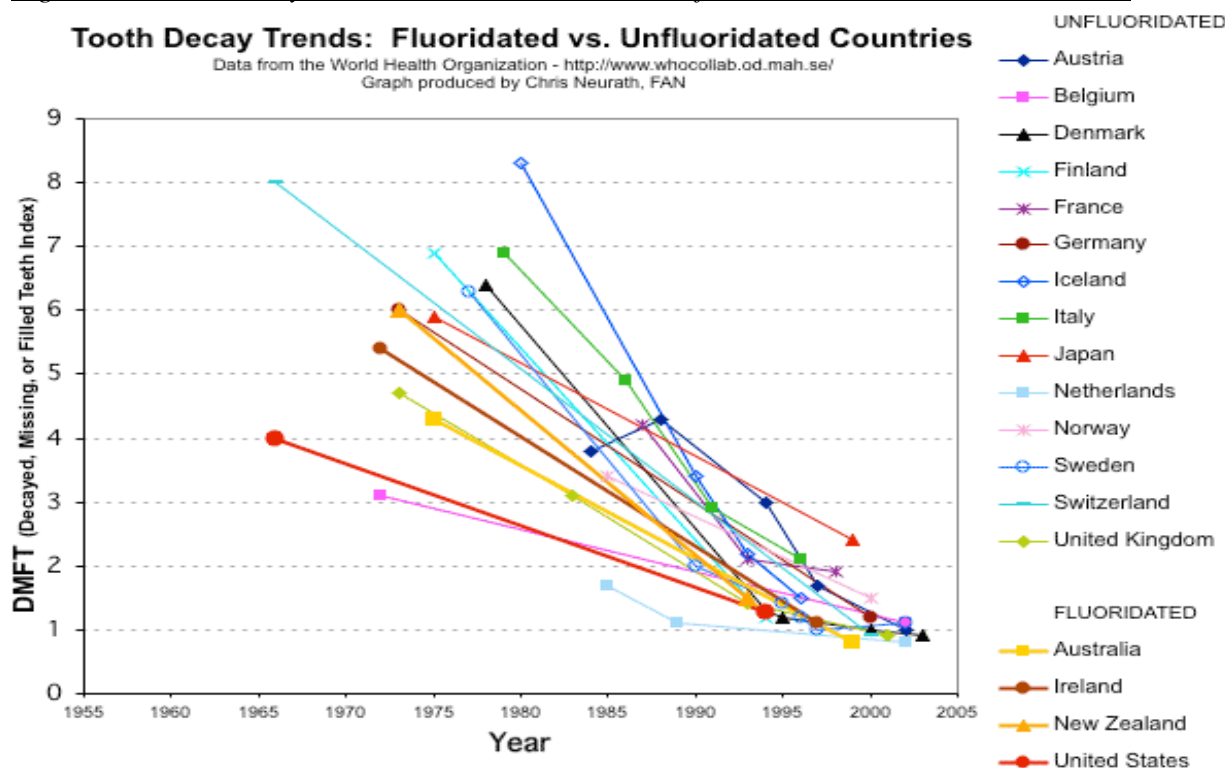
As another example, early research used to support water fluoridation as a means of reducing dental caries was later re-examined, and the potential of misleading data was identified. Initially, the reduction of decayed and filled deciduous teeth (DFT) collected in research was interpreted as proof for the efficacy of water fluoridation. However, subsequent research by Dr. John A. Yiamouyiannis suggested that water fluoridation could have contributed to the delayed eruption of teeth.⁵⁰⁸ Such delayed eruption would result in less teeth and therefore, the absence of decay,

meaning that the lower rates of DFT were actually caused by the lack of teeth as opposed to the alleged effects of fluoride on dental caries.

Other examples in the scientific literature have questioned fluoride's use in preventing tooth decay. A 2014 review affirmed that fluoride's anti-caries effect is reliant upon calcium and magnesium in the tooth enamel but also that the remineralization process in tooth enamel is not dependent on fluoride.⁵⁰⁹ Research published in 2010 identified that the concept of "fluoride strengthening teeth" could no longer be deemed as clinically significant to any decrease in caries linked to fluoride use.⁵¹⁰ Furthermore, research has suggested that *systemic* fluoride exposure has minimal (if any) effect on the teeth,^{511 512} and researchers have also offered data that dental fluorosis (the first sign of fluoride toxicity⁵¹³) is higher in U.S. communities with fluoridated water as opposed to those without it.⁵¹⁴

Still other reports show that as countries were developing, decay rates in the general population rose to a peak of four to eight decayed, missing, or filled teeth (in the 1960's) and then showed a dramatic decrease (today's levels), regardless of fluoride use. It has been hypothesized that increased oral hygiene, access to preventative services, and more awareness of the detrimental effects of sugar are responsible for the visible decrease of tooth decay. Whatever the reasons might be, it should be noted that this trend of decreased tooth decay occurred with and without the systemic application of fluoridated water,⁵¹⁵ so it would appear that factors other than fluoride caused this change. Figure 2 below exhibits the tooth decay trends by fluoridated and non-fluoridated countries from 1955-2005.

Figure 2: Tooth Decay Trends in Fluoridated and Unfluoridated Countries, 1955-2005



Several other considerations are relevant in any decision about using fluoride to prevent caries. First, it should also be noted that fluoride is not an essential component for human growth and development.⁵¹⁶ Second, fluoride has been recognized as one of 12 industrial chemicals “known to cause developmental neurotoxicity in human beings.”⁵¹⁷ And finally, the American Dental Association (ADA) called for more research in 2013 in regard to the mechanism of fluoride action and effects:

Research is needed regarding various topical fluorides to determine their mechanism of action and caries-preventive effects when in use at the current level of background fluoride exposure (that is, fluoridated water and fluoride toothpaste) in the United States. Studies regarding strategies for using fluoride to induce arrest or reversal of caries progression, as well as topical fluoride's specific effect on erupting teeth, also are needed.⁵¹⁸

Section 8.2: Lack of Evidence

References to the unpredictability of levels at which fluoride’s effects on the human system occur have been made throughout this position paper. However, it is important to reiterate the lack of evidence associated with fluoride usage, and thus, Table 4 provides an abbreviated list of stringent warnings from governmental, scientific, and other pertinent authorities about the dangers and uncertainties related to utilizing fluoridated products.

Table 4: Selected Quotes about Fluoride Warnings Categorized by Product/Process and Source

PRODUCT/ PROCESS REFERENCED	QUOTE/S	SOURCE OF INFORMATION
Fluoride for dental uses, including water fluoridation	<p>“The prevalence of dental caries in a population is not inversely related to the concentration of fluoride in enamel, and a higher concentration of enamel fluoride is not necessarily more efficacious in preventing dental caries.”</p> <p>“Few studies evaluating the effectiveness of fluoride toothpaste, gel, rinse, and varnish among adult populations are available.”</p>	Centers for Disease Control and Prevention (CDC). Kohn WG, Maas WR, Malvitz DM, Presson SM, Shaddik KK. Recommendations for using fluoride to prevent and control dental caries in the United States. <i>Morbidity and Mortality Weekly Report: Recommendations and Reports</i> . 2001 Aug 17:i-42.
Fluoride in drinking water	“Overall, there was consensus among the committee that there is scientific evidence that under certain conditions fluoride can weaken bone and increase the risk of fractures.”	National Research Council. <i>Fluoride in Drinking Water: A Scientific Review of EPA’s Standards</i> . The National Academies Press: Washington, D.C. 2006.

Fluoride in drinking water	“The recommended Maximum Contaminant Level Goal (MCLG) for fluoride in drinking water should be zero.”	Carton RJ. Review of the 2006 United States National Research Council Report: Fluoride in Drinking Water. <i>Fluoride</i> . 2006 Jul 1;39(3):163-72.
Water fluoridation	“Fluoride exposure has a complex relationship in relation to dental caries and may increase dental caries risk in malnourished children due to calcium depletion and enamel hypoplasia...”	Peckham S, Awofeso N. Water fluoridation: a critical review of the physiological effects of ingested fluoride as a public health intervention. <i>The Scientific World Journal</i> . 2014 Feb 26; 2014.
Fluoride in dental products, food, and drinking water	“Because the use of fluoridated dental products and the consumption of food and beverages made with fluoridated water have increased since HHS recommended optimal levels for fluoridation, many people now may be exposed to more fluoride than had been anticipated.”	Tiemann M. Fluoride in drinking water: a review of fluoridation and regulation issues. <i>BiblioGov</i> . 2013 Apr 5. Congressional Research Service Report for Congress.
Fluoride intake in children	<p>“The ‘optimal’ intake of fluoride has been widely accepted for decades as between 0.05 and 0.07 mg fluoride per kilogram of body weight but is based on limited scientific evidence.”</p> <p>“These findings suggest that achieving a caries-free status may have relatively little to do with fluoride intake, while fluorosis is clearly more dependent on fluoride intake.”</p>	Warren JJ, Levy SM, Broffitt B, Cavanaugh JE, Kanellis MJ, Weber-Gasparoni K. Considerations on optimal fluoride intake using dental fluorosis and dental caries outcomes—a longitudinal study. <i>Journal of Public Health Dentistry</i> . 2009 Mar 1;69(2):111-5.
Fluoride-releasing dental restorative materials (i.e. dental fillings)	“However, it is not proven by prospective clinical studies whether the incidence of secondary caries can be significantly reduced by the fluoride release of restorative materials.”	Wiegand A, Buchalla W, Attin T. Review on fluoride-releasing restorative materials—fluoride release and uptake characteristics, antibacterial activity and influence on caries formation. <i>Dental Materials</i> . 2007 Mar 31;23(3):343-62.

Dental material: silver diamine fluoride	<p>“Because silver diamine fluoride is new to American dentistry and dental education, there is a need for a standardized guideline, protocol, and consent.”</p> <p>“It is unclear what will happen if treatment is stopped after 2-3 years and research is needed.”</p>	<p>Horst JA, Ellenikiotis H, Milgrom PM, UCSF Silver Caries Arrest Committee. UCSF Protocol for Caries Arrest Using Silver Diamine Fluoride: Rationale, Indications, and Consent. <i>Journal of the California Dental Association</i>. 2016 Jan;44(1):16.</p>
Topical fluoride for dental use	<p>“The panel had a low level of certainty regarding the benefit of 0.5 percent fluoride paste or gel on the permanent teeth of children and on root caries because there were few data on the home use of these products.”</p> <p>“Research is needed concerning the effectiveness and risks of specific products in the following areas: self-applied, prescription-strength, home-use fluoride gels, toothpastes or drops; 2 percent professionally applied sodium fluoride gel; alternative delivery systems, such as foam; optimal application frequencies for fluoride varnish and gels; one-minute applications of APF gel; and combinations of products (home-use and professionally applied).”</p>	<p>Weyant RJ, Tracy SL, Anselmo TT, Beltrán-Aguilar ED, Donly KJ, Frese WA, Hujoel PP, Iafolla T, Kohn W, Kumar J, Levy SM. Topical fluoride for caries prevention: Executive summary of the updated clinical recommendations and supporting systematic review. <i>Journal of the American Dental Association</i>. 2013;144(11):1279-1291.</p>
Fluoride “supplements” (tablets)	<p>“Evident disagreements among the results show that there’s a limited effectiveness on fluoride tablets.”</p>	<p>Tomasin L, Pusinanti L, Zerman N. The role of fluoride tablets in the prophylaxis of dental caries. A literature review. <i>Annali di Stomatologia</i>. 2015 Jan;6(1):1.</p>
Pharmaceuticals, fluorine in medicine	<p>“No one can responsibly predict what happens in a human body after administration of fluorinated compounds.”</p>	<p>Strunecká A, Patočka J, Connett P. Fluorine in medicine. <i>Journal of Applied Biomedicine</i>. 2004; 2:141-50.</p>

Drinking water with poly- and perfluoroalkyl substances (PFASs)	<p>“Drinking water contamination with poly- and perfluoroalkyl substances (PFASs) poses risks to the developmental, immune, metabolic, and endocrine health of consumers.”</p> <p>“...information about drinking water PFAS exposures is therefore lacking for almost one-third of the U.S. population.”</p>	<p>Hu XC, Andrews DQ, Lindstrom AB, Bruton TA, Schaidler LA, Grandjean P, Lohmann R, Carignan CC, Blum A, Balan SA, Higgins CP. Detection of Poly-and Perfluoroalkyl Substances (PFASs) in US Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants. <i>Environmental Science & Technology Letters</i>. 2016 Oct 11.</p>
Occupational exposures to fluoride and fluoride toxicity	<p>“Review of unpublished information regarding the effects of chronic inhalation of fluoride and fluorine reveals that current occupational standards provide inadequate protection.”</p>	<p>Mullenix PJ. Fluoride poisoning: a puzzle with hidden pieces. <i>International Journal of Occupational and Environmental Health</i>. 2005 Oct 1;11(4):404-14.</p>
Review of safety standards for exposure to fluorine and fluorides	<p>“If we were to consider only fluoride’s affinity for calcium, we would understand fluoride’s far-reaching ability to cause damage to cells, organs, glands, and tissues.”</p>	<p>Prystupa J. Fluorine—a current literature review. An NRC and ATSDR based review of safety standards for exposure to fluorine and fluorides. <i>Toxicology Mechanisms and Methods</i>. 2011 Feb 1;21(2):103-70.</p>

Section 8.3: Lack of Ethics

Another major concern about fluoride exposure from drinking water and food is related to the production of the fluorides used in community water supplies. According to the Centers for Disease Control and Prevention (CDC), three types of fluoride are generally used for community water fluoridation:

- Fluorosilicic acid: a water-based solution used by most water systems in the United States. Fluorosilicic acid is also referred to as hydrofluorosilicate, FSA, or HFS.
- Sodium fluorosilicate: a dry additive, dissolved into a solution before being added to water.
- Sodium fluoride: a dry additive, typically used in small water systems, dissolved into a solution before being added to water.⁵¹⁹

Controversy has arisen over the industrial ties to these ingredients. The CDC has explained that phosphorite rock is heated with sulfuric acid to create 95% of the fluorosilicic acid used in water fluoridation.⁵²⁰ The CDC has further explained: “Because the supply of fluoride products is related to phosphate fertilizer production, fluoride product production can also fluctuate depending on factors such as unfavorable foreign exchange rates and export sales of fertilizer.”⁵²¹ A government document from Australia has more openly stated that hydrofluosilicic acid, sodium silicofluoride and sodium fluoride are *all* “commonly sourced from phosphate fertilizer manufacturers.”⁵²² Safety advocates for fluoride exposures have questioned if such industrial ties are ethical and if the industrial connection with these chemicals might result in a cover-up of the health effects caused by fluoride exposure.

A specific ethical issue that arises with such industry involvement is that profit-driven groups seem to define the evolving requirements of what constitutes the “best” evidence-based research, and in the meantime, unbiased science becomes difficult to fund, produce, publish, and publicize. This is because funding a large-scale study can be very expensive, but industrial-based entities can easily afford to support their own researchers. They can also afford to spend time examining different ways of reporting the data (such as leaving out certain statistics to obtain a more favorable result), and they can further afford to publicize any aspect of the research that supports their activities. Unfortunately, history has shown that corporate entities can even afford to harass independent scientists as a means of ending their work if that work shows harm generated by industrial pollutants and contaminants.

Indeed, this scenario of unbalanced science has been recognized in fluoride research. Authors of a review published in *the Scientific World Journal* in 2014 elaborated: “Although artificial fluoridation of water supplies has been a controversial public health strategy since its introduction, researchers—whom include internationally respected scientists and academics—have consistently found it difficult to publish critical articles of community water fluoridation in scholarly dental and public health journals.”⁵²³

Additionally, a conflict of interest can be directly related to studies about dietary exposures to perfluorinated compounds (PFCs). In an article published in 2012, research about food intake from PFCs was examined by country. The author revealed that data from the U.S. was very limited, consisting only of a 2010 publication by a number of American academic researchers, as well as a 3M sponsored survey that served as the primary research prior to the 2010 publication (and alleged that most samples of food had contaminant levels below detection.)⁵²⁴ Yet, the academic researchers produced different findings than the 3M report and wrote in their 2010 publication: “Despite product bans, we found POPs [persistent organic pollutants] in U.S. food, and mixtures of these chemicals are consumed by the American public at varying levels. This suggests the need to expand testing of food for chemical contaminants.”⁵²⁵

Conflicts of interest have also been known to infiltrate government agencies involved in toxic chemical regulation. A 2014 *Newsweek* article by Zoë Schlanger entitled “Does the EPA Favor Industry When Assessing Chemical Dangers?” included a quote from ecologist Michelle Boone that alleged “all or most of the data used in risk assessments may come from industry-supplied research, despite clear [conflicts of interest].”⁵²⁶

It is easily recognizable that the dental industry has a major conflict of interest with fluoride because profits are made by corporations that produce fluoride-containing dental products. Additionally, procedures involving fluoride administered by the dentist and dental staff can also earn profits for dental offices,^{527 528} and ethical questions have been raised about pushing these fluoride procedures on patients.⁵²⁹

In relation to the ethics of medical and dental practices, a cornerstone of public health policy known as the precautionary principle must be considered as well. The basic premise of this policy is built upon the centuries-old medical oath to “first, do no harm.” Yet, the modern application of the precautionary principle is actually supported by an international agreement.

In January 1998, at an international conference involving scientists, lawyers, policy makers, and environmentalists from the U.S., Canada and Europe, a formalized statement was signed and became known as the “Wingspread Statement on the Precautionary Principle.”⁵³⁰ In it, the following advice is given: “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof.”⁵³¹

Not surprisingly, the need for the appropriate application of the precautionary principle has been associated with fluoride usage. Authors of a 2006 article entitled “What Does the Precautionary Principle Mean for Evidence-Based Dentistry?” suggested the need to account for cumulative exposures from all fluoride sources and population variability, while also stating that consumers can reach “optimal” fluoridation levels without ever drinking fluoridated water.⁵³² Additionally, researchers of a review published in 2014 addressed the obligation for the precautionary principle to be applied to fluoride usage, and they took this concept one step further when they suggested that our modern-day understanding of dental caries “diminishes any major future role for fluoride in caries prevention.”⁵³³

Section 9: Alternatives to Fluoride Use

Based upon the elevated number of fluoride sources and the increased rates of fluoride intake in the American population, which have risen substantially since water fluoridation began in the 1940’s, lowering exposures to fluoride has become a necessary and viable alternative. For example, the author of a 2013 Congressional Report noted that significant levels of fluoride can be obtained from sources other than water.⁵³⁴ As another example, researchers from the University of Kent in Canterbury, England, considered the quantity of fluoride sources and wrote in 2014 that “the prime public health priority in relation to fluoride is how to reduce ingestion from multiple sources, rather than adding this abundant and toxic chemical to water or food.”⁵³⁵

Section 9.1: Caries Prevention

There are many ways to prevent caries without fluoride. The American Dental Association (ADA) Council on Scientific Affairs has stated that some strategies for caries prevention are “altering the bacteria flora in the mouth, modifying the diet, increasing the resistance of tooth enamel to acid attack or reversing the demineralization process.”⁵³⁶ Other strategies of preventing caries can be deduced by the factors that cause them, which include high levels of

cariogenic bacteria and/or intake of fermentable carbohydrates; inadequate salivary flow, dental care, and/or oral hygiene; inappropriate methods of feeding of infants; and the presence of poverty and/or malnutrition.⁵³⁷ (Interestingly, while some proponents of water fluoridation believe they are helping those of lower socio-economic status, as well as malnourished children, fluoride can actually increase the risk of dental caries in these populations due to calcium depletion and other circumstances.⁵³⁸)

At any extent, it is essential to understand that tooth decay is a disease caused by specific bacteria called *Streptococcus mutans*. Many bacteria do not process their food into carbon dioxide and water, but, rather, they “ferment” their foods into other kinds of waste products, such as alcohols or acids. *Streptococcus mutans* lives in microscopic colonies on the surface of the teeth, and it has the distinction of being able to produce concentrated acid waste that can dissolve the tooth enamel on which it resides. In other words, these germs can create holes in teeth, and all they require to do so is a fuel such as sugar, processed foods, and/or other carbohydrates.

Thus, utilizing the knowledge of what causes tooth decay is instrumental in developing ways to prevent it without fluoride. Some simple methods to prevent caries include eating less sugar-containing foods, drinking less sugar-containing beverages such as soft drinks, improving oral hygiene, and establishing a nutritious diet and lifestyle that strengthens the teeth and bones.

In support of such strategies to prevent dental caries without fluoride, the trend of decreased decayed, missing, and filled teeth over the past few decades has occurred both in countries *with and without* the systemic application of fluoridated water.⁵³⁹ This suggests that increased access to preventative services and more awareness of the detrimental effects of sugar are responsible for these improvements in dental health.⁵⁴⁰ Furthermore, research has documented decreases of tooth decay in communities that have discontinued water fluoridation.⁵⁴¹

Section 9.2: Consumer Choice and Consent

The issue of consumer choice is essential in relation to fluoride for a variety of reasons. First, consumers have many choices when it comes to utilizing fluoride-containing products; however, many of these products do not require informed consumer consent or labeling that provides the levels of fluoride in the item. Second, the only choice consumers have when fluoride is added to their municipal water is to buy bottled water or costly filters. In regard to water fluoridation, concerns have been raised that fluoride is added allegedly for the prevention tooth decay, while other chemicals added to water serve a purpose of decontamination and elimination of pathogens. Researchers wrote in 2014: “In addition, community water fluoridation provides policy makers with important questions about medication without consent, the removal of individual choice and whether public water supplies are an appropriate delivery mechanism.”⁵⁴²

Furthermore, in a 2013 Congressional Report, it was established that the practice of adding fluoride to water for dental reasons should not be imposed by the government, especially because it means that consumers are not able to exercise choice without buying bottled water or treating their tap water.⁵⁴³ Filtration systems are available to consumers for purchase to take the fluoride out of their water, but these filters are expensive, and some of the consumers who could benefit from them (i.e. individuals with diabetes, renal problems, or infants) cannot afford them. The

EPA has acknowledged that charcoal-based water filtration systems do not remove fluoride and that distillation and reverse osmosis systems, which can remove fluoride, are costly.⁵⁴⁴

97% of western Europe does not use water fluoridation, and governments from this region of the world have identified consumer consent as one reason for not adding fluoride to community drinking water. The following are just a few statements from these countries:

- “Fluoride has never been added to the public water supplies in Luxembourg. In our views, the drinking water isn’t the suitable way for medicinal treatment and that people needing an addition of fluoride can decide by their own to use the most appropriate way, like the intake of fluoride tablets, to cover their [daily] needs.”⁵⁴⁵
- “This water treatment has never been of use in Belgium and will never be (we hope so) into the future. The main reason for that is the fundamental position of the drinking water sector that it is not its task to deliver medicinal treatment to people.”⁵⁴⁶
- “In Norway we had a rather intense discussion on this subject some 20 years ago, and the conclusion was that drinking water should not be fluoridated.”⁵⁴⁷

Some of the countries that do not use fluoridated water have opted to use fluoridated salt and milk as a means to offer consumers the choice of whether they would like to consume fluoride or not. Fluoridated salt is sold in Austria, the Czech Republic, France, Germany, Slovakia, Spain, and Switzerland,⁵⁴⁸ as well as Colombia, Costa Rica, and Jamaica.⁵⁴⁹ Fluoridated milk has been used in programs in Chile, Hungary, Scotland, and Switzerland.⁵⁵⁰

On the contrary, a major issue in the U.S. is that consumers simply are not aware of the fluoride added to hundreds of products they routinely use. Some citizens do not even know that fluoride is added to their water, and because there are no food or bottled water labels, consumers are likewise not aware of those sources of fluoride. While toothpaste and other over-the-counter dental products include disclosure of fluoride contents and warning labels, the average person has no context for what these ingredients or contents mean (if they are fortunate enough to read the small font on the back of their product). Materials used at the dental office provide even less consumer awareness as informed consent is generally not practiced, and the presence and risks of fluoride in dental materials is, in many instances, never mentioned to the patient.⁵⁵¹ For example, in the case of silver diamine fluoride, the product was introduced to the U.S. market in 2014 without a standardized guideline, protocol, or consent.⁵⁵²

Section 9.3: Education for Medical/Dental Professionals, Student, Patients, and Policy Makers

Educating medical and dental practitioners, students of medicine and dentistry, patients, and policy makers about fluoride exposures and the associated potential health risks is essential to improving the dental and overall health of the public. Since a scientific understanding of the health effects of fluoride has been limited to promoting its benefits, the reality of its overexposure and potential harms must now be conveyed to healthcare workers and students, such as those in the medical, dental, and public health fields. This concept was supported in a 2005 publication in which the authors explained that their findings emphasized “the significance of educating parents and child-care specialists about fluorosis risk by public health practitioners, physicians, and dentists.”⁵⁵³

Although informed consumer consent and more informative product labels would contribute to increasing patient awareness about fluoride intake, consumers also need to take a more active role in preventing caries. Better diet, improved oral health practices, and other measures would assist in reducing tooth decay, as well as many other ailments that not only drain the human body but also drain the financial resources of individuals and the government due to rising healthcare costs.

Finally, policymakers are tasked with the obligation of evaluating the benefits and risks of fluoride. These officials are often bombarded by dated claims of fluoride's alleged purposes, many of which are constructed upon limited evidence of safety and improperly formulated intake levels that fail to account for multiple exposures, individual variances, fluoride's interaction with other chemicals, and independent (non-industry sponsored) science. Authors of a 2011 publication linked parents and policymakers to the basics of fluoride's impact on the human system:

Safe, responsible, and sustainable use of fluorides is dependent on decision makers (whether they be politicians or parents) having a firm grasp on three key principles: (i) fluorine is not so much 'essential' as it is 'everywhere,' (ii) recent human activities have significantly increased fluorine exposures to the biosphere, and (iii) fluorine has biogeochemical effects beyond bones and teeth.⁵⁵⁴

Section 10: Conclusion

The sources of human exposure to fluoride have drastically increased since community water fluoridation began in the U.S. in the 1940's. In addition to water, these sources now include food, air, soil, pesticides, fertilizers, dental products used at home and in the dental office (some of which are implanted in the human body), pharmaceutical drugs, cookware, clothing, carpeting, and an array of other consumer items used on a regular basis. Official regulations and recommendations on fluoride use, many of which are not enforced, have been based on limited research and have only been updated after evidence of harm has been produced and reported.

Exposure to fluoride is suspected of impacting nearly every part of the human body, including the cardiovascular, central nervous, digestive, endocrine, immune, integumentary, renal, respiratory, and skeletal systems. Susceptible subpopulations, such as infants, children, and individuals with diabetes or renal problems, are known to be more severely impacted by intake of fluoride. Accurate fluoride exposure levels to consumers are unavailable; however, estimated exposure levels suggest that millions of people are at risk of experiencing the harmful effects of fluoride and even toxicity, the first visible sign of which is dental fluorosis. A lack of efficacy, lack of evidence, and lack of ethics are apparent in the current status quo of fluoride usage.

Informed consumer consent is needed for all uses of fluoride, and this pertains to water fluoridation, as well as all dental-based products, whether administered at home or in the dental office. Providing education about fluoride risks and fluoride toxicity to medical and dental professionals, medical and dental students, consumers, and policy makers is crucial to improving the future of public health.

There are fluoride-free strategies in which to prevent dental caries. Given the current levels of exposure, policies should reduce and work toward eliminating avoidable sources of fluoride, including water fluoridation, fluoride-containing dental materials, and other fluoridated products, as means to promote dental and overall health.

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To view the brochures in Connecticut and Maine, see

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From: gdn2@aol.com
To: [Public Submissions](#)
Subject: [EXT] Fluoride opposition
Date: Saturday, October 19, 2019 2:28:55 PM

To whom it concerns,

I am a physician that specializes in Environmental medicine and for the last three years have been engaged in the Flint Water Crisis. It is important to know that Fluoride like lead is a toxin to the nervous system and there is a fallacy to the statement that it is perfectly safe in the water. There has never been a quality study that showed its safety and as far as protecting the teeth, it is truly ineffective when used in water.

Please read the scientific studies or at least query the worlds scientists for guidance. The time to finally rid this carcinogenic, neurotoxin from our water is now.

Please make the right decision for future generations of Canadian Children and be an example to the rest of the fluoridating world.

Respectfully,

Gerald Natzke

Gerald D Natzke DO FAAEM DIBEM
Past President of the American Academy of Environmental Medicine
Assistant Clinical Professor Michigan State University
Director of the Allergy & Environmental Medicine Center/JLN Wellness Center
9475 Holly Rd. Ste # 205 Grand Blanc, Mi 48439
O: 810.344.4567
F: 810.344.6234

From: [David Warwick](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); [Safe Water Calgary](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Saturday, October 19, 2019 3:21:35 PM
Attachments: [Water fluoridation in Calgary..pdf](#)

Updated submission

From Dr. David Warwick
drdavid17@mac.com
202, 2nd ave. West
Hanna, Alberta
T0J1P0

To The City of Calgary Council
re: Water Fluoridation and Effective Alternatives

My name is Dr. David Warwick and I have been practicing dentistry for over 36 years in Hanna, Alberta. I was trained at the Faculty of Dentistry in Edmonton, Alberta and was trained in the virtues of water fluoridation for the reduction of decay during my schooling.

Having heard all of the evidence supporting fluoridation and promoting it myself in the early years of my career, I was reluctant to consider any other position. When I did begin looking at **all** of the available literature I began to doubt both the safety and the effectiveness of fluoride as it was presented to me in dental school. Over the last 20 years based on additional scientific study, my position on water fluoridation effectiveness is that it is at best inconclusive. Additionally, I believe the body of evidence suggests very strongly that the practice of water fluoridation represents a risk to the well being of the human race. Based on this, my recommendation to the City of Calgary Council is to vote on the side of caution and continue to provide drinking water to their citizens without adding additional fluoride.

I have a history of helping the councillors of Calgary make informed choices with regards to water fluoridation. My daughter Robin Ermel DDS, who is my partner, originally provided councillor Diane Colley-Urquart's office with balanced, updated information on the practices of water fluoridation before council decided to remove fluoridation in 2011.

Observing the growing conversation regarding water fluoridation in Calgary, I am watching with interest. There are several groups that are presenting to council the cautionary aspects of considering fluoridation including environmental issues, toxicological issues and analysis regarding the less than ideal efficacy of fluoridation however there are four points that I would like to touch on that are not getting as much attention as they should. Unfortunately I am not able to attend the meeting regarding fluoridation on October 29 so I hope you consider the four points and the summary of this letter as I understand my letter submitted on time in July was not considered. I also want to stress that included in this letter is a more effective and cost effective strategy to reducing caries in children than fluoride. I continue to believe that the ongoing scientific literature being published on water fluoridation is supporting an even stronger position that water fluoridation is neither safe or effective. Strangely, some of the conclusions I have drawn come from results of scientific studies that are being used to actually justify the reestablishment of fluoridated water in Calgary.

#1. The Alberta Data

In the data that Lindsay McLaren and her group used to pen papers on the effects of fluoride cessation in Alberta comparing Calgary and Edmonton from 2004/5 and 2013/14, there are **only 9** statistically significant findings and the first 8 are the following;

- Baby teeth decay significantly increased in Edmonton
- Baby teeth decay significantly increased in Calgary
- Baby teeth decay significantly increased in Edmonton amongst those who had defs >0
- Baby teeth decay significantly increased in Calgary amongst those who had defs >0

Baby teeth decay on smooth surfaces significantly increased in Edmonton
Baby teeth decay on smooth surfaces significantly increased in Calgary
Baby teeth decay on smooth surfaces in participants with at least 1 decay significantly increased in Edmonton
Baby teeth decay on smooth surfaces in participants with at least 1 decay significantly increased in Calgary

In these first 8 statistically significant changes in the prevalence of decay over time in the two cities, both cities behaved the same, even though Calgary had terminated municipal water fluoridation and Edmonton had continued it. **The only conclusion one can make from this data is that in our province, amongst our people, fluoride in the water doesn't have a meaningful effect on decay in baby teeth and some other factor is causing a distressing increase in baby tooth decay!**

The only other statistically significant change that occurred in the data is that the prevalence of permanent tooth decay decreased in Calgary. The permanent tooth decay rates in Edmonton's population stayed relatively the same over the time studied.

I am perplexed that this has not been looked at or discussed. The improvement in the status of permanent tooth health in Calgary over the time of the study has **not** received enough attention or comment. **The decay rates in permanent teeth in Calgary dropped a whopping 67%!** Granted the starting rate of permanent tooth decay was higher in Calgary than Edmonton while both cities were fluoridated, however the reduction in decay over the time of the study took the decay rate in permanent teeth in Calgary well below Edmonton. I don't have an answer as to why this occurred and whether it had anything to do with fluoride but it is very important because in reality, if we are looking for preventative dental health strategies, the permanent teeth are far more important than the baby teeth. Perhaps, the removal of fluoride in Calgary's water reduced the amount of fluorosis. Fluorosis is a phenomenon that occurs far more frequently in fluoridated communities and can actually cause the permanent teeth to be weaker and more susceptible to decay.

Regardless of the reason for the improvement in the dental health status of permanent teeth in Calgary over the time studied, more attention is deserved on this change and certainly consideration that at least in part the negative effect of fluorosis on dental health may be at play.

#2 Alberta Health Services stated Fact 1

The best evidence available shows us that community water fluoridation, at the levels recommended in Canada, is safe and does not pose risk of health effects. (available at <https://www.albertahealthservices.ca/Blogs/BTH/Posting315.aspx#.XSPHy6fMzOR>)

Alberta Health Services rebuttal to a study that suggested that fluoride exposure is associated with lower IQs in children does not go far enough to analyze the available information. At the time of this government release (2017), there were 52 studies that showed an impairment in IQ due to fluoride exposure. Alberta Health Services suggested that different forms and concentrations of fluoride in the study in question was different than what applies to Alberta, however AHS failed to acknowledge that many of the studies measured urinary F, and that the levels of urinary fluoride found in these studies was below a factor of 10 difference than those found in fluoridated communities in Alberta. Even a very nominal reduction in IQ can have devastating effects on a society because although a small reduction in the "average" citizen may not be detected, the people that sit at the ends of the bell curve can be drastically impacted. A minimal reduction of IQ at each end of a population bell curve results in fewer people who are blessed with the IQ of a genius and more people who are classified as mentally

challenged. Both of these sequelae are undesirable for a successful community. The claim that fluoride exposure may reduce human IQ should be taken seriously and I believe that Alberta Health Services fell short of thoroughly examining all of the evidence that suggests this and the implications it may have. In addition, the latest comments from the O'Brien institute add further doubt to the safety status of water fluoridation. With reference to a new Canadian Study on children IQs and maternal fluoride levels the O'Brien stated "...there is some new emerging evidence that fluoride exposure during pregnancy may be harmful to the brain development of children, with important studies having been published subsequent to the review of this evidence by the National Research Council in the U.S. in 2006...The new emerging studies in this domain need to be tracked very closely, and carefully evaluated as they appear." People in position to protect the public surely cannot consider taking the risks that are associated with water fluoridation when experts (O'Brien Institute) who had previously promoted the practice are now casting a significant shadow of doubt.

#3 Alberta Health Services stated Fact 2

Research consistently shows that communities with water fluoridation at the recommended levels have better oral health than communities with low water fluoride levels, and that the greatest positive impact is realized by vulnerable individuals. (available at <https://www.albertahealthservices.ca/Blogs/BTH/Posting315.aspx#.XSPHy6fMzOR>)

The most pertinent data regarding communities with and with out fluoridation and their decay rates is found in the data used by Lindsay McLaren. This data regarding Albertans, simply does not support the statements made by AHS. As of 2013/14, the decay rates amongst the populations studies were higher in fluoridated Edmonton than Calgary which isn't fluoridated.

#4 A safe and effective strategy to reduce children's decay in Alberta.

It is common for those who favour the fluoridation of water to criticize those who have reservations about the practice as being uncaring, or being "negative Nellies" with no solution to the ongoing problem of dental decay. It is very clear that the data used by McLaren and her associates prove that fluoride is not effective in Alberta. There is however a chronic condition that Albertans suffer from that has been shown to significantly increase the experience of tooth decay. On March 11th, 2015, Alberta Health Services released a memo to all Alberta Doctors and Nurses that stated among other things; "The majority of Albertans would benefit from Vitamin D supplementation but do not require testing to do so safely." Unfortunately, the implementation and recommendation of Vitamin D supplementation in Alberta has not been adequate, especially in children. The question is, what implication does this have on decay. There are many studies regarding the prevalence of decay and vitamin D status. Almost all of them universally state that there is an association between vitamin D deficits and decay. A review (Hujoel, 2013) of the literature concerning this association included a cohort of over 2800 suggests very strongly that optimizing vitamin D status reduces decay. Most lay people understand the physiology on why this is so and also understand why we are deficient. It is an issue that is admitted by Alberta Health Services yet there is absolutely no coordination between what the public needs and what is being delivered and as a result a preventable disease persists. Instead, Alberta Health Services is promoting a practice that has not been shown to be effective in this province (according to the data used by McLaren) and has unacceptable risk factors.

If the City of Calgary is genuine in their goals of reducing tooth decay in children (including those who are less fortunate) the easiest, most efficient, least expensive strategy would be to ensure that Vitamin D is optimized.

I have experience in idealizing vitamin D levels to improve dental health in Albertans and am available without fee to help institute such a plan.

Summary

The scientific evidence does not support water fluoridation. The effectiveness of water fluoridation is questionable and there are risks that have still not been defined and because of this, fluoridation of water supplies is a practice that should not be supported.

There are far more important factors that are creating the concerning increase in baby teeth decay that are not being considered. Dr. Steven Patterson, a professor at the U of Alberta faculty of dentistry and co-author of the papers that assessed Calgary decay rates after fluoride cessation was quoted in the Globe and Mail as saying "...the big impact (on increased decay rates) is related to what people chose to eat". I one hundred percent agree with Dr. Patterson, but if this is so, why are we treating the effects of a dietary insufficiency with a non-essential element (fluoride) that might not work and appears to have undesirable side effects on society.

There are several simple and obvious actions that can be taken to reduce decay in lieu of water fluoridation. I question how council can vote to put a known toxin in the water to treat dental decay when schools are selling the very food that causes this disease. In our town, we started a healthy lunch program and removed the soda machines out of the school. It is quite likely that along with vitamin D, vitamin K2 levels are also inadequate in the Alberta population, yet nothing is being done to remedy this. Our sugar consumption is far too high to expect a healthy population. There has been no consideration for the effects of environmental pollutants on the formation of baby teeth which are mostly formed in the womb. It is known that some heavy metals, that the fetus is exposed to in gestation by the mother, can cause weakened enamel and therefore teeth that are more susceptible to decay. There are endless strategies that can be employed to help prevent decay that would be far more effective and far safer than water fluoridation but are not being considered.

I would be glad to answer any questions regarding this information and in closing I urge council to consider all of the facts and continue to offer Calgarians safe water by rejecting water fluoridation and instead consider more effective and safer alternatives that have been outlined in this letter.

Yours sincerely
Dr. David Warwick

From: [Karen Relkov](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] No Poison (Fluoride) in our water please
Date: Saturday, October 19, 2019 4:18:12 PM

To whom it may concern,

I am asking that you consider this to be a personal matter as to who wants fluoride in their water. I personally have 2 children ages 4 and 21 months who drink 8-10 cups of water a day. I have a kangen water filtration system but you putting this man made toxin into our water will require me to up grade to another filtration system so as not to "dumb down" my kids growing and developing brains.

As you know the economy is already in a downward spiral this would put a larger financial strain on us. Plus dont you want smart kids for our future? It has been proven in several studies (NOT FUNDED BY THE ACTUAL PEOPLE MAKING THE FLUORIDE!!) That this is a man made neuro toxin!!! So for one less cavity in 10 yrs you would cause dumb people? I had fluoride poisoning my self and had to decalcify my pineal gland years ago in order to be able to sleep properly. Im 40 now.

I truly feel with this new 5th generation internet (5G) and all the problems that is going to cause health wise you should just give this generation an extra year to live and leave out the fluoride.

You dont want us swallowing our toothpaste or we should call poison control but its ok to drink this stuff?

Here is a news clip of fluoride burning a hole in cement. Thats going into your body and liver and blood and brain.

<https://www.youtube.com/watch?v=pmMGYwFcvbw&fbclid=IwAR3JMTxtbwAU4nrkPHkViBnfpuCZqAFWvh8glF54VmDRhBgYEhfCXi3kGTM>

Karen
403-998-8046

From: [Jennifer Koh](#)
To: [Public Submissions](#)
Cc: cityclerk@Calgary.ca; SafeWaterCalgary@gmail.com
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Saturday, October 19, 2019 7:21:38 PM
Attachments: [Water Fluoridation 9 Oct 2019v2.pdf](#)
Importance: High

Please find attached my submission for the Oct 29th Hearing on Water Fluoridation.

Sincerely

A handwritten signature in black ink, appearing to be 'J. Koh'.

Jennifer Koh
Mother of a Calgary teenager living in Braeside, SW Calgary
Organizational Development Consultant, Healthcare

URGENT!

PO Box 22018 RPO Capri Centre
Kelowna, BC
9 October 2019
jenn@myartofchange.com
250-552-7030

To: publicsubmissions@calgary.ca
Cc: cityclerk@Calgary.ca

Dear Mayor and Council,

In 2006 my family and I immigrated to Canada from South Africa. We landed in the beautiful city of Calgary. At that time, I believe Calgary's water was fluoridated. It was a relief to see that in 2011, Calgary City Council voted to stop fluoridating drinking water.

In 2016 when Calgary's economy plummeted, and my business suffered, I had very little choice but to accept a position in BC, where my research tells me, 98% of the water is not fluoridated.

My teenage son chose to remain in Calgary, a city he loves. Knowing that his health and the health of many of my dear friends and the residents of Calgary, Airdrie, Chestermere and Strathmore is at risk with the introduction of toxic industrial fluoride waste, is infuriating, disappointing and disheartening to say the least.

I am opposed to the water my teenage son drinks to include artificially high fluoride levels. Toothpaste manufacturers tell us that one shouldn't swallow a pea-sized amount of toothpaste (estimated to be 0.25mg), the same as two 8oz glasses of fluoridated water.

We also know that:

- any benefit from fluoride comes from topical application: http://fluoridealert.org/issues/caries/topical_systemic/
- the risk comes from ingestion: <http://fluoridealert.org/issues/health/>
- fluoride is readily available in topical form, is easy to find and inexpensive

If you cannot guarantee that adding fluoridation chemicals to our drinking water is safe for pregnant women, infants on formula reconstituted with tap water, people with hypothyroidism or kidney issues, or those who already have dental fluorosis from overexposure to toothpaste, THEN I URGE YOU, DON'T MANDATE IT IN OUR DRINKING WATER.

Citizens should have clean and safe drinking water. This ought to be the top priority. Adding additional contaminants, chemicals, or hazardous waste products to our drinking water makes no sense.

Choose to represent citizens rather than lobbyists and corporate polluters. We don't need to buy their pollution for our drinking water. Please vote against fluoridation.

Thank you.

Sincerely



Jennifer Koh
Mother of a Calgarian teenager living in Braeside, SW Calgary
Organizational Development Consultant, Healthcare

From: [Dr. Brian D. McLean](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Saturday, October 19, 2019 7:30:47 PM

Please allow a general dentist (me) to explain how a lay-person can evaluate fluoridation geek-speak in a meaningful way. You will have to conclude that community water fluoridation is a bad idea.

I'm assuming that most city councillors are not trained scientists or health professionals. Yet you are asked to listen to scientific arguments and come to important science-based decisions. It seems unfair to ask that of you.

It is not. Please read on. What I learned gradually during my almost half-century as a practising general dentist in Ontario i firmly believe can be of help to you.

I was very proud that science is what informed the profession of dentistry. That is one of the main reasons I chose the profession. In dental school I was trained that community water fluoridation was a great benefit to the public. I was taught that we dentists should be proud of this public health achievement - that fluoridation was one of dentistry's great gifts to humanity.

I believed all of that for about the first thirty years of my career. Then I heard of Dr. Hardy Limeback, head of the department of preventive dentistry at the University of Toronto dental school. I had graduated from that school decades earlier. Dr. Limeback was stating publicly that fluoridation was a mistake!

What was I to do with that? I soon discovered that almost all of my colleagues dismissed Dr. Limeback as sort of a kook, How could one tiny voice be right when the great majority of experts said the opposite?

But about that time I had been reading a biography of Albert Einstein, that was peppered with many of his quotations. One was, "A foolish faith in authority is the worst enemy of truth." That made me uncomfortable because it is clear that if it were possible that the authority that one respects is being foolish, then one's decisions and values would likely be flawed.

Did Einstein mean have faith in valid authorities but shun the foolish ones? Or did he mean that it is foolish to have faith in *any* authority? If the latter, that sounded like the first step on the road to anarchy. Depending on the circumstances of the moment, I think he meant it to be taken both ways. But “scientific anarchy” was not his intent, nor does following Einstein’s advice risk that.

How does a city councillor distinguish between a valid authority and a foolish one?

Are credentials good enough? Dr. Limeback was a rarity in that he had earned a Ph.D. in biochemistry *before* he enrolled in dental school. In the early part of his career at the University of Toronto Dental Faculty he became a world-respected authority advocating the merits of fluoridation. Typically the public health officers who address city councils advocating fluoridation have a “mere” Master’s degree earned *after* they graduated from dental (or medical) school. By that criterion, Dr. Limeback wins and you should follow his expertise, even though his expert opinion had changed to opposing fluoridation.

Perhaps a councillor should go with the majority opinion. Most dental experts on fluoridation advocate fluoridation. Only a tiny minority of recognized experts (such as Dr. Limeback) oppose it. That’s a tempting thing to do! “Who am I, “ you might ask yourself, “untrained in dentistry and untrained in science to sort this all out. I’ll just go with the majority of experts. That seems safe.” That seems like reason enough to dispel any lingering discomfort you might have about making a foolish decision.

Who am I to decide who is scientifically right?” you probably are asking yourself.

What I gradually came to understand over the course of my career, is *that is the wrong question to ask!* The appropriate question is, “Who is wrong?” At first blush that sounds like hair-splitting because surely if an expert is not right then he is wrong. What difference can it make how you phrase the question?

It makes all the difference in the world!

The simple fact is that it is impossible for science or logic to determine if a *theory* is absolutely true. But it *is possible*, when the appropriate verified evidence comes to light, *for science to prove that a theory is absolutely false.*

The reason that we no longer believe that the world is flat, is *not* that it is proved to be ball-shaped, but that evidence surfaced that the flat-earth theory could not explain. So far, the ball-shaped theory explains *all* of the available data so we *believe* that to be the truth. It is only a belief however. It is not absolutely proven. It is my personal opinion, and probably yours, that the evidence will never arise to disprove that particular theory. But that is only an opinion. It is not and cannot be absolutely proven true.

Here’s a more interesting example. Newton, when he put forth his laws of motion and gravity, stated at the outset that one of his assumptions was that time was something that passed at a constant rate only in one direction - from the past into the future. That seems so obviously true that I was astounded to learn that Newton even bothered to mention it. But Newton had formal training in logic, something that

tends not to be taught to today's scientists (or to myself). Newton recognized the necessity of identifying underlying assumptions.

One of the hallmarks of Einstein's genius is that he had the courage and curiosity to challenge Newton's assumption. "What," he asked himself, "if time doesn't move at a constant rate?" Soon he published his special and later his general *theory* of relativity that said, among other things, that time slows down as we move faster. Sounds crazy. Yet eventually experiments were done to show that is in fact the case. This does not mean that Einstein's theory is right. It *does* mean that Newton's laws are proven wrong (in its details).

Why isn't Einstein's theory proven correct? Einstein answered that question thus: "The truth of a theory can never be proven, for one never knows if future experiments will contradict its conclusions."

More Einstein quotations speak to this:

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong."

And, "My ideas caused people to reexamine Newtonian physics. It is inevitable that my own ideas will be reexamined and supplanted. If they are not, there will have been a gross failure somewhere."

Taken together, we learn that it is foolish to believe that any given theory is proven true. We must relentlessly look for evidence that it is *not* true. Failure to do that can leave us mindlessly barking up the wrong tree for decades or centuries. If no verified evidence exists to disprove a theory, *only then* can we give ourselves permission to believe that a given theory is probably true. Even then, that permission is granted tentatively. No theory ever has been nor ever will be proven absolutely true. If you hear an expert say, "The science is settled," he is deceiving you or himself or both.

Imagine that a world-renowned authority on birds stated that "All swans are white." Further suppose that you travelled to Australia and brought back a black swan to present to him. How foolish would he be to ignore your black swan? How illogical, irrelevant and foolish would he be to do another study and come up with another million examples of white swans?

POINTING TO "THE OVERWHELMING MAJORITY" OF EVIDENCE WHICH SUPPORTS A THEORY IS IRRELEVANT IN THE FACE OF EVEN A SINGLE PIECE OF VALID EVIDENCE WHICH CONTRADICTS IT.

A very important word in the above sentence is “VALID.” The appropriate thing for our expert to do upon being presented with a black swan is to be sure that the swan is not a white swan fraudulently doctored with shoe polish or a white swan rescued from an oil slick. *Ignoring evidence* which purports to disprove a theory is the antithesis of science. Any authority that does so you can quickly identify as foolish. Indeed he would be foolish even if that black swan were a fraud:

Einstein again:

“Condemnation without investigation is the height of ignorance.”

So as a city councillor listening to erudite and often baffling scientific geek-speak about fluoridation, do not ask, “What theory is true?” Ask instead, “What theory is false.” That is the *only* question that science and logic can answer so *insist* that the experts taking up your valuable time do that. Interrupt them if they do not and get them back on track.

Ask, “Why, precisely, are your opponents wrong when they say...”

If the response is that “28 world-respected public health authorities endorse fluoridation,” understand that such a claim is irrelevant. In such a case you are not listening to a scientific argument. Presumably you are seeking the best scientific advice you can get. Don’t be afraid to identify and rule out propaganda that pretends to be science.

Brian D. McLean, BSc. DDS
Barrie, ON Canada

From: [Petra Fitzpatrick](#)
To: [Public Submissions](#)
Subject: [EXT] HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees
Date: Saturday, October 19, 2019 11:29:12 PM

PUBLIC SUBMISSION

RE: HEARING SUBMISSION - The Problem isn't lack of fluoridation, but high dental fees

Dear PUBLIC SUBMISSION,

Dear Mayor and Councilors,

please be aware that my Family and Friends are 100% against Flouride in our Water. We would like to choose by ourselves if we want to consume flouride and NOT being forced by the City of Calgary.
It is absolutely appalling to me, that you are not only taking our freedom away of having a choice in that matter NO you are yet again discussing it over and over also people voted against it in the past.
Are we still living in a democratic country OR are we already taken over by a dictatorship ?

Europe eliminated flouridation long long time ago and that for a good reason.
My both kids and Us have healthy teeth and that without any flouride treatments - They eat healthy food most of the time , regular visits to our dentist and a healthy lifestyle.
Where I grew (in Europe) up a dentist visit every 6 month was mandatory otherwise major treatment would be not covered under the insurance. Yes Insurance was higher (50/50 paid by employer and employee) but at least everybody had the same chance of going to a dentist and other services. In Calgary only people with benefits and money can go to a dentist.

There is no shortage of fluoride in Calgary. There are no access issues. Anyone can find fluoride toothpaste, rinse, floss, fluoridated bottled water, or fluoride supplements for cheap at any bodega, grocery store, or pharmacy (for supplements).

Any dental problem is not due to lack of fluoride, but high dental fees set by the lobbying organization that represents Alberta dentists: https://urldefense.proofpoint.com/v2/url?u=https-3A__www.theglobeandmail.com_opinion_the-2Dexorbitant-2Dcost-2Dof-2Ddentist-2Dvisits-2Din-2Dalberta-2Dcannot-2Dbe-2Dbrushed-2Doff_article36153690_&d=DwICaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYef1b63aY8s&m=J6OqyZbIPQ6lVp7YFMOTIoRZ2oLkpK5JJ6q-nqGmjbe&s=5zcNzFAFsMv5QKApwVMoGSWM9xdjCsKXRPG6A3uixbk&e=

It's time for the government to step in an call for a revised fee schedule for basic dental services instead of paying the phosphate fertilizer industry for their waste to dump in our drinking water.

Please oppose fluoridation.

Thank you,
The Fitzpatrick Family (Petra, John, Adriana and Tamara)

Sincerely,
Petra Fitzpatrick

Calgary, AB

From: [Emile Begin](#)
To: [Public Submissions](#); [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [FAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Sunday, October 20, 2019 12:57:55 PM
Attachments: [provincial-kindergarten-dental-survey-report-2015-2016.pdf](#)

October 20, 2019

This letter reaffirms my opposition to fluoridation in the City of Calgary. I am a Forest technologist and registered professional forester in Prince George, British Columbia (BC) (over 45 years). I do not speak for or on behalf of my employer. We voted fluoridation out (2014) after 60 years of forced fluoridation based on healthy discussions and credible information.

You will be making a decision on fluoridation. The decision will define you. Residents voted you in to help the City of Calgary continue to grow into a healthy, enlightened and progressive City – through respecting residents, demonstrating knowledge, trust and wisdom considering social processes, visitors our environment and future.

In 2011, a progressive Calgary City Council voted to end fluoridation use; a transport Canada Schedule 2 corrosive and toxic dangerous good. This untreated dangerous good was directly injected into Rocky Mountain Fresh drinking water; all related dangerous good toxins were added to City waters. How is that even possible in an educated and enlightened City?

Responsible Mayor and Council elected representatives; self-admit to having no fluoridation expertise deferring to local public health “experts”; pushing a known and research supported; failed public health fluoridation policy continually reaffirmed by acknowledged and trained researchers to harm people. Has the City provided all residents the MSDS?

The Journal of the [American Medical Association – Pediatrics](#), a primary and credible source for Public Health Agencies reaffirmed (2019) the harm from fluoridation to pregnant mothers and our children.

The [BC Ministry of Health and Public Health](#) Agencies confirm ending fluoridation and related benefits to our kindergarten-aged children for thousands of British Columbia children is very real (BC 98.8% fluoridation free). Years of enforced public health research and in their own words since 1990 – reaffirms (2017) (attached – pdf):

“Overall, a kindergarten student enrolled in the 2015/2016 school year is more likely to be caries free and less likely to have treated caries or visible decay than a student enrolled in the 2006/2007 school year.” Public Health “expects” know; applying their own research; fluoridation does not work! In society things can go wrong, fluoridation is wrong.

The Socially correct and Canadian Public Health research supported direction is to end fluoridation completely in Calgary, British Columbia and all of Canada. Public trust is built upon actions demonstrated by public institutions such as Public Health and Social structures demonstrating they continue to earn the public’s trust. We have demonstrated Public Health in Alberta is ignoring Public Health results in Canada, regardless of the source Province. Public Health’s, primary object is to maintain and improve public health; 2017 and 2019 fluoridation research confirms fluoridation harms public health.

Do the rights of the citizens exceed the rights of Public Health organizations?

If Calgary Council chooses to restart fluoridation in Calgary they will lose all credibility and trust in all areas of public decision-making. Your actions, will define who you and the City of Calgary really are; enlightened and progressive, respecting informed voters or ignorant and divisive.

Responsible, healthy choices are yours to consider and make, affecting hundreds of thousands of people and our children's future. Will we be a responsible and healthy society with you making responsible decisions to keep us safe and healthy?

Respectfully

Emile Begin, RPF (Visitor to Calgary)

7490 Southridge Ave.

Prince George, BC, V2N4Y5

From: [Emile Begin](#)
To: [Public Submissions](#)
Subject: [EXT] Re: Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 4:04:58 PM
Attachments: [Association Between Maternal Fluoride Exposure During Pregnancy and IQ Scores in Offspring in Canada.pdf](#)

Thank you for receiving my submission.

We appreciate your informing us the links provided in the received email may not be there when the data is reviewed later. I attached one document (second report - PDF BC Ministry of Health / Public Health - public Record - Kindergarten Children Dental Health - 2017) and have included a PDF of the first document referenced (JAMA Pediatrics), for everyone's respectful consideration without relying on the web links.

Fluoridation remains a controversial topic as we all appreciate good health. After personally researching fluoridation use since fluorine (base element creating all fluorides) was first added to the Periodic table of elements in 1884 by Henri Moissan; we have discovered considerable quantities of credible and challenging information demonstrating harm from fluoride at many levels, including very small quantities consumed or absorbed through our skin. One would expect that after over 135 years of research, knowledge and understanding fluoride harms people and over 74 years of fluoridation use (Brantford Ontario started fluoridation in 1945); the solution would be obvious. Fluorides harm people. It is that simple.

One reasonable conclusion is that the science on using fluoridation as a dental benefit through consuming dangerous goods in drinking water, is not sound science or sensible.

With fluoride bearing chemicals "dissociating" and separating out to a base element (Fluorine), in water; fluorides become very toxic in human bodies. That science appears to be well documented, and complex. So why complicate peoples lives even more? The KISS Principle works!

Public Health remains a human invention and as humans, mistakes are too often made. Public Health supporting Thalidomide for pregnant mothers is a well defined example of the best of intentions gone seriously wrong. Canadian and International evidence strongly suggests Community Water Fluoridation, (Fluoridation) is one more failed Public Health hope. A hope that is failing many tests even if the tests are considered well developed.

The BC Ministry of Health / Public Health records of kindergarten aged children's dental health reports demonstrates sound and real world examples confirming fluoridation is not needed and does not work in drinking water. If fluoridation worked as well as some argue BC children would have the worst dental health in all of Canada, and that simply is not the case. Public Health Agencies know that truth. So why do they defend a failed and failing dental health

policy? Science is improving, so fluoridation is becoming less of an acceptable option, what is difficult about that?

The Precautionary Principal, to which Canada is a signatory establishes the need to end fluoridation for the simple reason; none of the scientific community can agree on fluoridation as being safe and research demonstrates it is not safe. The defined risks and harms are becoming more prevalent and less acceptable to informed parents and society as a whole. Equally true, improved public and dental health alternatives are being confirmed by Public Health agencies in BC and Internationally and the alternatives are working. A good news story all way around.

The decision comes down to who in Public Health can be trusted by people and elected representatives when their own Public Health research and since 1990; confirms fluoridation is not needed? Time to stop experimenting on our children and regain their health.

Do City of Calgary elected representatives trust Public Health in British Columbia, medial Doctors, dentists and Canadian Dental Association approved Dental Hygienists who have over the recent 29 years confirmed our children's dental health is improving; by eliminating fluoridation in 98.8% of the Province of BC? We are headed to 100% fluoridation free! Or do you believe Public Health in Alberta, who have not demonstrated fluoridation is safe might be trusted? (Please note: This is a reasonable and not a rhetorical question. We respectfully request a written reply to this question by the City of Calgary Mayor and Council, please - Which Public Health Agency do you trust to help you make the best decision?)

JAMA - Pediatrics researchers struggled to conclude significant caution to pregnant mothers and our children for documented reasons, and they are the research experts Public Health Agencies defer to.

Were on the same team; I hope; we want our children to be healthy and to spend less time at the dentists office; and in BC, ending fluoridation is working very well as demonstrated by our Ministry of Health and Public Health Agencies reports. Who should we trust? Can Alberta and BC Public Health work together to share alternate and improved methods that eliminate fluoridation? Yes, we can.

Fresh Rocky Mountain water is pretty incredible and we are extremely fortunate to have such good Canadian water. What person in their right mind would chose to inject dangerous goods into it and then tell everyone to drink the toxic mix when the world is dealing with clean, safe water shortages?

I respect the challenges many considerate and elected leaders face. They have taken on

significant responsibilities and need to keep taking this serious, we the people (and parents) do; and through informed processes, we have discovered fluoridation is clearly too high of a risk and not needed. City of Prince George Engineers confirmed, after fluoridation was ended; fluoridation chemicals are a dangerous good and hazardous waste material that cost residents significantly more Tax dollars to appropriately dispose of the dangerous good correctly, and not in drinking water. What more evidence to you need to prove fluoridation is a hazardous waste material?

I appreciate all the work your City does to help people, consideration of our letter and the significant time needed to review the facts and come to a healthy and precautionary choice, making a medical intervention decision for thousands of residents and visitors (and horses at the Stampede and Yes fluoridation HARMS horses, documented!)

Do any City or Public Health staff's have the right to chose my medical interventions, when they do not have my informed consent? No, you do not.

Respectfully

Emile Begin, RPF

From: Public Submissions <PublicSubmissions@calgary.ca>
Sent: October 21, 2019 1:04 PM
To: Emile Begin <Treesoap1@hotmail.com>
Subject: RE: Submission for Hearing on Water Fluoridation

Good afternoon,

Thank you for your submission regarding Fluoride. This item will be considered by the Standing Policy Committee on Community & Protective Services on Fluoride on 2019 October 29. Your submission includes a link which will be included as presented in your submission. We do not pursue links and their associated materials to include in our Agenda as they can change, become inactive, or disappear over time. However the path will be there should anyone viewing the Agenda wish to pursue these further.

In accordance with sections 43 through 45 of Procedure Bylaw 35M2017, as amended, your name, contact information and comments will be made publicly available as part of the agenda and be published at www.calgary.ca/ph.

Please advise by noon 2019 October 22 if you would like your submission excluded.

*Note: Personal information provided in submissions related to matters before Council or Council Committees is collected under the authority of Bylaw 35M2017 and section 33 (c) of the Freedom of

Information and Protection of Privacy Act of Alberta (FOIP) for the purpose of receiving public participation in the municipal decision-making process. If you have any questions regarding the collection and use of your personal information, please contact the City Clerk's Legislative Coordinator at 403-268-5861.

Regards,

Legislative Advisor

Governance & Protocol Services Division | City Clerk's Office

The City of Calgary | Mail code: #8007

T (403) 268-5861 | www.calgary.ca

City Hall, 800 Macleod Tr. S.E.

P.O. Box 2100, Station M, Calgary, AB T2P 2M5

From: Emile Begin [mailto:Treesoap1@hotmail.com]

Sent: Sunday, October 20, 2019 12:58 PM

To: Public Submissions <PublicSubmissions@calgary.ca>; Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>

Subject: [EXT] Submission for Hearing on Water Fluoridation

October 20, 2019

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Respectfully

Emile Begin, RPF (Visitor to Calgary)

7490 Southridge Ave.

Prince George, BC, V2N4Y5

British Columbia Dental Survey of Kindergarten Children: A Provincial and Regional Analysis, 2015/2016

Ministry of Health
Population and Public Health Division
November 2017



Ministry of
Health

Executive Summary

In the 2015/2016 school year, 39,926 children in British Columbia (BC) participated in a provincial kindergarten dental survey, representing 92.0% of enrolled students. This survey was administered in public schools, independent schools, participating First Nations schools, and public health units. Within this population, a total of 3,363 children who participated in the survey self-identified¹ as Aboriginal, representing 89.8% of the estimated enrolled Aboriginal children. This report summarizes the findings of the 2015/2016 survey and compares them to findings from previous survey cycles. The comparison of data collected across the years provides a useful picture of the state of kindergarten dental health over time in BC.

It should be noted that the data for this kindergarten dental survey are collected through a visual inspection of each child's teeth using a pen light, rather than through a full dental exam. As such, it is possible that decay or treated caries could be missed. However, the data are still valuable to detect trends in early childhood dental health over time. Another strength of the survey is that it facilitates the identification of children in need of referral for dental care.

All BC children

Across all BC kindergarten children in 2015/2016:^{2,3}

- **69.1%** were caries free⁴ (no visible decay or broken enamel),
- **16.7%** had treated caries⁵ (no visible decay but existing restorations), and
- **14.2%** had evidence of visible decay.

Since 2006/2007, the oral health of BC kindergarten children has improved at the provincial level:

- the prevalence of caries free among BC kindergarten children has increased by **8.0 percentage points**, from 61.1% to 69.1%
- the prevalence of treated caries among BC kindergarten children has decreased by **5.0 percentage points**, from 21.7% to 16.7% , and
- the prevalence of visible decay among BC kindergarten children has decreased by **3.1 percentage points**, from 17.3% to 14.2%

Overall, a kindergarten student enrolled in the 2015/2016 school year is more likely to be caries free and less likely to have treated caries or visible decay than a student enrolled in the 2006/2007 school year.

¹ Information provided by teachers and schools was used to determine Aboriginal identity for kindergarten children surveyed. Identification was based primarily on known First Nation status or through self-identification by a parent. The School Act provides the authority for public health staff to access student demographic information for public health programs delivered in school settings.

² The categories of caries free, treated caries, and visible decay are mutually exclusive. A child cannot be represented in more than one of these categories. For example, if a child had both treated caries and visible decay, they would have been categorized as having visible decay only.

³ This report does not disaggregate data by sex. It is hoped that future surveys will allow for this level of disaggregation and analysis.

⁴ It is difficult to determine if someone is truly caries free through visual assessment alone. The term "caries free" is used through this report to indicate that there was no visible decay or broken enamel noted at the time of the survey. While this approach may miss some cases of dental decay, it is still possible to confidently describe trends in early childhood dental health.

⁵ Some treated caries may be missed due to white fillings that may be difficult to identify using a pen light. Decay between teeth may also be missed.

These results suggest modest overall improvement in children's dental health at the provincial level over the past decade.

Treated caries indicate that there was decay at some point in the early years of life. Taken together with the 14.2% of children with visible decay at the time of the 2015/2016 survey, approximately 30% of kindergarten aged children in BC had or had previously experienced dental decay. However, it is encouraging that the fraction of children with treated caries or visible decay is decreasing.

Progress is more variable, however, when survey findings are examined at the health authority and Health Service Delivery Area level, and clear disparities in outcomes are apparent across jurisdictions. Geographical inequities in early childhood dental health continue to persist, and, in some cases, appear to be widening. For example, in 2006/2007, the difference between the health authorities with the highest and lowest prevalence of caries free was 6.3 percentage points (Vancouver Island: 65.1%, Northern: 58.8%), while in 2015/2016, this difference widened to 11.8 percentage points (Vancouver Coastal: 72.4%, Northern 60.6%).

Aboriginal Children

Among Aboriginal kindergarten children in 2015/2016:

- **45.7%** were caries free (no visible decay or broken enamel),
- **30.7%** had treated caries (no visible decay but existing restorations), and
- **23.6%** had evidence of visible decay

Since 2009/2010⁶, the oral health of Aboriginal kindergarten children in BC has improved at the provincial level:

- the prevalence of caries free among Aboriginal kindergarten children has increased by **6.4 percentage points**, from 39.3% to 45.7%,
- the prevalence of treated caries among Aboriginal kindergarten children has decreased by **1.5 percentage points**, from 32.2% to 30.7%, and
- the prevalence of visible decay among Aboriginal children has decreased by **4.9 percentage points**, from 28.5% to 23.6%

Despite these improvements in dental health among Aboriginal kindergarten children over time, disparities between Aboriginal and non-Aboriginal children have persisted. Since 2009/2010, disparities in oral health outcomes between Aboriginal and Non-Aboriginal children have remained relatively constant, or have only marginally improved:

- In 2009/2010, the prevalence of caries free was 25.8 percentage points lower in Aboriginal children (39.3 %) than in non-Aboriginal children (65.1%); in 2015/2016, this difference was 25.5 percentage points (45.7% of Aboriginal children and 71.2% of non-Aboriginal children).
- In 2009/2010, the prevalence of treated caries was 13.4 percentage points higher in Aboriginal children (32.2 %) than in non-Aboriginal children (18.8%); in 2015/2016, this difference was 15.3 percentage points (30.7% of Aboriginal children and 15.4% of non-Aboriginal children).

⁶ The 2009/2010 survey is the most recent survey to allow for disaggregation by Aboriginal/non-Aboriginal.

- In 2009/2010, the prevalence of visible decay was 12.3 percentage points higher in Aboriginal children (28.5%) than in non-Aboriginal children (16.2%); in 2015/2016, this difference was 10.2⁷ percentage points (23.6% of Aboriginal children and 13.3% of non-Aboriginal children).

The disparity between Aboriginal and non-Aboriginal dental health outcomes reflect the complex biomedical and social factors which contribute to early childhood caries, and is not unique to BC.^{1,2,3} Provincially, work is underway to address disparities in oral health between Aboriginal and non-Aboriginal children. An oral health strategy has been developed to guide the delivery of collaborative public health and community services that are focused on improving the oral health of First Nations and Aboriginal children aged 0-18 years and their families in BC. *Healthy Smiles for Life: BC's First Nations and Aboriginal Oral Health Strategy* provides a comprehensive, evidence-based and multi-level set of recommendations that will inform public health and community planning, policy development and program implementation.

This report includes some findings specific to Aboriginal children; however, more detailed findings for this group will be presented in the report *BC Dental Survey of Aboriginal Kindergarten Children 2015/2016: A Provincial and First Nations Schools Analysis*.⁸

When examining trends in early childhood dental health outcomes from 2006/2007 to 2015/2016, the greatest improvements appear to have been observed in the years between 2009/2010 and 2012/2013 surveys. Progress between the 2012/2013 and 2015/2016 surveys is much more modest, and in some instances, difficult to detect. For example, the prevalence of visible decay decreased by 0.3 percentage points from 2006/2007 to 2009/2010, by 2.3 percentage points from 2009/2010 to 2012/2013 surveys, and then by 0.5 percentage points from 2012/2013 to 2015/2016. There was a similar trend in increasing the fraction of children who were caries free, with differences of 2.2, 3.9, and 1.9 percentage points across the same time period.

The findings of the 2015/2016 survey are of special interest as they measure trends in early childhood dental outcomes since the introduction of the dental public health service statements which were developed in 2013. The intention of the service statements was not only to distinguish interventions which should be offered universally, but also to reduce inequities by identifying vulnerable groups and taking proportionate action. The findings of the 2018-2019 survey will be particularly meaningful in evaluating the impact of the dental health service statements, as the birth cohort reaching kindergarten age at that time will have grown up with the service statements in place. However, the comparatively minimal progress since 2012/2013 is an interesting trend and worth noting. Health authorities can offer insights as to why progress in achieving universal improvements in early childhood dental health and in decreasing inequities appears to have slowed in the years between the 2012/2013 and 2015/2016 surveys.

⁷ All figures have been rounded, and as such some calculations may appear to be inexact.

⁸ This report is due for release in late 2017.

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Introduction

In 1990, a standardized public health dental survey was implemented in British Columbia (BC) to assess the dental health of kindergarten aged children. This dental survey is conducted by public health dental professionals (registered dental hygienists and certified dental assistants) who have been evaluated in screening competencies and have achieved calibration. Public health dental staff perform a visual inspection using a pen light and tongue depressor to assess each child's dental health. Most assessments are done in a school setting during the kindergarten school year. In Northern Health, assessments typically take place in a public health setting in the spring before kindergarten entry, at the same time as pre-kindergarten vaccinations.

During the survey, kindergarten children are assessed for:

- no evidence of visible dental decay/no broken enamel (caries free)
- no evidence of visible decay but evidence of existing restorations (treated caries)
- evidence of visible dental decay in one or more teeth (visible decay)
- the number of quadrants affected
- evidence of pain or infection at the time of screening
- need for urgent or non-urgent referral for dental care

Though dental caries are preventable, they remain the most common chronic condition in childhood.^{4,5} The many adverse outcomes resulting from poor dental health in early childhood include pain, difficulty eating and sleeping, difficulties with speech, and poor self-esteem. Early childhood caries are also expensive. At present, the number one reason for which Canadians between the ages of 1 and 5 years undergo day surgery is for the repair of dental decay, with annual costs estimated at \$3.5 million in BC.⁶

In March 2005, the BC government announced a commitment to improve early childhood development. The dental health initiative was one part of an integrated cross-ministry strategy for addressing dental, hearing, and vision concerns in the early childhood years (birth to five years of age). Health Authorities received increased funding to enhance early childhood dental health programs. The goal was to provide programs that would offer the best opportunity to improve the dental health and well-being of infants and children. The Early Childhood Dental Health initiative included:

1. Provision of increased public health dental health services through registered dental hygienists and certified dental assistants, allowing health authorities to increase prevention of early childhood caries and improve identification of higher risk, more vulnerable segments of the population
2. Increased access to dental treatment, especially for low-income families
3. Public awareness and education programs aimed at reducing early childhood caries

Health authority early intervention dental programs include: provision of information about oral health care and oral hygiene practices to families and care providers; screening for caries risk behaviours; application of fluoride varnish for children identified at risk of caries; promotion of healthy eating as it relates to dental health; and applying a dental health lens to policy development (e.g. dental health messaging is considered during the development of healthy food guidelines, sugar sweetened beverage policies, school food sales guidelines, etc.) In addition, dental public health staff work with community organizations, schools, and pregnancy outreach programs to support vulnerable populations and improve oral health.

Health authority dental staff have continued to monitor the impact of early intervention programs on dental health through an ongoing dental survey of kindergarten children every three years. The survey does not replace a regular dental exam. Rather, its purpose is to determine the prevalence of obvious or visible dental decay, to identify trends in dental health, and where possible, to obtain a measure of the effectiveness of early childhood dental public health initiatives. In 2015/2016, this province-wide dental survey was conducted by public health dental staff to assess the dental health of kindergarten children in each health authority.

This survey was administered in public schools, public health units, independent schools, and participating First Nations schools. In the 2015/2016 school year, 39,926 kindergarten children participated in the provincial dental survey (92.0% of all those enrolled). Within these schools, a total of 3,363 children who participated in the survey self-identified as Aboriginal,^{ix} representing 89.8% of enrolled Aboriginal children.

This report compares the 2015/2016 survey results to those from the 2012/2013, 2009/2010, and 2006/2007 survey findings. Comparisons are limited these years because there was greater consistency of screening practices and data recording practices during this period. Disaggregation of Aboriginal and non-Aboriginal data is only possibly from the 2009/2010 survey onward.

This report includes some findings specific to Aboriginal children; however, more detailed findings for this group are presented in the report titled *BC Dental Survey of Aboriginal Kindergarten Children 2015/2016: A Provincial and First Nations Schools Analysis*

^{ix} Information provided by teachers and schools was used to determine Aboriginal identity for kindergarten children surveyed. Identification was based primarily on known First Nation status or through self-identification by a parent. The School Act provides the authority for public health staff to access student demographic information for public health programs delivered in school settings.

BC Public Health Dental Screening Criteria and Definitions^x

Caries Free ^{xi}	No evidence of visible decay (no broken enamel) and no existing restorations
Treated Caries ^{xii}	No evidence of visible decay but evidence of existing restorations
Visible Decay	Evidence of obvious decay in one or more teeth
Decay by Quadrants ^{xiii}	Evidence of decay in one or more teeth in 1,2,3, or 4 quadrants
Urgent referrals	Children who were referred for further treatment due to the urgency of their conditions
Non-urgent referrals	Children who did not have urgent conditions but were referred for further treatment

Target Population

The target population for this survey is all children between the ages of 4 and 6 years who were enrolled in kindergarten in the 2015/2016 school year across the province.

^x The categories of caries free, treated caries, and visible decay are mutually exclusive. A child cannot be represented in more than one of these categories. For example, if a child had both treated caries and visible decay, they would have been categorized as having visible decay only.

^{xi} It is difficult to determine if someone is truly caries free through visual assessment alone. The term “caries free” is used through this report to indicate that there was no visible decay or broken enamel noted at the time of the survey. While this approach may miss some cases of dental decay, it is still possible to confidently describe trends in early childhood dental health.

^{xii} Some treated caries may be missed due to white fillings that may be difficult to identify using a pen light. Decay between teeth may also be missed.

^{xiii} The number of quadrants affected with visible decay is not necessarily a proxy of severity or the number of dental appointments needed to provide treatment; the number of teeth affected and the seriousness of decay are not reflected in this metric.

Provincial Analysis

Overall Trends

In the 2015/2016 school year, 39,926 children participated in the provincial dental survey (92.0% of all those enrolled in kindergarten). The percentage of children screened in each health authority in 2015/2016 was similar to the last two survey cycles (Table 1).

Table 1: Number and percentage of children screened by health authority, over time (2009/2010 to 2015/2016).⁷

	2009/2010			2012/2013			2015/2016		
Health Authority	Enrolled	Screened	Percentage Screened	Enrolled	Screened	Percentage Screened	Enrolled	Screened	Percentage Screened
Interior	6,146	5,574	90.7	6,657	5,961	89.5	6,271	5,599	89.3
Fraser	15,060	13,660	90.7	17,794	16,643	93.5	18,124	17,051	94.1
Vancouver Coastal	8,616	7,864	91.3	9,067	8,279	91.3	8,954	8,170	91.2
Vancouver Island	5,922	5,320	89.8	6,504	5,749	88.4	6,627	5,876	88.7
Northern	3,135	3,002	95.8	3,504	3,332	95.1	3,409	3,230	94.7
BC	38,879	35,420	91.1	43,526	39,964	91.8	43,385	39,926	92.0

Figure 1 compares provincial survey results across four survey cycles. At the provincial level, progress in improving early childhood dental health has been observed over time. Since 2006/2007, the fraction of caries free kindergarten children has increased by 8.0 percentage points, from 61.1% to 69.1%. The fraction with treated caries has decreased by 5.0 percentage points, from 21.7% to 16.7%, and the fraction with visible decay has decreased by 3.1 percentage points, from 17.3% to 14.2%. 85.8% of children had no visible decay at the time of the 2015/2016 survey. More modest improvements have been made since 2012/2013, with a 1.9 percentage point increase in caries free children, a 1.4 percentage point decrease in children with treated caries and a 0.5 percentage point decrease in children with visible decay.

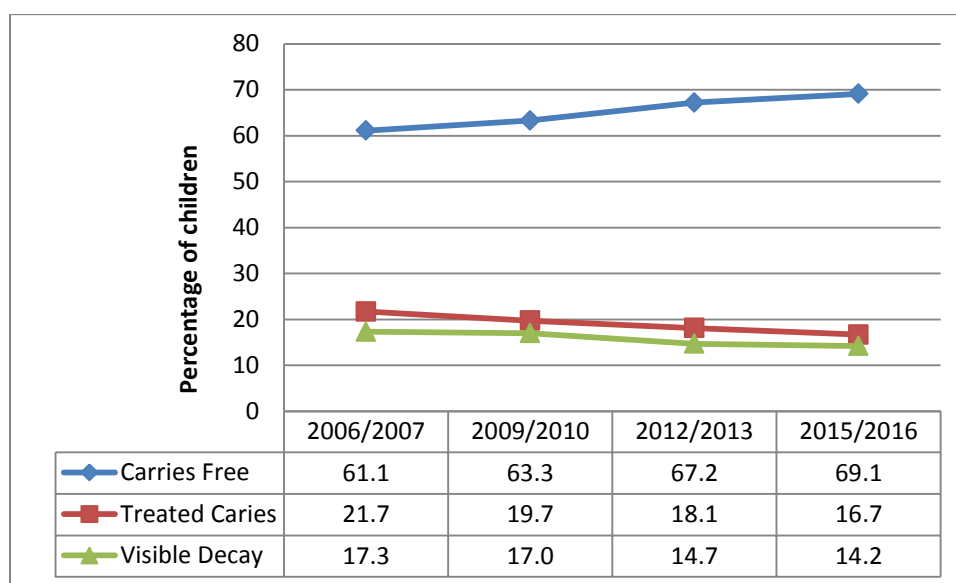


Figure 1: Provincial kindergarten dental survey results, dental outcomes, over time (2006/2007 to 2015/2016).⁸

Aboriginal Children

In 2015/2016, 3,363 children self-identified Aboriginal participated in the survey (89.8% of estimated total Aboriginal children enrolled in participating schools). Figure 2 shows that dental health in Aboriginal children has improved steadily over time. Since the 2009/2010^{xiv} survey, the fraction of BC Aboriginal children who were caries free has risen by 6.4 percentage points (39.3% to 45.7%), while the prevalence of treated caries and visible decay has decreased by 1.5 percentage points (32.2% to 30.7%) and 4.9 percentage points (28.5% to 23.6%), respectively.

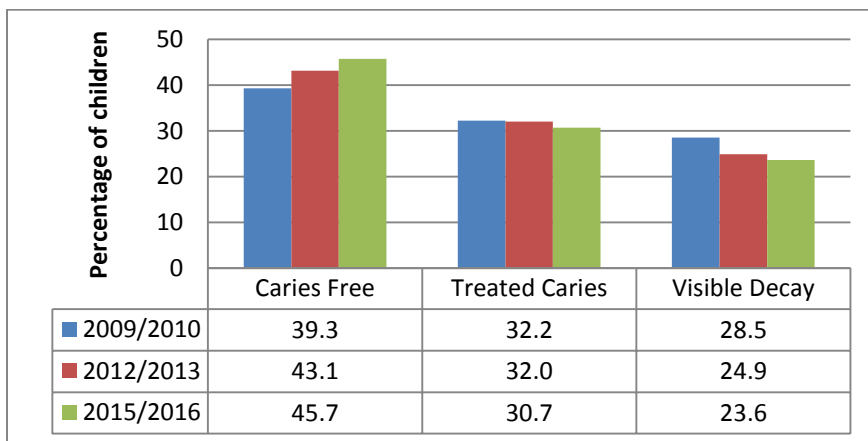


Figure 2: Aboriginal provincial kindergarten dental survey results, dental outcomes, over time (2009/2010 to 2015/2016).⁹

Despite improvements over time in the dental health of Aboriginal kindergarten children at the provincial level, disparities exist between the Aboriginal and non-Aboriginal populations (Figure 3). In 2015/2016, the fraction of caries free children was 25.5 percentage points lower in Aboriginal children than in non-Aboriginal children. Similarly, the fraction of children with treated caries or visible decay was 15.3 percentage points and 10.2^{xv} percentage points higher, respectively, in Aboriginal children than in non-Aboriginal children.

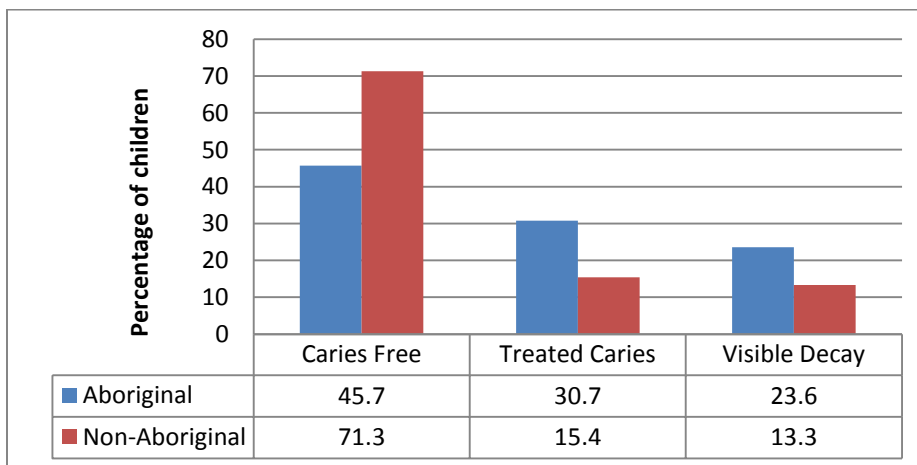


Figure 3: Provincial kindergarten dental survey results, comparison of dental outcomes in Aboriginal and non-Aboriginal kindergarten students, 2015/2016.¹⁰

^{xiv} Data for Aboriginal children not available for the 2006/2007 survey year.

^{xv} Some columns may not add up to 100.0% due to rounding.

Disparities in the dental health of Aboriginal and non-Aboriginal children have also remained relatively consistent over time (Figure 4). For example, the fraction of caries free children was 25.8 percentage points lower among Aboriginal children than non-Aboriginal children in 2009/2010. This difference remained virtually unchanged across the next 2 surveys, i.e. 26.3 percentage points in 2012/2013 and 25.5 percentage points in 2015/2016. Thus, while the inequity between Aboriginal and non-Aboriginal children does not appear to be increasing, it is also not markedly improving. Over the same time period, the disparity between Aboriginal and non-Aboriginal children with visible decay at the provincial level has slightly reduced from 12.3 percentage points higher in Aboriginal children at the time of the 2009/2010 survey to 10.2^{xvi} percentage points in 2015/2016.

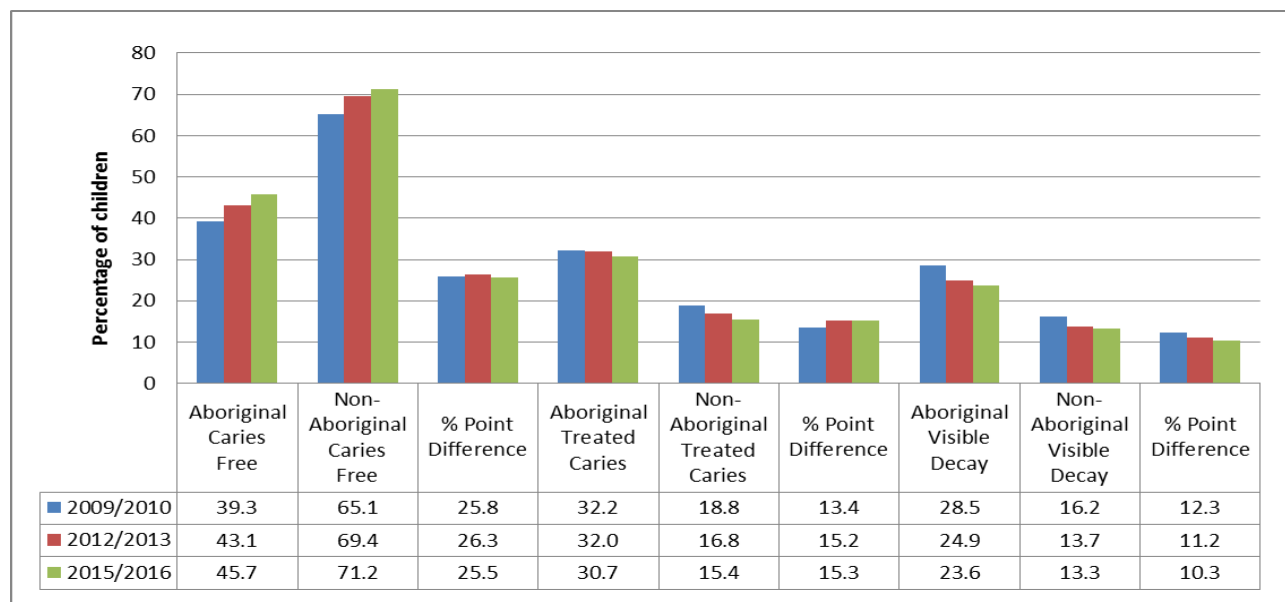


Figure 4: Provincial kindergarten dental survey results, disparities between Aboriginal and non-Aboriginal, over time (2009/2010 to 2015/2016).¹¹

Several health authorities, however, have made notable progress on reducing these inequities. Interior has closed the gap between the fraction of caries free Aboriginal children and non-Aboriginal children by 7.4 percentage points since the 2009/2010 survey (28.7 percentage point difference in 2009/2010, compared to 21.3 percentage point difference in 2015/2016). This is particularly striking as, at a provincial level, disparity in this outcome has decreased by only 0.4 percentage points over the same time period. Fraser has narrowed the gap between Aboriginal children and non-Aboriginal children with visible decay by 5.7 percentage points since the 2009/2010 survey (9.5 percentage points in 2009/2010 to 3.7 percentage points in 2015/2016). This is compared to a narrowing of 2.0 percentage points provincially.

More detailed findings for Aboriginal children will be presented in the report titled *BC Dental Survey of Aboriginal Kindergarten Children 2015/2016: A Provincial and First Nations Schools Analysis*.

Visible Decay in One, Two, Three, or Four Quadrants

During the survey, dental hygienists counted the number of quadrants with visible decay in each child's mouth. Figure 5 shows the percentage of children with visible decay in one, two, three, three, or four

^{xvi} Some columns may not add up to 100.0% due to rounding.

quadrants over the last four kindergarten dental surveys. The fraction of children with visible decay in all quadrant categories has progressively declined since 2006/2007. This mirrors the overall decline in visible decay across the province.

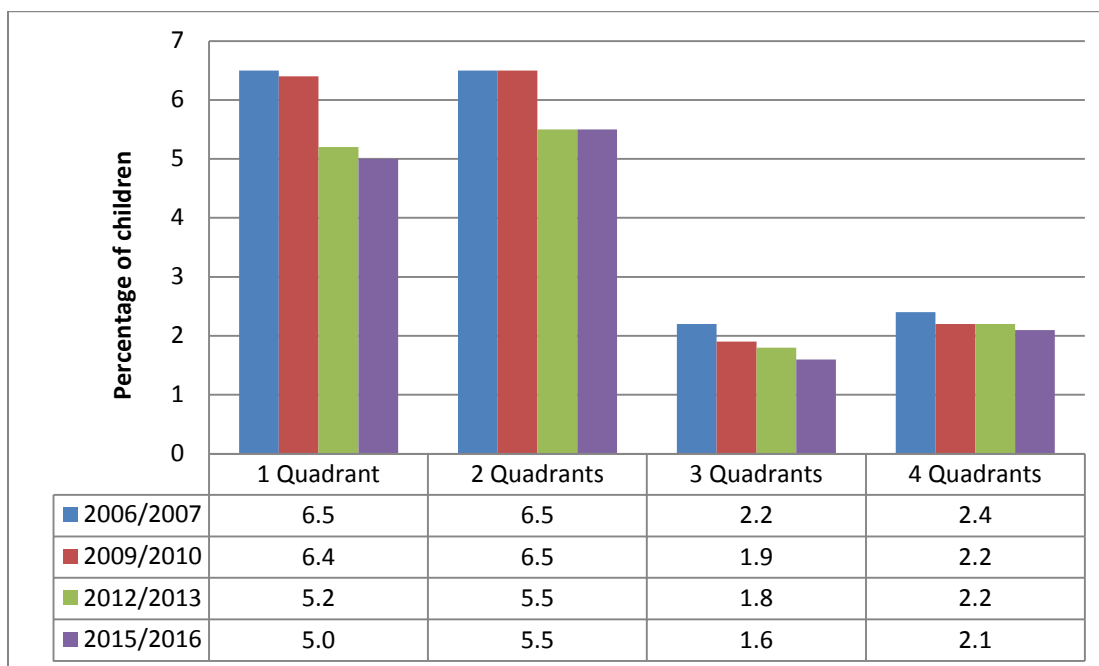


Figure 5: Provincial kindergarten dental survey results, percentage of children with visible decay in one, two, three, or four quadrants, over time (2006/2007 to 2015/2016).¹²

Health Authority Analysis by Indicator

Figure 6 summarizes the 2015/2016 dental survey results for caries free, treated caries, and visible decay by health authority. Overall, Vancouver Coastal and Vancouver Island had the best dental health outcomes, followed by Interior, Fraser and Northern. The percentage of caries free children was highest in Vancouver Coastal and Vancouver Island (72.4% and 72.3% respectively), and lowest in Northern (60.6%). The fraction of children with treated caries was highest in Northern (20.8%), and lowest in Vancouver Coastal (14.4%). For visible decay, the prevalence was highest in Northern (18.6%), and lowest in Vancouver Island (12.0%).

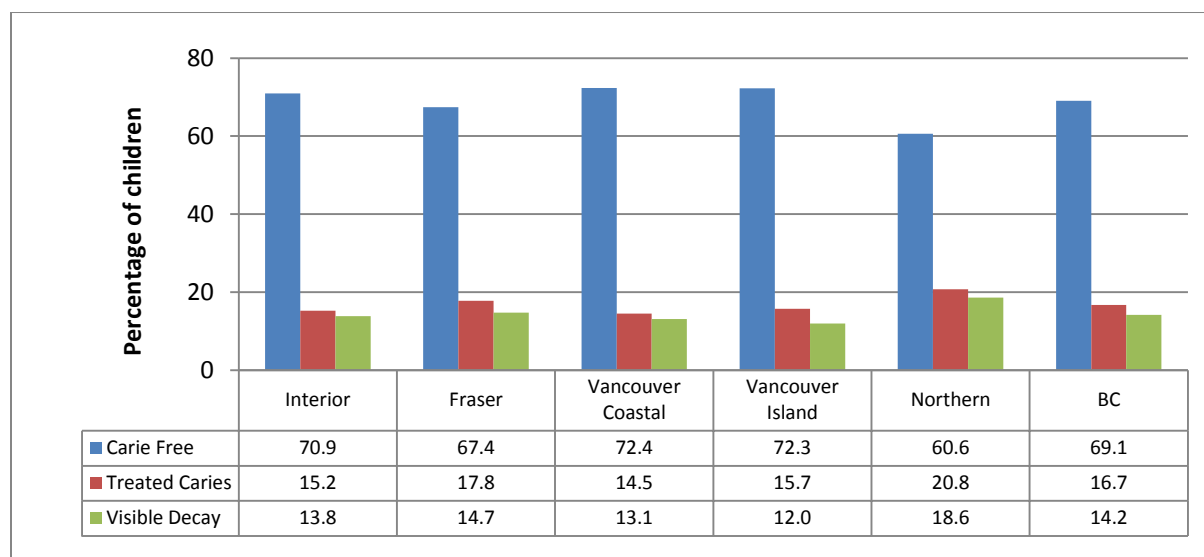


Figure 6: Provincial kindergarten dental survey results, dental outcomes by health authority, 2015/2016.¹³

Caries Free by Health Authority

Figure 7 shows the percentage of caries free kindergarten children in each health authority across the last four survey cycles. The fraction of caries free children has increased over time in all health authorities, suggesting overall improvement in kindergarten children's dental health. However, the rate of improvement has been slower over time in Northern (flatter line over time) than elsewhere, resulting in a widening gap between Northern and the other health authorities. For example, the percent difference in caries free children between Northern and Vancouver Island nearly doubled from 6.3 percentage points in 2006/2007 to 11.7 percentage points in 2015/2016.

In 2015/2016, the prevalence of caries free children was highest in Vancouver Coastal (72.4%) and Vancouver Island (72.3%) and lowest in Northern (60.6%). The prevalence of caries free children in both Northern and Fraser has been lower than the provincial average over the past three to four survey cycles, including in 2015/2016.

Over the past four survey cycles, the greatest gains in improving the fraction of caries free children occurred between the 2009/2010 and 2012/2013 surveys, where there was an increase of 3.9 percentage points. This can be compared to an increase of 1.9 percentage points from the 2012/2013 survey to the 2015/2016 survey.

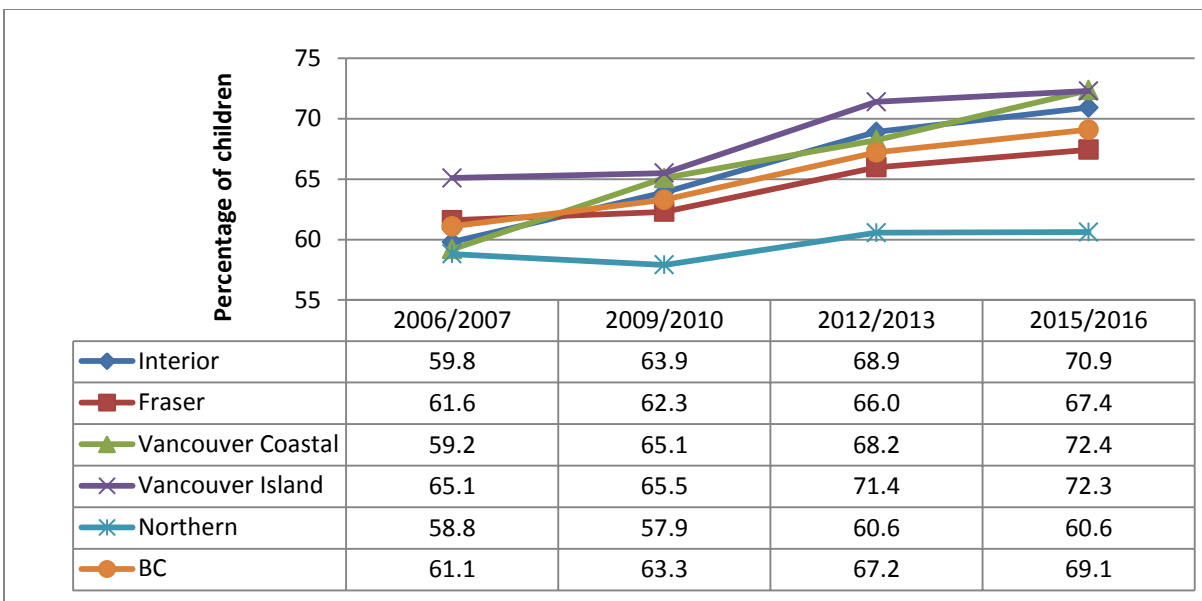


Figure 7: Provincial kindergarten dental survey results, percentage of caries free children by health authority, over time (2006/2007 to 2015/2016).¹⁴

Treated Caries by Health Authority

Figure 8 compares the prevalence of treated caries in kindergarten children in each health authority across the last four survey cycles. Since 2006/2007, the prevalence of treated caries has decreased steadily over time, except in Northern where the prevalence has fluctuated between survey cycles.

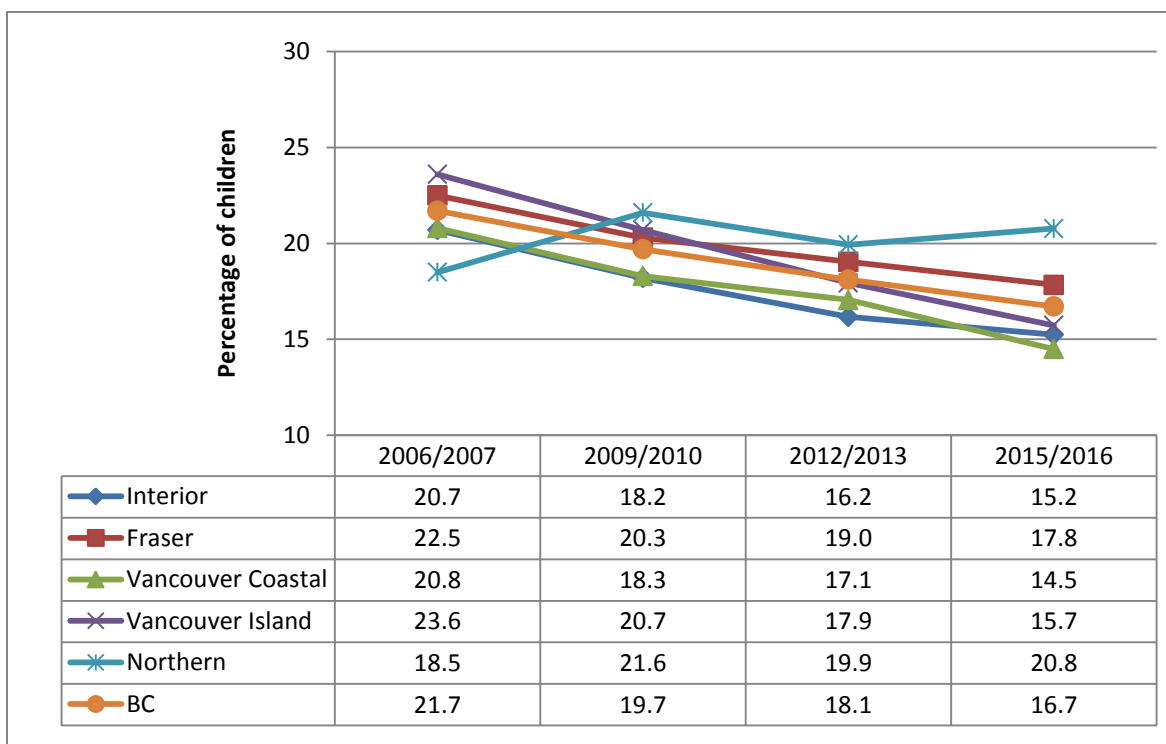


Figure 8: Provincial kindergarten dental survey results, percentage of children with treated caries by health authority, over time (2006/2007 to 2015/2016).¹⁵

In 2015/2016, the percentage of children with treated caries was highest in Northern (20.8%) and lowest in Vancouver Coastal (14.5%). Both Fraser and Northern have been above the provincial average for treated caries for the past three surveys.

Visible Decay by Health Authority

Figure 9 compares the prevalence of visible decay in kindergarten children in each health authority across the last four survey cycles. Since 2006/2007, the percentage of children with visible decay has decreased in all health authorities except in Vancouver Island. In Vancouver Island, the prevalence of visible decay has increased by 1.3 percentage points since the 2012/2013 survey cycle. Also, the fraction of children with visible decay in 2015/2016 (12.0%) is higher than the fraction observed at the time of the 2006/2007 (11.3%) survey by 0.7 percentage points. At a provincial level, the greatest reductions in visible decay occurred between the 2009/2010 and 2012/2013 survey cycles, where the fraction of children with visible decay decreased by 2.3 percentage points. In contrast, the decrease between the 2012/2013 and 2015/2016 survey cycles was 0.5 percentage points.

In 2015/2016, the fraction of children with visible decay was highest in Northern (18.6%) and lowest in Vancouver Island (12.0%). In 2015/2016, the fraction of children with visible decay in Northern and Fraser were higher than the provincial average for visible decay.

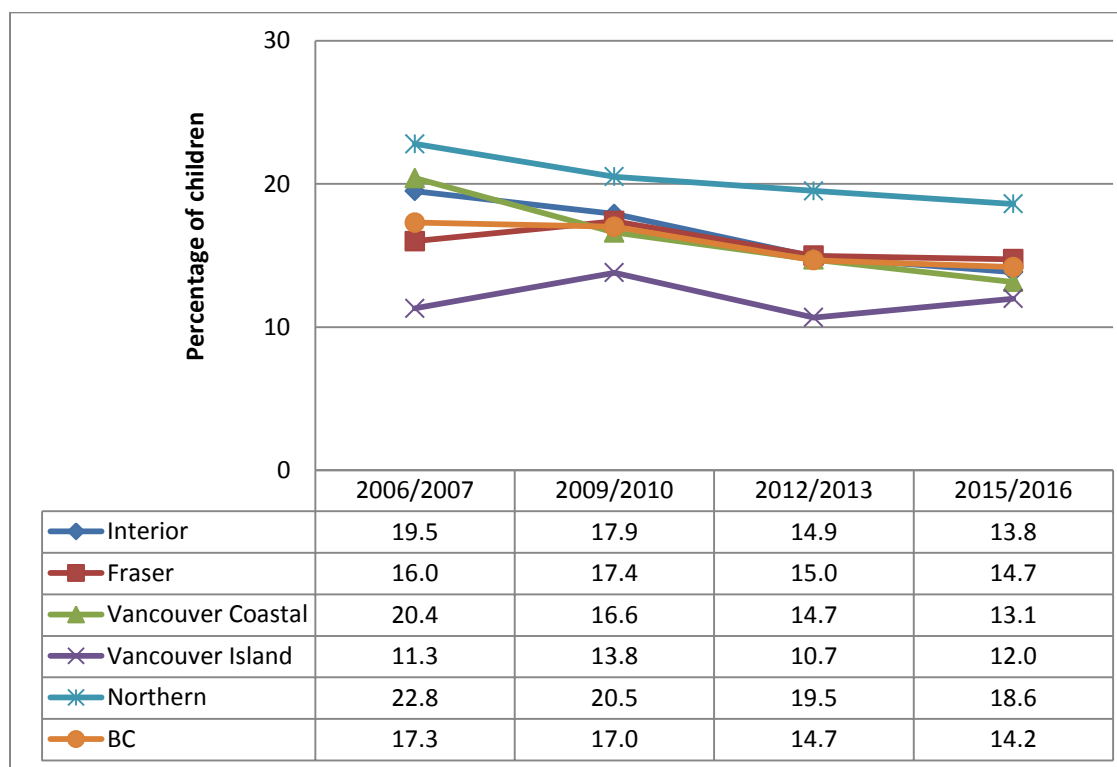


Figure 9: Provincial kindergarten dental survey results, percentage of children with visible decay by health authority, over time (2006/2007 to 2015/2016).¹⁶

Visible Decay in 1, 2, 3 or 4 Quadrants by Health Authority

Figure 10 shows the percentage of visible decay by quadrant for each health authority in 2015/2016. Northern had the highest percentage of decay in quadrants 1, 2, and 3 (7.0%, 6.8%, and 2.5%, respectively) and Fraser had the highest percentage of decay in 4 quadrants (2.5%).

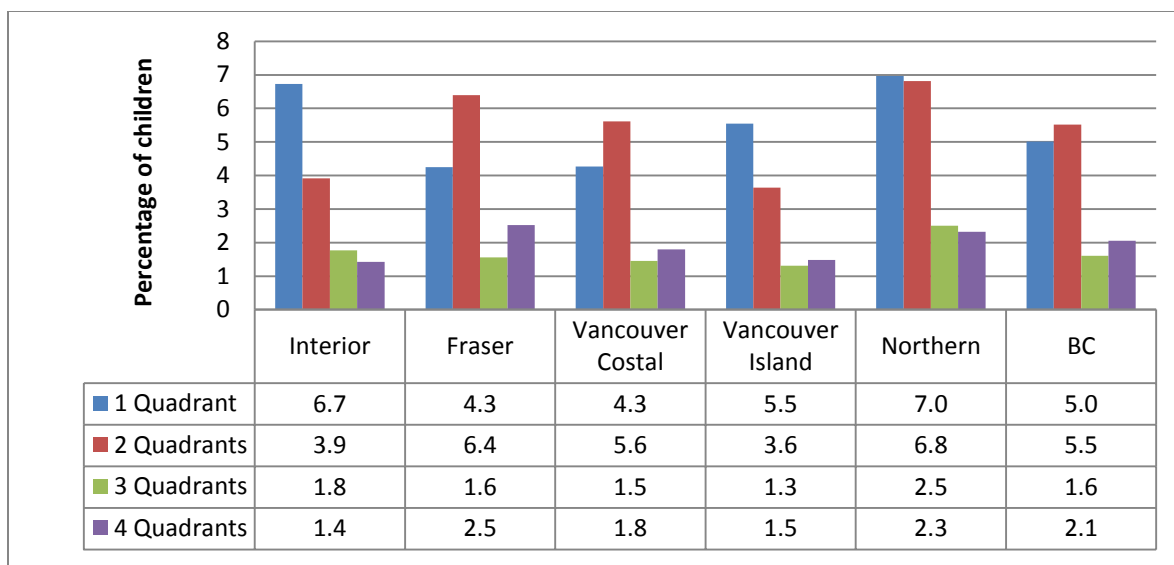


Figure 10: Provincial kindergarten dental survey results, percentage of children with visible decay in 1, 2, 3, or 4 quadrants by health authority, 2015/2016.¹⁷

Urgent and Non-urgent Referrals by Health Authority

Across BC, 2.4% of kindergarten children were referred for urgent conditions (e.g. pain, swelling and/or visible infection present) and 12.1% of children received non-urgent referrals at the time of the 2015/2016 survey (Figure 11). Vancouver Coastal had the lowest percentage of urgent referrals (1.4%), while Northern had the highest (3.2%) (Figure 11). Vancouver Island had the lowest percentage of non-urgent referrals (10.3%), while Northern had the highest (15.9%).

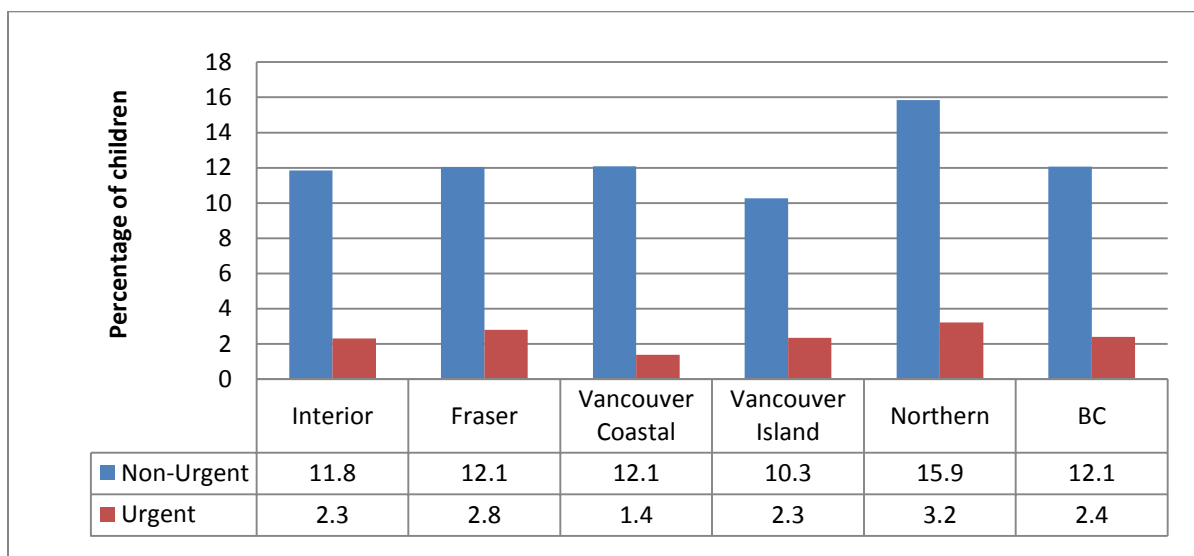


Figure 11: Provincial kindergarten dental survey results, percentage of children requiring non-urgent and urgent referrals by health authority, 2015/2016.¹⁸

Figure 12 compares referrals in 2015/2016 to the 2012/2013 survey. While the overall averages are relatively similar between the two survey cycles, Vancouver Island had an increase in both urgent and non-urgent referrals from 2012/2013 to 2015/2016. Fraser also experienced an increase in urgent referrals.

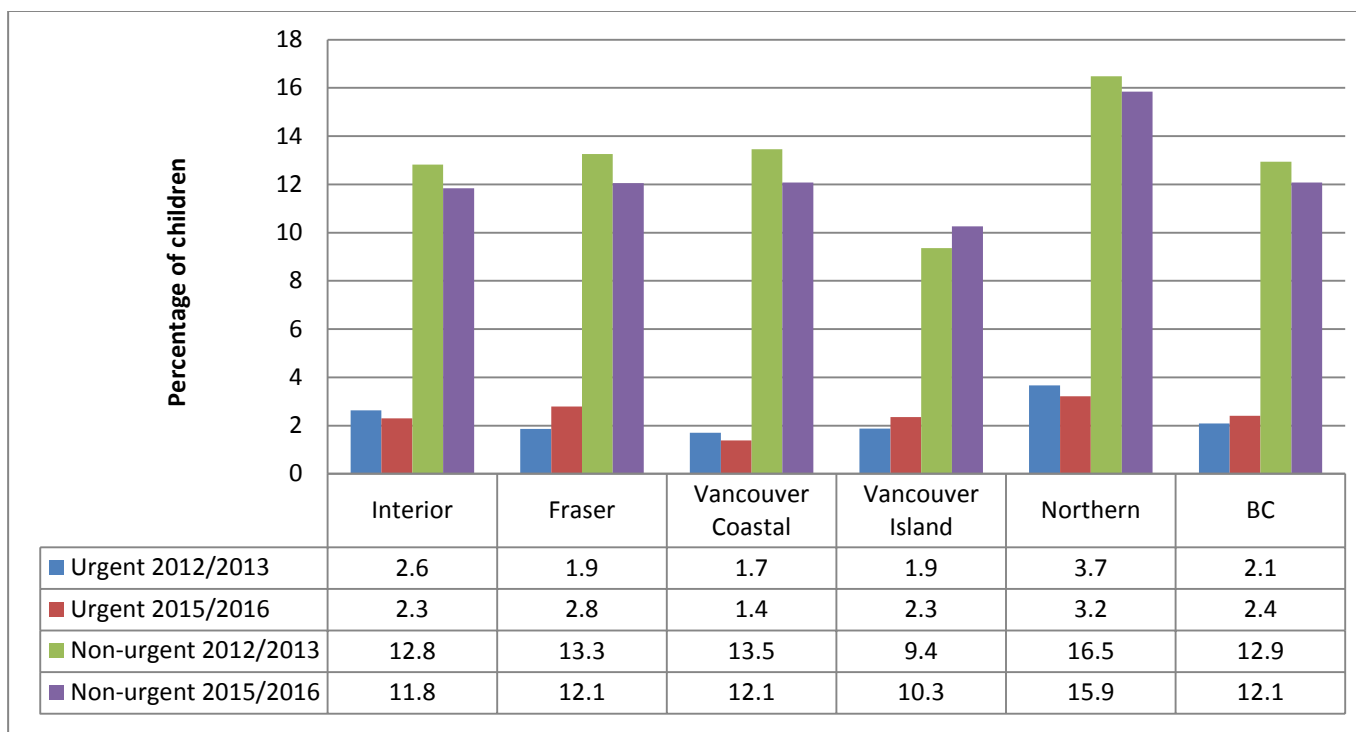


Figure 12: Provincial kindergarten dental survey results, percentage of children with non-urgent and urgent referrals by health authority, over time (2012/2013 and 2015/2016).¹⁹

Regional Analysis by Health Service Delivery Area (HSDA)

Caries Free, Treated Caries, and Visible Decay

Table 2 compares the percentage of kindergarten children who were caries free, had treated caries or had visible decay across the last three survey cycles (2009/2010, 2012/2013, and 2015/2016) by Health Service Delivery Area (HSDA). Key findings for 2015/2016 include the following:

- North Shore Coast Garibaldi had the highest percentage of caries free (79.6%), followed by Okanagan (76.1%) and North Vancouver Island (75.4%).
- Northeast had the highest percentage of visible decay (20.2%), followed by Northwest (20.1%) and Richmond (19.9%).
- Northwest had the highest percentage of treated caries (22.5%), followed by Fraser East (21.1%) and Northeast (20.3%).
- HSDAs with a percentage of visible decay higher than the provincial average included Fraser North, Fraser South, Kootenay Boundary, Thompson Cariboo, Northeast, Northern Interior, Northwest, Richmond, and Vancouver.

Looking at the data by HSDA provides more insight about how the dental health of BC kindergarten children is changing in different areas of the province. Despite general improvements in kindergarten children's dental health over time at the provincial level (rising prevalence of caries free children and decreasing prevalence of treated caries and visible decay), the proportion of HSDAs experiencing minimal progress or even setbacks on these three indicators has increased since the 2012/2013 survey. Key findings related to these trends include the following (Table 2):

- 50% of HSDAs experienced a decline in the percentage of caries free children from 2012/2013 to 2015/2016. This is notable, because only one HSDA (Northwest) realized a decline in caries free children from 2009/2010 to 2012/2013.
- 25% of HSDAs experienced an increase in the percentage of children with treated caries from 2012/2013 to 2015/2016. In contrast, all HSDAs had made some measure of progress in reducing this percentage between 2009/2010 and 2012/2013.
- 56% of the HSDAs experienced an increase in the percentage of children with visible decay from 2012/2013 to 2015/2016. In contrast, only one HSDA (Northwest) observed an increased prevalence of visible decay from 2009/2010 to 2012/2013.

Table 2: Provincial kindergarten dental survey results, dental outcomes by Health Service Delivery Area, over time (2009/2010 to 2015/2016).^{20**}

Health Authority	Health Service Delivery Area	2009/2010			2012/2013			2015/2016		
		Caries Free (%)	Treated Caries (%)	Visible Decay (%)	Caries Free (%)	Treated Caries (%)	Visible Decay (%)	Caries Free (%)	Treated Caries (%)	Visible Decay (%)
Interior	East Kootenay***	67.7	16.1	16.1	72.0	16.8	11.2	74.2	13.7	12.1*
	Kootenay Boundary***				68.4	13.8	17.8	65.0*	17.1*	17.9*
	Okanagan****	66.8	16.9	16.3	70.5	15.9	13.6	76.1	12.5	11.3
	Thompson Cariboo****	56.8	21.8	21.4	65.3	17.2	17.5	63.3*	19.5*	17.1
Total – Interior		63.9	18.2	17.9	68.9	16.2	14.9	70.9	15.2	13.8
Fraser	Fraser East	63.3	23.2	13.5	68.9	22.0	9.1	68.3*	21.1	10.5*
	Fraser North	65.0	21.1	13.9	68.5	19.9	11.6	67.7*	16.4	15.9*
	Fraser South	59.8	18.6	21.6	63.0	17.3	19.7	66.9	17.5*	15.6
Total – Fraser		62.3	20.3	17.4	66.0	19.0	15.0	67.4	17.8	14.7
Vancouver Coastal	North Shore Coast Garibaldi	78.7	14.2	7.2	80.5	13.1	6.4	79.6*	12.8	7.6*
	Richmond	57.1	20.7	22.2	60.2	18.2	21.5	65.2	14.8	19.9
	Vancouver	59.9	19.8	20.3	64.2	18.9	17.0	70.2	15.5	14.3
Total – Vancouver Coastal		65.1	18.3	16.6	68.2	17.1	14.7	72.4	14.5	13.1
Vancouver Island	Central Vancouver Island	62.0	23.0	14.9	67.5	19.4	13.1	66.5*	19.3	14.2*
	North Vancouver Island	62.3	22.8	14.7	70.2	17.4	12.3	75.4	10.7	13.8*
	South Vancouver Island	69.1	18.2	12.7	74.9	16.9	8.2	75.3	14.9	9.7*
Total – Vancouver Island		65.5	20.7	13.8	71.4	17.9	10.7	72.3	15.7	12.0
Northern	Northeast	57.8	21.4	20.7	62.6	20.5	16.9	59.5*	20.3	20.2*
	Northern Interior	60.8	19.5	19.7	63.6	17.7	18.7	63.2*	20.0*	16.8
	Northwest	53.7	24.8	21.5	53.3*	23.2	23.5*	57.4	22.5	20.1
Total - Northern		57.9	21.6	20.5	60.6	19.9	19.5	60.6	20.8	18.6
BC		63.3	19.7	17	67.2	18.1	14.7	69.1	16.7	14.2

* Indicates HSDAs with poorer dental health outcomes compared to the previous survey year (i.e. a decline in % caries free, an increase in % with treated caries, or an increase in % with visible decay). Note that some changes are very small (less than 1%), and may not indicate an actual deterioration in dental health indicators. Rather, they indicate opportunities for reflection and further investigation.

** Please note that the percentages reported for each HSDA in each survey year may not add up to 100.0% due to rounding.

***At the time of the 2009/2010 survey data for East Kootenay and Kootenay Boundary were combined. Comparisons of 2009/2010 data and 2012/2013 data were based on an average of 2012/2013 data for East Kootenay and Kootenay Boundary. East Kootenay and Kootenay Boundary are now combined again under the name Interior Health East.

**** Okanagan is now known as Interior Health Central. Thompson Cariboo is now known as Interior Health West.

Visible Decay in 1, 2, 3, or 4 Quadrants

Table 3 shows the percentage of visible decay in 1, 2, 3, or 4 quadrants by HSDA in 2015/2016. Key findings include the following:

- Kootenay Boundary had the highest percentage of decay in one quadrant (9.1%)
- Richmond had the highest percentage of decay in two quadrants (8.1%)
- Northwest had the highest percentage of decay in three quadrants (4.0%)
- Northeast had the highest percentage of decay in four quadrants (2.9%)

Table 3: Provincial kindergarten dental survey results, percentage of children with visible decay in 1, 2, 3, 4 quadrants by Health Service Delivery Area, 2015/2016.²¹

Health Authority	Health Service Delivery Area	1 Quadrant (%)	2 Quadrants (%)	3 Quadrants (%)	4 Quadrants (%)
Interior**	East Kootenay***	6.6*	3.5	1.2	0.9
	Kootenay Boundary***	9.1*	3.9	2.6*	2.4*
	Okanagan	6.0*	3.0	1.4	0.9
	Thompson Cariboo	7.1*	5.5	2.4*	2.2*
Total - Interior		6.7	3.9	1.8	1.4
Fraser	Fraser East	4.4	4.0	1.0	1.2
	Fraser North	4.6	6.8*	1.7*	2.7*
	Fraser South	4.0	7.0*	1.7*	2.9*
Total - Fraser		4.3	6.4	1.6	2.5
Vancouver Coastal	North Shore Coast Garibaldi	3.0	2.8	0.9	1.0
	Richmond	6.2*	8.1*	3.0*	2.6*
	Vancouver	4.5	6.5*	1.3	2.0
Total – Vancouver Coastal		4.3	5.6	1.5	1.8
Vancouver Island	Central Vancouver Island	5.5*	4.8	1.7*	2.2*
	North Vancouver Island	7.8*	3.5	1.2	1.4
	South Vancouver Island	4.8	2.9	1.1	1.0
Total – Vancouver Island		5.5	3.6	1.3	1.5
Northern	Northeast	7.0*	7.8*	2.4*	2.9*
	Northern Interior	7.4*	5.8*	1.7*	1.9
	Northwest	6.1*	7.5*	4.0*	2.5*
Total - Northern		7.0	6.8	2.5	2.3
BC		5.0	5.5	1.6	2.1

*Indicates HSDAs which were above the provincial average for decay in that number of quadrants.

** East Kootenay and Kootenay Boundary are now combined again under the name Interior Health East. Okanagan is now known as Interior Health Central. Thompson Cariboo is now known as Interior Health West.

***The rates for visible decay in 3 and 4 Quadrants for East Kootenay, Kootenay Boundary, and North Vancouver Island should be interpreted with caution due to low sample size and high variability.

Urgent and Non-Urgent Referrals

Table 4 shows the percentage of non-urgent and urgent referrals by HSDA for 2015/2016. Richmond had the highest percentage of non-urgent referrals (18.5%) followed by Northeast (18.2%) and Northwest (17.4%). Kootenay Boundary had the highest percentage of urgent referrals (4.3%), followed by Northern Interior (3.7%) and Northwest (3.6%). High urgent referral rates in Fraser and Northern mirror the higher prevalence of visible decay in these health authorities compared to the provincial average.

Among sixteen HSDAs across BC, ten (63%) are above the provincial average for non-urgent referrals and seven (44%) are above the provincial average for urgent referrals.

Table 4: Provincial kindergarten dental survey results, percentage of children with non-urgent and urgent referrals by Health Service Delivery Area, 2015/2016.²²

Health Authority	Health Service Delivery Area	Non-Urgent	Urgent
Interior**	East Kootenay***	11.0	1.2
	Kootenay Boundary***	14.2*	4.3*
	Okanagan	9.5	1.9
	Thompson Cariboo	15.0*	2.7*
Total -Interior		11.8	2.3
Fraser	Fraser East	8.5	2.1
	Fraser North	12.9*	3.1*
	Fraser South	12.9*	2.8*
Total - Fraser		12.1	2.8
Vancouver Coastal	North Shore Coast Garibaldi**	7.0	0.7
	Richmond	18.5*	2.0
	Vancouver	13.1*	1.6
Total - Vancouver Coastal		12.1	1.4
Vancouver Island	Central Vancouver Island	11.7	3.1*
	North Vancouver Island**	13.5*	0.8
	South Vancouver Island	8.1	2.3
Total – Vancouver Island		10.3	2.3
Northern	Northeast**	18.2*	2.1
	Northern Interior	13.6*	3.7*
	Northwest	17.4*	3.6*
Total - Northern		15.9	3.2
BC		12.1	2.4

* Indicates HSDAs which were above the provincial average for non-urgent and urgent referrals.

**East Kootenay and Kootenay Boundary are now combined again under the name Interior Health East. Okanagan is now known as Interior Health Central. Thompson Cariboo is now known as Interior Health West.

***The rates for Urgent East Kootenay, Kootenay Boundary, North Shore Coast Garibaldi, Northeast, and North Vancouver Island should be interpreted with caution due to low sample size and high variability.

Summary Findings by Health Authority

Interior Health Authority

Figure 13 compares the prevalence of caries free, treated caries, and visible decay in Interior Health Authority over the past four kindergarten dental survey cycles (2006/2007 to 2015/2016). Key findings include:

- East Kootenay and Okanagan have had progressively higher percentages of caries free children over time, and were above the 2015/2016 provincial average.
- Okanagan had the highest percentage of caries free (76.1%) and the lowest percentage of visible decay (11.3%) in 2015/2016.
- Kootenay Boundary and Thompson Cariboo both observed a peak in the percentage of caries free children in 2012/2013, and a subsequent decline to 2015/2016; both HSDAs were below the 2015/2016 provincial average.
- Thompson Cariboo had the lowest percentage of caries free (63.3%) in 2015/2016.
- Kootenay Boundary has observed a steady increase in the percentage of children with visible decay since the 2009/2010 survey and in 2015/2016 had the highest percentage of visible decay (17.9%) of the four HSDAs.



Figure 13: Provincial kindergarten dental survey results, dental outcomes, Interior Health Authority, over time (2006/2007 to 2015/2016).²³

* In 2009/2010, East Kootenay and Kootenay boundary results were reported together and are therefore identical for that year.

All four Interior HSDAs were above the provincial average for decay in 1 quadrant and both Thompson Cariboo and Kootenay Boundary were above the provincial average for decay in 3 and 4 quadrants at the time of the 2015/2016 survey (see Table 3). Kootenay Boundary and Thompson Cariboo were above the provincial average for both urgent and non-urgent referrals at the time of the 2015/2016 survey (see Table 4).

Fraser Health Authority

Figure 14 compares the prevalence of caries free, treated caries, and visible decay in Fraser Health Authority over the past four kindergarten dental survey cycles (2006/2007 to 2015/2016). Key findings are summarized include:

- In the 2015/2016 survey, the percentage of caries free children was below the provincial average in all three Fraser HSDAs.
- Fraser South has experienced a sustained increase in the percentage of caries free children. Progress in Fraser North and Fraser East appears to have stalled since the 2012/2013 survey.
- Fraser East was the HSDA with the highest percentage of caries free (68.3%) in 2015/2016.
- In 2015/2016, Fraser North had the highest percentage of children with visible decay (15.9%). Since, 2012/2013, the percentage of children with visible decay in this HSDA has increased by 4.3%.
- Fraser East had the lowest percentage of children with visible decay in 2015/2016, but has observed a 1.4% increase since the 2012/2013 survey.
- Fraser South was the only HSDA to decrease the percentage of children with visible decay since the 2012/2013 survey.

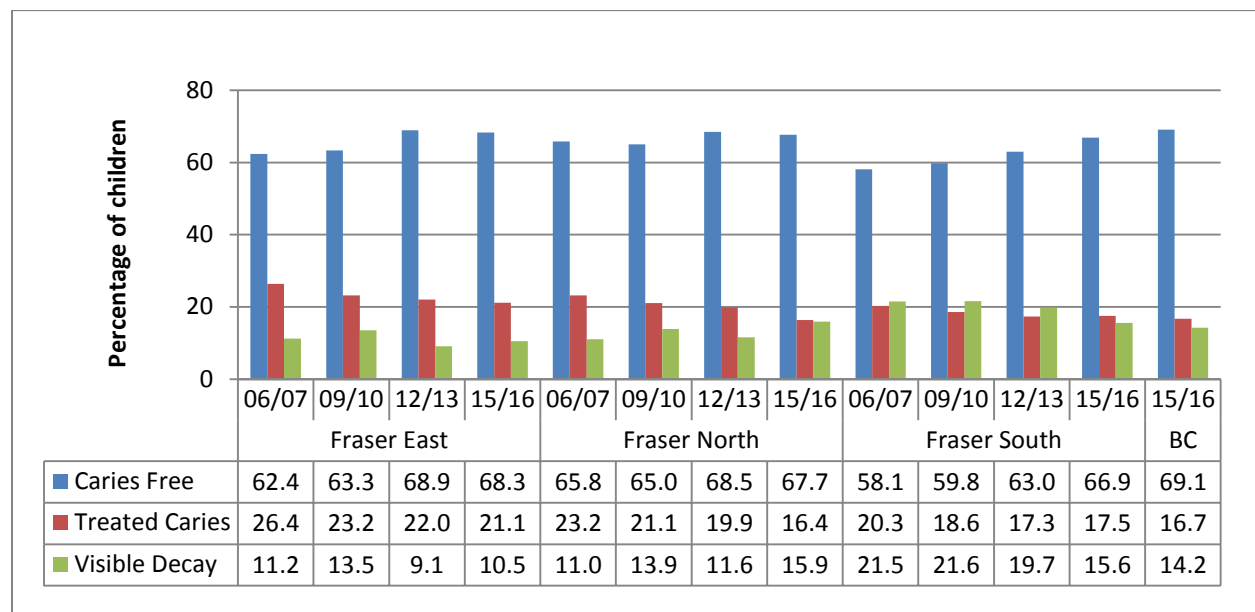


Figure 14: Provincial kindergarten dental survey results, dental outcomes, Fraser Health Authority, over time (2006/2007 to 2015/2016).²⁴

Fraser North and Fraser South were above the provincial average for visible decay in 2, 3 and 4 quadrants at the time of the 2015/2016 survey (see Tables 3). Fraser North and Fraser South were also above the provincial average for both urgent and non-urgent referrals at the time of the 2015/2016 survey (see Table 4).

Vancouver Coastal Health Authority

Figure 15 compares the percentage of caries free children, children with treated caries, and children with visible decay in the Vancouver Coastal Health Authority over the past four kindergarten dental survey cycles (2006/2007 to 2015/2016). Key findings include:

- North Shore Coast Garibaldi and Vancouver were above the provincial average for caries free at the time of the 2015/2016 survey.
- North Shore Coast Garibaldi had the highest percentage of caries free (79.9%) and the lowest percentage of visible decay (7.6%) at the time of the 2015/2016 survey and was the only HSDA to be under the provincial average for visible decay. However, this HSDA is the only one of the three to have experienced a decrease in caries free and an increase in visible decay since the 2012/2013 survey.
- Richmond had the lowest percentage of caries free (65.2%) and the highest percentage of children with visible decay (19.9%) within Vancouver Coastal. However, Richmond has experienced both a steady increase in the percentage of caries free children and a steady decline in visible decay since the 2006/2007 survey.

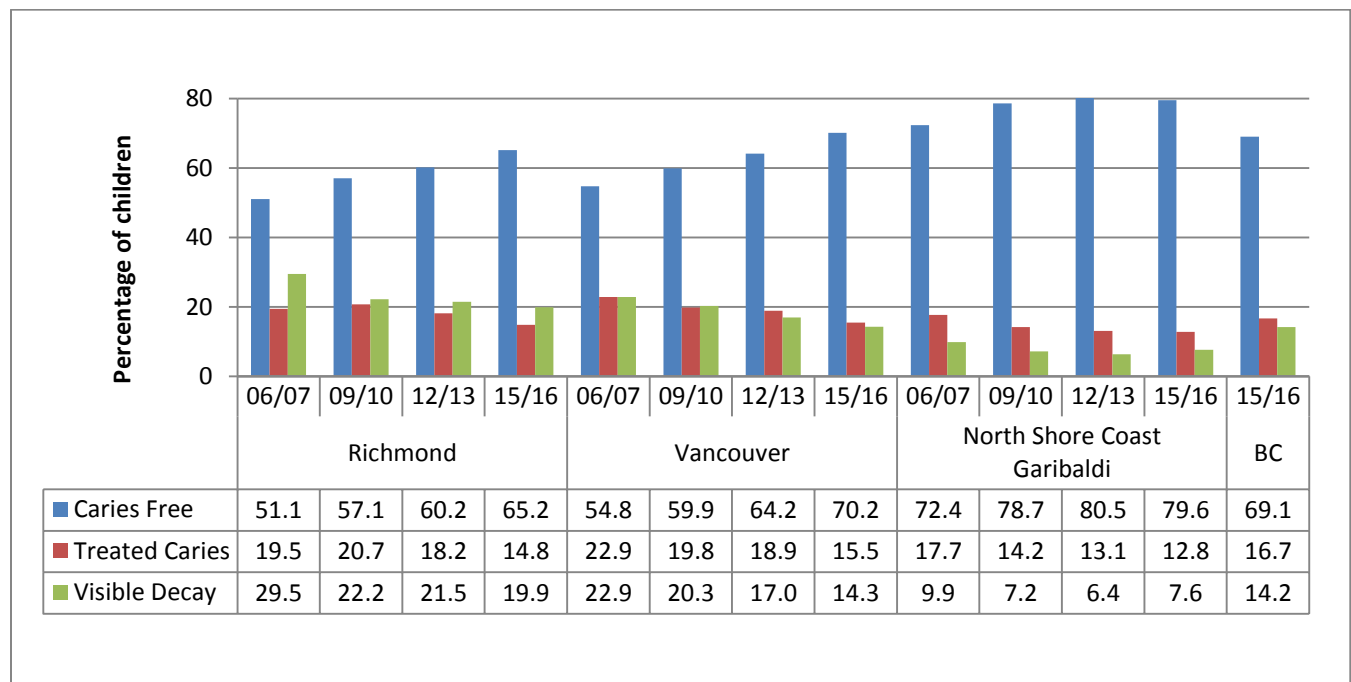


Figure 15: Provincial kindergarten dental survey results, dental outcomes, Vancouver Coastal Health Authority, over time (2006/2007 to 2015/2016).²⁵

Richmond was above the provincial average for decay in 1, 2, 3, and 4 quadrants and Vancouver was above the provincial average for decay in 2 quadrants at the time of the 2015/2016 survey (see Table 3). Both Richmond and Vancouver were above the provincial average for non-urgent referrals at the time of the 2015/2016 survey and all three Vancouver Coastal HSDAs were below the provincial average for urgent referrals (see Table 4).

Vancouver Island Health Authority

Figure 16 compares the percentage of caries free children, children with treated caries, and children with visible decay in the Vancouver Island Health Authority across four survey cycles. Key findings for 2015/2016 include:

- North Vancouver Island and South Vancouver Island were above the provincial average for caries free. There has been steady progress in improving the proportion of caries free children across the four survey cycles in these two HSDAs.
- Vancouver Island was the only health authority where all HSDAs experienced an increase in visible decay since the 2012/2013 survey.
- North Vancouver Island had the highest percentage of caries free children (75.4%).
- South Vancouver Island had the lowest percentage of children with visible decay (9.7%).
- Central Vancouver Island had both the lowest percentage of caries free (66.5%) and the highest percentage of visible decay (14.2%).
- All three HSDAs were below the provincial average for visible decay; however, progress in reducing this percentage has fluctuated in all three HSDAs since 2006/2007 and sustained improvements in this area are not apparent.
- There has been an overall decline in all three HSDAs for the percentage of children with treated caries; however, Central Vancouver Island is still above the provincial average and has not experienced notable change in this area since the 2012/2013 survey.

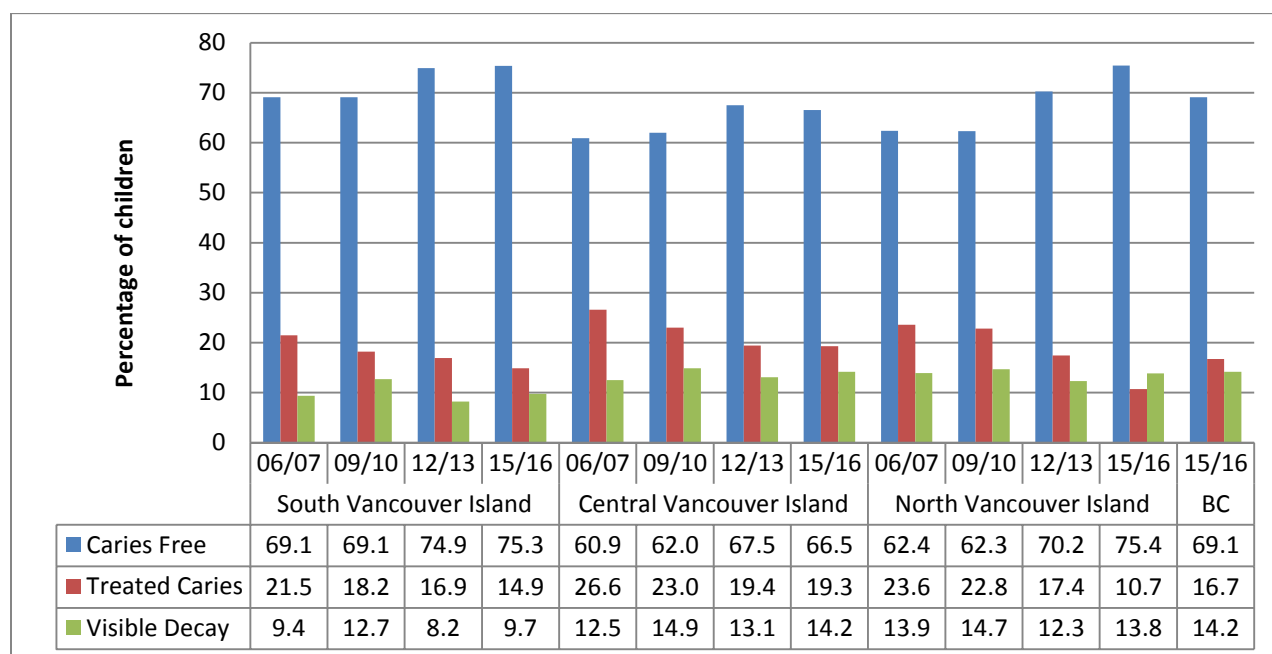


Figure 16: Provincial kindergarten dental survey results, dental outcomes, Vancouver Island Health Authority, over time (2006/2007 to 2015/2016).²⁶

Central Vancouver Island was above the provincial average for decay in 1, 3, and 4 quadrants at the time of the 2015/2016 survey and North Vancouver Island was above the provincial average for decay in 1 quadrant (see Table 3). At the time of the 2015/2016 survey, North Vancouver Island was above the provincial average for non-urgent referrals and Central Vancouver Island was above the provincial average for urgent referrals (see Table 4).

Northern Health Authority

Figure 17 compares the percentage of caries free children, children with treated caries, and children with visible decay in Northern Health Authority across four survey cycles. Key findings for 2015/2016 include:

- Northern Interior had the highest percentages of caries free children (63.2%), but all Northern HSDAs remain below the provincial average for percentage of caries free children.
- Northwest observed the lowest percentage of caries free children (57.4%). This ranking has been consistent since the 2006/2007 survey.
- Northwest had the highest percentage of treated caries (22.5%), but all Northern HSDAs were above the provincial average. Progress in this area has fluctuated in Northern Interior, while progress in Northeast and Northwest appears to have either stagnated or deteriorated slightly since the 2012/2013 survey.
- All Northern HSDAs were above the provincial average for visible decay, but Northeast had the highest percentage at 20.2%. Since the 2012/2013 survey, Northeast observed an increase of 3.3 percentage points in children with visible decay while Northern Interior and Northwest observed decreases of 1.9 and 3.4 percentage points, respectively.

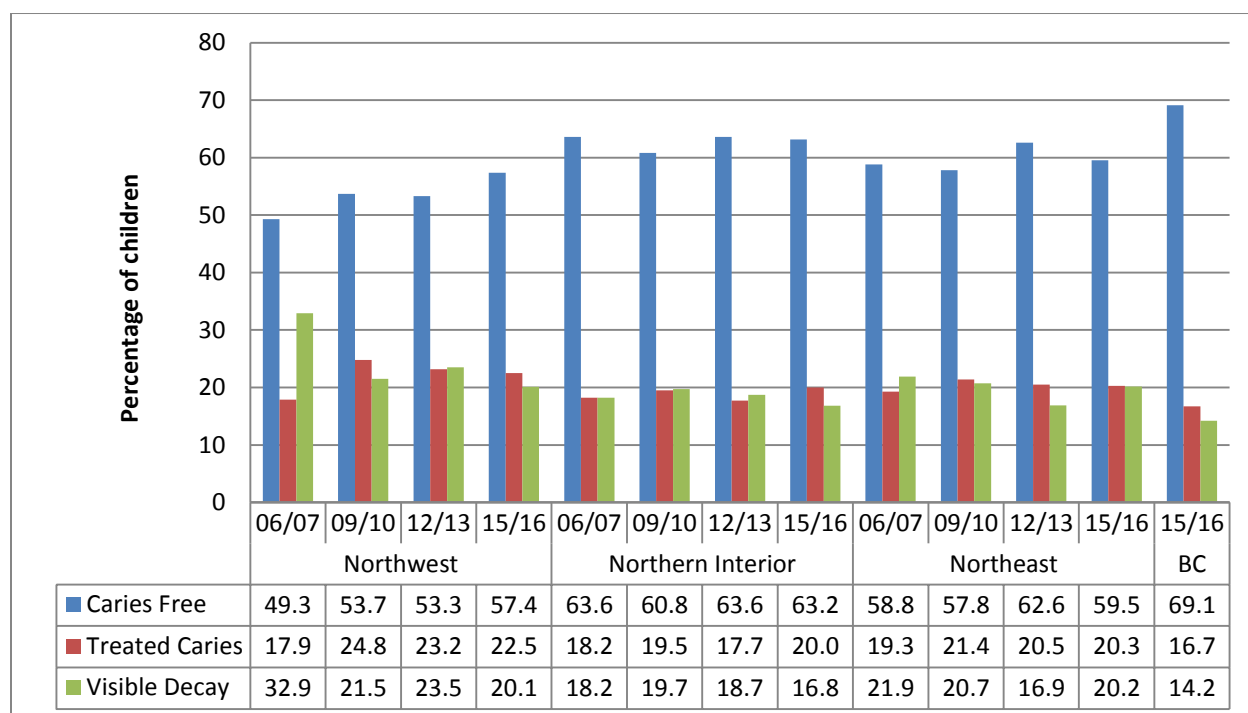


Figure 17: Provincial kindergarten dental survey results, dental outcomes, Northern Health Authority, over time (2006/2007 to 2015/2016).²⁷

All three Northern HAs were above the provincial average for visible decay in 1, 2, or 3 quadrants at the time of the 2015/2016 survey and Northeast and Northwest were also above the provincial average for decay in 4 quadrants (see Table 3). All three Northern HAs were above the provincial average for non-urgent referrals at the time of the 2015/2016 survey. Northwest and Northern Interior were also above the provincial average for urgent referrals (see Table 4).

Discussion

Overall, the fraction of caries free kindergarten children in BC is increasing over time, and the fraction of children with treated caries or visible decay is decreasing. However, when considered in full, the findings of the 2015/2016 survey indicate that progress across jurisdictions has been highly variable and that stubborn inequities are not only persisting, but widening in some instances. Of particular concern is the persistent disparity between early childhood dental outcomes for Aboriginal and non-Aboriginal children.

The greatest benefit from this report will be gleaned by considering the full picture provided for each Health authority and HSDA. For example, the Northwest HSDA has the second highest percentage of visible decay (20.1%) and the lowest rates of caries free children (57.4%) (see Figure 17, Table 2). However, Northwest is also the only Northern HSDA to have increased the percentage of children who are caries free since 2012/2013 and, out of all sixteen HSDAs, experienced the second highest reduction in visible decay in the province since the last survey. Vancouver Island was the health authority with the lowest percentage of children with visible decay in the 2015/2016 survey, but it was also the health authority where all HSDAs experienced an increase in the percentage of children with visible decay since the 2012/2013 survey (see Figure 16, Table 2).

Complex biomedical and social factors contribute to early childhood dental outcomes. As such, health authorities can provide context and nuance to the findings captured in this report and theorize as to why progress has occurred, or has been challenging, within their jurisdictions. For example, many Northern communities have experienced an economic decline as a result of challenges in the oil and gas industry. Fraser has seen a particularly high influx of immigrant families in recent years, and many in this demographic may face barriers to accessing timely health care or have arrived from a setting where dental care was not readily available. In addition, this report does not interpret findings in light of factors such as water fluoridation or the practitioner to patient ratio which varies across jurisdictions. All of the findings presented in this report provide opportunities for learning, growth, and improved policy and programming when viewed through a contextually informed lens.

Early childhood dental health is the result of many interconnected factors. While diet, dental hygiene practices, and access to dental care play an important role, outcomes are also influenced by social determinants of health such as socioeconomic status, geographic location, access to health services, and cultural influences.²⁸ Poor dental outcomes may be indicative of other vulnerabilities. As such, the results of the kindergarten dental survey offer a window of insight into the status of young children across the province and can be beneficial to actors and decision makers inside and external to the field of dental medicine. For example, over the last nine years, Vancouver Coastal has seen a 13.2 percentage point increase in kindergarten children who are caries free (see Figure 15, Table 2). This is the largest increase across all health authorities. This is especially notable as Vancouver Coastal had the second lowest percentage of caries free children at the time of the 2006/2007 survey. By contrast, a true improvement in the proportion of caries free children in Northern is more difficult to detect. Northern has seen an increase of only 1.8% since the 2006/2007 survey, with progress appearing to have stagnated since the 2012/2013 survey (see Figure 17, Table 2).

This observation is not made for the purpose of critique, rather to point out an opportunity for collaborative learning. It is likely that at least some of the factors which allowed Vancouver Coastal to greatly increase the proportion of caries free children can be applied to other jurisdictions. Concurrently, understanding the ongoing barriers to improved early childhood dental health in Northern

will be necessary to ensure that policy and programming is effectively designed and implemented to decrease inequities. Disparities in dental health have been highlighted throughout this report. Identifying the factors contributing to these persistent inequities should play a significant role in shaping future early childhood dental strategies.

As was described in the provincial summary, when data from the four survey cycles are compared, the greatest progress in increasing the percentage of children who were caries free was realized in the period between the 2009/2010 and 2012/2013 surveys. This trend is also present at the health authority level. Given that the later time period between the 2012/2013 and 2015/2016 surveys coincides with the development of the enhanced dental health service statements, there is a need to evaluate their impact as well as the impact of other early child dental health initiatives across the province through future kindergarten dental surveys. The results of the 2018-2019 will be of particular interest in this regards, as the kindergarten cohort at that time will have grown up with the service statements in place.¹⁷

Health Authorities and the Ministry of Health continue to monitor the dental health of kindergarten children in BC through this provincial dental survey. The survey results inform public health program planning and allocation of resources to those areas with identified need, where those needs can be addressed through preventative programs. This provincial survey is conducted every three years; subsequent kindergarten surveys will be important for monitoring ongoing trends, identifying inequities, and informing policy and program planning aimed at improving the oral health of all children in BC.

¹⁷ It is acknowledged that not every kindergarten aged child who participates in the 2018-2019 survey will have spent the entirety of their life in British Columbia with access to available dental health services.

Appendix A – Excerpt from Healthy Start Initiative: Provincial Perinatal, Child and Family Dental Public Health Services

Prenatal Dental Public Health Services

1.1a) Universal Service Statement

All pregnant women have access to oral health promotion and education supported by resources such as the Pregnancy Passport, Baby's Best Chance, or HealthLinkBC files and referral as needed for dental assessment.

This universal service statement could be accomplished by:

- Providing oral health information during routine prenatal contact with any public health staff.
- Informing clients about the importance of a dental visit during pregnancy when reviewing the Pregnancy Passport or Baby's Best Chance.
- Providing information about daily oral care during pregnancy (HealthLinkBC file #38b).

Family Health: Dental Public Health Services from 6 Months Up to 6 Years of Age

3.1a) Universal Service Statement

At routine contact, families with children aged 6 months up to 6 years will be offered screening for caries risk behaviours, oral health promotion and education and referral as needed for dental assessment.

This universal service statement could be accomplished by:

- Providing oral health information during routine contact by any public health staff (e.g. daily oral care, first dental visit, and access to care (Healthy Kids Program)).
- Providing accessible oral health information through social media or resources (e.g. Baby's Best Chance, Toddler's First Steps, HealthLinkBC files, health authority and Ministry websites).
- Screening for caries behavioural risk factors as early as possible:
 - Parent not brushing the child's teeth twice daily;
 - No daily exposure to fluoride; and
 - Frequent exposure to sugar between meals.
- Referral for enhanced services if concern/issue identified.
- Kindergarten Dental Survey every 3 years as provincial surveillance tool.

3.4a) Enhanced Service Statement

All families with children aged 6 months up to 6 years identified through screening or referral will be offered a dental assessment, health promotion, education and more intensive follow-up including referral as needed.

This enhanced statement could be accomplished by:

- Assessment of caries behavioural risk factors.
- Visual assessment of the mouth.
- Health promotion and education.
- Referral to appropriate dental preventive and treatment services for intervention.
- Application of fluoride varnish.
- Support to access dental treatment (Save-A-Smile, Healthy Kids Program, and Non- Insured Health Benefits (NIHB)).
- Kindergarten case finding and referral as needed.

Appendix B – School Districts by Health Service Delivery Area

Interior Regional School Districts

HSDA	S.D#	School District Name	Communities
Kootenay	5	Southeast Kootenay	Cranbrook, Elkford, Fernie, Sparwood, Grasmere, Jaffrey
	6	Rocky Mountain	Edgewater, Golden, Invermere, Kimberly, Windermere, Field, Canal Flats, Radium Hot Springs
	8	Kootenay Lake	Canyon, Crawford Bay, Creston, Kaslo, Nelson, Salmo, South Slokan, Yahk
	10	Arrow Lakes	Burton, Edgewood, Nakusp, New Denver
	20	Kootenay Columbia	Castlegar, Fruitvale, Robson, Rossland, Trail
	51	Boundary	Big White, Beaverdell, Christina Lake, Grand Forks, Greenwood, Midway, Rock Creek
Okanagan	22	Vernon	Coldstream, Cherryville, Lumby, Vernon
	83	North Okanagan/Shuswap	Armstrong, Falkland, Enderby, Grindrod, Sicamous, Malakwa
	23	Central Okanagan	Kelowna, Lake Country, Peachland, West Kelowna,
	53	Okanagan-Similkameen	Cawston, Hedley, Keremeos, Okanagan Falls, Oliver, Osoyoos
	58	Nicola-Similkameen	Princeton
	67	Okanagan-Skaha	Kaleden, Naramata, Penticton, Summerland,
Thompson Cariboo Shuswap	19	Revelstoke	Revelstoke
	27	Cariboo Chilcotin	100 Mile, 108 Mile, 150 Mile, Alexis Creek, Anahim Lake, Big Lake, Bridge Lake, Horsefly, Lac La Hache, Likely, Lone Butte, Nemiah Valley, Tatla Lake, Williams Lake
	58	Nicola-Similkameen	Merritt
	73	Kamloops/Thompson	Barriere, Blue River, Clearwater, Chase, Kamloops, Logan Lake, Pinantan Lake, Savona, Vavenby, Westwold
	74	Gold Trail	Ashcroft, Cache Creek, Clinton, Gold Bridge, Lillooet, Lytton
	83	North Okanagan/Shuswap	Celista, Canoe, Salmon Arm, Tappen

Fraser Regional School Districts

HSDA	S.D#	School District Name	Communities
Fraser East	33	Chilliwack	Chilliwack
	34	Abbotsford	Abbotsford
	75	Mission	Mission
	78	Fraser Cascade	Agassiz, Boston Bar, Harrison Hot Springs, Hope, North Bend
Fraser South	35	Langley	Aldergrove, Langley
	36	Surrey	Surrey, Whiterock
	37	Delta	Delta
Fraser North	40	New Westminster	New Westminster
	41	Burnaby	Burnaby
	42	Maple Ridge-Pitt Meadows	Maple Ridge, Pitt Meadows
	43	Coquitlam	Anmore, Belcarra, Coquitlam, Port Coquitlam, Port Moody

Vancouver Coastal School Districts

HSDA	S.D#	School District Name	Communities
Richmond	38	Richmond	Richmond
Vancouver	39	Vancouver	Vancouver
Coastal	44	North Vancouver	North Vancouver
	45	West Vancouver	Bowen Island, Lions Bay, West Vancouver
	46	Sunshine Coast	Cedar Grove, Gibsons, Halfmoon Bay, Madeira Park, Roberts Creek, Seschelt
	47	Powell River	Powell River
	48	Sea to Sky	D'Arcy, Pemberton, Squamish, Whistler
	49	Central Coast	Bella Bella, Bella Coola, Hagensborg

Vancouver Island School Districts

HSDA	S.D#	School District Name	Communities
South Vancouver Island	61	Greater Victoria	Esquimalt, Victoria
	62	Sooke	Port Renfrew, Sooke
	63	Saanich	Saanich
	64	Gulf Islands	Gulf Islands
Central Vancouver Island	68	Nanaimo-Ladysmith	Gabriola Island, Ladysmith, Nanaimo,
	69	Qualicum	Bowser, Parksville, Qualicum, Lasqueti
	70	Alberni	Bamfield, Port Alberni, Tofino, Ucluelet
	79	Cowichan Valley	Chemainus, Crofton, Duncan, Lake Cowichan, Mill Bay, Penelakut, Shawnigan Lake
North Vancouver Island	71	Comox Valley	Black Creek, Comox, Courtenay, Cumberland, Denman Island, Hornby Island, Union Bay
	72	Campbell River	Campbell River, Cortes Island, Quadra Island, Sayward
	84	Vancouver Island West	Gold River, Zeballos
	85	Vancouver Island North	Alert Bay, Port Alice, Port Hardy, Port McNeil, Sointula, Woss

Northern Regional School Districts

HSDA	S.D#	School District Name	Communities
Northwest	50	Haida Gwaii	Masset, Port Clements, Queen Charlotte City, Sandspit
	52	Prince Rupert	Port Edward, Prince Rupert
	54	Buckley Valley	Houston, Quick, Smithers, Telkwa
	82	Coast Mountain	Hazelton, Kitimat, Kitwanga New Hazelton, South Hazelton, Stewart, Terrace
	87	Stikine	Atlin, Dease Lake
	92	Nisga'a	Gitwinksihlkw, Laxgalts'ap
Northern Interior	28	Quesnel	Quesnel
	57	Prince George	Bear Lake, Hixon, Mackenzie, McBride, McLeod Lake, Prince George, Valemount
	91	Nechacko Lakes	Burns Lake, Fort Fraser, Fraser Lake, Fort St James, Granisle, Vanderhoof
Northeast	59	Peace River South	Chetwynd, Dawson Creek, Tumbler
	60	Peace River North	Fort St. John, Hudson's Hope, Taylor
	81	Fort Nelson	Fort Nelson

Endnotes

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- ⁶ Schroth, R. J., Quiñonez, C., Shwart, L., & Wagar, B. (2016). Treating Early Childhood Caries Under General Anesthesia: a National Review of Canadian Data. *J Can Dent Assoc*, 82(g20), 1488-2159.
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- ⁸ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).
- ⁹ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.
- ¹⁰ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.
- ¹¹ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).
- ¹² BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).
- ¹³ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.
- ¹⁴ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).
- ¹⁵ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).
- ¹⁶ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).

¹⁷ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

¹⁸ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

¹⁹ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).

²⁰ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016. (Corrected for 2012/2013).

²¹ BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

²² BC Dental Survey of Kindergarten Children 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

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²⁴ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

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²⁶ BC Dental Survey of Kindergarten Children 2006/2007 - 2015/2016, BC Ministry of Health. Prepared by Population Health Surveillance and Epidemiology, BC Office of the Provincial Health Officer, BC Ministry of Health, March 2016.

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²⁸ Davies, G. N. (1998). Early childhood caries—a synopsis. *Community dentistry and oral epidemiology*, 26(S1), 106-116.

From: [Arthur](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewatercalgary@gmail.com
Subject: [EXT] Submission for Oct 29 SPC Community and Protective Services Public hearing
Date: Sunday, October 20, 2019 1:01:56 PM

This email is my written submission for the October 29, 2019 SPC Community and Protective Services Public hearing Agenda.

My name is Art Matsui and I am a longtime Calgary taxpayer and have voted in every election on three levels of government since 1974. I am a third generation Japanese Canadian whose family's rights were stripped due to our racial background and am sensitive to the protection of my rights.

I have read the O'Brien report and hereby put the City of Calgary On Notice that I do NOT consent to being medicated by the addition of fluoride to the municipal water supply. I also hereby revoke any consent for water fluoridation implied, or otherwise that may be attached to my Name.

"Water, like air, is a shared resource that is necessary to life. There are many for whom consumption of even 'optimally' fluoridated water is harmful. But even if low concentrations weren't harmful to some consumers, fluoridation is still a medical assault and battery on any individual who does not individually consent to that treatment."

Karen Spencer, M.A. Lesley University

"Any preventive, diagnostic and therapeutic medical intervention is only to be carried out with the prior, free and informed consent of the person concerned, based on adequate information. The consent should, where appropriate, be express and may be withdrawn by the person concerned at any time and for any reason without disadvantage or prejudice."

- UNESCO on Medical Consent in Bioethics and Human Rights, Article 6 (2005)

"In no case should a collective community agreement or the consent of a community leader or other authority substitute for an individual's informed consent."

- UNESCO documents on Medical Consent in Bioethics and Human Rights, Article 6 (2010)

The **O'Brien report** (pages 30, 31, 32) identifies "A key ethical/legal issue related to community water fluoridation programs centres around individual autonomy and the ability to make personal health-related decisions." and "Furthermore, it should be noted that it is particularly challenging to individually opt out of water fluoridation".

In conclusion, water fluoridation is a therapeutic medical intervention by the City of Calgary to which I do NOT consent and to opt out should the City go forward would be of considerable cost and expense to myself and other Calgarians. To that end, should a water fluoridation initiative go forward to Calgary City Council, I will submit my fee schedule at that time. As a taxpayer it seems to me that the costs and ancillary costs of fluoridation are unnecessary in these times of budgetary restraint.

Art Matsui
Calgary Resident, Voter and Taxpayer

From: [Donald R Davis](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Sunday, October 20, 2019 5:13:27 PM

Dear council members,

I am a retired university researcher and co-author of a 2017 peer-reviewed article, "Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada," published in *Community Dentistry and Oral Epidemiology*,
<https://onlinelibrary.wiley.com/doi/full/10.1111/cdoe.12329>

I urge Calgary-area city councils not to fluoridate their drinking water, for the following reasons:

1. There is substantial evidence from recent, high-quality studies in Mexico and Canada that typical fluoride consumptions by mothers during pregnancy decrease the IQ of their children and also increases the risk of childhood ADAD.
2. Fluoride is a proven neurotoxin in animals, comparable to lead, which likely explains these human findings.
3. Strongly rising rates of dental fluorosis in children and youths, at least in the U.S., show that many infants and children are consuming excessive fluoride.
4. Fluoride toothpaste is a more effective and safer way to prevent tooth decay than fluoridating drinking water.
5. Water fluoridation infringes the rights of individuals who wish to avoid fluoridated water.

Sincerely yours,

Donald R. Davis, Ph.D.

Retired from:
Biochemical Institute
The University of Texas
Austin, Texas

<http://www.researcherid.com/rid/B-8531-2009>
<http://orcid.org/0000-0001-8343-1268>

From: [Sudeshna](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewatercalgary@gmail.com
Subject: [EXT] Submission for hearing on water fluoridation
Date: Sunday, October 20, 2019 5:53:23 PM

Hello,

I live in NW,CALGARY (ward-2)with my family. I have kids one with special need.

What I have learnt that environmental toxin can create so many health issues! So I am very scared accepting the fact about water fluoridation.

I don't want any percentage of toxin in our drinking water.

Water is life.Please save our life.

Kind regards

Sudeshna Pal

Ward-2

From: [Owen Cran](#)
To: [Public Submissions](#)
Cc: safewatercalgary@gmail.com; [City Clerk](#)
Subject: [EXT] Water Fluoridation
Date: Sunday, October 20, 2019 6:21:19 PM

Hello,

I am writing this to you as a victim of fluoride. I have fluorosis, a permanent yellow stain on my teeth due to poisoning from this substance.

Any claims that fluoride helps prevent tooth decay are a joke, I have had many trips to the dentist and fluoride did nothing to help "prevention" of tooth decay.

Fluoride in its elemental form is poisonous to the human body. Please help future generations avoid this faulty science being pushed back onto Calgarians who voted to be free of the purposeful poisoning of our water supply.

Thank you

Owen

From: [Diane Sprules](#)
To: [Public Submissions](#)
Cc: [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] "Submission for Hearing on Water Fluoridation" New Paper -" Aluminium and fluoride in drinking water in relation to later dementia risk."
Date: Sunday, October 20, 2019 6:54:45 PM

Hello Calgary Council,

We have new evidence that fluoride is not only damaging to developing infants' brains but also to older adults.

A new Scottish study (<https://www.ncbi.nlm.nih.gov/pubmed/30868981>) of the effect of aluminum and fluoride on the incidence of dementia published in the March 2019 Journal of Psychiatry concluded:

"Higher levels of aluminium and fluoride were related to a dementia risk in a population of men and women who consumed relatively low drinking water levels of both"

Senile dementia and Alzheimer's are a growing concern.

Why would Calgary Council want to expose its citizens to a higher risk of this malady?

Diane Sprules BSc MSc (Biology and Chemistry)

Oakville, Ontario

From: [W Sprules](#)
To: [Public Submissions](#)
Cc: [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation: Much publicized journal article did NOT show accelerated tooth decay after water fluoridation was stopped in Calgary
Date: Sunday, October 20, 2019 7:07:36 PM
Attachments: [Neurath et al 2017 Comm Dent Oral Epidemio 45, 496-502.pdf](#)

Dear Calgary Mayor and Councillors:

I am a Professor Emeritus of Biology who taught Biostatistics for 40 years at the University of Toronto and who continues to do scientific research. I was a co-author of the attached publication which is a critique of a widely reported study by Dr. L. McLaren and colleagues claiming to show that cessation of water fluoridation in Calgary accelerated tooth decay rates. The McLaren study is very typical of the faulty scientific basis upon which proponents of water fluoridation base their claims – poor study design, incomplete data, faulty logic, and conclusions that do not follow from the data. When my colleagues and I added critical data omitted from the original study and conducted more rigorous statistical analyses, we showed clearly that cessation of water fluoridation in Calgary did not increase tooth decay rate.

I urge you to vote against the reintroduction of a fluoridated drinking water supply in Calgary. There is little to no scientific basis for doing so.

Yours truly,


Dr. W. Gary Sprules



Dr. W. Gary Sprules, Professor Emeritus
Rm DV4023E, Department of Biology
University of Toronto Mississauga
gary.sprules@utoronto.ca
<http://www.erin.utoronto.ca/~w3jmuirh/index.htm>

COMMENTARY

Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada

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²Faculty of Medicine, University of Calgary, Calgary, AB, Canada

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⁴Department of Biology, University of Toronto Mississauga, Mississauga, ON, Canada

⁵Fluoride Action Network, Los Angeles, CA, USA

⁶Smiles of Bellevue, Private Dental Practice, Bellevue, WA, USA

⁷Biochemical Institute, University of Texas at Austin, Austin, TX, USA

Correspondence

Christopher Neurath, American Environmental Health Studies Project, Lexington, MA, USA.
Email: cneurath@AmericanHealthStudies.org

Abstract

A paper published in this journal, "Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices," by McLaren et al had shortcomings in study design and interpretation of results, and did not include important pertinent data. Its pre-post cross-sectional design relied on comparison of decay rates in two cities: Calgary, which ceased fluoridation, and Edmonton, which maintained fluoridation. Dental health surveys conducted in both cities about 6.5 years prior to fluoridation cessation in Calgary provided the baseline. They were compared to decay rates determined about 2.5 years after cessation in a second set of surveys in both cities. A key shortcoming was the failure to use data from a Calgary dental health survey conducted about 1.5 years prior to cessation. When this third data set is considered, the rate of increase of decay in Calgary is found to be the same before and after cessation of fluoridation, thus contradicting the main conclusion of the paper that cessation was associated with an adverse effect on oral health. Furthermore, the study design is vulnerable to confounding by caries risk factors other than fluoridation: The two cities differed substantially in baseline decay rates, other health indicators, and demographic characteristics associated with caries risk, and these risk factors were not shown to shift in parallel in Edmonton and Calgary through time. An additional weakness was low participation rates in the dental surveys and lack of analysis to check whether this may have resulted in selection biases. Owing to these weaknesses, the study has limited ability to assess whether fluoridation cessation caused an increase in decay. The study's findings, when considered with the additional information from the third Calgary survey, more strongly support the conclusion that cessation of fluoridation had no effect on decay rate. Consideration of the limitations of this study can stimulate improvement in the quality of future fluoridation effectiveness studies.

KEYWORDS

caries, epidemiology, fluoridation, public health policy, study design

1 | INTRODUCTION

A recent paper in *Community Dentistry and Oral Epidemiology* (CDOE), titled "Measuring the short-term impact of fluoridation cessation on

dental caries in Grade 2 children using tooth surface indices," by McLaren et al¹ argues that changes in decay rates over time in Calgary compared to Edmonton (Canada) support a conclusion that fluoridation cessation led to increases in decay. However, we believe

the study has serious shortcomings that raise concern for the validity of this conclusion. Most importantly, omitted data favor the opposite conclusion: cessation of fluoridation had no effect on decay rates. Other weaknesses, including lack of adequate control for confounding, further reduce confidence in the conclusion that fluoridation cessation increased decay.

This paper has attracted widespread media attention, with over 100 news stories in Canada and around the world.² It achieved the second highest Altmetric attention score of any article in CDOE and scored in the top 99th percentile for all Wiley journal articles.³ The media reports and the lead author have said that this paper provides strong scientific evidence that should influence public policy. A careful evaluation of its strengths and weaknesses is therefore warranted. Such a discussion can also inform the important public health question of how to obtain high-quality scientific evidence to determine the effectiveness of water fluoridation. Accordingly, we first examine in detail the weaknesses of this study and then describe stronger study designs.

We limit our discussion to caries in primary teeth because there were too few permanent teeth in the 7-year-olds to provide reliable estimates of decay in the permanent dentition.

2 | UNUSED DATA

McLaren et al concluded “Trends observed for primary teeth were consistent with an adverse effect of fluoridation cessation on children’s tooth decay, 2.5-3 years post-cessation.” This conclusion is controverted by unused, but relevant, caries data, which suggest there was no effect, adverse or beneficial, of fluoridation cessation. The unused data, reported by the authors in a separate paper⁴ in a different journal, were from a survey in Calgary in 2009/2010, shortly prior to fluoridation cessation in 2011.⁵ The study reported in CDOE only used pre-cessation data from a 2004/2005 survey, which was 6-7 years prior to cessation. The 2009/2010 survey was conducted with similar methods to the 2004/2005 survey, on the same target population, and was intended to allow comparisons with the 2004/2005 survey. The omitted 2009/2010 data are important because they provide information temporally much closer to cessation. They also provide a third data point allowing Calgary pre-cessation trends to be compared to post-cessation trends (Figure 1). McLaren has stated that she excluded the Calgary 2009/2010 data because there were no corresponding data for Edmonton in 2009/2010.³ However, adding the Calgary 2009/2010 data would have strengthened the study, not weakened it.

When data from all three Calgary surveys are used in a time-trend analysis, it can be seen that more of Calgary’s increase in decay occurred during the years before fluoridation ceased, and importantly, that there is no detectable difference between the annual average increase in decay before and after fluoridation cessation (Figure 1B). In both time periods, the increase was +0.12 deft (sum of decayed,

extracted due to caries, and filled teeth) per year (Table 1). Therefore, the better-supported conclusion is that fluoridation cessation did not lead to an increase in caries rates. This is consistent with several previous studies of fluoridation cessation conducted over the past 20 years in Canada, Finland, East Germany, and Cuba.⁶⁻¹⁰

Results of the time-trend analysis strongly suggest factors other than fluoridation cessation played the dominant role in increasing the decay rate in Calgary. Further evidence is provided by the Edmonton data, which showed a substantial increase in decay over the entire study period of 2004-2014 despite continuous fluoridation (Figure 1A). Similar secular increases in deciduous tooth decay have been reported in developed countries, especially in North America, over the last 10-20 years.¹¹⁻¹⁷

McLaren et al¹ argue that the tooth surface level decay measure (defs, sum of decayed, extracted due to caries, and filled tooth surfaces), which was only available for the 2004/2005 and 2013/2014 surveys, is “more sensitive” than the tooth level measure deft, and therefore preferable. There is indeed a difference in effect size between the two measures (Figure 1 and Supplement Figure S1 available in online Supplement). The slopes, which reflect time-trend effect sizes, were steeper with the defs measure, but the data points maintained the same relationships with each other. The precision of the estimates was similar using either measure, as seen in the 95% confidence intervals. The lesser sensitivity of deft is compensated for by the added inferential power of having three time points with deft data, rather than just two with defs data.

3 | INADEQUATE CONSIDERATION OF CONFOUNDING

The authors claim that factors besides fluoridation, such as socio-demographic characteristics of the samples and less dental treatment and preventive programming, had been considered and ruled out as the cause of the increase in decay.¹ Similarly, the lead author is quoted in a media story¹⁸:

McLaren said the study is clear about the cause and effect at play.

“We designed the study so we could be as sure as possible that [the increased tooth decay] was due to [fluoride] cessation rather than due to other factors,” she told the CBC. “We systematically considered a number of other factors ... and in the end, everything pointed to fluoridation cessation being the most important factor.” (edits in square brackets in original media story)

However, the CDOE paper itself did not consider or measure any potential confounders. Therefore, it could not rule out any other factors that might contribute to the differences in decay.

A related paper in the *International Journal for Equity in Health* (IJEH) likewise fails to support the claims that potential confounding was adequately addressed.⁴ The IJEH paper controlled for just two

³McLaren L. Email from Lindsay McLaren to Hamidah Meghani, Halton Region (Canada) Minister of Health, March 7, 2016.

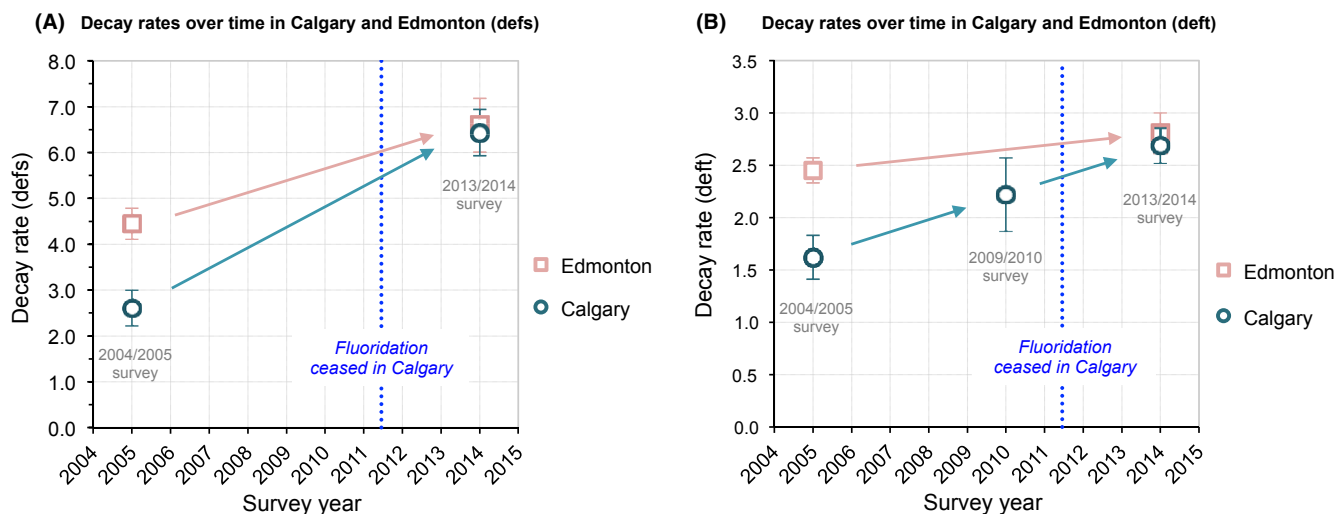


FIGURE 1 Dental decay rates by two measures: (A) defs, (B) deft. All data, including Calgary 2009/2010 data, provided by study author (personal communication, McLaren, February 25, 2016). Weighted values. Error bars indicate 95% CIs. Arrows rather than continuous lines are used to connect points to emphasize they are not regression lines. No data are available for any times other than the survey dates. [Colour figure can be viewed at wileyonlinelibrary.com]

Survey years	2004/2005	2009/2010	2013/2014
Mean deft, weighted	1.62	2.22	2.69
Midpoint of survey	January 1, 2005	January 1, 2010	January 1, 2014
Period between surveys	Pre-cessation	Mostly Post-cessation	
Years between surveys	5.0	4.0	
Change in deft between surveys	+0.60	+0.47	
Time-trend (deft/y)	+0.12	+0.12	

TABLE 1 Annualized decay trends (deft/y) for the two time periods between the three Calgary dental surveys

The two periods approximate the pre-cessation and post-cessation periods. The deft rates were supplied by the lead study author (personal communication, McLaren, February 25, 2016).

alternative factors that might account for its findings: presence/absence of dental insurance and a deprivation index of socioeconomic status. The authors acknowledged the two variables were “crude” or “limited” and concluded, “further research is needed to ... explore possible alternative reasons for the findings.” A more recent related paper in *Public Health (PH)* did not adjust for any confounders.¹⁹

None of the three papers (*CDOE*, *IJEH*, *PH*) controlled for many factors that may affect decay rates.^{20–22} Such factors include ethnicity/genetics; diet/nutritional status; health status; sugar consumption; vitamin D/sunlight; oral hygiene; fluoridated toothpaste; fluoride varnishes; sealants; access to dental services; dental care practices; public health dental policies; public health dental expenditures; blood lead; enamel hypoplasia; and cariogenic oral bacteria. The increasing rate and large differences in caries, when both cities were fluoridated, show that factors besides fluoridation were involved. Data on several of the potentially confounding factors (eg ethnicity, health status, sealants) are publicly available but were not considered.^{5,23–26} A recent Cochrane review judged fluoridation studies that controlled for fewer than four confounding variables to be at high risk of bias.²⁷ Thus, none of the three papers (*CDOE*, *IJEH*, *PH*) adequately addressed alternative explanations for differences or increases in decay.

4 | UNSUITABLE COMPARISON CITY

The authors elected to control for confounding by choosing Edmonton as a control city rather than measuring and adjusting for confounding factors. They mentioned only two similarities between Edmonton and Calgary: They are the two largest cities in Alberta, and both are urban centers with diverse demographic profiles.¹ Size and diverse demographics say little about factors that influence decay rates. A government report on the health of Albertans in 2006 found many differences between the cities.²⁵ For most health measures, Edmonton was worse than Calgary. It had significantly higher rates of diabetes, arthritis, and injuries, and twice the “aboriginal” percentage.^{28,29} The authors have not demonstrated that Edmonton is sufficiently similar on factors that may affect caries to be considered “well matched” to Calgary. The defs rate was about 73% higher in Edmonton than Calgary in 2004/2005 when both cities were fluoridated. This large difference in decay rate remains unexplained, and any comparisons between the two cities are of limited validity.

The authors’ pre-post cross-sectional design in itself cannot eliminate confounding. Factors influencing caries can change over time in either city, and there is no assurance that such temporal changes

will occur in parallel so as to cause the same degree of confounding in both cities at both times. Studies by Künzel et al^{9,10} of four cities at 15 sequential time points over more than 35 years illustrate how decay rates can change rapidly even when fluoridation status is not changing. Both the York Review of fluoridation³⁰ and the follow-up Cochrane Review²⁷ required that in studies of pre-post type, the baseline rates for the comparison cities be similar. The McLaren et al study does not meet this criterion.

5 | LOW SURVEY PARTICIPATION RATES, POSSIBLE SELECTION BIASES

The overall participation rates in the 2013/2014 surveys were only about 25%, which raises concern for selection bias.¹ No information was provided on characteristics of nonparticipants versus participants, or on why schools and individual students declined to participate. Bias is also a concern in the 2004/2005 surveys. Student-level participation rates were higher (Calgary 60%, Edmonton 89%), but school-level participation rates were not reported, and no information was given on characteristics of non-participants versus participants. An example of a possible selection bias occurs in the 2009/2010 Calgary survey because children in Catholic schools appear to have been substantially over-represented.^{5,31} If children in religious-affiliated schools have different decay rates than those in other schools, selection bias could impair the validity of results.

The paper claims that "... because of the rigorous sampling methods and development and application of sampling weights, we believe the 2004/2005 estimates to be an accurate reflection of the caries experience at that time," but no weighting details were given.¹ Stratified sampling by urban/rural and neighborhood household income was used in the Calgary 2004/2005 survey,³² but urban/rural was irrelevant to the McLaren et al study, because it was restricted to urban schools. It is unclear whether weighting by income was applied. In neither the McLaren et al study nor the final report of the Calgary 2004/2005 survey was there any suggestion that weighting took place on other potential risk factors for caries, such as age, gender, ethnicity, or Catholic versus non-Catholic school. Only age and gender were even measured in the 2004/2005 survey.

6 | SUBGROUP ANALYSES: EQUALLY SUBJECT TO CONFOUNDING

McLaren et al argue that subgroup analyses are more sensitive to the effect of fluoridation on decay. Their main analysis is of the defs rate differences for all tooth surfaces of all children while their two subgroup analyses are as follows: (i) for the subset of tooth surfaces that are smooth, by excluding those tooth surfaces that have pits and fissures; and (ii) for the subset of children with any decay (defs>0). The authors state that they expect the smooth surface subgroup to be more sensitive to effects of fluoridation. They do not

explicitly state that the subset with defs>0 will also be more sensitive, although this can be inferred.

McLaren et al found larger differences in decay rates between Calgary and Edmonton and over time in both subset analyses, but the relative percent differences in the defs>0 subgroup were smaller than in their full group analysis (see Supplement Figures S1a and S2). The defs>0 subgroup analysis therefore lends little support to the claim that fluoridation cessation causes an increase in decay. Furthermore, the confounding that occurs in the main analysis would have equal or greater chance of distorting relationships in both subgroup analyses. Many factors besides fluoridation could have larger effects in higher-risk children, and some factors, like flossing, would be expected to influence decay rates on smooth surfaces more than on pitted surfaces.

To see whether a time-trend subgroup analysis might produce a different result than we showed for the full group of all children (Figure 1 and Supplement Figure S1; Table 1), we conducted an analysis using the three Calgary survey points for the subset of children with defs>0 (Figure 2 and Supplement Figure S2). It shows that this subset demonstrates a *deceleration* in rate of increase in the period after the 2009/2010 survey, not an acceleration, suggesting that ceasing fluoridation is associated with a decrease in dental caries, the opposite conclusion of McLaren et al. Data on smooth surface decay in 2009/2010 were not available to us, so we could not conduct a similar time-trend analysis for this subgroup.

An unavoidable limitation in our time-trend analysis for the subset defs>0 is that data for 2009/2010 were only available as deft, not defs. Therefore, we used the ratio of defs to deft in the 2013/2014 survey to make the conversion, the values coming from the CDOE and IJEH articles, respectively, as well as from the lead author.^b Support for the validity of this conversion factor comes from the 2013/2014 and 2009/2010 surveys being relatively close in time, done in the same city, and using very similar methods. Furthermore, when we applied this conversion to the 2004/2005 Calgary survey, where both deft and defs are known, the calculated defs was very close to the known defs.

7 | LOW FLUORIDE BOTTLED WATER CONSUMPTION UNLIKELY TO EXPLAIN INCREASES IN DECAY

McLaren et al state that an increasing use of bottled water (generally low in fluoride) over the study period may explain the increases in decay in both Calgary and Edmonton. The reasoning is circular because it assumes that fluoridated water reduces decay, which is the main hypothesis being tested. Nevertheless, to explore this claim, we used bottled water consumption data from McLaren et al, noting the limitation that it is for all of Canada, rather than specific to Calgary and Edmonton. The information on bottled water intake per household leads to a per capita daily consumption of 0.11 L in

^bMcLaren, personal communication, February 26, 2016.

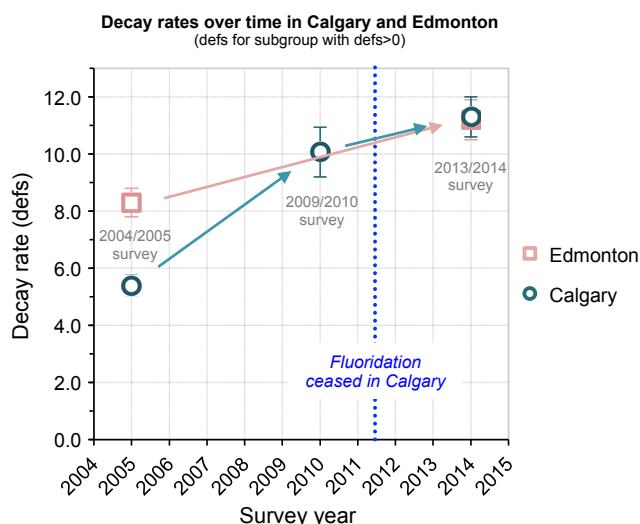


FIGURE 2 Dental decay rates for subgroup of those children with at least one defs (defs>0). Data for 2004/2005 and 2013/2014 from CDOE paper. Data for 2009/2010 from IJEH paper, but converted from deft to defs using conversion method described in text. Error bars indicate 95% CIs. [Colour figure can be viewed at wileyonlinelibrary.com]

2004, rising to 0.18 L in 2014 based on 2.5 people per household.³³ As adults consume about 1 L/d of drinking water,³⁴ the majority of consumed water would still be from fluoridated tap water: 89% in 2004 decreasing to 82% in 2014. It is implausible that such a small decrease in fluoridated water intake could account for a 45% increase in defs in always-fluoridated Edmonton and a 110% increase in decay while Calgary was fluoridated (Figure 1A).

8 | STRONGER STUDY DESIGNS TO ASSESS FLUORIDATION EFFECTIVENESS

We have shown that the McLaren et al study design gives only a weak test of whether fluoride cessation caused an increase in tooth decay, or whether confounding factors, both through time and between cities, were the true cause. The authors say cross-sectional studies that look at a single point in time (post-cessation) are weak, yet their pre-post cross-sectional study that examines two points in time is only slightly less weak. It is compromised by the unsuitability of Edmonton as comparison city, lack of adjustment for confounding, and the use of presurvey data collected 6-7 years prior to cessation. Both the York Review of fluoridation³⁰ and the Cochrane Review update²⁷ required that pre-post design studies have baseline data collected within 3 years of the change in fluoridation status because rapid changes in caries rates can occur unrelated to fluoridation. The McLaren et al study was also limited by ecological (group-level) measures of exposure with no information on individual-level exposures.

The highest quality, gold standard, study design is a randomized controlled trial (RCT). This is the only study design that can avoid most risk of confounding. For assessing fluoridated water

effectiveness, a suitable RCT design would randomly assign individuals to receive either fluoridated or unfluoridated bottled water. RCTs could also be cluster-randomized by household so that the bottled water could be shared for family food preparation.

Some might argue an RCT would be impractical because the benefits of fluoridation are relatively small, thus requiring a large sample and long observation period to see an effect. However, statistical power calculations, based on a study population with a background decay rate typical for many developed countries (mean DMFT of 2 with SD of 3 in 12-15-year-olds),¹¹ show that a study duration of 2 years with a sample size of 2500 would be sufficient to have an 80% probability of detecting a 15% decrease in decay increment, or just over 0.3 DMFT.³⁵

Another weakness of the McLaren et al study and most other observational studies of fluoridation effectiveness is lack of blinding. Even when participants are examined at a location that hides fluoridation status, dental fluorosis could reveal fluoride exposure to an examiner. Blinding may require dental radiographs assessed by persons blind to fluoridation status and fluorosis. RCT studies, however, could avoid radiographs because the fluoridated water need only be given when subjects are beyond the age of susceptibility to dental fluorosis.

Since 2003 when the authors of the York Review of fluoridation urged that higher-quality studies were necessary to provide a quantitative estimate of the effect of water fluoridation,³⁶ their recommendation has been largely ignored. The 2015 Cochrane Review confirmed that no RCT of fluoridated water has been conducted, but claimed, without explanation, that they are “unfeasible”.²⁷ Presumably, they used a narrow definition of fluoridation that assumes the unit of randomization to be entire communities of relatively large size. Such a trial would indeed be difficult, but we have described how randomization at the individual or small cluster level would be feasible. Methods to allow generalizing an individual-level RCT to community-level are available.³⁷

The study design that is next in order of quality, after RCTs, is the longitudinal study with individual-level information on the same subjects over time. This could be a cohort study, or for rare outcomes, a case-control study. Prospective cohort studies usually have less risk of recall bias than retrospective case-control studies, but for rare outcomes, such as extractions under general anesthesia in hospitals, the greater efficiency of case-control design studies can outweigh this limitation. Control of confounders is more easily achieved with longitudinal designs than with cross-sectional studies because many important confounding factors will remain relatively constant for individuals over time (such as oral hygiene practices, aboriginal). It will still be important to have diverse exposures to fluoride, rather than drawing a sample from just one fluoridated and one unfluoridated city. Otherwise, exposure will be completely correlated with location, causing any other risk factors that differ between those two locations to become confounders. Rothman describes how even RCTs suffer when there are only two study groups: “In the extreme case in which only one subject is included in each group (as in the community fluoridation trials with one

community in each group), randomization is completely ineffective in preventing confounding.”³⁸

The committee that oversaw the York Review issued a statement warning that the review had been frequently misinterpreted, that no high-quality evidence existed in any fluoridation literature, and that only rigorous studies could fill the gaps in knowledge about all aspects of fluoridation.³⁶ The chairperson of that committee assessed the CDOE and IJEH studies and concluded they do not “provide a valid assessment of the effect of fluoridation cessation on the levels or distribution of caries in these populations”.³⁹ He cited many of the same shortcomings we have outlined, and also noted that the dramatic increase in tooth decay during periods of constant fluoridation in both Edmonton and Calgary indicates that fluoridation does not reduce tooth decay sufficiently to prevent poor oral health. McLaren et al acknowledge that the York Review and the Cochrane Review have both voiced concern for the dearth of higher-quality studies, but their study would score too low on quality criteria to be included in either of these authoritative reviews.

9 | CONCLUSIONS

In summary, due to the omission of key data that contradict the authors' conclusion, inadequate control of confounding factors, and limitations in the design of the study that were largely unacknowledged, we believe that claims by McLaren et al that their study supports the hypothesis that fluoridation cessation causes an increase in decay is unjustified. Recognition of the limitations of this study can point toward stronger designs in future studies.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

How to cite this article: Neurath C, Beck JS, Limeback H, et al. Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada. *Community Dent Oral Epidemiol*. 2017;45:496–502. <https://doi.org/10.1111/cdoe.12329>

From: [James Solomon Beck](#)
To: [Public Submissions](#)
Subject: [EXT] Hearing on fluoridation
Date: Sunday, October 20, 2019 8:11:14 PM
Attachments: [Beck,submission.rtf](#)

Please accept my submission for the hearing on fluoridation.

James S. Beck
4959 Vantage Cres. NW
Calgary

Submission to hearing of City Council on water fluoridation

James S. Beck, MD, PhD

My scientific background is in medicine and biophysics. After confronting the fact of fluoridation in Calgary in 1999, I undertook a long and deep review of scientific literature on the supposed efficacy and on the toxicity of fluoridation. Many of the publications showed poor design of experiment and/or data analysis and reached unjustified conclusions on safety and efficacy. I coauthored a book on fluoridation, *The Case Against Fluoride*, published in 2010.

Some councillors may remember my contacts with them and my participation in hearings in Calgary preceding the decision by Council in 2011 to stop fluoridation. I also gave lectures in public meetings and testimony before other city councils, mostly in Alberta but also in other provinces. Some of these involved promoters of fluoridation. The ignorance and the mistakes, among promoters of fluoridation in scientific argument were disappointing, indeed shocking. Such errors were made by dentists, physicians and scientists. It was a difficult and frustrating era for city councillors facing the issue.

An example of the problem for Calgary councillors arose with the publication in 2016 of a paper by a group on the faculty of the University of Calgary that falsely claimed that cessation of fluoridation in Calgary was followed by an increase in incidence of dental cavities greater than in Edmonton, fluoridated, among second grade students. The paper's statements and conclusions were false by its own data. This was followed by widespread publication in Canadian newspapers advocating fluoridation and failing to face contrary results and failing to publish contrary submissions, even though the data in the study showed no substantial difference in the continuing increase in frequency of cavities in both Calgary and Edmonton before and after cessation in Calgary.

Since the cessation of fluoridation in Calgary some very well designed studies on toxicity have been published. In particular a study in Canada has shown a substantially reduced intelligence quotient in young children associated with fluoridation.

So we have a serious concern here: additional evidence of harm and further evidence of inefficacy. Clearly resuming fluoridation in Calgary would be a serious mistake.

Submission to hearing of City Council on water fluoridation

James S. Beck, MD, PhD

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So we have a serious concern here: additional evidence of harm and further evidence of inefficacy. Clearly resuming fluoridation in Calgary would be a serious mistake.

From: [Helen Innes](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoride accumulates in the body
Date: Sunday, October 20, 2019 8:53:20 PM

PUBLIC SUBMISSION

RE: Fluoride accumulates in the body

Dear PUBLIC SUBMISSION,

+SUBMISSION FOR PUBLIC HEARING ON FLUORIDATION+

Dear Councilors,

Say NO to fluoridation chemicals!

Healthy adult kidneys excrete only 50 to 60% of the fluoride ingested each day (Marier & Rose 1971). The remainder accumulates in the body, largely in calcifying tissues such as the bones and pineal gland (Luke 1997, 2001). Infants and children excrete less fluoride from their kidneys and take up to 80% of ingested fluoride into their bones (Ekstrand 1994). The fluoride concentration in bone steadily increases over a lifetime (NRC 2006).

Please don't force residents to avoid our drinking water.

Vote No!

Sincerely,
Helen Innes

Calgary, AB

From: [Graham Innes](#)
To: [Public Submissions](#)
Subject: [EXT] Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing
Date: Sunday, October 20, 2019 8:55:56 PM

PUBLIC SUBMISSION

RE: Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing

Dear PUBLIC SUBMISSION,

Dear Council,

I don't want fluorosilicic acid in my drinking water.

Fluoride is the only chemical added to water for the purpose of medical treatment. The U.S. Food and Drug Administration (FDA) classifies fluoride as a drug when used to prevent or mitigate disease (FDA 2000).

Informed consent is standard practice for all medication, and one of the key reasons why most of Western Europe (97%) has ruled against fluoridation. With water fluoridation we are allowing governments to do to whole communities (forcing people to take a medicine irrespective of their consent) what individual doctors cannot do to individual patients.

Vote No on fluoridation.

Thanks,

Sincerely,
Graham Innes

Calgary, AB

From: [Helen Innes](#)
To: [Public Submissions](#)
Cc: safewatercalgary@gmail.com; [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Hearing on Water Fluoridation - Submission
Date: Sunday, October 20, 2019 9:15:40 PM

Dear Councilors,

Please VOTE NO to fluoridation chemicals!

There is NO evidence fluoridation benefits citizens. Adding unnecessary toxic chemicals to our water supply harms the health of residents. The only people who benefit are big businesses selling this toxic waste product and the water filter companies who the rich can turn to remove the poison from the water supply to their homes.

By adding this to our water supply you will be forcibly medicating the entire population of the city without their consent. Where only those with higher incomes can choose to purchase a reverse osmosis water filter to remove it. Those on lower incomes have no choice.

"The fluoride chemicals used to fluoridate drinking water are: fluorosilicic acid, sodium fluorosilicate, and sodium fluoride. Unlike the fluoride compounds found in toothpaste or supplements, fluoridation chemicals are not pharmaceutical grade quality. They are, instead, unpurified industrial by-products that are collected in the air pollution control systems of certain industries." <http://fluoridealert.org/issues/water/fluoridation-chemicals/>

Don't waste taxpayer dollars on this toxic waste product. We don't need it! We don't want it!
Keep it out of our water!

Helen Innes
Ward 1, Crestmont, Calgary

From: [Jennifer Alexander](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Sunday, October 20, 2019 9:19:25 PM
Attachments: [FAN Neurotox Flyer Updated Oct 2019 Final.pdf](#)

"A Harvard-funded meta-analysis found that **children ingesting higher levels of fluoride** tested an average **7 IQ points lower** in **26 out of 27 studies.**"

This concerns me greatly!

My son is only 12 months old. He deserves the opportunity to live the best life possible and that requires proper health of his mind and body. All humans deserve this.

I want to raise my son drinking water... lots of it! Not juice, not pop, not soda water... our local water. He is an active boy and I imagine he will enjoy many sports as he grows thus drinking much water. If fluoride is put back into our water, there is no way I can measure how much fluoride he is ingesting. I'm sure you can understand, as a parent, this is very disconcerting. Imagine, handing your child his eighth glass of water in a day and wondering if it's this glass that will not allow him to go to university one day.

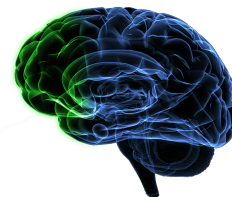
If I want my son to have fluoride, I'll buy fluoride toothpaste and have it given at each dental appointment. Fluoride must be given safely and putting it in our water and then ingesting in unmeasured dosages is not safe for any of us, including you and your family.

Attached is a one-pager that outlines these concerns. Please take a minute to read it and I hope you'll agree with me that Calgary should stay unfluoridated.

Jennifer Eve Alexander
Cell/Text: 403-850-8703

FLUORIDATION'S NEUROTOXICITY

There is **no question** that fluoride is neurotoxic, damaging the brain and central nervous system, as documented by hundreds of studies. Extensive scientific evidence, including studies at exposures caused by fluoridated water, shows it can harm children. ***It can NOT be declared safe.***



2006: The National Research Council published Fluoride in Drinking Water¹, the most authoritative review of fluoride's toxicity. It stated unequivocally that ***"fluorides have the ability to interfere with the functions of the brain and the body"*** and ***"the chief endocrine effects of fluoride include decreased thyroid function."*** Low thyroid function (hypothyroidism) is known to be linked to lowering IQs.

2012: A Harvard-funded meta-analysis² found that children ingesting higher levels of fluoride tested an average 7 IQ points lower in **26 out of 27 studies**. Most had higher fluoride concentrations than in U.S. water, but many had total exposures to fluoride no more than what millions of Americans receive.

"Fluoride seems to fit in with lead, mercury, and other poisons that cause chemical brain drain."

Philippe Grandjean, MD, PhD, Harvard study co-author, Danish National Board of Health consultant, co-editor of Environmental Health, author of over 500 scientific papers

2017: A petition to EPA³ to end fluoridation documented that fluoride caused neurotoxic harm in **57 out of 61 human studies (mainly lowered IQ), several at levels in fluoridated water, and 112 out of 115 animal studies**. EPA denied the petition, triggering a lawsuit. A federal judge denied the EPA's motion to dismiss the suit. The legality of fluoridation is scheduled to go on trial in federal court in February 2020.

2017: A National Institutes of Health (NIH) - funded study⁴ in Mexico covering 13 years found that every one milligram per liter (1 mg/L) increase in fluoride in pregnant women's urine – approximately the difference caused by ingestion of fluoridated water⁵ - was associated with a reduction of their children's IQ by an average 5-6 points. Leonardo Trasande, a leading physician unaffiliated with the study, said it ***"raises serious concerns about fluoride supplementation in water."***⁶

2018: A Canadian study⁷ found iodine-deficient adults (nearly 18% of the population) with higher fluoride levels had a greater risk of hypothyroidism. Author Ashley Malin said ***"I have grave concerns about the health effects of fluoride exposure."***⁸

2019: Another NIH – funded study⁹ in the Journal of the American Medical Association Pediatrics found every 1 mg/L increase in Canadian pregnant women's urine was linked to a 4.5 decrease in IQ in their male children. The study was so strong that the editor of JAMA Pediatrics said ***"I would not have my wife drink fluoridated water"***¹⁰ if she was pregnant. The authors and independent reviewers both said the study showed fluoride is as toxic as lead in lowering intelligence.

From: [George Doherty](#)
To: [Public Submissions](#)
Subject: [EXT] submission for
Date: Sunday, October 20, 2019 10:41:58 PM
Attachments: [FAN Fluoride Efficacy Flyer Print FINAL.pdf](#)

I am a Calgary Pharmacist that has lived and worked in this great city my whole life.

I was so pleased when the city discontinued adding fluoride to our water many years ago for the reasons in the above attachment

I strongly hope you will not reintroduce this unsafe and ineffective chemical to our wonderful safe water supply.

Sincerely,
George C Doherty BSc Pharm

George Doherty
25 Hawkside Road NW
Calgary, AB
T3G 3K9

Is Water Fluoridation Effective?

According to most major sources, estimates of fluoridation effectiveness amount to at most a reduction of only one-half cavity per child. Low end estimates find **no significant reduction at all**. Children aged 6-17 average 2.1 cavities in their permanent teeth¹:

- Cochrane Collaboration² (2015): 26% (**0.5 cavity per child**)
- CDC³ (2018): 25% (**0.5 cavity per child**)
- Iowa Fluoride Study⁴ (2018): **No significant reduction**
- World Health Organization data⁵ (2005): **No evidence of fluoridation's effectiveness**



There is already a consensus including CDC, Cochrane Collaboration, the Iowa Fluoride Study and others that fluoride's effectiveness in preventing cavities is mainly topical (not swallowed).

The **Cochrane Collaboration** is considered the gold standard of evaluating effectiveness. It said the cavity reduction referenced above was **"based predominantly on old studies and may not be applicable today."**

"Over 97% of the 155 studies were at a high risk of bias, which reduces the overall quality of the results... We did not identify any evidence... to determine the effectiveness of water fluoridation for preventing caries in adults... There is insufficient evidence to determine whether water fluoridation results in a change in disparities in caries levels across socio-economic status."

The **Iowa Fluoride Study (IFS)**, funded by the National Institutes of Health, is the most comprehensive, ongoing research project in the U.S., the only one measuring all sources of fluoride ingestion. The 2018 study from IFS referenced above found no significant correlation between ingested fluoride and cavity reduction, further validating a 2009 study⁶ from IFS that stated:

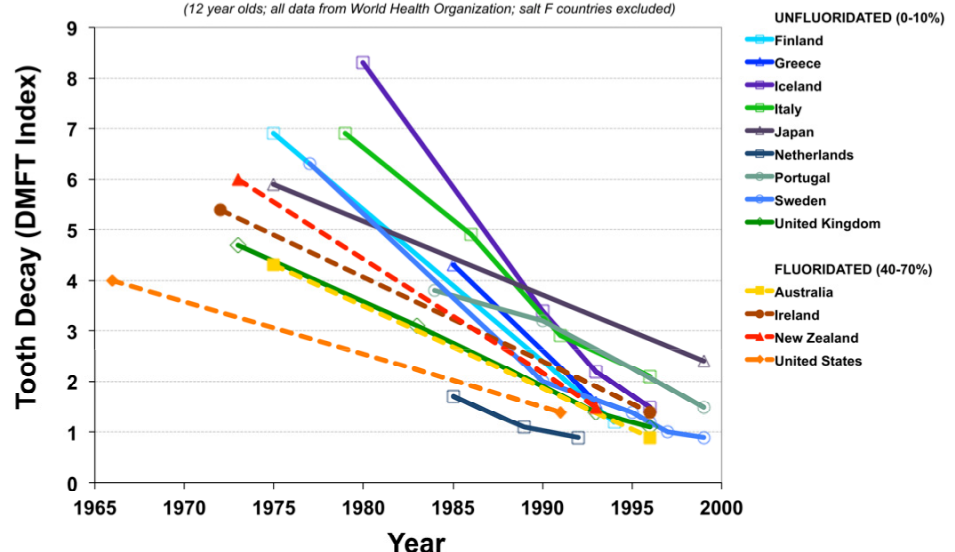
*"... achieving a caries-free status may have relatively little to do with fluoride **intake** (emphasis in the original) ... recommending an 'optimal' fluoride intake is problematic."*

Finally, World Health Organization data show cavity rates in children (age 12) have dropped as much in nations that don't fluoridate (darker solid lines) as in nations that do (red/yellow dotted lines). (See graph)

1. Slade et al, 2018, Journal of Dental Research, <https://www.ncbi.nlm.nih.gov/pubmed/29900806>
2. Cochrane Collaboration, 2015, https://www.cochrane.org/CD010856/ORAL_water-fluoridation-prevent-tooth-decay
3. CDC, 2018, <https://www.cdc.gov/fluoridation/index.html>
4. Curtis et al, 2018, Journal of Public Health Dentistry, <https://www.ncbi.nlm.nih.gov/pubmed/29752831>
5. Neurath, 2005, Fluoride, <http://www.fluorideresearch.org/384/files/384324-325.pdf>
6. Warren et al, 2009, Journal of Public Health Dentistry, <https://www.ncbi.nlm.nih.gov/pubmed/19054310>

**Tooth Decay Trends:
Fluoridated vs. Unfluoridated Countries**

(12 year olds; all data from World Health Organization; salt F countries excluded)



From: [Yecai Li](#)
To: [Public Submissions](#); [Magliocca, Joe](#)
Cc: [safewatercalgary@gmail.com](#); [Mary Lee](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Sunday, October 20, 2019 10:55:00 PM

Please do NOT add fluoride to city water.

Thank you!

Eric
240 Hawkhill Court NW
Calgary

From: [TREVOR IRONSIDE](#)
To: [Public Submissions](#)
Subject: [EXT] Please do not contaminate Calgary's water with Floride please!
Date: Sunday, October 20, 2019 11:32:05 PM

Sent from my Samsung Galaxy smartphone.

From: [trina listanco](#)
To: [Public Submissions](#)
Subject: [EXT] Please Go Beyond Artificial Water Fluoridation
Date: Sunday, October 20, 2019 11:54:35 PM

Dear City Council,

I hope that You and the broader health and wellness community of professionals and advocates in the City can come together to sincerely address a myriad of pressing public health concerns in the City e.g. mental illness, malnutrition, social isolation, addiction etc.

I ask that you expend our resources and energy BEYOND the contentious and divisive issue of "community water fluoridation".

The indigent, the working poor, the physically challenged Calgarians, like my friends and patients, deserve more than "mass administered" medication, and "short-cut" public health programs.

Please choose to confront the more difficult questions, and set the standard of quality health care in the City. If worsening poverty is the problem, and poor oral health is one of the symptoms, then let us address poverty and improve the health outcomes of ALL Calgarians.

I trust that with your leadership and discernment, the DIGNITY and the health of the poor, and every person in the City will be protected.

And that you will inspire and galvanize Calgarians to truly care and look after for the poorest and the most vulnerable among us.

In health,

Trina Go Listanco MSc. RMT
SW, Calgary

From: [Lb Lb](#)
To: [Public Submissions](#)
Cc: safewatercalgary@gmail.com
Subject: [EXT] Water fluoridation
Date: Monday, October 21, 2019 5:44:51 AM

Good day

My name is Linda Beaudoin I am a concerned Canadian citizen.

I write to ask that you do not fluoridate the water .

I do not want to ingest fluoride

We all have a right to not be forced to drink water while ingesting fluoride.

Reviewing the WIMS Manuel it shows fluoride is toxic material.

I ask why do you take my right away to drink unfluoridated water? There is absolutely no good reason for me to consume fluoridated water for the prevention of cavities as I wear a denture.

Please see enclosed pictures.

Sincerely

Linda Beaudoin





S25547.pdf



Effective date : 10.24.2014

Sodium Fluoride, Lab Grade

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : Sodium Fluoride, Lab Grade

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25547

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:



Irritant

Skin irritation, category 2
Eye irritation, category 2A



Toxic

Acute toxicity (oral, dermal, inhalation), category 3

Hazards Not Otherwise Classified - Combustible Dust

Acute toxicity - Oral - Acute Tox. 3

Skin corrosion/irritation - Skin Irrit. 2

Serious Eye Damage/Eye Irritation - Eye Irrit. 2

HNOC: Contact with acids liberates very toxic gas

Signal word : Danger

Hazard statements:

Causes skin irritation

Causes serious eye irritation

Toxic if swallowed

Precautionary statements:

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Do not eat, drink or smoke when using this product

Wash skin thoroughly after handling

Wear protective gloves/protective clothing/eye protection/face protection

Specific treatment (see supplemental first aid instructions on this label)

Rinse mouth

From: [Carol Wells](#)
To: [Public Submissions](#)
Subject: [EXT] FLUORIDATION SUBMISSION - Our Kids Don't Want Dental Fluorosis
Date: Monday, October 21, 2019 6:40:52 AM

PUBLIC SUBMISSION

RE: FLUORIDATION SUBMISSION - Our Kids Don't Want Dental Fluorosis

Dear PUBLIC SUBMISSION,

Dear Mayor and Council,

If you fluoridate our drinking water you will absolutely increase dental fluorosis rates significantly. Numerous studies show this, including the Cochrane Collaboration's review of water fluoridation.

The CDC reported that in 2010, the dental fluorosis rates in the U.S. were over 40% of teens. The CDC reported this year that the rate has increased to 61% as more children are already overexposed to fluoride from toothpaste:

Children with dental fluorosis can suffer significant embarrassment and anxiety over the appearance of their teeth. No matter how much they might brush and floss, the fluorosis stains do not go away. In cases of severe fluorosis, a child may be perceived as having “dirty” or “rotten” teeth, which can cause significant damage to a child’s self esteem and emotional well-being. Even “mild” fluorosis — particularly when present on the front two teeth — can be highly objectionable. https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_studies_dental-5Ffluorosis04b_&d=DwIFaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=EDCiCuzOOFK8p7LprchDGXLE902sOt22alQMe-R2nP4&s=cJgYSEyS4FeZ89Ud1dyiJWEvAOCgew5JYePT0Q-3EV4&e=

The teeth are not the only tissue in the body that accumulate fluoride (the bones, pineal gland, and arteries accumulate it as well). There is no apparent reason, therefore, why fluoride’s effects on the body will be limited to the teeth.

As noted by Dr. Hardy Limeback, “it is illogical to assume that tooth enamel is the only tissue affected by low daily doses of fluoride ingestion.” According to the late Dr. John Colquhoun, “Common sense should tell us that if a poison circulating in a child’s body can damage the tooth-forming cells, then other harm also is likely.”

Thank you.

Sincerely,
Carol Wells

Hamilton, ON

From: [Hanle](#)
To: [Public Submissions](#)
Subject: [EXT] "Submission for Hearing on Water Fluoridation"
Date: Monday, October 21, 2019 7:00:58 AM
Attachments: [Fluoride - the Deadly Legacy.doc](#)

To the Council Members of the city of Calgary

I have been researching the research of Fluoridation for the past 50 years, which has led me to the conclusion and conviction that Calgary must not legislate mandatory Fluoridation of its water supply ever again..

Mandatory mass medication, dictated by bureaucrats (who are ignorant of the science or its history, and/or routinely ignore the scientific literature), is an outrageous violation of human rights and medical practice, and encompasses all of the attributes of ‘inescapable Dictatorship’ - **It is “evil and dangerous” beyond description.**

Increasingly, **DICTATORSHIP is riding in on the Medical Horse.** These imposed practices cannot be tolerated in any civilized, democratic society. The practice of medicine and the use of therapeutics must always be an **individual matter**, and include **informed consent**.

By what rational are bureaucrats given the right to mandate “mass medication”. - or to “inflict medication” on a defenseless public.

There is no legitimate “science” - and there has never been any legitimate “science” - to validate the “science fiction” that fluoride is an essential nutrient that contributes to health; This “myth” survives through the ongoing perpetuation of “Truth Decay”.

Citizens are sick and tired of being MADE “sick and tired” via enforced mandatory medication, legislated by corporate/government sponsored, propagandized manipulations and fabrications, to get the public to “accept the unacceptable”.

Fluoridating Calgary again cannot be ranked as anything other than a “crime against humanity”.

Please note: In the environment, the crumbling of unrepairable, brittlized teeth of fluoride-exposed animals is one of the first visible effects of the fluoride poisoning of their environment.

80 years ago, Fluoridation was the decided-upon Solution to a “Pollutant Disposal Problem”, where the fluoride component of minerals had to be removed – examples, aluminum, uranium, phosphorous, - from most minerals needed in the industrial, technological age.

Fluoride in the “free state” proved to be not only extremely toxic, but non-disposable or storable, since it ate through every known container material. (*Today, teflon, that is not attacked being a fluoride compound, is being used to line storage containers.*)

The Solution arrived at by the industries’ research institute – the Melon Institute – was to reverse the then “health practice” of DEfluoridating drinking water to 1 ppm, and to then disperse the fluoride into the watershed at the “then acceptable concentration of 1 ppm”.

The “permissible” 1 ppm became the “essential” 1 ppm.

In order to implement the program of dispersing this very toxic fluoride into the environment, the public had to be sold “a bill of goods” to convince them that ingesting this poison - **with a toxicity quotient between lead and arsenic** - “was not only “good for them, but essential for good teeth.”

- witness the wave of the magical wand and the creation of the “fairytale myth of preventing tooth decay with “TRUTH DECAY”.

The job of devising this strategy was given to Edward Bernay – the Father of PR –

programmed rhetoric designed to manipulate. **Please fully digest the modus operandi and its implications.**

Bernay wrote:

"The conscious and intelligent manipulation of the organized habits and opinions of the masses must be done by experts, the public relations counsels' (Bernay invented the term)

- . . . they are the **invisible rulers** who control the destinies of millions . . .
- . . . the most direct way to **reach the herd** is through the **leaders**. For, if the group leaders accept our ideas, **the group they dominate will respond** . . .
- . . . all this **must be planned** . . . **indoctrination must be subtle.**

It should be worked into the everyday life of the people - 24 hours a day, in a hundred ways . . .

- . . . **A redefinition of ethics is necessary . . . the subject matter of the propaganda need not necessarily be true."**

The Dental Association was persuaded to indoctrinate and regulate its "members" into believing that it is acceptable to "poison the body" with fluoride in order to "hypothetically" prevent cavities. It tenaciously clings to that "religion" - "belief doctrine" - to this day, hence the pressure to re-fluoridate Calgary's water, after it had thankfully earlier succeeded in removing this toxin from its water supply.

However the results of programs that "destroy health" cannot be permanently denied and silenced because **the TRUTH of the after-effects continues to "stare us in the face"**.

Truth, like a buoy, will always bob back up to the surface, no matter how often or how strenuously it is submerged under water.

No matter how often "fluoride" is declared to be an essential nutrient, the symptoms of "systemic fluoride poisoning", metabolic and endocrine disruption, skeletal stenosis and bone deformations, the dumbing-down neurological destruction that lowers IQ levels, etc. continue to manifest with ever-increasing frequency and intensity.

Society is suffering from "new diseases", which have to be forever "officially classified" as being of "unknown causes". God forbid that the "true sources" be acknowledged.

Fluoridation always was, and continues to be, the inexcusable, unconscionable poisoning of a population and the environment, in order to accommodate corporate agendas - using **"Science by Declaration"** (scientism) in contradiction to "science based on evidence and fact".

Fluoridation was originally the-decided-upon "Dilution Solution to Pollution" that **was willing to accept** poisoning the health of the population under the concocted guise of "preventing tooth decay", **as unavoidable, hence acceptable, collateral damage.**

Over 50% of the children in fluoridated cities develop mottled teeth – the most visible symptom of fluoride poisoning.

Dr. Dean Burk of the National Cancer Institute demonstrated decades ago that statistically the cancer rate explodes exponentially two years after the implementation of fluoridation.

No research to prove "**safety**" was done;

No research to prove "**efficacy**" was done prior to implementation;

and all post-implementation evolving science from astute independent scientists and physicians of impeccable integrity has been vigorously attacked, vilified, denounced, ignored, and the researchers publicly attacked, vilified, denigrated, demoted, and silenced.

Additionally pressure is being exerted -and propagandized - that only those researchers compliant with, and subservient to, the "official agenda" - *no matter how fabricated and falsified* – should be funded.

We are traveling down a very dangerous path!

Mandatory Medication is an Assault on an individual's health, and the individual's sovereignty over his/her own body.

Forced Medication without Informed Consent is internationally illegal according to the

Nuremberg Code.

“Whoever usurps the right to Protect us completely “OWNS us completely”

“Owning a person” is the definition of “slavery” - and “mandatory medication” is the modern version of enslavement.

Dictatorship is indeed “riding in on the Medical Horse”.

As long as the Fluoride TRUTH is criminalized and we continue to fluoridate drinking water, fluoride poisoning symptoms will persist and escalate.

How the bureaucrats and the public were bamboozled and fooled into accepting Fluoridation in the 1950s is documented and understood, but “mandating the ingestion of fluoride” – a very toxic element – **today**, as an “essential therapy” after over 70+ years of research detailing its health-destructive properties is **inconceivably criminal**.

We cannot under any circumstances still accept the imposition of the “Dilution Solution to Pollution” under the disguise of preventing tooth cavities., or any other excuse.

As Edward Bernay explained -

“The conscious and intelligent manipulation of the organized habits and opinions of the masses must be done by experts, the public relations counsels’ (Bernay invented the term)

- . . . they are the **invisible rulers** who control the destinies of millions . . .
- . . . the most direct way to **reach the herd** is through the **leaders**. For, if the group leaders accept our ideas, **the group they dominate will respond . . .**
- . . . all this **must be planned . . . indoctrination must be subtle.**

It should be worked into the everyday life of the people - 24 hours a day, in a hundred ways . . .

- . . . A redefinition of ethics is necessary . . . the subject matter of the propaganda need not necessarily be true.”

Citizens are praying that the “voting politicians” in Calgary will vote with their conscience and on validated science , and not succumb once again to the propaganda of the DA, or become compliant regurgitating parrots of an “invented scientism” - allegiance to the “religion” with Technocracy’s doctrines and dogmas.

Vote NO to allowing Calgary to be re-Fluoridated – or any other city.

Thank You,

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Fluoride: The Deadly Legacy

by Gary Null, Ph.D.

There's nothing like a glass of cool, clear water to quench one's thirst. But the next time you or your child reaches for one, you might want to question whether that water is in fact, too toxic to drink. If your water is fluoridated, the answer may well be yes.

For decades, we have been told a lie, a lie that has led to the deaths of hundreds of thousands of Americans and the weakening of the immune systems of tens of millions more. This lie is called fluoridation. A process we were led to believe was a safe and effective method of protecting teeth from decay is in fact a fraud.

In recent years it has been shown that fluoridation is neither essential for good health nor protective of teeth. What it *does* do is poison the body. Thus, some fundamental questions arise: 1) how is it possible that the public has all been misled? 2) why does public health policy and the American media continue to live with and perpetuate this scientific sham?

This History of Fluoride, a Toxic Waste

"We would not purposely add arsenic to the water supply. And we would not purposely add lead. But we do add fluoride. The fact is that fluoride is more toxic than lead and just slightly less toxic than arsenic."¹

These words of Dr. John Yiamouyiannis may come as a shock to you because, if you're like most Americans, you have positive associations with fluoride. You may envision tooth protection, strong bones, and a government that cares about your dental needs. What you may not know is that the fluoride added to drinking water and toothpaste is a crude industrial waste product of the aluminum and fertilizer industries, and a substance toxic enough to be used as rat poison. How is it that Americans have learned to love an environmental hazard? This phenomenon can be attributed to a carefully planned marketing program launched even before Grand Rapids, Michigan, became the first community to officially fluoridate its drinking water in 1945.² As a result of this ongoing campaign, nearly two-thirds of the nation has enthusiastically followed Grand Rapids' example. But this push for fluoridation has less to do with a concern for America's health than with industry's penchant to expand at the expense of our nation's well-being.

What is Fluoride? Many people associate fluoride with its periodic table namesake, *fluorine*. While fluorine is an element (a gas that is frequently listed as a trace mineral and human nutrient), fluoride is very different. Fluoride is a compound of fluorine, and while fluorine is one of earth's natural elements, fluoride is a chemical byproduct ("chemical byproduct" = toxic waste) of aluminum, phosphate, cement, steel, and nuclear weapons manufacturing.³ Its toxicity was recognized at the beginning of the Industrial Revolution, when, in the 1850s iron and copper factories discharged it into the air and poisoned plants, animals, and people.⁴

In the early years of the 20th Century, a young dentist named Frederick McKay settled in Colorado Springs, Colorado. There he discovered that as many as 90% of lifetime residents of the town had grotesque brown stains on their teeth, and that the tooth enamel had an irregular surface texture described as "mottled". Locals referred to the familiar condition as Colorado Brown Stain, but no one had a clue as to its cause. Over the next two decades Dr. McKay, later with the help of dental researcher G. V. Black, proved that the cause was something contaminating the water supply. They also speculated that the affected teeth might be somewhat more resistant to decay.⁵

By the 1920's, rapid industrial growth had exacerbated the problems of industrial pollution, and fluoride was one of the biggest problems. Medical writer Joel Griffiths explains that "it was abundantly clear to both industry and government that spectacular U.S. industrial expansion -- and the economic and military power and vast profits it promised -- would necessitate releasing millions of tons of waste fluoride into the environment."⁶ Their biggest fear was that "if serious injury to people were established, lawsuits alone could prove devastating to companies, while public outcry could force industry-wide government regulations, billions in pollution-control costs, and even mandatory changes in high-fluoride raw materials and profitable technologies."⁷

In 1931, by means of photo-spectrographic analysis of McKay and Black's water samples conducted at the laboratories at the Aluminum Company of America (ALCOA), it was confirmed that the cause of the mottled teeth was fluoride in the water supply. ALCOA took a proprietary interest in this issue, since fluoride is a major waste product of aluminum production. The company wanted to know how much fluoride exposure people could tolerate without getting mottled, discolored teeth. Or, more specifically, how much fluoride could ALCOA release into the nation's earth, water, and air without the public realizing that the company was polluting the environment with a powerful toxin?⁸

That question was to be addressed later that same year, when H. Trendley Dean was sent to study water sources in 345 Texas communities. Dean, a former dental surgeon for the US Public Health Service, was then head of the Dental Hygiene Unit of the National Institute of Health. (Dean's overseer and mentor at the USPHS had been Treasury Secretary Andrew W. Mellon, a founder and major stockholder of ALCOA.) Based on his own research, Dean claimed that "fluoride levels of up to 1.0 ppm in drinking water did not cause mottled enamel; if the fluoride exceeded this level, however, fluorosis would occur."⁹

Dean, while establishing the threshold for fluoridation, also explored the idea that fluorosis victims mottled, discolored teeth were especially decay resistant. Dean suspected that 1ppm of fluoride added to the water supply would prevent tooth decay, while avoiding damage to bones and teeth.¹⁰ He recommended further studies to determine whether his hypothesis was true.

According to Griffiths, the news that adding fluoride to the water supply for improved dental health was "galvanic", particularly to the Mellon Institute (ALCOA's Pittsburgh industrial research lab). Consequently, they initiated their own research. Biochemist Gerald J. Cox immediately fluoridated some lab rats in a study and concluded that fluoride reduced cavities and that: "The case should be regarded as proved." In a historic moment in 1939, the first public proposal that the U.S. should fluoridate its water supplies was made not by a doctor, or dentist, but by Cox, an industry scientist working for a company threatened by fluoride damage claims and burdened by the odious expense of disposing of tons of toxic industrial waste. Cox began touring the country, campaigning for fluoridation.¹¹

Dean, meanwhile, continued his research and became the authority on public water fluoridation. He became the first dental scientist at the National Institute of Health, advancing to director of the dental research section in 1945. After World War II, he directed epidemiological studies for the Army in Germany. When Congress established the National Institute of Dental Research (NIDR) in 1948, Dean was appointed its director, a position he held until retiring in 1953.¹² In his post at the NIDR, oversaw the first clinical trial of fluoridation in an American city: Grand Rapids, Michigan.¹³

With Dean's impressive credentials, it is easy to assume—and many do—that his findings were scientifically sound. Unfortunately, Dean's "science", when placed under further scrutiny, is shaky, not solid; biased, not impartial, and above all, hardly a standard sound enough to launch mass fluoridation. An independent study of his results revealed that he had engaged in "selective use of data," employing figures from 21 cities that confirmed his findings, and ignoring those from 272 other localities that didn't.¹⁴ In a 1955 court case challenging fluoridation, Dean admitted under oath that his published conclusions were wrong.¹⁵ In hearings conducted by the AMA in 1957, he was forced to admit that dental fluorosis, the first sign of fluoride overdose, could be caused by water fluoridated at 1.0 ppm.¹⁶ Shockingly, these admissions were not widely publicized, and they were never acknowledged by the USPHS, the American Dental Association, or the other governmental bodies responsible for foisting fluoride on the public. Consequently, this dangerous industrial waste carcinogenic is still dumped in our water today.

At first, industry could dispose of fluoride legally only in small amounts by selling it to insecticide and rat poison manufacturers.¹⁷ But Dean's "discovery," paved the way for a commercial outlet for the toxin. Griffiths writes that this was not a scientific breakthrough, but rather part of a "public disinformation campaign" by the aluminum industry "to convince the public that fluoride was safe and good," Industry's need prompted Alcoa-funded scientist Gerald J. Cox to announce that "The present trend toward complete removal of fluoride from water may need some reversal."¹⁸ Griffiths writes:

"The big news in Cox's announcement was that this 'apparently worthless by-product' had not only been proved safe (in low doses), but actually beneficial; it might reduce cavities in children. A proposal was in the air to add fluoride to the entire nation's drinking water. While the dose to each individual would be low, 'fluoridation' on a national scale would require the annual addition of hundreds of thousands of tons of fluoride to the country's drinking water.

"Government and industry - especially Alcoa - strongly supported intentional water fluoridation... [It] made possible a master public relations stroke - one that could keep scientists and the public off fluoride's case for years to come. If the leaders of dentistry, medicine, and public health could be persuaded to endorse fluoride in the public's drinking water, proclaiming to the nation that there was a 'wide margin of safety,' how were they going to turn around later and say industry's fluoride pollution was dangerous?

"As for the public, if fluoride could be introduced as a health enhancing substance that should be added to the environment for the children's sake, those opposing it would look like quacks and lunatics....

"Back at the Mellon Institute, Alcoa's Pittsburgh Industrial research lab, this news was galvanic. Alcoa-sponsored biochemist Gerald J. Cox immediately fluoridated some lab rats in a study and concluded that fluoride reduced cavities and that 'The case should be regarded as proved.' In a historic moment in 1939, the first public proposal that the U.S. should fluoridate its water supplies was made - not by a doctor, or dentist, but by Cox, an industry scientist working for a company threatened by fluoride damage claims."¹⁹

Once the plan was put into action, industry was buoyant. They had finally found the channel for fluoride that they were looking for, and they were even cheered on by dentists, government agencies, and the public. Chemical Week, a publication for the chemical industry, described the tenor of the times when they exclaimed that: "All over the country, slide rules are getting warm as waterworks engineers figure the cost of adding fluoride to their water supplies." The article further explained that the general public quickly adhered to the new trend urged upon them by the U.S. Public Health Service, the American Dental Association, the State Dental Health Directors, various state and local health bodies, and vocal women's clubs from coast to coast. They further wrote that "[fluoridation] adds up to a nice piece of business on all sides and many firms are cheering the PHS and similar groups as they plump for increasing adoption of fluoridation."²⁰

Such overwhelming acceptance allowed government and industry to proceed hastily, albeit irresponsibly. The Grand Rapids experiment was supposed to take 15 years, during which time health benefits and hazards were to be studied. In 1946,

however, just one year into the experiment, six more U.S. cities adopted the process. By 1947, 87 more communities were treated; popular demand was the official reason for this unscientific haste.

The general public and its leaders did support the cause, but only after a massive government public relations campaign spearheaded by Edward L. Bernays, (a nephew of Sigmund Freud). Bernays, a public relations pioneer who has been called "the original spin doctor,"²¹ was a masterful PR strategist. As a result of his influence, Griffiths writes, "Almost overnight...the popular image of fluoride -- which at the time was being widely sold as rat and bug poison -- became that of a beneficial provider of gleaming smiles, absolutely safe, and good for children, bestowed by a benevolent paternal government. Its opponents were permanently engraved on the public mind as crackpots..."²²

Griffiths explains that while opposition to fluoridation is usually associated with right-wingers, this picture is not totally accurate. He provides an interesting historical perspective on the anti-fluoridation stance:

"Fluoridation attracted opponents from every point on the continuum of politics and sanity. The prospect of the government mass-medicating the water supplies with a well-known rat poison to prevent a nonlethal disease flipped the switches of delusionals across the country - as well as generating concern among responsible scientists, doctors, and citizens.

"Moreover, by a fortuitous twist of circumstances, fluoride's natural opponents on the left were alienated from the rest of the opposition. Oscar Ewing, a Federal Security Agency

administrator, was a Truman "fair dealer" who pushed many progressive programs such as nationalized medicine. Fluoridation was lumped with his proposals. Inevitably, it was attacked by conservatives as a manifestation of "creeping socialism," while the left rallied to its support. Later during the McCarthy era, the left was further alienated from the opposition when extreme right-wing groups, including the John Birch Society and the Ku Klux Klan, raved that fluoridation was a plot by the Soviet Union and/or communists in the government to poison America's brain cells.

"It was a simple task for promoters, under the guidance of the 'original spin doctor,' to paint all opponents as deranged - and they played this angle to the hilt....

"Actually, many of the strongest opponents originally started out as proponents, but changed their minds after a close look at the evidence. And many opponents came to view fluoridation not as a communist plot, but simply as a capitalist-style con job of epic proportions. Some could be termed early environmentalists, such as the physicians George L. Waldbott and Frederick B. Exner, who first documented government-industry complicity in hiding the hazards of fluoride pollution from the public. Waldbott and Exner risked their careers in a clash with fluoride defenders, only to see their cause buried in toothpaste ads."²³

By 1950, fluoridation's image was a sterling one, and there was not much science could do at this point. The Public Health Service was fluoridation's main source of funding as well as its promoter, and therefore caught in a fundamental conflict of interest.²⁴ If fluoridation was found to be unsafe and ineffective, and laws were repealed, the organization feared a loss of face, since scientists, politicians, dental groups, and physicians unanimously supported it.²⁵ For this reason, studies concerning its effects were not undertaken. The Oakland Tribune noted this when it stated that "public health officials have often suppressed scientific doubts" about fluoridation.²⁶ Waldbott sums up the situation when he states that from the beginning, the controversy over fluoridating water supplies was "a political, not a scientific health issue."²⁷

The clever marketing of fluoride continued. In a 1983 letter from the Environmental Protection Agency, then Deputy Assistant Administrator for Water, Rebecca Hammer, wrote that EPA's stance on fluoridation: " [the EPA] regards [fluoridation] as an ideal environmental solution to a long-standing problem. By recovering by-product fluosilicic acid from fertilizer manufacturing, water and air pollution are minimized and water utilities have a low-cost source of fluoride available to them."²⁸ More recently, a 1992 policy statement from the Department of Health and Human Services says, "A recent comprehensive PHS review of the benefits and potential health risks of fluoride has concluded that the practice of fluoridating community water supplies is safe and effective."²⁹

Today, nearly 250 million people worldwide drink fluoridated water, including about 130 million Americans in 9600 communities. Out of the 50 largest cities in the US, 41 have fluoridated water.³⁰

To help celebrate fluoride's widespread use, the media recently reported on the 50th anniversary of fluoridation in Grand Rapids. Newspaper articles titled "Fluoridation: a shining public health

success"³¹ and "After 50 years, fluoride still works with a smile"³² painted glowing pictures of the practice. Had investigators looked more closely, though, they might have learned that children in Muskegon, Michigan, a nearby un-fluoridated "control" city, had equal drops in dental decay. Had they looked closer, they would have seen the dangerous truth behind the supposed wonder of fluoride.

The Fluoride Myth Doesn't Hold Water

The big hope for fluoride was its ability to immunize children's developing teeth against cavities. Rates of dental caries were supposed to plummet in areas where water was treated. Yet decades of experience and worldwide research have contradicted this expectation numerous times. Here are just a few examples:

In British Columbia, only 11% of the population drinks fluoridated water, as opposed to 40-70% in other Canadian regions. Yet British Columbia has the lowest rate of tooth decay in Canada. In addition, the lowest rates of dental caries within the province are found in areas that do not have their water supplies fluoridated.³³

According to a Sierra Club study, people in un-fluoridated developing nations have fewer dental caries than those living in industrialized nations. As a result, they conclude that "fluoride is not essential to dental health."³⁴

In 1986-87, the largest study on fluoridation and tooth decay ever was performed. The subjects were 39,000 school children between 5 and 17 living in 84 areas around the country. A third of the places were fluoridated, a third were partially fluoridated, and a third were not. Results indicate no statistically significant differences in dental decay between fluoridated and un-fluoridated cities.³⁵ The benefit to fluoridated communities, if there is any, amounts to 0.6 fewer decayed tooth surfaces per child, which is less than one percent of the tooth surfaces in a child's mouth.³⁶

A World Health Organization survey reports a decline of dental decay in western Europe, which is 98% un-fluoridated. They state that western Europe's declining dental decay rates are equal to and sometimes better than those in the U.S.³⁷

A 1992 University of Arizona study yielded surprising results when they found that "the more fluoride a child drinks, the more cavities appear in the teeth."³⁸

Although all Native American reservations are fluoridated, children living there have much higher incidences of dental decay and other oral health problems than do children living in other U.S. communities.³⁹

A 1999 study of water fluoridation in Italy shows that parents' socioeconomic status, area of residence, and children's sweets consumption are more significant predictors of dental caries than fluoride consumption. The authors conclude that universal fluoridation is an inadequate approach and the decision to fluoridate or de-fluoridate water requires careful epidemiological consideration.⁴⁰

A 2001 article in the Journal of the American Dental Association admits that the fluoride that is swallowed and incorporated into teeth is "insufficient to have a measurable effect" on reducing cavities.⁴¹ This is a stunning admission from the ADA, historically one of the principal supporters and defenders of water fluoridation.

A follow-up of a study of the town of Kuopio, Finland six years after fluoridation was discontinued found no increase in dental caries. The authors conclude that fluoridation was unnecessary to begin with.⁴²

A study comparing prevalence and incidence of caries in 2,994 life-long residents of British Columbia, Canada, in grades 5, 6, 11, 12, found that caries incidence was not different between the still-fluoridating and fluoridation-ended communities.⁴³

In 1997, following the cessation of drinking water fluoridation in La Salud, Cuba, caries prevalence remained at a low level for the 6- to 9-year-olds and appeared to decrease for the 10/11-year-olds. In the 12/13-year-olds, there was a significant decrease while the percentage of caries-free children of this age group had increased from 4.8 (1973) and 33.3 (1982) up to 55.2%.⁴⁴

A 1998 study conducted in New Zealand found that "when the timing of various forms of fluoride supplementation is correlated with the decline in caries, the decline continues beyond the time of maximum population coverage with fluoridated water and fluoridated toothpaste." The authors call for a "reassessment of the fluoride effect."⁴⁵

In contrast to the anticipated increase in dental caries following the cessation of water fluoridation in the German cities Chemnitz (formerly Karl-Marx-Stadt) and Plauen, a significant fall in caries prevalence was observed. This trend corresponded to the national caries decline and appeared to be a new population-wide phenomenon.⁴⁶

A 1999 New York State Department of Health study of 3,500 7-14-year-olds shows that children in fluoridated Newburgh, New York, have no less tooth decay but significantly more dental fluorosis than children from Kingston, New York, which has never been fluoridated. Since 1945, children of the two towns have been examined periodically in order to demonstrate that fluoridation reduces tooth decay. "This new research shows the experiment has failed," the report concludes.⁴⁷ A similar comparison revealed that "In most European countries, where [water fluoridation] has never been adopted, a substantial decline [75%] in caries prevalence has been reported in the last decades".⁴⁸

In light of all the evidence, fluoride proponents now make more modest claims. For example, in 1988, the ADA professed that a 40- to 60% cavity reduction could be achieved with the help of fluoride. Now they claim an 18- to 25% reduction. Other promoters mention a 12% decline in tooth decay.

And other former supporters are even beginning to question the need for fluoridation altogether. In 1990, a National Institute for Dental Research report stated that "it is likely that if caries in children remain at low levels or decline further, the necessity of continuing the current variety and extent of fluoride-based prevention programs will be questioned."⁴⁹ This is a startling claim coming from the very same governmental organization that spearheaded the drive for compulsory water fluoridation.

A 1999 review of literature conducted by Dr. Hardy Limeback, a long-time advocate of water fluoridation in Canada, indicates that the topical effect of fluoride is its primary mechanism for the prevention of dental caries. Swallowing fluoridated water is ineffective and unnecessary. Limeback concludes that everyone working in the dental health field must examine more closely the risks and benefits of fluoride in all its delivery forms.⁵⁰ According to Dr. Limeback, head of

preventive dentistry at the University of Toronto, 'Dental decay rates in North America are so low that water fluoridation provides little to no benefit whatsoever these days. In fact, studies show that when you turn the water fluoridation taps off and

look for dental decay rates, they don't move whatsoever. There is no increase in dental decay when you stop fluoridating.⁵¹ Limeback adds that what you do see is an increase in unsightly dental fluorosis.⁵² Today fluorosis occurs on two or more teeth in 30% of children in areas where the water is fluoridated, and not all in its mildest form.⁵³

In a letter published in 1999, dentist and public health official Dr. John Colquhoun, formerly one of New Zealand's most prominent pro-fluoridation advocates and educators, explains how over the course of years he came to recognize that there was no benefit in water fluoridation, and that children's dental health is slightly better in non-fluoridated areas than in fluoridated ones.⁵⁴ As another sign of the growing disillusionment with fluoridation, the National Institutes of Health conducted an intensive review of the data supporting fluoride in tap waters, looking at over 560 studies, and expressed in a 2001 news release their disappointment in "the overall quality of the clinical data that it reviewed. According to the panel, far too many studies were small, poorly described, or otherwise methodologically flawed."⁵⁵

Most government agencies, however, continue to ignore the scientific evidence and to market fluoridation by making fictional claims about its benefits and pushing for its expansion. For instance, according to the U.S. Department of Health and Human Services, "National surveys of oral health dating back several decades document continuing decreases in tooth decay in children, adults and senior citizens. Nevertheless, there are parts of the country and particular populations that remain without protection. For these reasons, the USPHS...has set a national goal for the year 2000 that 75% of persons served by community water systems will have access to optimally fluoridated drinking water; currently this figure is just about 60%. The year 2000 target goal is both desirable and yet challenging, based on past progress and continuing evidence of effectiveness and safety of this public health measure."⁵⁶

This statement is flawed on several accounts. First, as we've seen, research does not support the effectiveness of fluoridation for preventing tooth disease. Second, purported benefits are supposedly for children, not adults and senior citizens. At about age 13, any advantage fluoridation might offer comes to an end and less than 1% of the fluoridated water supply reaches this population.⁵⁷ And third, fluoridation has never been proven safe. On the contrary, numerous studies directly link fluoridation to disease, including skeletal fluorosis, dental fluorosis, thyroid disorders, brain and kidney damage, Alzheimer's disease, lead poisoning, and several rare forms of cancer. This alone should force us to reconsider its use.

Biological Safety Concerns

Only a small margin separates supposedly beneficial fluoride levels from amounts that are known to cause adverse effects. Dr. James Patrick, a former antibiotics research scientist at the National Institutes of Health, describes the predicament:

"[There is] a very low margin of safety involved in fluoridating water. A concentration of about 1 ppm is recommended. ...in several countries, severe fluorosis has been documented from water

supplies containing only 2 or 3 ppm. In the development of drugs... we generally insist on a therapeutic index (margin of safety) of the order of 100; a therapeutic index of 2 or 3 is totally unacceptable, yet that is what has been proposed for public water supplies."⁵⁸

Other countries argue that even 1 ppm is not a safe concentration. Canadian studies, for example, imply that children under three should have no fluoride whatsoever. The Journal of the Canadian Dental Association states that "fluoride supplements should not be recommended for children less than 3 years old."⁵⁹ Since these supplements contain the same amount of fluoride as water does, they are basically saying that children under the age of three shouldn't be drinking fluoridated water at all, under any circumstance. Japan has reduced the amount of fluoride in their drinking water to one-eighth of what is recommended in the U.S. Instead of 1 milligram per liter, they use less than 15 hundredths of a milligram per liter as the upper limit allowed.⁶⁰

The 1 ppm dosage recommendation for water fluoridation has a checkered past, and its present is even more so. As we have seen, the first mention of this "magic" number was made by Dr. Trendley Dean, who juggled his results to reach the conclusion that "fluoride levels of up to 1.0 ppm in drinking water did not cause mottled enamel; if the fluoride exceeded this level, however, fluorosis would occur."⁶¹

But the adoption of this dosage for water fluoridation was not Dean's brainchild. It was set in 1953 by Dr. Harold C. Hodge, Ph.D., then chairman of the US National Academy of Sciences committee on toxicology. Unfortunately, Dr. Hodge made a serious miscalculation in his estimate of the safe dosage level for fluoride. His figures err by a factor of 2.25, which means that they understate the toxicity of fluoride considerably. The story of this potentially fatal miscalculation is told in a document from the UK National Pure Water Association:

"It is important when any new drug is marketed that the dose at which it is toxic is determined. There is then a margin allowed for safety (usually a factor of 100) and a maximum dose is published. In 1953 the National Academy of Sciences published their estimate of the quantity of fluoride which produces the condition known as crippling skeletal fluorosis. The calculation was done by a famous toxicologist, Harold C. Hodge, Ph.D., who was chairman of the US National Academy of Sciences (NAS) committee on toxicology.

To arrive at his figures, Hodge cited a classic study of the effects of fluoride among cryolite workers by a European researcher, Kaj Roholm, and published in 1937. Roholm's dosage figures were presented in milligrams of fluoride per kilogram of body weight. In his study, Roholm showed that at levels of 0.2 to 0.35mg/kg some workers developed crippling skeletal fluorosis in a very short time. The first stage of the disease appeared, in general, after 2 1/2 years; Stage two was reached by 4 1/2 years; and crippling skeletal fluorosis appeared after 11 years."⁶²

Hodge wanted to apply Roholm's figures to a typical range of body weights in order to set a maximum intake level in milligrams per day. But Hodge was American and used to dealing in pounds rather than kilograms. By using a range of body weights from 100 to 229 pounds, he multiplied the 0.2 mg figure by 100 pounds, giving a figure of 20 mg/day; and 0.35 mg by 229

pounds yielded 80 mg/day. Thus the amounts of fluoride which would cause crippling skeletal fluorosis, he said, were 20mg to 80mg per day. And rather than quote Roholm's eleven year figure for crippling fluorosis, he gave a range of 10 to 20 years. These are the figures that appear in the American Dental Association's pamphlet, Fluoridation Facts, and on which many other articles are based, even today.

But Hodge made a simple but significant error. Roholm's figures were not for pounds. They were milligram per kilogram figures. Unfortunately, Hodge was the expert and no-one, apparently, checked his figures. This error, which gave a false safety margin more than double what it should have been went unnoticed for many years until anti-fluoride campaigner, Darlene Sherrell tried to duplicate Hodge's arithmetic and couldn't make it add up. She worked out that Hodge had made an error when he neglected to convert pounds to kilograms.

Correcting for this error, Sherrell reduced the amount of fluoride needed to be crippling to 10 to 25 milligrams per day, for 10 to 20 years.

But fluorides accumulate throughout our lives so a higher intake will have the same effect in a shorter time, and smaller doses will have the same effect in a longer time. If we apply Roholm's dosage figures to a lifetime of 55 to 96 years, just 1 mg per day (the amount in one liter of water) for each 55 pounds of body weight could be a crippling dosage.

The NAS Admits It Was Wrong

In 1989 Sherrell wrote to the NAS and asked on what they based their 20 to 80 mg/day figures. Two years passed before the Academy told her that they had identified Hodge's interpretation of Roholm as the data source.

Four years later the error was finally corrected by the National Research Council's Board on Environmental Studies and Toxicology in their 1993 publication, *Health Effects of Ingested Fluoride* where they changed the figure from 20-80mg/day to 10-20mg/day.⁶³

As it happens, Hodge had written a chapter in a book released in 1979 entitled *Continuing Evaluation of the Use of Fluorides*. In it Hodge had corrected his previously published figures. But nobody seemed to notice. In 1991, when the US Department of Health and Human Services published their Review of Fluoride: Benefits and Risks, they continued to use figures of 20-80 mg/day as the 'crippling daily dose of fluoride'. As, indeed does the current RDA and Dietary Reference Intakes published by the Institute of Medicine in 1997.

Myths are Very Hard to Dislodge

We can get a good idea of how much fluoride is safe by working with Roholm's figures. You will remember that after the figures had been corrected, the amount needed to cause crippling fluorosis in a 100 to 229 lb person was reckoned to be 10 to 20 mg per day for 10 to 20 years. Since fluorides accumulate in a linear fashion, the crippling dosage of 10 mg per day for 10 years is the same as 5 mg per day for 20 years, and so on. If we extrapolate this to a normal lifetime with fluoridated water this is the same as 2.5 to 5 mg per day for 40 to 80 years. But we should

note that, for persons with kidney disease, the risk is greater because less fluoride will be eliminated by their malfunctioning kidneys.

It is also important to note that these figures are for crippling fluorosis, the last stage. It will take only four years at 10 mg/day, or sixteen years at 2.5 mg per day before a 100 pound individual can expect to experience phase 2, musculo-skeletal fluorosis, with chronic joint pain and arthritic symptoms - with or without osteoporosis. That is the amount of fluoride found in just 2 1/2 liters of water. And that's without counting the extra that today is inevitably found in foods, toothpaste, et cetera

From this it is clear that the only safe limit for fluoride is *none*.

Even supposing that low concentrations are safe, there is no way to control how much fluoride different people consume, as some take in a lot more than others. For example, laborers, athletes, diabetics, and those living in hot or dry regions can all be expected to drink more water, and therefore more fluoride (in fluoridated areas) than others.⁶⁴ Due to such wide variations in water consumption, it is impossible to scientifically control what dosage of fluoride a person receives via the water.⁶⁵

In "50 Reasons to Oppose Fluoridation,"⁶⁶ Paul Connett, Ph.D., Professor of Chemistry at St. Lawrence University (NY) states that the supposedly safe fluoride levels in our water may pose a particular danger for any of the millions of people who suffer from thyroid disorders. He explains:

"Earlier in the 20th century, fluoride was prescribed by a number of European doctors to reduce the activity of the thyroid gland for those suffering from hyperthyroidism (over active thyroid)."⁶⁷

With water fluoridation, we are forcing people to drink a thyroid-depressing medication which could serve to promote higher levels of hypothyroidism (under active thyroid) in the population, and all the subsequent problems related to this disorder. Such problems include depression, fatigue, weight gain, muscle and joint pains, increased cholesterol levels, and heart disease.

It bears noting that according to the Department of Health and Human Services (1991) fluoride exposure in fluoridated communities is estimated to range from 1.58 to 6.6 mg/day, which is a range that actually overlaps the dose (2.3 - 4.5 mg/day) shown to decrease the functioning of the human thyroid.⁶⁸ This is a remarkable fact, and certainly deserves greater attention considering the rampant and increasing problem of hypothyroidism in the United States. (In 1999 the second most prescribed drug of the year was Synthroid, a hormone replacement drug, which is used to treat an under active thyroid.) More than twenty million people in the U.S. receive treatment for thyroid problems and many others are thought to go undiagnosed.⁶⁹

Today, 90% of the fluoride added to our drinking water is no longer a natural sodium fluoride compound. Today's fluoride is industrial waste that is complexed with silica or sodium. "Fluoride complexed with silica or sodium is readily ionized to free fluoride ions that are quickly absorbed in the gastrointestinal tract, whereas, when chemically bound to calcium, less of it ionizes and

less is absorbed. Calcium inhibits fluoride absorption and is, in fact, the treatment of choice for fluoride ingestion overdoses."⁷⁰

Another concern is that fluoride is not found only in drinking water; it is everywhere. Fluoride is found in foods that are processed, which, in the United States, include nearly all bottled drinks and canned foods.⁷¹ Researchers writing in The Journal of Clinical Pediatric Dentistry have found that fruit juices, in particular, contain significant amounts of fluoride. In a recent study, a variety of popular juices and juice blends were analyzed and it was discovered that 42% of the samples examined had more than 1 ppm of fluoride, with some brands of grape juice containing much higher levels - up to 6.8 ppm! The authors cite the common practice of using fluoride-containing insecticide in growing grapes as a factor in these high levels, and they suggest that the fluoride content of beverages be printed on their labels, as is other nutritional information.⁷² Considering how much juice some children ingest, and the fact that youngsters often insist on particular brands that they consume day after day, labeling seems like a prudent idea.

Clean water activist Jeff Green points out that fluoride is "in Wheaties at 10 ppm, 10 times the amount that you find in water. It's in Post Grape Nuts and Shredded Wheat and Fruit Loops. These are items that people are eating all the time without realizing that it has fluoride in it. Because it's a pesticide residue that's allowed to be on produce now it's taken a big jump and the EPA has allowed it to be at really high levels, 180 ppm on a head of lettuce, 55 ppm on raisins. I mean no child is going to wash all that off."⁷³

Prepared baby foods are a problem, too. A 1997 article in the Journal of the American Dental Association⁷⁴ warns that some baby foods contain such high levels of fluoride that babies who eat the food risk dental fluorosis. "Any infants who regularly eat more than a couple of ounces of infant foods containing high-fluoride-content chicken would be at elevated fluorosis risk," the authors conclude.⁷⁵ Infants who eat large quantities of dry infant cereals reconstituted with fluoridated water could ingest substantial quantities of fluoride from this source, this study shows. "Children should also be monitored to make sure that they do not ingest too much fluoride from other sources such as fluoride dentifrice, dietary fluoride supplements or fluoridated water...."⁷⁶

Fluoride exposure during infancy can be expected to increase risk of fluoride-related illness, since a recent study shows that the first year of life is the most critical period for fluoride exposure. Children exposed during the first year of life, and to a lesser extent in the second year, are far more likely to develop fluorosis than those whose exposure begins later. The early mineralizing teeth-the central incisors and first molars-are most likely to be affected.⁷⁷

This is confirmed by a recent study of fluorosis risk. "There is substantial evidence that fluoridated water, fluoride supplements, infant formulas, and fluoride toothpastes are risk factors for fluorosis," alone and together, reports Ohio State University researcher Dr. Ana Karina Mascarenhas.⁷⁸

A recent study of fluoridated and non-fluoridated communities in Brazil proved that fluoride toothpaste contributes to fluorosis. In the study, children who started using fluoride before the

age of three were 4.43 times more likely to have dental fluorosis than those who started using it after the age of three.⁷⁹

Dr. Connett observes that "the level of fluoride put into water (1 ppm) is 100 times higher than normally found in mothers' milk (0.01 ppm). There are no benefits, only risks, for infants ingesting this heightened level of fluoride at such an early age (this is an age where susceptibility to environmental toxins is particularly high)."⁸⁰

Fluorosis gets worse as a child approaches puberty, according to study done in Norway. The study showed a significant increase in the severity of fluorosis with increasing age in a high fluoride community, whereas no change in severity with age was observed in a low fluoride community. Fluorosis resulting from high fluoride content of drinking water increases between the ages of ten and fourteen.⁸¹

But beyond this is the larger issue that this study brings up: Is it wise to subject children and others who are heavy juice drinkers to additional fluoride in their water?

Here's a little-publicized reality: Cooking can greatly increase a food's fluoride content. Peas, for example, contain 12 micrograms of fluoride when raw and 1500 micrograms after they are cooked in fluoridated water, which is a tremendous difference. Furthermore, fluoride is an ingredient in pharmaceuticals, aerosols, insecticides, and pesticides.

And of course, toothpastes. It's interesting to note that in the 1950s, fluoridated toothpastes were required to carry warnings on their labels saying that they were not to be used in areas where water was already fluoridated. Crest toothpaste went so far as to write: "Caution: Children under 6 should not use Crest." These regulations were dropped in 1958, although no new research was available to prove that the overdose hazard no longer existed. Today, common fluoride levels in toothpaste are 1000 ppm. Research chemist Woodfun Ligon notes that swallowing a small amount adds substantially to fluoride intake. Dentists say that children commonly ingest up to 0.5 mg of fluoride a day from toothpaste.⁸²

Dr. Hardy Limeback cites studies conducted by the toothpaste manufacturers showing that children under the age of six typically swallow as much as 60 percent of the toothpaste that goes into their mouths. "The warning labels, in my personal opinion, are there to get them off the hook in the next ten years. People who have been exposed to too much fluoride ingestion before the tubes were labeled have a case against the toothpaste companies. They weren't told that a lifetime of fluoride ingestion may be harmful."⁸³

Which begs the question: How safe is all this fluoride? According to scientists and informed doctors, such as Dr. John Lee, it is not safe at all. Dr. Lee first took an anti-fluoridation stance back in 1972, when as chairman of an environmental health committee for a local medical society, he was asked to state their position on the subject. He stated that after investigating the references given by both pro- and anti-fluoridationists, the group discovered three important things:

"One, the claims of benefit of fluoride, the 60% reduction of cavities, was not established by any of these studies. Two, we found that the investigations into the toxic side effects of fluoride have not been done in any way that was acceptable. And three, we discovered that the estimate of the amount of fluoride in the food chain, in the total daily fluoride intake, had been measured in 1943, and not since then. By adding the amount of fluoride that we now have in the food chain, which comes from food processing with fluoridated water, plus all the fluoridated toothpaste that was not present in 1943, we found that the daily intake of fluoride was far in excess of what was considered optimal."⁸⁴

What happens when fluoride intake exceeds the optimal? The inescapable fact is that this substance has been associated with severe health problems, ranging from skeletal and dental fluorosis to bone fractures, to fluoride poisoning, and even to cancer.

Dental Fluorosis

The publication *Health Effects of Ingested Fluoride*, put out by the National Academy of Sciences, reports that in areas with optimally fluoridated water (1 ppm, either natural or added), dental fluorosis levels in recent years ranged from 8 to 51%. Recently, a prevalence of slightly over 80% was reported in children 12-14 years old in Augusta, Georgia.⁸⁵ Other research gives higher figures. In a report entitled "Trends in Prevalence of Dental Fluorosis in North America," studies found that 35% to 60% of people living in fluoridated communities experience dental fluorosis, while non-fluoridated areas figure from 20% to 45%.⁸⁶

Fluoride is a noteworthy chemical additive in that it's officially acknowledged benefit and damage levels are about the same. Writing in *The Progressive*, science journalist Daniel Grossman elucidates this point: "Though many beneficial chemicals are dangerous when consumed at excessive levels, fluoride is unique because the amount that dentists recommend to prevent cavities is about the same as the amount that causes dental fluorosis."⁸⁷ Although the American Dental Association and the United States Government consider dental fluorosis only a cosmetic problem, the *American Journal of Public Health* says that "...brittleness of moderately and severely mottled teeth may be associated with elevated caries levels."⁸⁸ In other words, in these cases the fluoride is causing the exact problem that it's supposed to prevent. Yiamouyiannis adds, "In highly naturally-fluoridated areas, the teeth actually crumble as a result. These are the first visible symptoms of fluoride poisoning."⁸⁹

Also, when considering dental fluorosis, there are factors beyond the physical that you can't ignore - the negative psychological effects of having moderately to severely mottled teeth. These were recognized in a 1984 National Institute of Mental Health panel that looked into this problem.⁹⁰

A telling trend is that TV commercials for toothpaste, and toothpaste tubes themselves, are now downplaying fluoride content as a virtue. This was noted in an article in the *Sarasota/Florida ECO Report*,⁹¹ whose author, George Glasser, feels that manufacturers are distancing themselves from the additive because of fears of lawsuits. The climate is ripe for these and Glasser points out that such a class action suit has already been filed in England against the manufacturers of fluoride-containing products on behalf of children suffering from dental fluorosis. A major threat

when one considers that the CDC is reporting anywhere from 1/3 to 1/2 of all school children in the US suffer from fluoride overdose and sport the pitted, discoloration of dental fluorosis.⁹²

Still, certain segments of industry have yet to get the message. A recent newspaper ad campaign promotes Dannon's "Fluoride to Go" spring water "for kids who can't sit still."⁹³ Supplied in convenient kid-sized bottles with the pop-up "athletic" cap kids adore, the product perpetuates fluoride's false promise of better dental health for the new generation of kids for whom bottled water is more desirable than soda pop. The irony is that the shift from pop to water is one thing that does impact children's dental health significantly. Fluoride is totally out of place in this scenario. It makes one wonder how much fluoride might be in other brands of bottled water, including Evian and Volvic, which are owned by Dannon's parent company.

Skeletal Fluorosis

When fluoride is ingested, approximately 93% of it is absorbed into the bloodstream. A good part of the material is excreted, but the rest is deposited in the bones and teeth,⁹⁴ and is capable of causing a crippling skeletal fluorosis. This is a condition that can damage the musculoskeletal and nervous systems and result in muscle wasting, limited joint motion, spine deformities, and calcification of the ligaments, as well as neurological deficits.⁹⁵

Large numbers of people in Japan, China, India, the Middle East, and Africa have been diagnosed with skeletal fluorosis from drinking naturally fluoridated water. In India alone, nearly a million people suffer from the affliction.⁹⁶ While only a dozen cases of skeletal fluorosis have been reported in the United States, Chemical and Engineering News states that "critics of the EPA standard speculate that there probably have been many more cases of fluorosis - even crippling fluorosis - than the few reported in the literature because most doctors in the U.S. have not studied the disease and do not know how to diagnose it."⁹⁷ Because some symptoms of skeletal fluorosis mimic those of arthritis, the first two clinical phases of fluorosis can be easily misdiagnosed.⁹⁸ According to Dr. Paul Connett, the causes of most forms of osteoarthritis are unknown. It is not implausible that the high prevalence of arthritis in America (42 million Americans have it) may be related to our high levels of fluoride intake.⁹⁹

Dr. Hardy Limeback says, "We're quite concerned that fluoride accumulates through a lifetime of water fluoridation and causes the bone to become more brittle. We've started a study, and we're close to publishing it, that shows that people who have been exposed to just 20 to 30 years of water fluoridation have twice the amount of fluoride in their bones. Now there are all kinds of epidemiological studies to show that people who live in fluoridated areas have a higher risk for hip and other kinds of fractures, such as forearm fractures when they fall down. So this is quite a concern. I personally don't think that we need to be ingesting fluoride to protect our kids' teeth because they're already protected at a maximum. The rest of us are swallowing all this fluoride from the drinking water and possibly increasing the risk for bone fracture. It just doesn't make sense at all."¹⁰⁰

Radiological changes in bone occur when fluoride exposure is 5 mg/day, according to the late Dr. George Waldbott, author of *Fluoridation: The Great Dilemma*. While this 5 mg/day level is the amount of fluoride ingested by most people living in fluoridated areas,¹⁰¹ the number

I felt at that time that the reports were alarming. They showed that the levels of fluoride that can cause cancers in animals are actually lower than those levels ingested in people (who take lower amounts but for longer periods of time).

I went to a meeting that was held in Research Triangle Park, in April 1990, in which the National Toxicology Program was presenting their review of the study. I went with several colleagues of mine, one of whom was a board-certified veterinary pathologist who originally reported hepatocholangial carcinoma as a separate entity in rats and mice. I asked him if he would look at the slides to see if that really was a tumor or if the pathologists at Botel had made an error. He told me after looking at the slides that, in fact, it was correct.

At the meeting, every one of the cancers reported by the contractor had been downgraded by the National Toxicology Program. I have been in the toxicology business looking at studies of this nature for nearly 25 years and I have never before seen every single cancer endpoint downgraded.... I found that very suspicious and went to see an investigator in the Congress at the suggestion of my friend, Bob Carton. This gentleman and his staff investigated very thoroughly and found out that the scientists at the National Toxicology Program down at Research Triangle Park had been coerced by their superiors to change their findings."²¹⁶

Once Dr. Marcus acted on his findings, something ominous started to happen in his life:

"...I wrote an internal memorandum and gave it to my supervisors. I waited for a month without hearing anything. Usually, you get a feedback in a week or so. I wrote another memorandum to a person who was my second-line supervisor explaining that if there was even a slight chance of increased cancer in the general population, since 140 million people were potentially ingesting this material that the deaths could be in the many thousands. Then I gave a copy of the memorandum to the Fluoride Work Group, who waited some time and then released it to the press.

Once it got into the press all sorts of things started happening at EPA -- I was getting disciplinary threats, being isolated, and all kinds of things which ultimately resulted in them firing me on March 15, 1992."²¹⁷

In order to be reinstated at work, Dr. Marcus took his case to court. In the process, he learned that the government had engaged in various illegal activities, including 70 felony counts, in order to get him fired. At the same time, those who committed perjury were not held accountable for it. In fact, they were rewarded for their efforts:

When we finally got the EPA to the courtroom...they admitted to doing several things to get me fired. We had notes of a meeting...that showed that fluoride was one of the main topics discussed and that it was agreed that they would fire me with the help of the Inspector General. When we got them on the stand and showed them the memoranda, they finally remembered and said, oh yes, we lied about that in our previous statements.

Then...they admitted to shredding more than 70 documents that they had in hand - Freedom of Information requests. That's a felony.... In addition, they charged me with stealing time from the government. They...tried to show...that I had been doing private work on government time and getting paid for it. When we came to court, I was able to show that the time cards they produced were forged, and forged by the Inspector General's staff...."²¹⁸

For all his efforts, Dr. Marcus was rehired, but nothing else has changed: "The EPA was ordered to rehire me, which they did. They were given a whole series of requirements to be met, such as paying me my back pay, restoring my leave, privileges, and sick leave and annual leave. The only thing they've done is put me back to work. They haven't given me any of those things that they were required to do."219

What is at the core of such ruthless tactics? John Yiamouyiannis feels that the central concern of government is to protect industry, and that the motivating force behind fluoride use is the need of certain businesses to dump their toxic waste products somewhere. They try to be inconspicuous in the disposal process and not make waves. "As is normal, the solution to pollution is dilution. You poison everyone a little bit rather than poison a few people a lot. This way, people don't know what's going on."220 Since the Public Health Service has promoted the fluoride myth for over 50 years, they're concerned about protecting their reputation. So scientists like Dr. Marcus, who know about the dangers, are intimidated into keeping silent. Otherwise, they jeopardize their careers.

Dr. John Lee elaborates: "Back in 1943, the PHS staked their professional careers on the benefits and safety of fluoride. It has since become bureaucratized. Any public health official who criticizes fluoride, or even hints that perhaps it was an unwise decision, is at risk of losing his career entirely. This has happened time and time again. Public health officials such as Dr. Gray in British Columbia and Dr. Colquhoun in New Zealand found no benefit from fluoridation. When they reported these results, they immediately lost their careers.... This is what happens - the public health officials who speak out against fluoride are at great risk of losing their careers on the spot."221

Yiamouyiannis adds that for the authorities to admit that they're wrong would be devastating. "It would show that their reputations really don't mean that much.... They don't have the scientific background. As Ralph Nader once said, if they admit they're wrong on fluoridation, people would ask, and legitimately so, what else have they not told us right?"222

Accompanying a loss in status would be a tremendous loss in revenue. Yiamouyiannis points out that "the indiscriminate careless handling of fluoride has a lot of companies, such as Exxon, U.S. Steel, and Alcoa, making tens of billions of dollars in extra profits at our expense.... For them to go ahead now and admit that this is bad, this presents a problem, a threat, would mean tens of billions of dollars in lost profit because they would have to handle fluoride properly. Fluoride is present in everything from phosphate fertilizers to cracking agents for the petroleum industry." 223

Fluoride could only be legally disposed of at a great cost to industry. As Dr. Bill Marcus explains, "There are prescribed methods for disposal and they're very expensive. Fluoride is a very potent poison. It's a registered pesticide, used for killing rats or mice.... If it were to be disposed of, it would require a class-one landfill. That would cost the people who are producing aluminum or fertilizer about \$7000+ per 5000- to 6000-gallon truckload to dispose of it. It's highly corrosive."224

Another problem is that the U.S. judicial system, even when convinced of the dangers, is powerless to change policy. Yiamouyiannis tells of his involvement in court cases in Pennsylvania and Texas in which, while the judges were convinced that fluoride was a health hazard, they did not have the jurisdiction to grant relief from fluoridation. That would have to be done, it was ultimately found, through the legislative process.225

Dr. Hirzy, vice president of the union that represents the scientists who work for the EPA, cites three landmark cases in which judges with "no interest except in the finding of fact and administering justice"226 ruled against fluoridation. In November, 1978, Judge John Flaherty, now Chief Justice of the Supreme Court of Pennsylvania, issued findings in the case, Aitkenhead v. Borough of West View, tried before him in the Allegheny Court of Common Pleas.

He summarized his findings as follows.

"In my view, the evidence is quite convincing that the addition of sodium fluoride to the public water supply at one part per million is extremely deleterious to the human body, and, a review of the evidence will disclose that there was no convincing evidence to the contrary..."227

"Prior to hearing this case, I gave the matter of fluoridation little, if any, thought, but I received quite an education, and noted that the proponents of fluoridation do nothing more than try to impugn the objectivity of those who oppose fluoridation."228

In an Illinois decision, Judge Ronald Niemann concludes: "This record is barren of any credible and reputable scientific epidemiological studies and or analysis of statistical data which would support the Illinois Legislature's determination that fluoridation of the water supplies is both a safe and effective means of promoting public health."229

Judge Anthony Farris in Texas found: "[That] the artificial fluoridation of public water supplies, such as contemplated by {Houston} City ordinance No. 80-2530 may cause or contribute to the cause of cancer, genetic damage, intolerant reactions, and chronic toxicity, including dental mottling, in man; that the said artificial fluoridation may aggravate malnutrition and existing illness in man; and that the value of said artificial fluoridation is in some doubt as to reduction of tooth decay in man."

Dr. Hirzy, himself a toxicologist and an expert in environmental management and risk assessment, comments: "The significance of Judge Flaherty's statement and his and the other two judges' findings of fact is this: proponents of fluoridation are fond of reciting endorsement statements by authorities, such as those by CDC and the American Dental Association, both of which have long-standing commitments that are hard if not impossible to recant, on the safety and efficacy of fluoridation. Now come three truly independent servants of justice, the judges in these three cases, and they find that fluoridation of water supplies is not justified."230

Interestingly, the judiciary seems to have more power to effect change in other countries. Yiamouyiannis states that when he presented the same technical evidence in Scotland, the Scottish court outlawed fluoridation based on the evidence.²³¹

Indeed, most of Western Europe has rejected fluoridation on the grounds that it is unsafe. In 1971, after 11 years of testing, Sweden's Nobel Medical Institute recommended against fluoridation, and the process was banned. The Netherlands outlawed the practice in 1976, after 23 years of tests. France decided against it after consulting with its Pasteur Institute²³² and Germany rejected the practice because the recommended dosage of 1 ppm was "too close to the dose at which long-term damage to the human body is to be expected."²³³ Dr. Lee sums it up: "All of western Europe, except one or two test towns in Spain, has abandoned fluoride as a public health plan. It is not put in the water anywhere. They all established test cities and found that the benefits did not occur and the toxicity was evident."²³⁴

But Europe is not the sole bastion of sanity in the fluoridation arena. Several municipalities in the United States have taken an enlightened stance on the issue. In 1997, the Natick (MA) Fluoridation Study Committee submitted a comprehensive report to the Town and the Board of Selectmen, overwhelmingly recommending rejection of fluoridation of the town's water. The committee consisted of scientists, academics, and citizens of the town of Natick. The committee summarized its findings as follows:

- Recent studies of the incidence of cavities in children show little to no difference between fluoridated and non-fluoridated communities.
- Ten to thirty percent (10-30%) of Natick's children will have very mild to mild dental fluorosis if Natick fluoridates its water (up from probably 6% now). Approximately 1% of Natick's children will have moderate or severe dental fluorosis. Dental fluorosis can cause great concern for the affected family and may result in additional dental bills. It should not be dismissed as a "cosmetic" effect.
- Fluoride adversely affects the central nervous system, causing behavioral changes and cognitive deficits. These effects are observed at fluoride doses that some people in the US actually receive.
- There is good evidence that fluoride is a developmental neurotoxicant, meaning that fluoride affects the nervous system of the developing fetus at doses that are not toxic to the mother. The developmental neurotoxicity would be manifest as lower IQ and behavioral changes.
- Water fluoridation shows a positive correlation with increased hip fracture rates in persons 65 years of age and older, based on two recent epidemiology studies.
- Some adults are hypersensitive to even small quantities of fluoride, including that contained in fluoridated water. At least one such person is a Natick resident.
- The impact of fluoride on human reproduction at the levels received from environmental exposures is a serious concern. A recent epidemiology study shows a correlation between decreasing annual fertility rate in humans and increasing levels of fluoride in drinking water.
- Animal bioassays suggest that fluoride is a carcinogen, especially for tissues such as bone (osteosarcoma) and liver. The potential for carcinogenicity is supported by fluoride's genotoxicity and pharmacokinetic properties. Human epidemiology studies to date are inconclusive, but no appropriate major study has been conducted.
- Fluoride inhibits or otherwise alters the actions of a long list of enzymes important to metabolism, growth, and cell regulation.
- Sodium fluorosilicate and fluorosilicic acid, the two chemicals Natick intends to use to fluoridate the water supply, have been associated with increased concentrations of lead in tap water and increased blood lead levels in children, based on case reports and a new, as-yet-unpublished study.
- If Natick fluoridates its water supply at the proposed level, most children under the age of three will daily receive more fluoride than is recommended for them.

The scientific literature supporting these findings is summarized in the full report which also discusses a variety of non-health related concerns that have been raised about water fluoridation.

The Committee reached the firm conclusion that the risks of overexposure to fluoride far outweigh any current benefit of water fluoridation.

Their Recommendations:

1. The Natick Fluoridation Study Committee unanimously and emphatically recommends that the town of Natick NOT fluoridate the town water supply.
2. The Natick Fluoridation Study Committee unanimously and emphatically recommends that the Board of Selectmen take appropriate action to ensure that fluoridation of the town water supply does not take place.²³⁵

Conclusion

Natick is not an isolated case. The town of Bishopville, SC recently voted to discontinue fluoridation. Eureka Springs, Arkansas decided not to begin a proposed fluoridation program. "The citizens of Eureka Springs don't want to be medicated against their will," Mayor Beau Satori said. "They just want fine-tasting water."²³⁶ In fact, the Fluoride Action Network list over 100 municipalities in the US and Canada that have rejected or discontinued fluoride since 1990.²³⁷

Isn't it time the United States as a whole followed this example? While the answer is obvious, it is also apparent that government policy is unlikely to change without public support. We therefore must communicate with legislators, and insist on one of our most precious resources - pure, unadulterated drinking water. Yiamouyiannis urges all American people to do so. He emphasizes the immediacy of the problem:

"There is no question with regard to fluoridation of public water supplies. It is absolutely unsafe...and should be stopped immediately. This is causing more destruction to human health than any other single substance added purposely or inadvertently to the water

supply. We're talking about 35,000 excess deaths a year...10,000 cancer deaths a year...130 million people who are being chronically poisoned. We're not talking about dropping dead after drinking a glass of fluoridated water.... It takes its toll on human health and life, glass after glass."²³⁸

Dr. Hirzy points to the absurdity of government policy on fluoride. The phosphate fertilizer industry captures hydrofluosilicic acid and uses what would otherwise be an air or water pollutant as a low-cost source of fluoride for water authorities. "If this material comes out of a smoke stack it's an air pollutant; if it goes out the drain pipe into the river it's a water pollutant. But it is magically converted into some sort of beneficial agent when put in a tank wagon and bled into the drinking water. It's a remarkable transformation."²³⁹

There is a major moral issue in the fluoridation debate that has largely escaped notice. The first is that, as columnist James Kilpatrick observes, it is "the right of each person to control the drugs he or she takes." Kilpatrick calls fluoridation compulsory mass medication, a procedure that violates the principles of medical ethics.²⁴⁰ A New York Times editorial agrees:

"In light of the uncertainty, critics [of fluoridation] argue that administrative bodies are unjustified in imposing fluoridation on communities without obtaining public consent.... The real issue here is not just the scientific debate. The question is whether any establishment has the right to decide that benefits outweigh risks and impose involuntary medication on an entire population. In the case of fluoridation, the dental establishment has made opposition to fluoridation seem intellectually disreputable. Some people regard that as tyranny."²⁴¹

The time to act is now. We have a responsibility to stand up against political influence and corruption, and do what is really best for us, our health, and the planet. The issue is no longer whether there is adequate science to make us question fluoride's safety. There is more than enough scientific evidence to support a total ban on fluoride. But industry and the our legislative bodies that are dominated by special interest groups may never get around to admitting the obvious danger, unless we demand it.

The official stance on the fluoride issue reflects a consistent pattern of denial that begins in the earliest years of the twentieth century, with industry's initial support and encouragement for water fluoridation and continues to this day with propaganda campaigns, scientific disinformation, and out and out attacks on those who have attempted to let the truth be known.

We must speak out now, and let our leaders know that we want the truth to come out. If not for us, for future generations to have the choice, the option, the opportunity (after all, are we not a country that rallies behind freedom?) to drink water -- the liquid of life -- without risking their vitality.

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From: brya3775@telus.net
To: [Public Submissions](#)
Subject: [EXT] FW: Water Fluoridation October 29th, 2019
Date: Monday, October 21, 2019 7:58:01 AM
Importance: High

I am writing this as an appeal to the Court to please NOT allow fluoride to be added to Calgary's water supply.

This week two young mother's entrusted me with babysitting their precious babies, both of which use water from the taps to give to their little ones. After doing research on fluoride and the damage it causes to children in particular, I have to admit I could not help but think/feel how fortunate we are here in Calgary to not have fluoride in our water for those two precious babies not to mention all the other children here in our city.

I spoke to both the mothers about the fact that we don't have fluoride in the water and how fortunate we are especially for their little ones cognitive development. There are so many things in this world that we cannot protect our children from so at the very least we should be a stand for the things we can. I understand the value of fluoride can provide regarding protecting our children's teeth from cavities however there are safer ways of getting fluoride by simply teaching our children how to brush their teeth with fluoride in their toothpaste rather than ingesting it into their entire body.

We are very blessed to live where we do and have the choices we have. As human beings we should be able to choose whether or not something as unsafe as fluoride be actually administered into our water system. I am a mother of four and a grandmother of five. I want to protect my children and my children's children in as many ways as I possibly can.

Please do NOT allow fluoride to be added to our wonderful water, do not take away our ability to choose.

Sincerely,

Doris Bryan

Doris Bryan

M. 403-400-7066

<https://ca.linkedin.com/in/doris-bryan-02132715>

" Strive not to be a success, but rather to be of value.' Albert Einstein

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: Submission for hearing on water fluoridation
Date: Monday, October 21, 2019 8:29:47 AM

-----Original Message-----

From: ANINDYA PAL [mailto:pal_anindya@hotmail.com]
Sent: Sunday, October 20, 2019 6:41 PM
To: publicsubmissions@calgary.ca
Cc: City Clerk <CityClerk@calgary.ca>; safewatercalgary@gmail.com
Subject: [EXT] Submission for hearing on water fluoridation

Dear Sir/Madam

As a responsible resident of Calgary and after getting aware of the risk of water fluoridation on our health, I would like to request you to take right decision, so that we the residents of Calgary will not suffer in future due to it. I have child with autism and I know how the environmental toxin can trigger autism and the other neurological conditions. When it comes to water, we never feel safe to drink water and shower with water having any toxin.

Thanks and regards
Anindya Pal
Ward no-2

From: [Lenna L.M.F.](#)
To: [Public Submissions](#)
Subject: [EXT] City Clerk: Public Forum on Water Fluoridation
Date: Monday, October 21, 2019 8:42:20 AM

KINDLY ERR ON THE SIDE OF CAUTION.

Does it really have to be complicated?

Those who want to take the fluoride;
they can do so through drops, gels and pastes.

Those who do not want to take the risk, need not be
forced to take fluoride through city water.

Keep our choice simple and safe.

KINDLY Err on the side of caution.

P.S. We all know by now that science and scientists
can be fallible and that agendas are not always based
on doing the best for all concerned. However choice
provides the best for all concerned. Thank you.

Lenna Lerner Fisher
1143 Gladstone Road N.W
Resident of Calgary since 1976.
403 880 7613

Sent from [Outlook](#)

From: Lenna L.M.F. <llmf8@hotmail.com>
Sent: October 21, 2019 8:37 AM
To: publicsubmission@calgary.ca <publicsubmission@calgary.ca>
Subject: City Clerk: Public Forum on Water Fluoridation

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1143 Gladstone Road N.W
Resident of Calgary since 1976.
403 880 7613

Sent from [Outlook](#)

From: [alexander audette](#)
To: [Public Submissions](#); [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [FAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Fluoridation hearing submission
Date: Monday, October 21, 2019 9:30:06 AM

Dear Mayor and Councilors,

As a former chemical engineer, Calgary resident, and practicing TCM/ Acupuncturist, I would like to explain why adding fluoride ion to drinking water supplies is a foolish endeavor. The first and foremost reason stems from the biochemistry of fluoride ion in the body. Although the rationale given by misinformed dentists and lobbyists is that it will help prevent dental caries (cavities), it is far more useful to look at sugar consumption. A lack of fluoride in the water is not causative. Below is some evidence for you to consider:

Fluoride ion exhibits strong hydrogen bonding and inhibits many enzyme systems in our bodies (Waldbott 1978, Emsley 1981). This effects digestion, immune system function and cancer risk.

Fluoride ion complexes with aluminum and aids in its accumulation in the brain (Strunecka and Patocha 1999, Li 2003) Which is a concern due to Alzheimers disease and its link to aluminum in amyloid plaques in the brain as well as behavioral disorders. (Mullenix 1995, Vamer 1998)

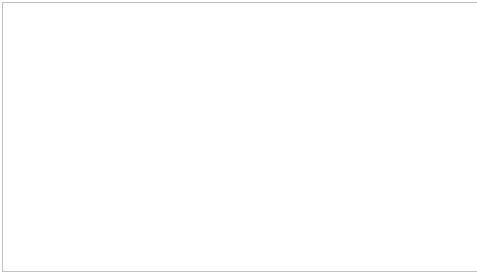
Fluoride ion competes with iodine for absorption. This will effect metabolism (due to lack of thyroid hormone synthesis) and IQ (especially in children). (Lin Fa-Fu 1991; Li 1995; Zhao 1996; Lu 2000; and Xiang 2003a, b).

Fluoride ion is used extensively in the pharmaceutical industry in order to make drugs lipophilic (fat loving) in order to get them past the blood brain barrier. Common examples of fluorinated drugs include: Lipitor (cholesterol lowering), Ciprofloxacin (antibiotic), and Halothane (general anesthetic).

Any dental problem is not due to lack of fluoride, but high dental fees set by the lobbying organization that represents Alberta dentists:

<https://www.theglobeandmail.com/opinion/the-exorbitant-cost-of-dentist-visits-in-alberta-cannot-be-brushed-off/article36153690/>

The exorbitant cost of dentist
visits in Alberta cannot be
brushed off - The Globe and



Mail

Lorian Hardcastle is an assistant professor in the Faculty of Law at the University of Calgary. A provincial government report found last year that dental procedures cost up to 44 per cent more in ...

www.theglobeandmail.com

If Calgary city council wishes to show some leadership instead of caving in to big money lobbyists, it would put a tax on sugar that was equal to the rate at which alcohol and tobacco are taxed. This way, not only dental caries will be reduced, but also type 2 diabetes, which costs taxpayers \$5880/year/case in Canada. (Canadian Institute for Health Information CIHI., *Economic costs of type 2 diabetes in Canada in 2017-18*, <https://www.cihi.ca/en/patient-cost-estimator>)

Finally, it is both unethical and bad practice to mass medicate a population against its consent with the medically unknown substance hydrofluorocilicic acid (which is an unadulterated waste product from the phosphate fertilizer industry that also contains traces of lead and arsenic).

I look forward to your response,

Yours Sincerely,

Alexander Audette TCMP, R.Ac., B.Eng.(Chem)

From: [John Daly](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation Oct 29, 2019
Date: Monday, October 21, 2019 9:46:14 AM

Dear City Council, Peter Demong,

It has come to my attention that the City of Calgary is considering mass-medicating it's population again with a neurotoxin called fluoride. Studies continue to come out about human consumption of fluoride being detrimental to human health and inducing a functional decline in I.Q including those from Harvard University:

<https://www.hsph.harvard.edu/news/features/fluoride-childrens-health-grandjean-choi/>

Vitamin C is a highly water-soluble vitamin and purports many studies showing it is effective in reducing hypertension, coronary heart-disease, and stroke:

<https://lpi.oregonstate.edu/mic/vitamins/vitamin-C#cardiovascular-disease-prevention>

According to the Linus Pauling Institute: *"...there is no reliable scientific evidence that doses of vitamin C up to 10 g/day in adults are toxic or detrimental to health."*

If we wanted to mass-medicate our citizenry for studied health benefits of one nutrient, I would suggest we put Vitamin C in our water instead.

It is noble to be conscious of the human health of our citizenry while sitting on council, but there are many more effective ways to improve the health of Calgarians without mass-medicating our water and – in a sense – forcing people to consume something they may not want to consume.

Thank you for hearing me out and considering a cleaner, more pure water supply for Calgary without human adulteration.

John Daly
Ward 14 Resident

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] SUBMISSION for the FLUORIDE PUBLIC HEARING
Date: Monday, October 21, 2019 10:05:47 AM

From: jenny lin [mailto:jenny_cc_lin@yahoo.com]
Sent: Monday, October 21, 2019 9:53 AM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] SUBMISSION for the FLUORIDE PUBLIC HEARING

Morning mayor and city councillors,

Our family OPPOSES the fluoridation of our Calgary drinking water. Please vote "No" to fluoridation.

Thank you for your time.

Jenny and family

Ward 2
587-578-2494 (cell phone)

From: [OREST SLEPOKURA](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Copy to City Clerk: Public Forum on Water Fluoridation
Date: Monday, October 21, 2019 10:05:57 AM

TO WHOM IT WILL CONCERN:

A copy of this was sent to publicsubmissions@calgary.ca
and I was informed a copy needed to be sent to
cityclerk@calgary.ca

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on doing the best for all concerned. However choice
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Orest Bohdan Slepokura
1143 Gladstone Road N.W
Resident of Calgary since 1976.
403 880 7613

Sent from [Outlook](#)

From: Lenna L.M.F. <llmf8@hotmail.com>
Sent: October 21, 2019 8:37 AM
To: publicsubmission@calgary.ca <publicsubmission@calgary.ca>
Subject: City Clerk: Public Forum on Water Fluoridation

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Lenna Lerner Fisher

1143 Gladstone Road N.W

Resident of Calgary since 1976.

403 880 7613

Sent from [Outlook](#)

From: [Christine Massey](#)
To: [Public Submissions](#); [City Clerk](#)
Subject: [EXT] additional Submission for Oct 29 SPC Water Fluoridation Agenda
Date: Monday, October 21, 2019 10:33:48 AM
Attachments: [CM 3rd submission re water fluoridation Oct 29 2019.pdf](#)

Hello,

I request that the attached submission be included in the Oct. 29 2019 water fluoridation agenda, for consideration by the SP Committee. Please note that this submission is new; I have not previously submitted this one.

I also request confirmation of receipt and confirmation of inclusion in the agenda.

Thank you and best wishes,
Christine Massey, M.Sc.

October 21, 2019

Dear Members of the Standing Policy Committee,

Subject: Official responses from City of Calgary, Ontario and Washington State institutions indicate 0 studies showing fluoride is safe during pregnancy with respect to childhood IQ, while 6 studies strongly suggest harm

In [2017](#) and [2018](#) high quality, U.S. government-funded studies published by an international team of top public health departments found that fluoride exposure during pregnancy is associated with lower IQs and increased ADHD symptoms.

The maternal fluoride exposures in these Mexican studies were very similar to those for Canadian pregnant women in fluoridated cities, according to [research](#) from York University published in 2018.

This research prompted a series of Freedom of Information records requests submitted to various institutions in Alberta, Ontario and Washington State, seeking the primary, peer-reviewed scientific studies on fluoride exposure during pregnancy relied upon when assuring the public that fluoridated water is a safe for everyone.

Every institution [failed](#) to provide or cite even one study indicating that fluoride exposure during pregnancy is safe with respect to childhood IQ or ADHD symptoms. The institutions are:

Alberta Ministry of Health
City of Calgary
Ontario Ministry of Health and Long Term Care
Public Health Ontario
Washington State Department of Health
Region of Peel (Ontario)
Windsor Essex County Health Unit (Ontario)
Town of Tecumseh (Ontario)
City of Toronto

This is all the more disturbing given that on Aug. 19 2019 another extremely rigorous, government-funded [study](#) was published in one of the world's top pediatric journals (JAMA Pediatrics) indicating that higher fluoride exposures (commonly experienced by Canadian pregnant women) are associated with lower IQs in children. You can watch an interview with the lead author [here](#).

Six studies now suggest that fluoride exposure during pregnancy results in lowered IQs; they are listed and accessible [here](#).

Had I realized sooner that the University of Calgary is subject to the *Freedom of Information and Protection of Privacy Act*, I would have submitted a records request to the O'Brien Institute for Public Health (OIPH) for you. However, OIPH's report to Council makes clear that they too know of zero responsive studies (see [pages 19-21](#)).

Yours for safe water,
Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)

From: [Bonnie Heine](#)
To: [Public Submissions](#)
Subject: [EXT] Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing
Date: Monday, October 21, 2019 11:10:55 AM

PUBLIC SUBMISSION

RE: Vote Against Fluoridation Chemicals -- Submission for Fluoride Hearing

Dear PUBLIC SUBMISSION,

Dear Council,

I don't want fluorosilicic acid in my drinking water.

Fluoride is the only chemical added to water for the purpose of medical treatment. The U.S. Food and Drug Administration (FDA) classifies fluoride as a drug when used to prevent or mitigate disease (FDA 2000).

Informed consent is standard practice for all medication, and one of the key reasons why most of Western Europe (97%) has ruled against fluoridation. With water fluoridation we are allowing governments to do to whole communities (forcing people to take a medicine irrespective of their consent) what individual doctors cannot do to individual patients.

Vote No on fluoridation.

Thanks,

Sincerely,
Bonnie Heine

Calgary, AB

From: [Christine Massey](#)
To: [Public Submissions](#); [City Clerk](#); [Office of the Mayor](#); [Carra, Gian-Carlo S.](#); [Chu, Sean](#); [Colley-Urquhart, Diane](#); [Gondek, Jyoti](#); [EAWard10 - Lesley Stasiuk](#); [Magliocca, Joe](#); [Woolley, Evan V.](#)
Subject: [EXT] last Submission for Oct 29 SPC Water Fluoridation Agenda
Date: Monday, October 21, 2019 11:14:36 AM

Hello,

I request that the following submission be included in the Oct. 29 2019 water fluoridation agenda, for consideration by the SP Committee. Please note that this submission is new; I have not previously submitted this one.

I also request confirmation of receipt and confirmation of inclusion in the agenda.

Thank you and best wishes,
Christine Massey, M.Sc.

Dear Members of the Standing Policy Committee,

Subject: CADTH (Canadian Agency for Drugs and Technologies in Health)

1. CADTH is not a government agency; this is made clear on CADTH's website:

Is CADTH a government agency?

No, CADTH is an independent, not-for-profit organization established in 1989 by the federal, provincial, and territorial governments.

<https://www.cadth.ca/about-cadth/who-we-are/faqs>

2. CADTH refuses to name the authors of their water fluoridation reports (which were extensively relied upon by the O'Brien Institute for Public Health). The following is an email from CADTH:

Good day Christine Massey,

Thank you for your inquiry and interest in CADTH.

In response to concerns expressed for the privacy and well-being of our staff and other contributors to this assessment, CADTH had decided not to list the names of the authors, contributors, and reviewers in the final report. All questions or comments about the report can be sent to requests@cadth.ca.

Sincerely,

Stephanie Gabrielle

Central Intake

613 226 2553 ext. 1221

Personal Email: stephaniega@cadth.ca

3. According to research published in the peer-reviewed journal ClinicoEconomics and Outcomes Research, 2017:

“The adherence of CADTH’s processes to the principles of accountability, transparency, participatory, equity, responsiveness and consensus is poor... CADTH’s overriding responsibility is toward the governments that “own,” fund and manage it, while the agency’s status as a not-for-profit corporation under federal law protects it from standard forms of accountability...”

CADTH’s governance documentation is not publicly available and CADTH is protected from freedom of information requests, whistle-blowing, Auditor General of reviews and ombudsman or integrity commissioner inquiries and investigations.

Canadians need a national organization for evaluating drugs for reimbursement in the public interest that fully embraces the principles of good governance – one that is publicly accountable, transparent and fair and includes all stakeholders throughout its processes....”

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5702169/>

4. CADTH's water fluoridation report all begin with an extensive Disclaimer:

“...no representations or warranties are made... The information in this document should not be used as a substitute for professional medical advice or as a substitute for the application of clinical judgment in respect of the care of a particular patient..”

<https://www.cadth.ca/sites/default/files/pdf/HT0022%20CWF%20-%20Clinical%20report.pdf>

Yours for safe water,
Christine Massey, M.Sc.
Brampton, ON
cmssyc@gmail.com
[Fluoride Free Peel](#)

Requests <requests@cadth.ca>

Mon, Feb 25, 11:47 AM

CPS2019-0965
Attachment 2

Letter 113a

to me, Requests ▾

Good day Christine Massey,

Thank you for your inquiry and interest in CADTH.

In response to concerns expressed for the privacy and well-being of our staff and other contributors to this assessment, CADTH had decided not to list the names of the authors, contributors, and reviewers in the final report. All questions or comments about the report can be sent to requests@cadth.ca."

Sincerely,

Stephanie Gabrielle

Central Intake

613 226 2553 ext. 1221

Personal Email: stephaniega@cadth.ca

CADTH

From: [Kimberly DeYong](#)
To: [Public Submissions](#)
Cc: [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation: A councillor's responsibility
Date: Monday, October 21, 2019 11:16:05 AM
Attachments: [Union Water - Fluoridation.pdf](#)

Dear City of Calgary Council,

As a council member of a non-fluoridated Ontario municipality (located near Windsor) , I can't imagine what kind of evidence I would need to be presented with in order to justify using the public drinking water supply to medicate the population with a supposed 'tooth medicine'.

What kind of safety studies would have to be shown, that prove the chosen chemical is safe for all to consume every day for a lifetime?

What kind of efficacy proof would need to be presented – especially given the evidence that shows nearly no difference in tooth decay between fluoridating and non-fluoridating communities?

Our water supplier's mandate is clear – provide the cleanest and safest water possible. It is obvious that water fluoridation has nothing to do with clean and safe drinking water.

Our water board has even come out with a position regarding water fluoridation and I've attached it here for you. What is your water supplier's position? Have you sought the advice of your water chemistry engineers?

Does it concern you that the agencies and authorities that promote water fluoridation accept none of the responsibility or liability?

The weight of the decision rests solely on the shoulders of the municipal councillors.

The City of Windsor Mayor (at the time the city voted to end fluoridation) stated that if the province believed water fluoridation was necessary, they'd make it mandatory. But they haven't. Instead they've off-loaded the risks and the costs to municipalities. And they've kept it a municipal CHOICE.

Why would a municipal councillor choose this unnecessary cost and unethical risk?

The risks of too much fluoride far outweigh any perceived benefit from water fluoridation; especially given the fact that fluoride (ie in toothpaste) is cheaply and readily available for those that want it.

Water fluoridation is UNETHICAL and UNNECESSARY.

Calgary's decision in 2011 to end water fluoridation was progressive and protective – don't go backwards!

Kind regards,
Kimberly DeYong
396 County Rd 34., Ruthven ON
519-817-6328



Union Water Supply System

P.O. Box 340, 1615 Union Avenue, Ruthven, Ontario, N0P 2G0

Tele: 519-326-1668 Fax: 519-326-3490

Email: rbouchard@unionwater.ca

www.unionwater.ca

SENT BY: mail
March 30, 2015

Ministry of Health and Long Term Care
Minister's Office
80 Grosvenor Street
10th Floor, Hepburn Block
Toronto, ON
M7A 2C4

Attention: Hon. Dr. Eric Hoskins, Minister

Ministry of the Environment and Climate Change
Minister's Office
77 Wellesley Street West
11th Floor, Ferguson Block
Toronto, Ontario
M7A 2T5

Attention: Hon. Glen Murray, Minister

Dear Sirs,

RE: Union Water Supply System's Position on Mandatory Fluoridation

At the January 17th, 2015 meeting of the Union Water Supply System (UWSS) Joint Board of Management a discussion was raised by UWSS Board members in regards to the November 27th, 2014 motion that was passed by Ontario MPPs that endorses water fluoridation as a healthy and essential measure to minimizing tooth decay. This motion was tabled to the Ontario Legislature by Mississauga-Streetsville MPP Bob Delaney.

In regards to this motion and other circulating correspondence that suggest possible provincial consideration for mandatory fluoridation of drinking water, the UWSS Board directed the UWSS General Manager to send correspondence to the Ontario Minister of Health and Long Term Care and the Ontario Minister of Environment and Climate Change to outline the UWSS' position on drinking water fluoridation.

History of Union Water Supply System

Prior to outlining UWSS' position on the subject of mandatory fluoridation of drinking water, it is somewhat important to first provide some historical information on the Union Water Supply System for context purposes.

The creation of the Union Water System (now the Union Water Supply System) came about through the Province of Ontario's drive to develop regional drinking water systems by the Ontario Water Resource Commission (OWRC) under the *Ontario Water Resources Commission Act*. The idea behind this Act was that clusters of municipalities would be better served by larger Regional Drinking Water systems rather than individual smaller systems.

For the development of the Union Water System, the OWRC signed agreements in southwestern Ontario with the municipalities of Essex, Gosfield North, Gosfield South, Leamington, Kingsville, Rochester and Sandwich South, Maidstone and Mersea and the H.J. Heinz Company to construct and operate facilities for joint use. This agreement to construct the Union Water System would ensure potable water to the partner communities, while at the same time promoting industrial development. The Union Water System was officially commissioned in 1960 by OWRC. It should be noted that the design of the Union Water System did not include a fluoridation scheme and equipment for fluoridation was not included in the construction of the Union Water System treatment plant.

The ownership of assets and control of the Union Water System remained with the OWRC until the OWRC's amalgamation into the Ministry of Environment in the early 1970's. The Ministry of Environment retained control and ownership of Union Water System assets until the creation of the Ontario Clean Water Agency (OCWA) in 1993, at which time ownership and control of the system was transferred to OCWA. In 1997, the Province of Ontario passed and implemented the *Municipal Water and Sewage Transfer Act, 1997*. This Act resulted in the transfer of Union Water System assets, ownership and control from OCWA to the newly amalgamated municipalities of Kingsville, Leamington, Essex and Lakeshore. This transfer of assets and control for the system was completed through a Transfer Order dated 2001 between the Province of Ontario and the Municipalities of Leamington, Kingsville, Essex and Lakeshore.

The Transfer Order stipulated the creation of a Joint Management Board of the Union Water Supply System (UWSS Board). The UWSS Board has full authority to manage the Union Water Supply System on behalf of the four respective municipalities. The UWSS Board is composed of 12 municipal councilors appointed by the municipalities in accordance with the representation requirements of the Transfer Order. Day to day administration of the Union Water Supply System is through the UWSS General Manager who reports to the UWSS Board.

The UWSS treats and transmits water to the four aforementioned municipalities for local distribution through municipally owned and operated distribution systems. Potable water from UWSS ultimately services approximately 60,000 residents, a variety of commercial and industrial businesses and a large agri/food processing industry that includes numerous canneries, food processors, and over 1,000 hectares of greenhouse.

UWSS and Drinking Water Fluoridation

As mentioned previously, the original design and construction of the UWSS treatment and transmission facilities did not include a drinking water fluoridation scheme. A review of available historical records indicates that the issue of drinking water fluoridation was briefly considered by the Union Water System Advisory Committee in the early 1960's. However, these records suggest that the Advisory Committee had concerns with the introduction of fluoride into the drinking water, especially in regards to the agri/food processing industry that utilized a significant portion of Union Water System's treated water. Large food processors (e.g. H.J. Heinz of Canada) were not in favor of utilizing fluoridated potable water within their food

products, which included infant food. As such, fluoridation of Union Water System's drinking water was never implemented and has never been introduced to this day.

UWSS' Position on Drinking Water Fluoridation

Firstly, it should be noted that the UWSS does not have an official position or opinion in regards to public health effects, positive or otherwise, of drinking water fluoridation. This is a public health issue, and not a water treatment issue. However, the UWSS does have concerns with the addition of a chemical to the UWSS drinking water that does not result in a net improvement in the water treatment process and thus an improvement to the potable quality of the drinking water.

Secondly, UWSS also has a number of other concerns that would be associated with the introduction of mandatory fluoridation at the UWSS facilities, specifically in regards to capital costs, health and safety concerns for treatment plant operations staff, and possible concerns to the agri/food processing industry "customers". These concerns are detailed further below.

Capital Cost Concerns

As aforementioned in this letter, a fluoride introduction scheme was never included in the construction of the UWSS treatment facilities. As such, introduction of fluoride into the UWSS drinking water treatment process would require significant capital investment on UWSS' part. This would require the construction of a building for bulk storage of the fluoride chemical, and to house the equipment needed to inject fluoride into the drinking water. The new building would require a heating, cooling and ventilation system and likely a scrubber system to prevent ventilation of fluoride chemical to the atmosphere. Monitoring equipment would be needed to monitor the dosage of fluoride. Significant upgrades/modifications to the Supervisory Control and Data Acquisition (SCADA) system would also be needed to allow treatment plant operators to monitor and control the fluoride system from the operator's control station.

Further, it needs to be noted that it is best practice to introduce the fluoride chemical after the water filtration step of the treatment process since filtration can extract fluoride thus potentially requiring boosting of the fluoride chemical to meet optimal dosage. This would not be operationally or cost effective. Also, the fluoride chemical solution typically has a low pH (approximately 1.0-1.5 on pH scale). The introduction of fluoride chemical after the filtration process would result in a decrease in pH of the treated water going to the contact chamber and reservoir. There would be a high potential for the lower pH water going into the transmission system to increase corrosion in the transmission and distribution system pipes and services. To mitigate this increase in corrosion, the UWSS would need to introduce a corrosion prevention system (e.g. lime dosing system) at the treatment plant to increase the pH of the water. UWSS does not currently need to increase pH of the water since it already meets the preferred pH range to minimize corrosion. Thus the UWSS does not currently have the equipment and monitoring instruments needed to increase the pH of the water within the treatment plant.

The capital costs associated with the construction of a fluoridation system and a pH balancing system would require a several million dollar investment by the UWSS. Operational and maintenance costs for these systems would be a few hundred thousand dollars on an annual basis.

Occupational Health & Safety Concerns

The implementation of a drinking water fluoridation scheme at UWSS would introduce occupational health and safety issues for treatment plant employees. Fluoridating chemicals, whether they be in solid form (i.e. sodium fluorosilicate and sodium fluoride) or liquid form (i.e. fluorosilicic acid) are hazardous materials. The design, construction and operation of equipment to receive, store and introduce the chemicals into the treated water require risk assessments for worker occupational health and safety issues and for the environment of and around the plant.

Operations and maintenance (O&M) of the UWSS treatment facilities is currently contracted out to an accredited drinking water O&M contracting firm under a multi-year fixed fee agreement. The existing O&M agreement does not include the operations and maintenance of a fluoridation or pH adjustment system. The introduction of a fluoridation scheme at the UWSS facilities would necessitate a renegotiation of the O&M agreement to include operations and maintenance of these systems; to ensure proper training of the treatment plant operators and maintenance staff in regards to drinking water fluoridation, and to address occupational health and safety hazards associated with handling of the fluoridation chemicals. This renegotiation would likely result in a significant cost increase to UWSS for O&M services.

Agri/Food Packaging Industry Concerns

UWSS provides potable water, through the local municipal distribution systems, to a large Agri/Food processing industry. This industry consists of small to large volume producers of canned food products such as tomatoes, tomato paste and sauce, beans and legumes, juice, and a variety of other products. A large greenhouse industry that consists of over 1000 hectares of small (less than 1 hectare) to very large (greater than 50 hectares) greenhouse operations are also serviced with UWSS' potable water. These greenhouse operations mainly produce hydroponically grown tomatoes, peppers, and cucumbers but also grow other produce in smaller quantities.

During the 1960's when drinking water fluoridation schemes were being implemented at many drinking water systems throughout Ontario, other provinces in Canada and in the United States, concerns were raised by local Agri/Food processing operations in regards to inclusion of fluoride within Union Water's drinking water. Based on available historic documents, these concerns by food processing operations were the main driver for not including fluoride within Union Water's drinking water. The local Agri/Food processing industry within the UWSS' service area has grown significantly since then. This industry is very important to the local economy. This industry is also dependent on a high quality potable water source such as UWSS'. Any changes to the quality of the drinking water, such as the introduction of fluoride, would most likely raise some concerns by this industry.

Closing Statement

The UWSS has identified some viable concerns that are associated with any consideration for mandatory fluoridation of UWSS' drinking water. It should be reiterated that the UWSS does not have an official position or opinion in regards to public health effects, positive or otherwise, of drinking water fluoridation. This is a public health issue, and not a water treatment issue. UWSS' concerns with any proposal for mandatory fluoridation are solely in regards to following:

- Significant capital costs to UWSS for designing and construction a drinking water fluoridation system;
- On-going operations and maintenance costs for the fluoridation system;
- Occupational Health and Safety hazards to water treatment plant staff and personnel; and
- Concerns associated with the large local Agri/Food processing and greenhouse industry that use UWSS' potable water.

Based on the UWSS' concerns as detailed in this correspondence, the UWSS would not be in favor of mandatory fluoridation of UWSS' drinking water. As such, the UWSS would not support at this time any consideration by the Province of Ontario to mandate fluoridation of municipal drinking water.

Should you have any questions or comments regarding the information contained within this correspondence, please do not hesitate to contact the undersigned at your convenience.

Sincerely,



Rodney Bouchard, General Manager
Union Water Supply System Joint Board of Management
kmj

cc: WECHU - Gary Kirk, MPP Taras Natyshak, MPP Rick Nicholls, Peter Neufeld, Dan DiGiovanni, Russ Phillips, Tom Touralias

From: [Carey Parder](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewatercalgary@gmail.com
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 11:30:07 AM

To whom it may concern,

This letter is to voice my concern about the current consideration of adding fluoride to Calgary's drinking water.

I would like to see this consideration dropped. I am opposed to addition of fluoride to Calgary's drinking water.

Mass Medication

The Food and Drug Administration (FDA) states that fluoride is not a mineral nutrient; it is a prescription drug.

Adding fluoride to our water is *mass medication. This is just plain wrong.

More and more **studies are showing that some of the population (e.g. the very young) are being adversely affected by their choiceless intake of fluoride in cities still endorsing this practice.

Free Choice

We should have free choice in this matter! Those that want to add fluoride to their water can do so on their own, but we should not be forced to ingest it. For those that want it, they can add it individually in measured doses, and therefore add it more safely and cheaply than adding it into our entire water system.

The use of fluoridated water in on the decline - *99% of western continental Europe has rejected, banned, or stopped fluoridation**

China has completely banned the addition of fluorides into public drinking water in accordance with the Hygiene Standard of Public Drinking Water.

Fluoridation is rejected in Austria, Belgium, Denmark, Norway, and Japan

Fluoridation has also been stopped in Finland, Germany, Hungary.

Why is Fluoridation even a consideration for Calgary?

Please – do some research and see why adding fluoride into Calgary's drinking water is simply a bad idea.

It *violates our free choice* and *assumes* this drug is *safe for all* - from the unborn and very young to the elderly, and even our small pets.

Sincerely,

Carey Parder
Calgary resident – Ward 8
1715 – 27th Street SW
T3C 1L6

References

[Statement In Opposition To Artificial Water Fluoridation - Executive Summary](#)

- * [Water Fluoridation: a Reckless Medical Practice](#)
- ** [Water Fluoridation - The Neurotoxicity of Fluoride](#)
- ** <https://fluoridealert.org/>
- ** <https://calgarynews.org/calgary-herald/corbella-if-fluoride-decreases-childrens-iq-are-harder-teeth-worth-the-risk/>
- ** <https://www.hsph.harvard.edu/news/features/fluoride-childrens-health-grandjean-choi/>
- ** <https://ehp.niehs.nih.gov/doi/10.1289/ehp.1104912>
- *** <http://www.fluoridation.com/c-country.htm>

From: [Zuzana Gardian](#)
To: [Public Submissions](#)
Subject: [EXT] FLUORIDATION SUBMISSION - Our Kids Don't Want Dental Fluorosis
Date: Monday, October 21, 2019 11:37:04 AM

PUBLIC SUBMISSION

RE: FLUORIDATION SUBMISSION - Our Kids Don't Want Dental Fluorosis

Dear PUBLIC SUBMISSION,

Dear Mayor and Council,

If you fluoridate our drinking water you will absolutely increase dental fluorosis rates significantly. Numerous studies show this, including the Cochrane Collaboration's review of water fluoridation.

The CDC reported that in 2010, the dental fluorosis rates in the U.S. were over 40% of teens. The CDC reported this year that the rate has increased to 61% as more children are already overexposed to fluoride from toothpaste:

Children with dental fluorosis can suffer significant embarrassment and anxiety over the appearance of their teeth. No matter how much they might brush and floss, the fluorosis stains do not go away. In cases of severe fluorosis, a child may be perceived as having “dirty” or “rotten” teeth, which can cause significant damage to a child’s self esteem and emotional well-being. Even “mild” fluorosis — particularly when present on the front two teeth — can be highly objectionable. https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_studies_dental-5Ffluorosis04b_&d=DwIFaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=bw2tRGa8JH2x5emQrfhxWMbU7BFaWJS2cq-iUuwXAs&s=q987cb3LM54VLXm8shKv1vgttwDeO_qKitvIRHliuo8&e=

The teeth are not the only tissue in the body that accumulate fluoride (the bones, pineal gland, and arteries accumulate it as well). There is no apparent reason, therefore, why fluoride’s effects on the body will be limited to the teeth.

As noted by Dr. Hardy Limeback, “it is illogical to assume that tooth enamel is the only tissue affected by low daily doses of fluoride ingestion.” According to the late Dr. John Colquhoun, “Common sense should tell us that if a poison circulating in a child’s body can damage the tooth-forming cells, then other harm also is likely.”

Thank you.

Sincerely,
Zuzana Gardian

Calgary, AB

From: [MacLean David](#)
To: [Public Submissions](#)
Subject: [EXT] Submission on Fluoridation
Date: Monday, October 21, 2019 11:38:18 AM
Attachments: [Submission on Fluoridation.pages](#)

Please find attached my submission to the public hearing regarding fluoridation of Calgary's water supply.

Dr. David MacLean

dr.david@dorchesterhealth.ca

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If you have received this email in error, please notify the sender immediately and we will arrange for retrieval at no cost to you.

From: [Angela Juvalé](#)
To: [Public Submissions](#); [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [FAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#)
Cc: [pat.fule@strathmore.ca](#); [lorraine.bauer@strathmore.ca](#); [tari.cockx@strathmore.ca](#); [denise.peterson@strathmore.ca](#); [melanie.corbiell@strathmore.ca](#); [bob.sobol@strathmore.ca](#); [jason.montgomery@strathmore.ca](#); [jthackray@strathmore.ca](#); [Peter.brown@airdrie.ca](#); [darrell.belyk@airdrie.ca](#); [tina.petrow@airdrie.ca](#); [al.jones@airdrie.ca](#); [candice.kolson@airdrie.ca](#); [Kelly.hegg@airdrie.ca](#); [ron.chapman@airdrie.ca](#); [mchalmers@chestermere.ca](#); [lbold@chestermere.ca](#); [cburness@chestermere.ca](#); [mfoat@chestermere.ca](#); [rmarayan@chestermere.ca](#); [vwagner@chestermere.ca](#); [myoung@chestermere.ca](#); ["Safe Water Calgary"](#)
Subject: [EXT] Submission for the October 29 2019 Standing Policy Committee on CS&PS Hearing on Water Fluoridation Agenda
Date: Monday, October 21, 2019 11:54:52 AM
Importance: High

His Worship, Naheed Nenshi, the Mayor of Calgary, and City of Calgary Council Members, the City Clerk's office

CC: Administrative Members of Airdrie, Chestermere and Strathmore, Safe Water Calgary

Hello,

My family and I reside in the community of Country Hills, in the Calgary Northern Hills.

I respectfully request that artificial water fluoridation NOT BE REINTRODUCED to Calgary's potable water supply. You cannot guarantee that fluoride is safe and effective for everyone.

The cessation of water fluoridation in 2011 was a huge relief to me and in light of the current budgeting concerns, I do not see the point in spending the money on fluoridating water that is used for watering lawns and washing cars, etc. Certainly not, if the fluoridating infrastructure needs to be replaced, as was mentioned.

If folks believe that fluoride is truly helpful to them, perhaps subsidize that and/or let them seek the use of topical fluoride or other, more effective intervention options. Swallowing fluoride delivers it to the entire body.... the brain and neurological system, the thyroid, bones, kidneys... and potentially causes harm to these and all organs and systems.

Please do not impose it on those who suffer **compromised immune systems**, such as myself, those who are **sensitive to chemical loads** or who have brain injuries and disease. I have a brain tumour and neurological issues that have yet to be fully diagnosed. My heavy metal body load testing came back as very high in 13 of 16 elements... fluoride being one of them, although I have not used any products with fluoride in a decade. My body just does not eliminate elements as other people's do. I am currently returning to the workforce after a period on disability, and, at age 57, I need to, *at least*, maintain the health gains I have made (or better yet continue to

improve my health!) in order to effectively earn sufficient wages to replace the retirement savings I had to use get by for the last 3 years. I have one shot at a decent latter third of my life! I do not want to have anything jeopardize my health or personal goals, such as fluoride in the City's water supply. We consider the substance a neurotoxin, and there is no guaranteeing that the additive is not tainted with other harmful chemicals, considering that it is sourced from industrial and fertilizer processing stacks! The fluoride ion is very small and very difficult to remove from water. It requires expensive reverse osmosis or distillation systems which not many can afford to install, *including my family*.

I believe that it is unethical to mass medicate citizens without their informed consent. We do not impose other medications on all citizens of a municipality in this way. When medicine is delivered this way, there is no control of dose or **dosage** for a **drug**, no matter what the concentration.

Only 5% of the world still participates in this antiquated practice. Meanwhile, there are thousands of studies about the dangers of water fluoridation to be considered. The louder voices of the pro-fluoride group should not rightly be allowed to sweep these concerns under the rug.

I will only vote for City and Council representatives who support freedom of choice, and I firmly believe that water fluoridation denies a person's right to choose what is best for their own health.

Sincere Regards,

Angela DeSabatino

subs@3downs.ca

From: susan@intentionalhealth.ca
To: [Farkas, Jeromy A.](#)
Cc: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 1:26:15 PM

Dear Jeromy,

I am very concerned about the upcoming October 29th discussion regarding re-introducing fluoride into Calgary's water supply. I believe there is good evidence to support concerns regarding safety, particularly concerns about fluoride accumulating in body tissues which constitutes a threat to health, particularly of children and pregnant women.

The research I have read shows the health concerns to be substantial. However, beyond that, I feel freedom of choice is a fundamental issue and should be central to the debate. If there is no fluoride in the public water supply and I want to ingest it, I can easily access it in the form of inexpensive drops or pills. If however, there is fluoride in the water and I don't want to ingest it, it's difficult to get it out. When Calgary's water supply was fluoridated before, I was unable to find a filter which would remove it, so I had to buy bottled water which was a significant expense and did not address the problem of absorption via baths and showers.

In addition, I feel the cost factor is significant. I understand the cost of installing the needed equipment to our water treatment plant is substantial, never mind the ongoing cost of the fluoride. I don't think this expense is warranted, particularly given the state of Calgary's economy at the moment. If council decides fluoride should in fact be ingested, it would be less expensive to make drops or pills available, free of cost, in pharmacies across the city.

Beyond those concerns, there is a more philosophical question, which is how our health, dental or otherwise, could possibly be improved by ingesting an industrial byproduct. The logic of that is lost on me.

Thank you Jeromy, for considering these points before you head into the discussion on October 29th, and thank you also for your determined and independent voice at City Hall.

Sincerely,
Susan Letourneau

From: [Four Worlds](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 2:22:53 PM
Attachments: [Public Submission on Water Fluoridation.pdf](#)

Kindly refer to the attached.

--

Four Worlds Centre for Development Learning

Box 395

Cochrane, AB T4C 1A6

Phone: 403-932-0882

Email: anyone@fourworlds.ca



Four Worlds Centre for Development Learning
PO Box 395, Cochrane AB, T4C 1A6
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anyone@fourworlds.ca / www.fourworlds.ca

October 21, 2019

Calgary City Council

Re: Public Submission for Hearing on Water fluoridation

Dear Mayor Nenshi and Council members,

The question of whether or not to fluoridate Calgary's drinking seems very difficult. It's a little like the story of the seven blind men who encounter an elephant. When the average person looks at the evidence, she finds two contradictory piles of research studies, one side in favour and one side against fluoridation.

So, it seems only reasonable to consult experts. Surely they will tell us what to do. Unfortunately, the "experts" are caught up in contradictory wrangling that seems not only confusing for its differences in perspectives, but also disconcerting because of the vitriol and ad hominem attacks attached to some of the positions that are being taken. There is more than a detached scientific search for the truth involved in this discussion. Clearly, at least some of the proponents are personally invested.

As a person with extensive training and experience in research, I decided to look into the matter myself. Here is a summary of what I found.

1. There are indeed hundreds of studies which seem to argue for both sides of the question.
2. On deeper examination however, I found that 90% of the pro-fluoride studies were derivative of just a few major studies. All the rest simply repeated, echoed and quoted from these few. Upon examination of those seminal studies, I found that all of them were dated and had excluded from consideration a huge body of evidence that has been accumulating for several decades proving that fluoride is dangerously harmful to human health, and is not even particularly effective in preventing tooth decay in children or anyone else.
3. On the other side of the ledger, I found the following.
 - For every one mm/liter increase in urine fluoride level in pregnant women, there is a 4.5 IQ point decrease in scores for boys when tested at age 3 - 4. A one milligram higher daily intake in pregnant women was associated with a 3.7 IQ point lower score for both boys and girls. (Greene et al., 2019)
 - The editors of the scientific journal JAMA asserted that fluoride has the ability to diminish intelligence of children as much or more than lead.
 - A panel of 12 eminent scientists in the USA concluded that "fluorides have the ability to interfere with the functions of the brain and the body" (NRC, 2006). In fact, 14 refereed scientific studies in the past two years have shown cognitive harm can come from elevated fluoride levels.
 - Beyond the harm it does, there is a huge body of research that demonstrates that fluoridating public water systems does not make any difference at all in preventing tooth decay. When jurisdictions that do not fluoridate (such as Vancouver, Calgary and most of Québec) are compared with jurisdictions that do add fluoride to their water, there is no significant difference in the levels of tooth decay in children or in adult populations.
 - Another significant factor is that our society would never tolerate delivering any other drug to the entire public, whether they needed it not, without their consent, which is exactly what is happening when fluoride is delivered to the entire public through drinking water.

Even if you want to fluoridate, applying it topically to those who want fluoride ensures that those who are getting it have given their consent.

- Finally, setting up and operating a water fluoridation system is hugely expensive. It would cost Calgary hundreds of thousands of dollars to do something that is not effective and, in fact is dangerous to human health.

Pro fluoridation "experts" have tried to convince us that we would be doing harm to children if we do not fluoridate Calgary's public water system. In the face of the overwhelming evidence against fluoridation, one has to wonder which self interests are being promoted with what is essentially fake news.

We were given the impression that the "experts" were the only people trained and qualified to interpret the research. I can tell you from first-hand experience in reading through the scientific studies on both sides of the argument, that this is simply not true. For sure, it is time-consuming to sift through all that paper, but anyone with a basic education and an open mind can do it.

And, anyone who does look at the evidence with an open mind cannot escape the conclusion that Calgary should not put fluoride in the drinking water. It would help no one and would be harmful to many.

Sincerely,



Michael Bopp, Ph.D.

Director

Four Worlds Centre for Development Learning

anyone@fourworlds.ca

Ph: 403-852-8283

From: [georgette.pare](#)
To: [Public Submissions](#)
Subject: [EXT] Anti-Fluoridation
Date: Monday, October 21, 2019 2:37:30 PM

Dear City Council,

I am writing to let you know that I am opposed to having my drinking water fluorinated. I object to meddling with human (all life) chemistry through our water source.

I think it is a very dangerous practice and history has proven enough times that it is not a good idea to medicate the masses.

Fluoride may have helped some study groups prevent cavities. This is not a good enough reason to dump it in all of our water sources. Besides the known and unknown health hazards, it is an expensive way to water our lawns and wash our cars.

If indeed fluoride has improved the dental health of certain groups, supply them with fluoridated tooth paste, bottled drinking water with fluoride or tablets. Offer it as an option in child care facilities and or schools.

It makes no sense to me that 95 percent of the population should have to consume medicated water for the perhaps 5% of people that may benefit its contamination (my opinion) with someone's left over fluoride.

Please do not add fluoride to our City of Calgary water. I cannot voice this strongly enough.

Best regards and trust that you will continue to take wise decisions.

Georgette Paré

403 708 2141

From: [Micky Leycraft](#)
To: [Public Submissions](#)
Subject: [EXT] Fwd: Please stop fluoridation
Date: Monday, October 21, 2019 2:38:08 PM

Letter: Janice Rae Leycraft

Calgary Alberta. What a beautiful city. Home of 1.6 million people. Home of the Calgary Olympics. A city featuring communities with safe schools -This is a city with open parks, bike paths, Calgary zoo, world known planetarium . Home of the Calgary stampede where millions of people have come and visited our beautiful city.

A city that becomes electricity with hockey and football games.

Calgary is known as a clean city, where a river flows with clean natural Rocky Mountain water. This is a city- that thousands-if not millions could only dream of bringing their children their families to share in our equity of rich resources.

The biggest -the greatest-the most privileged of all is the gift of turning on a tap and having clean potable drinking water. A blessing a right that millions could only dream fathomable.

Now you have informed us, you want to take away a right a privilege, a human right to medicate our waters by putting life affecting chemicals affecting our lives, our animals, recreation facilities And the environment.

We are only a group that sincerely cares of the life's of millions of Canadians. A group that has studied and brought the science of critical life affecting changes of putting Fluoridation in our privileged water. A group of citizens Demonstrating true science of the various health effects from dementia to affecting an unborn child. We are citizens that have given freely of our time, energy, and efforts ask that you do the same. I ask and trust that you keep our city with all the beauties attractions and natural resources alive. You too have the choice. Please stop fluoridation

Sincerely
Janice Rae Leycraft

From: [H S Micklem](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 2:48:04 PM

Dear Councillors,

To introduce myself: I am the Professor Emeritus of Immunobiology, School of Biological Sciences, University of Edinburgh, Scotland. I am co-author of the book *The Case against Fluoride* (Chelsea Green, 2010). More recently, I am a co-signatory of the *Statement in Opposition to Water Fluoridation: a Refutation of the CADTH Report on Community Water Fluoridation 2019* (Robert C Dickson et al 2019). I hold a DPhil (equivalent to PhD) degree from Oxford University, UK.

Back in 2009, when we completed our book, it was already apparent that, despite the strongly held views of dental authorities in Canada, the USA and a handful of other countries, the evidence was unconvincing for water fluoridation having anything more than a very marginal effect on dental decay. *That has not changed in the past decade.* In particular, I consider that the purported association, and by implication cause, of an increase in dental decay with the cessation of water fluoridation in Calgary rests on a misinterpretation of the data [C Neurath et al 2017 *Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada* [Community Dent Oral Epidemiol.](#) 2017 Dec;45(6):496-502]

So I submit that there is no good reason to restart community water fluoridation in Calgary for any supposed improvement in dental decay rates.

In 2009 there was already suggestive evidence that ingested fluoride could harm the brain and lower intelligence. *That evidence has increased vastly in the past decade.* Most recently three large studies have shown an association between prenatal exposure to fluoride and neurological damage to children. The most recent study by R. Green et al [*Association between maternal fluoride exposure during pregnancy and IQ scores in offspring in Canada* *JAMA Pediatr.* 2019;173(10):940-948.] was published after (according to the journal Editors) an exceptionally rigorous independent refereeing process, justified by the importance of the study's findings for fluoride toxicology and public policy.

I consider that the evidence for the neurotoxicity of fluoride is now as strong as it was for low-level lead in about 1990 and calls for a comparable degree of official acceptance and action. **Certainly the time has passed when deliberate addition of fluoride to the public water can possibly be justified.**

Respectfully,

Henry S Micklem DPhil
Emeritus Profesor of Immunobiology
School of Biological Sciences
University of Edinburgh
Scotland UK

hsmicklem@yahoo.com

From: [Gail Gay](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission for hearing on water fluoridation
Date: Monday, October 21, 2019 2:48:48 PM

I am deeply concerned about adding fluoride to Calgary's water. As a senior with osteoporosis, I have concerns about how fluoride effects old bones. Old bones should be supple and flexible not hard and brittle as too much fluoride can cause them to be.

Cavities in young children are caused mainly by poor diet and inability to access the dentist. Medicating an entire population for a few is just wrong.

Gail Gay Ward 4

Sent from [Mail](#) for Windows 10

From: [Joy Brockhoff](#)
To: [Public Submissions](#)
Subject: [EXT] Public Hearing Submission: Vote NO to Fluoridation Chemicals
Date: Monday, October 21, 2019 3:15:33 PM

PUBLIC SUBMISSION

RE: Public Hearing Submission: Vote NO to Fluoridation Chemicals

Dear PUBLIC SUBMISSION,

Dear Mayor and Council,

Please reject putting fluoridation chemicals into our city of Calgary water. Please maintain freedom of choice for me, you and all Calgarians. I wish to choose what I put into and onto my body.

As a resident of Calgary, I oppose the addition of fluoridation chemicals to my drinking, cooking, bathing, laundry and garden & yard maintenance water.

We should be cleaning our drinking water, not adding fluorosilicic acid contaminated with arsenic and heavy metals to it.

See study on contaminants found in fluoridation additives: https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ncbi.nlm.nih.gov_pmc_articles_PMC4090869_&d=DwlCaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=9iObD6Nv4a6ix1iDXyl48FPB5afnKh6DKrF8CYgUn8&s=fVRHJnCIViVI7nxEEb24LAnH2BonMa4l_XLcLA0OD6E&e=

Fluoride additives are also corrosive and have been shown to increase lead and copper levels in our drinking water: https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_articles_fluoridation-5Fflint-5Flead_&d=DwlCaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=9iObD6Nv4a6ix1iDXyl48FPB5afnKh6DKrF8CYgUn8&s=Fadmb3JX2W3lgZf-5pOqBIAup5hIBqmV6HrSrG_qp2k&e=

Fluoridation accidents are common and threaten public safety, and put water workers and first responders at risk: https://urldefense.proofpoint.com/v2/url?u=http-3A__fluoridealert.org_content_recent-2Dfluoridation-2Drelated-2Daccidents_&d=DwlCaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=9iObD6Nv4a6ix1iDXyl48FPB5afnKh6DKrF8CYgUn8&s=4sUZ8ftWeaOC7h7wH1iFVmtSUNfnzNR3v4tljrKstUc&e=

More info on fluoridation chemicals: https://urldefense.proofpoint.com/v2/url?u=https-3A__fluoridealert.org_issues_water_fluoridation-2Dchemicals_&d=DwlCaQ&c=jdm1Hby_BzoqwoYzPsUCHSCnNps9LuidNkyKDuvdq3M&r=k9F_06FbywnH2TQ5-aMCLBZGUGIRzrYefta1b63aY8s&m=9iObD6Nv4a6ix1iDXyl48FPB5afnKh6DKrF8CYgUn8&s=5NXL-0QuBalknPBxR9NbFw4qr_bXsf2zMS2WGTJYHY&e=

Please vote to keep Calgary water as clean as possible. Don't let the phosphate fertilizer industry pollute our drinking water.

Thank you.

Sincerely,
Joy Brockhoff

Calgary, AB

From: [Joy Brockhoff](#)
To: [Office of the Mayor](#); [Farrell, Druh](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [City Clerk](#); [Public Submissions](#)
Cc: safewatercalgary@gmail.com
Subject: [EXT] Please support Freedom of Choice and Reject Fluoridation Chemicals!
Date: Monday, October 21, 2019 3:18:27 PM

Dear Mayor and Council:

Please reject putting fluoridation chemicals into our city of Calgary water. Please maintain freedom of choice for me, you and all Calgarians. I wish to choose what I put into and onto my body.

As a resident of Calgary, I'm writing to let you know that I oppose the addition of fluoridation chemicals to my drinking, cooking, bathing, laundry and garden & yard maintenance water.

We should be cleaning our drinking water, not adding fluorosilicic acid contaminated with arsenic and heavy metals to it.

See study on contaminants found in fluoridation additive as:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4090869/>.

Fluoride additive are also corrosive and have been shown to increase lead and copper levels in our drinking water: http://fluoridealert.org/articles/fluoridation_flint_lead/.

Fluoridation accidents are common and threaten public safety, and put water workers and first responders at risk: <http://fluoridealert.org/content/recent-fluoridation-related-accidents/>.

More info on fluoridation chemicals: <https://fluoridealert.org/issues/water/fluoridation-chemicals/>.

Please vote to keep Calgary water as clean as possible. Don't let the phosphate fertilizer industry pollute our drinking water.

Thank you.

Joy Brockhoff
2424-25 Avenue NW
403-282-7733

From: [Catherine Little](#)
To: [Public Submissions](#)
Subject: [EXT] Submission and Request for presentation on Tuesday October 29, 2019 on the issue of Fluoridation in our Calgary public water system
Date: Monday, October 21, 2019 4:18:31 PM

October 29, 2019

My name is Catherine Little. I was born and raised in Calgary and have lived here most of my life. I have had the privilege of living elsewhere in Canada and overseas

in Zimbabwe for 2 1/2 years in the late 80's and also to travel widely around our amazing planet.

I have practised the profession of Physiotherapy for almost 40 years and have been self-employed with my own wholistic physio practice since 1997. When I say

wholistic I am referring to seeing humans as biological beings with the biological unit including our psyche, our brain, our body/organs and our microbes.

I am writing this (and presumably presenting this) with the blessing of my family, friends and clients, who will be working on October 29 and could not be present.

My 91 year old mother was my first teacher and mentor in the area of fluoridation. She would speak to us about all the past plebiscites/votes that have been held

in this city over the past decades and her firm stance and understanding of the issue to NOT want fluoride in our drinking water. Our dentist, at the time, was also

firmly against fluoride in our water as well (just a really honest man who did not want to do any harm to his clients).

I know you have looked at some of the science on this issue, although I know most of you are not scientists. I do have a science degree with my physio

and have looked at some of the science literature as well.

The majority of the world does not fluoridate their water - the last stat I read it said about 95% of the world's water is not fluoridated - including BC, Quebec, most

of Europe, Asia and Africa. Tooth decay was certainly not an issue when I worked in Zimbabwe - I worked in the rural areas exclusively. I would have to say

that I would have gladly traded my teeth for the beautiful teeth of the people I worked with and for.

As fluoride is NOT a food, a nutrient, or a supplement and always carries a warning for those that want it, to never ingest it.

My choice is in the not needed category and thus I brush with fluoride free toothpaste.

For me the main thrust for my presentation is to go beyond the debate of right/wrong, yes/no and speak to the issue in relation to CHOICE.

There is no issue for those that want access to fluoride, as it is easily obtained in many different forms - gels, pills, foams, toothpaste, etc. and these are all

much more efficient than delivery through our water system. For me there is no opt out choice, if you put it into the public water system - you have taken away

my choice.

I also want to add, as a medical practitioner, that we all have unique physiology. Knowing that fluoride binds with all metals in our body this can certainly be a

problem for certain populations of the public. Those with sensitive/low tolerant systems or compromised physiology or just aging could all be at risk. Fluoride in

our body does not discriminate for anyone or any group - babies with weaker immune systems, pregnant women and their growing fetuses, hospitalized people

with numerous illnesses, chronic conditions (thyroid, etc. on medications), leaving these populations very vulnerable to effects of a toxin in our water.

The recent studies reported in our newspapers (Calgary Herald August 27, 2019 article entitled "Is a Lower IQ For Our Kids Worth Harder Teeth?") I will

refer to in the science category as something that is very serious and should be considered.

So in conclusion I would like us to get beyond the debate and allow for some common sense about CHOICE to prevail so that it can be a Win, Win, Win.

First for those that want fluoride still can have it in other forms. Secondly for those who do not want fluoride do not have to spend their

own money to

buy unfluoridated water. Thirdly the city can save millions of dollars from the cost of putting it in our water.

If in doubt - please leave it out!!

Sincerely

Catherine Little B.Sc. P. T.

From: [Darcy](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoride - No Thanks
Date: Monday, October 21, 2019 4:23:29 PM

Please vote no to fluoride.

Darcy Waterbury
Point McKay Gardens NW
Calgary

From: [Denny Bardeau](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoride - No Thanks
Date: Monday, October 21, 2019 4:24:49 PM

> Please vote no to fluoride.
>
> Denise Bardeau
> Point McKay Gardens NW
> Calgary

From: [Lily Mae](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); [Office of the Mayor](#); [Sutherland, Ward](#); [Magliocca, Joe](#); [Gondek, Jyoti](#); [Chu, Sean](#); [Chahal, George](#); [Davison, Jeffrey R.](#); [Farrell, Druh](#); [Woolley, Evan V.](#); [Carra, Gian-Carlo S.](#); [EAWard10 - Lesley Stasiuk](#); [Keating, Shane](#); [Demong, Peter](#); [Colley-Urquhart, Diane](#); [Farkas, Jeromy A.](#); [pat.fule@strathmore.ca](#); [lorraine.bauer@strathmore.ca](#); [tari.cockx@strathmore.ca](#); [denise.peterson@strathmore.ca](#); [melanie.corbiell@strathmore.ca](#); [bob.sobol@strathmore.ca](#); [jason.montgomery@strathmore.ca](#); [jthackray@strathmore.ca](#); [Peter.brown@airdrie.ca](#); [darrell.belyk@airdrie.ca](#); [tina.petrow@airdrie.ca](#); [al.jones@airdrie.ca](#); [candice.kolson@airdrie.ca](#); [Kelly.hegg@airdrie.ca](#); [ron.chapman@airdrie.ca](#); [mchalmers@chestermere.ca](#); [lbold@chestermere.ca](#); [cburness@chestermere.ca](#); [mfoat@chestermere.ca](#); [rnarayan@chestermere.ca](#); [ywagner@chestermere.ca](#); [myoung@chestermere.ca](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 6:36:33 PM

Dear Mayor and Council,

I reside in the community of Panorama Calgary Alberta.

Thank you for taking the time to read my email. I appreciate you hearing my concern.

I am writing to ask you not to favor the reintroduction of water fluoridation in Calgary.

I know the concern surrounding this issue is coming from a good place, wanting to protect the health of our teeth and lifestyle within that. However, there has to be other options than reintroducing fluoride back into the water.

I personally have allergic reactions to fluoride and am very concerned I won't be able to protect myself, if it ends up in the public water again.

I strongly feel for those who need fluoride, a simple prescription fluoride rinse would be a more effective form of treatment. Plus would allow the choice to remain open to those who don't need or want to use fluoride. A common ground.

Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice.
Water Fluoridation denies a person's right to choose. You cannot guarantee that fluoride is safe and effective for everyone. With my case of having an allergic response to fluoride, being a prime example of how it isn't safe for me.

I look forward to your response,

Ruby Martin

From: [sreyasi munshi](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 6:45:31 PM

Hi ,

I strongly oppose adding fluoride into water as my family physician strongly recommend to avoid fluoride intake for my little kid .

Kindly consider this mail as my obligation and do the needful so that our concern can Considered before the hearing .

Thank you,
Sreyasi Munshi
Nolan Hill, Ward#2
Calgary , AB

From: [DeMarcos Design](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewater@gmail.com
Subject: [EXT] Opposition to fluoridated water in Calgary
Date: Monday, October 21, 2019 6:45:51 PM

Good evening,

I'm unable to attend the public hearing on whether or not council will move forward on adding fluoride back into Calgary's water. I oppose this initiative. We are fortunate to live downstream from the beautiful Rocky Mountains and drink water supplied to us by the Bow Glacier. Adding the expensive and toxic chemical fluoride to our phenomenal natural water supply is not an idea I can support.

Thank you,
Jennifer DeMarcos
Calgary NW resident

From: [Diverse](#)
To: [Public Submissions](#)
Subject: [EXT]
Date: Monday, October 21, 2019 7:08:39 PM

Hello

Please stop the Calgary fluoridation. My son has bilateral kidney hydro Nephrosis and adding fluoride to the water not only affects his kidneys overtime but affects his teeth as it did in the past when it was added over 10 years ago. We need to follow the science and do things that makes a positive change to everyone's health.

Thank you so much

Foozieh

Sent from my iPhone

From: [Ange B](#)
To: [Public Submissions](#)
Cc: safewatercalgary@gmail.com
Subject: [EXT] FW: Calgary's Water...
Date: Monday, October 21, 2019 9:24:07 PM

From: Ange B

Sent: 21 October 2019 08:46 PM

To: themayor@calgary.ca; ward.sutherland@calgary.ca; joe.magliocca@calgary.ca; jyoti.gondek@calgary.ca; sean.chu@calgary.ca; george.chahal@calgary.ca; jeff.davidson@calgary.ca; Druh.Farrell@calgary.ca; Evan.woolley@calgary.ca; Gian-carlo.carra@calgary.ca; ray.jones@calgary.ca; Shane.keating@calgary.ca; Peter.demong@calgary.ca; diane.colley-urquhart@calgary.ca; Jeromy.farkas@calgary.ca; cityclerk@calgary.ca

Cc: pat.fule@strathmore.ca; lorraine.bauer@strathmore.ca; tari.cockx@strathmore.ca; denise.peterson@strathmore.ca; melanie.corbiell@strathmore.ca; bob.sobol@strathmore.ca; jason.montgomery@strathmore.ca; jthackray@strathmore.ca; mchalmers@chestermere.ca; lbold@chestermere.ca; cburness@chestermere.ca; mfoat@chestermere.ca

Subject: Calgary's Water...

Dear Mayor and City Council:

I live in Eau Claire and I am very concerned about the possibility that we may once again have fluoride in our drinking water. ***I do not consent.***

Yours Truly,

Angela Belanger

From: [Spirit Healer](#)
To: [Public Submissions](#)
Subject: [EXT] Submission for hearing on water fluoridation
Date: Monday, October 21, 2019 9:42:11 PM

To City Councillors:

I want to keep this simple and to the point.

I DO NOT want fluoride added to Calgary's water.

This is what some feel is medication while I view it as a toxic substance along with many others and of course science. Why would I want to add a neurotoxin to my body? My teeth are healthy without it. And I DECIDE whether I want to use it NOT city councillors.

People all around the world enjoy healthy teeth without fluoride added to their water. To spend millions on this is would be such a waste of taxpayer dollars that could be better utilized elsewhere. It was already voted out years ago so why is it even back on the table? My educated guess would say it is Ignorance fueled by those who stand to gain financially. Why spend millions on something with 1% of the fluoridated water being consumed? Why put people's health at risk?

I WILL NOT and DO NOT WANT my body/my brain subjected to this poison.

I urge you to vote against reintroduction of water fluoridation in Calgary's water supply.

Sincerely,
Cheryl A Keagan

From: [Gitta Oorthuis](#)
To: [Public Submissions](#)
Subject: [EXT] Against adding fluoride to Calgary drinking water
Date: Monday, October 21, 2019 10:18:26 PM

Dear Mayor Nenshi and City Councillors,

Re: Fluoridating Calgary Water

I am a 73 year old senior and not a scientist however I have read all I can on this matter over the years. Originally I came from the Netherlands and stay in touch with family there. It has been banned there and most of the rest of Europe.

I am healthy but had thyroid problems up until 2011 and suffering from lethargy, chronic fatigue and disruptive immune system and problems with my digestion. These things have cleared up slowly since fluoride was removed from our drinking water. I have low blood pressure and need to drink at least 10 cups of water most days. I am on a fixed pension and could not afford to buy water. Having a regular water filter does not remove fluoride.

The dental clinic I attend do not do fluoride treatments because they believe it is unhealthy. However this can be a personal choice for people that want to use fluoride or toothpaste that contains fluoride. But please do not add this to our drinking water.

Sincerely,
Gitta Oorthuis

Sent from my iPad

From: [suzanne drzymala](#)
To: [Public Submissions](#)
Subject: [EXT] Safe water
Date: Monday, October 21, 2019 11:00:36 PM

To whom it concerns-

Freedom of choice with food and health is of utmost importance to me and my family. Pure food, pure water. Adding fluoride to our water is not only unnecessary - but also expensive and unwanted by many. For those who CHOOSE fluoride, it can be easily added with drops to their own water. For the city to add a chemical so controversial to a water system that all Calgarians rely on for health and safety goes against our right of free choice.

Keep our water as pure as possible! Allow individual choice for families. No fluoride .

Suzanne Drzymala
403-863-7596

From: noreply@calgary.ca
To: [Public Submissions](#)
Subject: Fluoridation City Council Meeting October 29, 2019
Date: Tuesday, October 22, 2019 12:03:21 AM
Attachments: [Calgary- Email of Introduction 10-22-2019.pdf](#)
[Canadian Antifluoridation document refute Final as of 10-22-19.pdf](#)
[Response to Questions of Calgary Councillors.pdf](#)
[Public Submission to the City Clerk's Office.pdf](#)

Public Submission from Johnny Johnson

October 22, 2019

His Worship, Mayor Naheed Nenshi, and
Calgary City Councillors
800 Macleod Trail SE,
Calgary, AB T2P 2M5

Dear His Worship Mayor Nenshi and Calgary City Councillors,

I write regarding the water fluoridation issue currently before you. Having practiced pediatric dentistry for 30 years in the United States, I wish to help you with respect to incomplete or misleading information sent to you about community water fluoridation (CWF).

The American Fluoridation Society (AFS) was so surprised, in particular by a document¹ authored by “Safe Water Calgary” that we felt compelled to respond to it. AFS’s Communication Officer, Dr. Steve Slott, provided evidence-based scientific facts, with credible references, in the attached document. Additionally, we are attaching answers to questions posed by the city councillors to the O’Brien Institute in your request for a report on water fluoridation.

You are hearing the very same claims from water fluoridation opponents that were made in Windsor, Tecumseh, LaSalle, and London, Ontario recently in their document. These same claims, I am ashamed to admit, emanate from the United States, hence my request to come to address the problems my countrymen have created for you.

What is the American Fluoridation Society?

The American Fluoridation Society was formed in 2014 by a group of healthcare professionals who decided that it was time to protect the health of our families from misinformation being spread by water fluoridation opponents. With the rapid growth of the internet, search engines make anti-vaccination and anti-fluoridation activists appear credible even as they spread misinformation and conspiracy theories. They attempted to advance their arguments to public health agencies, who of course rejected the claims. So not having succeeded there, they take their claims to elected officials.

AFS is a non-profit organization whose members do not accept any money for their work, nor do they profit in any way. This group of all volunteer healthcare providers disseminate credible, evidence-based scientific literature which overwhelmingly continues to support water fluoridation’s effectiveness and safety. We assist communities also with credible

¹ Safe Water Calgary: “Statement in Opposition to Artificial Water Fluoridation: A refutation of the CADTH (Canadian Agency on Drugs and Technologies in Health) Report on Community Water Fluoridation of 2019”

science to help them to dispel the myths that opponents of water fluoridation spread to cause fear and doubt.

AFS's help requested in Windsor and Tecumseh, Ontario's successful water fluoridation restart efforts

1. Windsor, ON

AFS was contacted by the Windsor-Essex County Health Unit with a request to attend the Windsor City Council Meeting on December 17, 2018. The Health Unit asked me to serve as a subject matter expert on community water fluoridation. Because most of the claims of harm from water fluoridation are born in the United States, I was considered to be a valuable resource regarding the evidence that public health officials would also address.

After several hours of testimony by the Medical Officer of Health, Dr. Wajid Ahmed, by delegations both in favor of water fluoridation and opposed to it, and additional questioning of me about how certain issues are dealt with in the U.S., Windsor City Council voted overwhelmingly (8 votes to 3) to return water fluoridation.

2. Tecumseh, ON

AFS was again asked by the Windsor-Essex County Health Unit to attend the Tecumseh City Council meeting on January 29, 2019. The subject of water fluoridation was to be discussed, but no vote would be taken that night.

At this meeting were most of the delegations that had appeared before the Windsor City Council. Again, claims against water fluoridation were made, with specific references to dentist Dr. Hardy Limeback's opposition view. Dr. Limeback, physician Bob Dickson, and chemist Paul Connett had also given input by email and/or an article in these cities. Not having succeeded in Windsor, none of them attended this meeting.

Thankfully for the oral and general health of Windsor, Tecumseh, and LaSalle's elderly, adults, and children, the Tecumseh City Council voted 6-0 to restart water fluoridation.

Fluoride occurs naturally in all water, but typically at a level too low to protect our teeth from cavities. Calgary's water is naturally fluoridated at 0.1 to 0.4ppm (parts per million [ppm]; milligrams per litre [mg/L]) depending upon the season. At 0.7ppm, fluoride in water prevents at least 25% of cavities over a person's lifetime. By simply adjusting the

fluoride from the naturally low level in your water to the optimal level of 0.7ppm, you will help to prevent cavities for every single resident in your city using the public water supply. That includes adults, the elderly, as well as the children in the entire city.

Water fluoridation is backed by over 74 years of experience and research in Canada and the U.S. In fact, more than 6,000 studies have been published on fluoridation. There has never been a single adverse health effect associated with water fluoridation in Canada or worldwide. As Calgary's experience demonstrates, tooth decay rates rise significantly when a community ends fluoridation. Dr. Lindsay McLaren's study after only three years of cessation clearly demonstrated a 146% rise in cavities in Calgary's Grade Two children as compared with continuously fluoridated Edmonton.

I know that each of you seeks to make the right decisions for the families of Calgary. I would welcome the opportunity to be a resource for questions that you might have or come across. AFS is available to address any questions or concerns that you may have over claims that are being made against water fluoridation. If you have questions or want any more information, please do not hesitate to call or email me.

Please listen to the world's credible experts in making this decision on the issue of fluoridation, instead of relying on a handful of people who use the internet to create fear and doubt. Calgary chose to fluoridate its water in the past based upon their responsibility to protect the public's health. Now a generation of Calgary's young adults and teens have strong teeth and beautiful smiles.

A partial list follows of health and scientific organizations that endorse CWF:

1. Canadian Paediatric Society
2. Public Health Agency of Canada
3. American Academy of Pediatrics
4. Canadian Dental Association
5. American Dental Association
6. American Public Health Association
7. Centers for Disease Control and Prevention (CDC)
8. Mayo Clinic
9. World Health Organization

Not a single, credibly recognized health or scientific organization in the world opposes water fluoridation. Not one.

Thank you very much for taking the time to read this letter. I would be honored to work with you to return water fluoridation to the residents of the City of Calgary.

Respectfully submitted,



Johnny Johnson, Jr., DMD, MS
Pediatric Dentist
Diplomat American Board of Pediatric Dentistry
Life Fellow, American Academy of Pediatric Dentistry
President, American Fluoridation Society
cell: 727-409-1770
email: Johnny@AmericanFluoridationSociety.com
web: www.AmericanFluoridationSociety.org
Twitter: @AFS_FLUORIDE

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Dentist

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Dental Hygienist

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Charles Haynie, MD, FACS
Vascular Surgeon

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Former Director, Division of Oral Health, U.S. Centers for Disease Control and Prevention.

Howard Pollick, BDS, MPH
Professor, Preventive & Restorative Dental Sciences
University of California San Francisco, School of Dentistry

John Morris, DDS (UK) - University of Birmingham School of Dentistry, former national lead for water fluoridation with Public Health England and regional consultant for the Midlands and East of England.

Michael Foley, BDSc, MPH, PhD (Aus) - Director of Research and Advocacy for Metro North Oral Health Services, Former Director of Brisbane Dental Hospital.

Timothy Wright, MS, DDS - UNC School of Dentistry Department of Pediatric Dentistry, Chapel Hill, NC

Mark Moss, DDS, PhD - Associate Professor, Department of Foundational Sciences, East Carolina School of Dentistry, Greenville, NC

Gary D. Slade, BDSc, DipDPH- John W. Stamm Distinguished Professor of Dentistry at the UNC Adams School of Dentistry, Chapel Hill, NC

Jennifer Meyer, PhD, MPH, CPH, RN- Assistant Professor of Health Sciences, University of Alaska Anchorage, AK

Response to Questions posed to the O' Brien Institute by Calgary City Councillors

October 22, 2019

The following are responses by the American Fluoridation Society (AFS) to questions to which the Calgary City Councilors desired answers. Questions with no response are those requiring local, or O'Brien specific input.

Definitions:

Cavities, caries, and decay are three words meaning the same thing

1. How will this analysis be put together?

The American Dental Association has compiled and regularly updated a booklet devoted to community water fluoridation. This booklet is not online currently, but AFS would be happy to supply you with copies of it at no cost to you.

This booklet is named "American Dental Association, Fluoridation Facts". It evaluates all literature that is available and provides evidence-based research on every topic in its [Table of Contents](#). I respectfully request that the Calgary City Council take a look at the table of contents to see the topics that are included. Almost all, if not all, of the questions asked by the city councillors are listed along with scientific references on each topic.

2. Has this type of analysis been done before?

Yes. (See number 1 above and the following)

- a. While the O'Brien Institute (OI) attempted to assemble an objective review, there are countless reviews of the fluoride literature which offer much more comprehensive information and in-depth analyses of the scientific studies, all of which provide substantial support for the effectiveness and safety of community water fluoridation. This includes the United States 2006 "National Research Council's **Fluoride in Drinking Water: A Scientific Review of EPA's Standards**" ([NRC](#) report), the 2000 "A Systematic Review of Public Water Fluoridation" from the University of York, York, England ([York Review](#)), The National Health and Medical Research Council ([NHMRC](#)) Reviews of the Australian government, the United States Community Preventive Services [Task Force](#), and numerous others.
- b. The majority of studies have been done on 1.0ppm, not 0.7ppm, as the level of 0.7ppm was recommended in April, 2015.

Previous levels were set based on the U.S. Public Health Service's observations that optimal cavity reductions occurred at 1ppm with only very mild to mild

fluorosis which was not noticeable except by dental personnel under a bright light and dried teeth.

That level was refined in 1962 to a range of 0.7-1.2ppm based primarily upon water intakes of children. Lack of widespread climate control (air conditioning, heating) accounted for differing water intakes across the U.S. However, as the climate of homes, schools, automobiles, and other areas became commonplace across the country, water intakes of children became the same no matter where they lived. Hence, the level was set at the single sweet spot of 0.7ppm.

Heller et al showed in 1999 that at this level of 0.7ppm, maximum cavity reductions with minimal dental fluorosis were obtained, with little change in cavity reductions between 0.7-1.2ppm, but an increase in dental fluorosis over that same range. Based on this study, along with many others, the single level of 0.7ppm was recommended.

3. Is there any proof that water fluoridation is beneficial for children, or other relevant groups, dental health?

Absolutely.

There are countless peer-reviewed scientific studies, current through 2019 which clearly demonstrate the effectiveness of fluoridation in the prevention of significant amounts of dental decay in entire populations.

4. Has the CADTH produced any research in the areas of the potential benefits, potential harms, cost, ethics, legal in regards to water fluoridation?

Yes.

The Canadian Agency for Drugs and Technology in Health (CADTH) publications thoroughly covered these topics. The Agency, like other research bodies around the world, have found that water fluoridation is effective in preventing cavities and that no adverse health effects are seen.

Additionally, there are volumes of information on these issues within the scientific literature on fluoridation. It is important to note that there are no adverse health effects of fluoridation as multiple Systematic Reviews have found. These Systematic Reviews have been occurring throughout the decades that water fluoridation has been in place. Systematic Reviews are ongoing (as is done with other public health measures) and current through today.

Fluoridation is one of the most studied public health measures in history. The volume of research is either first or second only to vaccination research.

5. Is the CADTH report something you could analyze on Calgary's behalf?

6. How do you have civil and respectful conversations about this contentious issue?

We continue to have respectful conversations about fluoridation by:

- a. Adhering to accurate information supported by valid evidence that has been published on community water fluoridation in credibly recognized, peer reviewed, scientific journals.
- b. Always demonstrating basic respect for the other person
- c. Avoiding personal attacks on each other. The credible science speaks for itself.
- d. Becoming expert at identifying pseudoscience and the tactics of those who promote profit by amplifying false claims.

7. What do you say to the people who believe fluoridation should be an individual decision, as opposed to a public health policy for the common good?

- a. This situation is the same that applies to any public policy. People without children do not get to choose whether or not to support schools through their tax dollars. The same is true for people who do not visit public libraries, people who do not drive on public highways, and so on. We are a democratic society in North America. The greater good of the people outweighs the desires of the few. To deny public health, safety, and well-being to the entire population because of the few who do not want it is to live in a state of chaos. We do not choose to do that.
- b. We are from the US and so cite this US case from Florida. In 2000, the court in Quiles v. City of Boynton Beach addressed the responsibilities of local government in any community.

“The Florida Constitution, as well as Florida law enacted pursuant to it, gives municipalities broad ‘governmental, corporate, and proprietary powers to enable them to conduct municipal government, perform municipal functions and render municipal services’ and to ‘exercise any power for municipal purposes.’ Art. VIII, § 2(b), Fla. Const.; § 166.021, Fla. Stat. (2000). In defining the scope of a municipal purpose, Florida courts have long held that ‘[i]t is the duty of public authorities in municipalities to protect the safety, the health and the general welfare of the citizens’ and that ‘[t]his duty involves sanitary and health regulations.’”

- c. We do lots of things in public health that benefit individual and population health. National programs that mandate the fortification of wheat products with folic acid have reduced the prevalence of neural tube defects worldwide. We add vitamin D to milk to prevent rickets and promote calcium absorption.

*Also see question 20 below for further discussion of challenges to individual rights.

8. Is there any study that states “what is the best method to treat the teeth with fluoride?”

- a. While there are numerous methods to provide fluoride protection against dental decay, they are meant to work in conjunction with each other, not as one or the other. One shot applications of highly concentrated fluoride in toothpaste, mouthrinses, and professional application have their value. However, none is a viable substitute for the consistent bathing of the teeth in a low concentration of fluoride as provided by water fluoridation, and none even nears the cost-effectiveness of fluoridation in the prevention of dental decay in entire populations.

- b. The hallmark study by Klein et al. considered all interventions to determine which would be the most effective in reducing cavities. It included over 20,052 children in Grade One, Two and Five from five fluoridated and five non-fluoridated communities. These children were examined at baseline and assigned to one of six treatment regimens.

Four years later, 9,566 members of this group were examined again. Analyses of their dental examination data showed that dental health lessons, brushing and flossing, fluoride tablets and mouthrinsing, and professionally applied topical fluorides were not effective in reducing a substantial amount of dental decay, even when all of these procedures were used together.

Occlusal sealants prevented one to two decayed surfaces in four years. Children who were especially susceptible to decay did not benefit appreciably more from any of the preventive measures than did children in general. Annual direct per capita costs were \$23 for sealant or fluoride prophylaxis/gel applications and \$3.29 for fluoride mouthrinsing.

Community water fluoridation was reaffirmed as the most cost-effective means of reducing tooth decay in children.

9. Are there any studies that show that water fluoridation benefits certain age or subject groups, and what does it do to all of the others?

Yes.

Numerous current studies demonstrating the benefits in children and adults may be viewed [here](#).

Water fluoridation benefits everyone regardless of age, socioeconomic status, race, ethnicity, level of education, or access to dental care. It is safe for everyone to drink because it has not been shown to cause any adverse health effects.

10. Is water fluoridation really that important of an issue compared to all of the other health issues we face as a population?

Absolutely.

From the US [Centers for Disease Control](#):

“Dental caries is the most common chronic disease among youth aged 6–19 years. Untreated caries can cause pain and infections.”

Dental decay which can be and is prevented by water fluoridation causes lifetimes of extreme pain, debilitation, black discoloration and loss of teeth, development of serious medical conditions, and life-threatening infection. People die as a direct result of untreated dental decay in but one tooth.

11. What does the research show when it comes to other variables besides fluoridation for oral health? For example, diet.

While there are multiple factors involved in human disease, this fact does not diminish the need for valuable measures to prevent dental decay. Prevention is the best cure for any disease, with water fluoridation being among the most effective against dental decay.

A diet rich in fermentable carbohydrates, i.e. breads, pasta, crackers, fruits, refined sugars, will lead to more cavities than a diet low in these sugars. But even in the face of these diet challenges, cavities are reduced by at least 25% above and beyond those already reduced by fluoridated toothpaste, mouth rinses, and professionally applied varnish.

12. What about the idea that oral health is as much part of total health as anything else?

Not only is oral health critical to maintaining proper nutrition for the body, it has been repeatedly demonstrated that poor oral health is directly contributory to a number of life-threatening systemic diseases. The head is attached to the rest of the body via a common bloodstream. Infections of the mouth directly affect the entire body, including the heart and brain.

The Mayo Clinic calls oral health “A window to our overall health”.

13. Is there a study that is truly scientific, which has a subject, control groups, as well as comparable study groups, that compares cities with things like socio-economics well defined, that shows benefits of water fluoridation?

Yes.

There are countless such properly controlled studies, numerous current ones which may be viewed [here](#). This includes the McLaren 2016 study of Calgary and Edmonton which, due to the similarities of Edmonton and Calgary, provides excellent control over the above mentioned variables, in addition to many others.

14. There were so many things in the McLaren study, for example, ‘non-significant trend towards increase, ‘that didn’t give me the confidence to make this multi-million dollar decision. We need clear evidence to say if it is a benefit, or a detriment.

- a. Credible scientific evidence will rarely, if ever, “prove” anything beyond a shadow of a doubt. The McLaren study was a well-controlled, high quality study which demonstrated as best as possible that while dental decay increased in both fluoridated Edmonton, and non-fluoridated Calgary, the increases in Calgary were starkly higher than in Edmonton, demonstrating the adverse effect of cessation of fluoridation in Calgary. The increase in cavities in Calgary children was almost three times that of Edmonton.

There can be no clearer evidence supporting the need for resuming fluoridation of Calgary than this fact.

- b. Recent studies of cessations in Windsor, ON, and Juneau, Alaska, have added to the evidence which Dr. McLaren’s study verified for Calgary.

i. Windsor, ON.

Windsor, ON ceased water fluoridation in January 2013. The city council asked the Windsor-Essex County Health Unit (WECHU) to monitor cavity changes as well as implement more preventive dental care.

After 5.5 years, the WECHU reported back to the Windsor City Council last December on their findings. The health unit found a 51% increase in cavities and dental emergencies during that 5.5 year cessation. After hearing all delegations, the city council voted 8-3 to reinstate fluoridation.

ii. Juneau, Alaska

Juneau, Alaska ceased water fluoridation in 2007. Last year, researcher Dr. Jennifer Meyer published a study of the impact that this cessation had on their children and teens.

By examining Medicaid records (low income children), Dr. Meyers reported that children up to the age of 7 years old experienced one more cavity per year. The cost of those procedures to repair the cavity was approximately \$300 each.

To appreciate this finding, please imagine that you are looking at 20 children at age 4 in Juneau before fluoridation was stopped. Compare that group to 20 children at age 4 after cessation. The 20 children after cessation occurred would have in total 20 more cavities than their cohort in fluoridated Juneau. Next year, when they were 5 years old, they would have in total 40 more cavities than their counterparts. By age 6, that group would have in total 60 more cavities than their cohort in fluoridated Juneau.

These are hard scientific facts of how devastating the cessation of fluoridation is on our communities. These children not only have more cavities and more severe cavities, they also suffer from inability to focus in school from a toothache, missing school to go to the health clinic for antibiotics and pain relief, having difficulty chewing their food, and suffering needlessly because of this fluoridation cessation. Some of these children will have to be treated in the operating room with general anesthesia because of the extensive amount of cavities that they have. Some will even die from brain abscesses caused by an abscessed tooth. They may die from the general anesthetic itself.

Cavities are preventable. Water fluoridation is one tool, but an important tool in our toolbox to prevent cavities.

15. If water fluoridation is re-introduced, the equipment will need to be upgraded. Would it be better to take the millions of dollars needed to do these upgrades, plus the operating costs, and actually put it into a different method to treat those who are being disproportionately affected by dental health issues?

No.

You would not accept that car manufacturers remove seat belts to save money saying that the money saved could help injured motorists have wheelchair accessible vans. Prevention is always best. Why drill into a tooth when we could prevent the decay in the first place?

Just as we have driver education classes, and we issue tickets for drinking and driving distracted driving and speeding, we still need the seatbelts. Likewise, we have oral hygiene instructions, dental sealants, use of topical fluoride products (toothpaste, mouth rinses, professionally applied varnish), diet modification, and improving access to dental care for all – but we still need water fluoridation.

Preventing disease is always far more effective and far less expensive than treating it after occurrence. Water fluoridation is the most cost-effective means to prevent significant amounts of dental decay in the entire population without a single cognitive change in anyone's behavior. Drink the water, reap the benefits.

COSTS:

In terms of actual costs, according to the 2019 Alberta Dental Fee Guide, the average cost for a two surface filling is \$182. The population of Calgary is over 1.3 million. Using a very conservative average of prevention of but one cavity per person with fluoridation, the cost of instead paying to fill those teeth after decay, would be over \$253 million..... and this does not take into consideration the lifetime costs of replacing those fillings with larger ones, more expensive crowns, root canals, etc., or the enormous costs to the community from untreated dental decay.

16. Many groups (newcomers to Canada, those of a lower socio-economic background) may not have the best dental health practices to begin with. Does adding fluoride to the water make a difference in these cases?

Yes.

Water fluoridation strengthens the teeth against decay, thereby making them more resistant to the effects of poor dental hygiene. Those who benefit the most, and are most at-risk for developing the disproportionate burden of decay, are the disadvantaged families, children and seniors.

Water fluoridation levels the playing field between the haves and have nots. It helps close the gap in dental health disparities.

17. What is working in other jurisdictions where tooth decay is decreasing?

Water fluoridation, for one. Comparison between fluoridated Edmonton and non-fluoridated Calgary is a prime example. The cause and preventive measures involved in dental decay are myriad and diverse. According to the CDC, fluoridation currently prevents 25% of dental decay in addition to that prevented by all other preventive measures.

18. There are European jurisdictions where they don't fluoridate, but are seeing improvements in oral health outcomes because of things like reducing obesity, diabetes and other health factors. Will you be looking at those jurisdictions?

Improvement of dietary habits, reduction of obesity, improvement in access to dental care, education, and many other measures have been advocated by the public health community for decades. That dental decay continues to be a major problem in spite of this is one of the strongest reasons for preventive measures such as water fluoridation, not against it.

19. What has prevented this report from happening in the past eight years? AHS knew City Council was talking about it. There were two public hearings. Alberta was the last province to have a dental fee guide, and 70 per cent of dentists are not following it. Children don't have access to affordable dental care. I worry about this single approach, when it needs a far more complicated approach.

Water fluoridation is not meant to be a "single approach". It is a disease preventive measure meant to work in conjunction with all other viable measures to prevent significant amounts of dental decay. That prevention of dental decay is a complicated problem is a strong reason for the prevention provided by fluoridation, not against it.

20. Will you be looking at the ethics, and the idea of personal choice when it comes to the water supply, and at other proven interventions, and making recommendations to different levels of government?

From CADTH p. 5 Ethics ([Evidence Highlights document](#)):

"The review found that CWF is ethically justified because in areas where it is available, it is provided to all households. CWF effectively improves oral health at the population level with few harms or side effects."

Legal Challenges by opponents to water fluoridation:

Water fluoridation opponents have challenged fluoridation in the U.S. based on mass medication, violation of fundamental liberties, abuse of municipal authority, unlicensed practice of medicine/compulsory medication, right to privacy, unnecessary, unsafe & wasteful, and a host of other legal challenges. These challenges are cataloged on the website FLUIDlaw.org. This acronym is for the Fluoride Legislative User Information Database.

No U.S. Court of last resort has ever found CWF to be illegal.

21. Would it be possible for the three orders of government, or the University, to initiate a pilot, something like Childsmile in Scotland, or a similar program?

While Childsmile is promoted by antifuoridationist groups as an alternative to fluoridation, in reality, this program is astronomically more expensive than fluoridation, provides for only a fraction of the population compared with fluoridation, and is not even recognized by dental authorities in Scotland as being a viable substitute for fluoridation.

The cost per annum per child for Childsmile is £125. The projected average cost of water fluoridation for Scotland is 40 pence per person. The British Dental Association

has recommended that Scotland implement CWF due to its far-reaching benefits to the entire population at a fraction of the cost.

Seeking to establish effective preventive programs is always encouraged. However, such programs should be expected to work in conjunction with fluoridation, not instead of it. The problem with dental decay is so overwhelming that all the help that can be obtained is required in order to make meaningful inroads into resolving it. The reality is that there is no preventive measure which even approaches the cost-effectiveness of fluoridation in the prevention of significant amounts of dental decay in entire populations.

22. It's so expensive here to get dental care. How to we have an impact there (reduce cost so more people can get dental care, more often).

Making dental care more widely available and more affordable is certainly a worthwhile goal. Water fluoridation is the best means to help mitigate the effects of these high costs.

23. If families are drinking water that has had the fluoride removed (either by filtering or by drinking bottled water), is the cost to put it in in the first place even worth it?

Yes.

According to the US CDC, fluoridation prevents 25% of dental decay in the entire population, in addition to that prevented by all other measures. Please see question #15 above for an explanation of costs savings of fluoridation.

Public policy exists for the greater good of the community. If families are inadvertently removing fluoride from their drinking water, then education must occur. If they are removing it because they do not agree with water fluoridation, then that is a different situation. Parents would thereby be making choices for themselves and their children that they will have to explain to their children.

Public policy exists to provide for the health, safety, and well-being of the entire community. It cannot be tailored to an individual level for the few who may not want it. We live in a democratic society; one that cares for everyone equally. The best public policy for the population is what our leaders are elected to provide for us. This is true for the United States as well.

24. There is a report from Harvard that councillor Farrell and I hope you can look at as well. If it's a public health issue, do you know of any other jurisdictions where the province pays to have this implemented in cities? Can you include a comparable to other jurisdictions to see what they are doing?

The O'Brien Institute Report discusses the Harvard Meta-analysis of 27 studies from China, Iran, and Mongolia. While the O'Brien Institute's Report correctly frames this analysis as not applicable to North America as the studies had naturally occurring high fluoride levels in the water (up to 11.5ppm), the Report goes on to state that the high fluoride level studies showed IQ deficits, giving it weight in their Cognition section.

The facts are that the Meta-analysis showed a 7 point IQ deficit in the high fluoride group. However, in the control fluoride group (fluoride levels around that found in CWF), ***no IQ deficits were found.***

Further, the authors of this Meta-analysis, Anna Choi and Philippe Grandjean stated “*the data is not particularly applicable here because it came from foreign sources where fluoride levels are multiple times higher than they are in American tap water.*”

25. What do you say to people who say that the O'Brien Institute and the University of Calgary have already formulated an opinion, and cannot remain unbiased?

We face this same situation in the US with the CDC being called biased. There are some people that will always distrust scientists and evidence-based science.

26. There seems to be evidence both for, and against, fluoridation. How are you going to disseminate the studies that show potential for harm?

When the evidence presented against fluoridation is properly and critically analyzed by qualified personnel, it is shown to be invalid or irrelevant. There are no claims of “potential for harm” that have not been entirely addressed and refuted by the peer-reviewed science.

Councillors are encouraged to take a more in-depth analysis of the scientific evidence than that provided by the O'Brien Report. In doing so, they will be far better equipped to make an informed decision.

27. I trust that this report will look at if there is any evidence for harm, in any organs, etc. What do we know about the long-term effects?

There is no valid, peer-reviewed scientific evidence of any harm to any organs from optimally fluoridated water. During the entire 74 year history of water fluoridation, hundreds of millions having consumed optimally fluoridated water during this time, there have been no proven adverse effects. This result is in spite of the fact that water fluoridation has been the most studied public health initiative in history, with opponent groups attempting constant, aggressive means to find any association of the initiative with adverse effects.

There can be no stronger affirmation of the lack of short, or long-term adverse effects than this.

28. The different countries that have withdrawn from fluoridation, in Europe for example, are saying that they have reviewed all of the data and research and made the decision to remove it. Will you review those decisions and why they were made?

While it is unclear as to who might be saying this, officials in different countries are subject to the same misinformation, false claims, and inadequate understanding of fluoridation as are those in Canada and the United States.

The reality is that the reasons different countries might not fluoridate their water are numerous; few, if any, are related to concerns with effectiveness or safety of the

initiative. Removal reasons include such things as logistics of existing water systems rendering fluoridation cost-prohibitive, use of fluoridated salt and/or milk programs in lieu of water fluoridation, existing water fluoride content already at, or above, the optimal level, cultural reasons, and equal access to comprehensive dental care for all citizens of a population.

AFS Note to Calgary City Councillors:

The O'Brien Institute's Report section on Cognition places heavy emphasis on two studies from Canada, one by Christine Till et al, and the other by Rivka Green et al.

AFS will be providing detailed information on both of these studies in an evaluation of the O'Brien Institute's Report which will be emailed to the city council later this week. The Green study has come under worldwide criticism from the scientific community, including experts in Epidemiology, Neurology, Psychology, and Nephrology, in addition to dental researchers and academicians. So has the Journal of the American Medical Association Pediatrics journal which published it.

We wish to thank you for your time in reading this document. We are available to answer any questions or concerns that you may have.



Response to Critique by Fluoridation Opponents of the 2019 CADTH Report on Fluoridation

October 22, 2019

In a recent document, a group of members, former members, and close affiliates of one or both of the anti-fluoridation groups, Fluoride Action Network (FAN), and International Academy of Oral Medicine and Toxicology (IAOMT), provided information claimed to be a “refutation” of the 2019 report of the *Canadian Agency for Drugs and Technologies in Health* (CADTH), [Community Fluoridation Programs](#). To point out the false claims, misrepresentations, and misinformation of this “refutation”, the American Fluoridation Society has provided facts, evidence, and peer-reviewed science in the following document.

Initial Points

- The term “the authors” is used in reference to Hardy Limeback, Paul Connett, and the peripheral group of other fluoridation opponents who have signed onto the document in question.
- The group, “Safe Water Calgary” appears to be a local anti-fluoridation group led by activist Bob Dickson.
- The IAOMT is an activist group which, as with its anti-fluoridation beliefs, has similarly long attempted to impose its flawed beliefs against dental amalgam onto the public via advocacy and court action. A 2016 [rejection](#) of such IAOMT claims by the District Court of the District of Columbia may be viewed in *International Academy of Oral Medicine and Toxicology v. Food and Drug Administration*, Civil Action No. 2014-0356 (D.D.C. 2016) *District Court, District of Columbia*.
- While the authors put forth a flurry of invalid and/or irrelevant studies which they claim were “omitted” by CADTH, in actuality, it is not possible or necessary to include every such study fluoridation opponents claim to support their position, with no regard to the quality or source of those studies. With 6000 studies on fluoridation in existence, responsible reviewers must focus on those which are pertinent and credible. Within this document are cited numerous valid, peer-reviewed studies refuting claims of the authors, which they themselves have omitted from their “refutation” paper.
- While the authors deceptively seek to differentiate between “artificial” and “natural” fluoridation, fluoride ions are all identical, regardless of whether they become incorporated into surface water as it passes over rocks (“natural fluoridation”), or whether they are added into water systems at a later time (“artificial fluoridation”).

The following document addresses the claims made by the authors within each of their sections.

I. Ethics

1. *Authors: "Health Canada defines a drug as any substance used for "the diagnosis, treatment, mitigation or prevention of a disease, disorder, abnormal physical state, or its symptoms, in human beings or animals." Fluoride added to water to prevent cavities, is, therefore, being used as a drug."*

Facts:

This claim by the authors will be separated into two parts: Drug and Ethics.

A. Drug:

The argument that fluoride is a drug is the same as is used in the U.S. The authors state here that fluoride is a drug per the definition of what a drug is used for. The same argument is used in the U.S. with the Food and Drug Administration.

Fluoride supplements are prescribed by healthcare professionals in areas where community water fluoridation (CWF) is not in place, or is not feasible. The prescription is required to assure that children are not getting fluoridated water in addition to a fluoride supplement. In other words, it's a safety net mechanism.

To state that the Food and Drug administration does not approve for fluoride to be added to water in the U.S., as the authors do, is absolutely false. The FDA allows fluoride to be added to bottled water to top up any fluoride already existing in the water to the optimal level of 0.7 ppm. These bottles of water are labeled "Fluoride Added". On the bottle label it clearly states that the fluoride is added to aid in the prevention of tooth decay.

It is interesting that the authors choose to lay claim that fluoride is a drug that is forced upon everyone without their informed consent. This claim has been made in the U.S. as well. Opponents have sued in U.S. Courts on this issue and a plethora of others listed in their refutation.

CWF has never been ruled illegal in a court of last resort in the U.S. The website FLUIDlaw.org (Fluoride Legislative User Information Database) logs this information. Click [here](#) to see the court cases where CWF was challenged as a drug. There are 19 in all to date.

Interestingly, the authors do not refer to fortification of other foods with minerals to prevent diseases. The Canadian Food and Drug regulations require addition of iodine to salt and Vitamin D to milk to prevent ill-health effects. Public health measures, like all public health and safety measures, are made for the greater good of the community. (46)(47)(48)

Water fluoridation is one of these measures.

B. Ethics:

The authors attack the CADTH report for the Ethical Statement:

- "Overall, this ethics analysis concludes that CWF is ethically justified because it effectively improves public oral health with few harms and side effects. It is also an impartial intervention because, within communities where it is available, it is provided to all households, irrespective of status or wealth."
- Another report, "Ethics Consultation Report Ethical Considerations in Community Water

Fluoridation”, Presented to Dr. James Taylor Chief Dental Officer, Public Health Agency of Canada by the Public Health Agency of Canada’s Public Health Ethics Consultative Group, also evaluated all aspects of CWF, including ethical considerations:

Their conclusions were:

“Arguments based on the primacy of individual rights could also be used to argue in favour of initiating and maintaining community water fluoridation. Individuals could argue that they have an individual right to public health and to health protection, including to measures that protect their oral health.¹⁵ That should include water fluoridation given that it is the most efficient, safe and cost-effective measure for the prevention of dental caries”

“Many public health measures involve interventions that have an impact on whole populations or communities. Given the nature of these interventions, it is generally impossible to seek informed consent from all those who are affected by the intervention and to then offer the intervention only to those who have consented. This, it can be argued, constitutes an infringement of individuals’ autonomy and their interest in self-determination. In certain circumstances however, it is ethically acceptable to limit individuals’ choice in order to obtain a population-level health benefit.

Community water fluoridation is an example of a public health measure that involves a limitation of individuals’ interest in choosing for themselves, for the benefit of the population.”

- Opponents have challenged CWF as being unethical in U.S. Courts numerous times. Again, checking FLUIDlaw.org. There are [two](#) major cases. Again, CWF was not found to be illegal.
- 2. *Authors: “As Dr. Arvid Carlsson, 2000 Nobel Prize winner in physiology or medicine, stated, water fluoridation is ‘obsolete’ and ‘against all modern principles of pharmacology.’ “*

Facts:

Arvid Carlsson was a fluoridation opponent whose unsubstantiated opinions on the issue were not supported by the peer-reviewed science, or the consensus opinion of the worldwide body of respected science and healthcare.

- 3. *Authors: “Several European nations, including France, Germany, Belgium and the Netherlands, have cited the improper and/or unethical nature of adding any drug to drinking water as one reason they have banned fluoridation.”*

Facts:

Neither France, Germany, Belgium, nor the Netherlands has banned fluoridation, as is falsely claimed by the authors. That a country chooses not to fluoridate its water for any of numerous reasons does not constitute the initiative having been banned. The statements cited by the authors are sourced from “fluoridealert”, the website of the NY antifluoridation group, FAN. They are not official government decrees but simply unsubstantiated opinions solicited by FAN from individuals within those countries. These opinions are subject to, and biased by, the same antifluoridation misinformation as are those of fluoridation opponents within the US and Canada.

In Reality:

- France- Fluoridation of water is neither banned nor prohibited. “Fluoridated salt is available in France, and 3% of the population uses naturally fluoridated water, but the water is not artificially fluoridated.” (3) [\(7\)](#)
- Germany- Fluoridation is neither banned nor prohibited. “Public drinking water supplies are not currently fluoridated in any part of Germany, however for children and adolescents use of fluoridated salt and toothpaste, as well as fluoride tablets and washes are strongly encouraged by the German Ministry of Health.” (1) [\(7\)](#)

- Belgium- Fluoridation of water is neither banned nor prohibited. It is simply not necessary. According to Vandevijvere, et al., “The legal norm for [existing] fluoride concentration in tap water is 1.5 mg/L (Directive 98/93/CE). (6) (7)

Water is fluoridated at 0.7 mg/L, less than one half this mean level which already exists in the waters of Belgium.

- Netherlands- Water fluoridation was “unauthorized” in 1973 due simply to an interpretation of Dutch law. “Dutch authorities had no legal basis for adding chemicals to drinking water if they would not contribute to a sound water supply.” (7)

4. *Authors: “Adding fluoride to drinking water because some people may get cavities makes no more sense than adding aspirin because some people have headaches or adding a statin drug because some people have high cholesterol.”*

Facts:

Water fluoridation is not the addition of a drug to water supplies. It is the simple adjustment of the existing level of fluoride ions in water by a minuscule amount up to that level at which has been determined that maximum dental decay prevention will occur in the population served by that water, with no adverse effects upon anyone. The fluoride ions added in this adjustment are identical to those which have always existed in water.

Fluoride ions are ingested from water regardless of whether additional ones are added or not. Fluoridation just ensures that maximum benefit is attained while so doing.

The attempt by the authors to equate the adjustment of existing fluoride levels in water to an addition of aspirin and statins to water, is disingenuous, at best. Aspirin and statins do not already exist in water, as do fluoride ions. The addition of them would therefore be the addition of foreign substances which, unlike fluoride at the optimal level, do have documented side effects.

5. *Authors: With fluoridation, there is no control whatsoever over who ingests the drug and how much they drink,...*

Facts:

Control over fluoride ingestion from optimally fluoridated water is far more strictly controlled than is that from water which is naturally fluoridated. In the U.S. there are water sources that contain up to 16ppm of fluoride.

Water is fluoridated, and strictly maintained, at a concentration of 0.7 mg/liter. This means that for every one liter of fluoridated water consumed, 0.7 mg fluoride is ingested. The recommended maximum allowable fluoride level in Canada is 1.5 mg/liter, or 1.5 mg fluoride ingested per every one liter of such water consumed. Therefore, fluoride ingested in non-fluoridated water can be twice as high as that in fluoridated systems.

Additionally, when the maximum amount of a substance which can be ingested falls below the level of adverse effects for that substance then intake level is of no concern in regard to adverse effects. Prior to the threshold of adverse effects being attained from ingestion of optimally fluoridated water in addition to that ingested from all other normal sources of fluoride, water toxicity would be the concern, not fluoride. This is true for not only fluoride but chlorine, ammonia, and the numerous other substances routinely added to drinking water supplies.

6. *Authors: “...making it especially risky to vulnerable sub-populations like pregnant women, children and those who consume a lot of water such as diabetes and kidney patients, athletes and manual laborers”*

Facts:

There is no valid, peer-reviewed scientific evidence of risk of adverse effects to “vulnerable sub-populations like pregnant women, children and those who consume a lot of water such as diabetes and kidney patients, athletes and manual laborers.”, or anyone else, from optimally fluoridated water in conjunction with that ingested from all other normal sources of fluoride. This includes the recent questionable thyroid and IQ studies which have received intense criticism from the scientific community.

7. *Authors: “Moreover, people are exposed to fluoride from numerous sources including food, pesticide residues, dental products (particularly toothpaste swallowed by young children), medications, and proximity to fluoride-emitting industries. All add to the toxic load.”*

Facts:

As estimated by the US CDC, of the total amount of fluoride ingested from all normal sources, 75% is from water and beverages. (10). This includes “fluoride from numerous sources including food, pesticide residues, dental products (particularly toothpaste swallowed by young children), medications, and proximity to fluoride-emitting industries.”

There is no valid, peer-reviewed scientific evidence of any adverse effects of fluoride from optimally fluoridated water in addition to that from all the other sources cited by the authors.

8. *Authors: “CADTH’s ethics claim is built on the premise that its benefits outweigh its risks. But this argument is totally unsupported by the scientific evidence. “*

Facts:

Contrary to the claim of the authors, as there are no risks of adverse effects from optimally fluoridated water, the CADTH claim that benefits outweigh risks is correct, and fully supported by the scientific evidence. While there is well-documented, peer-reviewed scientific evidence (11) of significant disease preventive benefit of optimally fluoridated water, there is no such evidence of risk of any adverse effects.

9. *Authors: “First, fluoridation’s benefits are minimal, at best less than one cavity reduction per child in permanent teeth (see Effectiveness section for documentation).”*

Facts:

The authors’ implication that a “one cavity reduction” is a “minimal” benefit reflects a profound lack of understanding of oral health disease. Dental decay is a very serious bacterial infection occurring in close proximity to the brain, with a direct pathway to the rest of the body via the blood stream. A periapical abscess directly resultant of but one untreated cavity in one tooth can cause a lifetime of extreme pain, debilitation, black discoloration and loss of multiple, if not all, teeth, development of serious medical conditions, and life-threatening infection. People can, and do, die from one untreated cavity in one tooth.

From the Journal of Endodontics:

“During the 9-year study period, a total of 61,439 hospitalizations were primarily attributed to periapical abscesses in the United States. The average age was 37 years, and 89% of all hospitalizations occurred on an emergency/urgent basis. The mean length of stay was 2.96 days, and a total of 66 patients died in hospitals.” (12)

As an example of the distorted use of individual averages, the Brunelle/Carlos study cited by the authors is routinely read superficially by folks eager to discount fluoridation. The paper can be quoted as averages to minimize the effect because the 0.6 surface is the effect averaged over both age and geography. 5 year olds have only 1 or two permanent teeth and there is essentially

no difference between cavity rates at that early age yet they are counted in calculating the 'average'

By age 17 the difference between fluoridated and non-fluoridated is about 1.6 surfaces and the benefit curve is sharply accelerating with a benefit just under 3 times higher than the 0.6 so commonly quoted." (14)

10. *Authors: "...with no credible documentation that it significantly helps socioeconomically disadvantaged children or adults."*

Facts:

This claim is false. A recent study in JAMA Pediatrics by Sanders, et al. concluded:

"This is the first U.S. study to show evidence that water fluoridation attenuates income-related inequalities in dental caries. The degree of attenuation was less pronounced in the permanent dentition, possibly because the level of decay was about half that of primary teeth. Greater attenuation in the permanent dentition might be seen in early adulthood, as the burden of DMFS doubles between adolescence and early adulthood." (15)

11. *Authors: "Second, the chemical used to fluoridate most water, fluorosilicic acid, is, according to water regulation agency NSF International, legally allowed to contain low levels of lead and arsenic. Health Canada cites arsenic as a carcinogen and lead as a neurotoxin that can lower IQ. The U.S. EPA has determined there are no safe levels of either. Drinking water may already naturally contain these contaminants, but it is clearly unethical to knowingly add them to drinking water"*

Facts:

These statements by the authors are egregious half-truths which misrepresent the accepted levels of contaminants in drinking water.

In actuality, the regulations regarding contaminants in water apply to all drinking water, not simply to fluorosilicic acid. Due to the ubiquity of arsenic and other contaminants throughout nature, it is inevitable that they will be present in drinking water supplies. Understanding this, the US EPA and regulatory bodies in Canada and other countries have set maximum levels for these contaminants which they have established to be safe for human consumption. As clearly noted in the "Fact Sheet on Fluoridation Substances" located on the website of NSF International, the amount of contaminants in tap water fluoridated with fluorosilicic acid is nearly negligible, far below US EPA mandated maximum allowable levels of safety. (16)

In addition, contrary to the claim of the authors, the US EPA has not established there "to be no safe levels of arsenic and lead". The EPA maximum allowable contaminant level (MCL) of arsenic is 10 parts per billion, with that of lead being 15 parts per billion. Stringent NSF testing of water fluoridated with fluorosilicic acid has shown no significant amount of any contaminant, with only a barely detectable amount of lead, or arsenic, far below the MCL for each

12. *Authors: "Third, no one questions that ingested fluoride can be toxic. The only question that remains is how toxic it is at levels in fluoridated water. As shown in the Health Risk section, there is substantial evidence that it poses serious threats to our health."*

Facts:

As will be discussed further, contrary to the assertion of the authors, there is no valid, peer-reviewed scientific evidence of any "threat to our health" from optimally fluoridated water. The studies upon which they rely for this assertion have been clearly demonstrated to be invalid, irrelevant, or misrepresented by fluoridation opponents.

13. *Authors: "Once fluoride is ingested, teeth, while very important, are relegated to only a minor role in the overall health picture."*

Facts:

When infected teeth can, and do, cause the well-documented devastating adverse health effects up to, and including, death, it is unfathomable that the authors would claim that they are “relegated to only a minor role in the overall health picture.”, while utilizing nothing more than speculation and unsubstantiated claims in attempts to associate fluoridated water with numerous health effects which cannot be supported with any valid evidence.

14. *Authors: “Finally, fluoridation is also a social justice concern. Low income and minority populations are more susceptible to kidney disease and diabetes, both of which, according to the NRC Report (pp. 303, 260), can be exacerbated by ingested fluoride”*

Facts:

The 2006 NRC Committee on Fluoride in Drinking Water was charged to evaluate the adequacy of the EPA primary and secondary MCLs for fluoride, 4.0 ppm and 2.0 ppm respectively, to protect against adverse effects. The final recommendation of this committee was for the primary MCL to be lowered from 4.0 ppm. The sole reasons cited by the Committee for this recommendation were the risk of severe dental fluorosis, bone fracture, and skeletal fluorosis, with chronic ingestion of water with a fluoride content of 4.0 ppm or greater. Nothing else. Had this committee deemed there to be any concerns with “kidney disease and diabetes” in anyone from fluoride at this level, it would have been responsible for stating so and recommending accordingly. It did not.

Additionally, the NRC Committee made no recommendation to lower the secondary MCL of 2.0 ppm. Water is fluoridated at 0.7 ppm. one third the level which the 2006 NRC Committee on Fluoride in Drinking Water made no recommendation to lower. [\(17\)](#)

In March of 2013, Dr. John Doull, Chair of the 2006 NRC Committee on Fluoride in Drinking Water made the following statement:

“I do not believe there is any valid, scientific reason for fearing adverse health conditions from the consumption of water fluoridated at the optimal level”

---John Doull, MD, PhD, Chair of the National Academy of Sciences, National Research Council 2006 Committee Report on Fluoride in Drinking Water

II. Health Risks

1. *Authors: “CADTH relied heavily upon Australia’s National Health and Medical Research Council (NHMRC) 2016 report which was an update of NHMRC’s 2007 report. NHMRC is part of the Australian government and has endorsed fluoridation since 1958. It cannot be considered balanced and objective regarding health risks.”*

Facts:

The unsubstantiated opinions of the authors on the quality of the report of the NHMRC of the Australian government are biased and unqualified.

2. *Authors: “CADTH omitted the U.S. National Research Council’s (NRC) 2006 report “Fluoride in Drinking Water”*

Facts:

In regard to the report of the 2006 NRC Committee on Fluoride in Drinking Water, see item #13 in the previous section of this document. There was no need for CADTH to note this report.

3. *Authors: “But standard toxicological risk assessment practice, as noted in the reference book A Small Dose of Toxicology (p. 260), always includes a margin of safety factor of at least 10 to account for human variability, protecting more vulnerable sub-populations at higher risk of harm than the average.”*

Facts:

Purported toxicological margin of safety for drugs has no relevance to optimal level fluoride ions which have always existed in water.

During the entire 74 year history of water fluoridation, hundreds of millions having chronically ingested optimally fluoridated water during this time, there have been no proven adverse effects. There can be no more definitive demonstration of the adequacy of the “margin of safety factor” than this.

4. *Authors: “But this rating [of Broadbent, et al.] is completely unjustified because it fails to account for several major weaknesses (Grandjean/Choi 2015 and Osmunson et al. 2016).*

Facts:

The Broadbent study which found no association between optimally fluoridated water and purported IQ reductions was peer-reviewed and published in a highly respected scientific journal. The biased assessment of this study by the antifluoridation authors is of no relevance. Citing Bill Osmunson is of no merit. Osmunson is non-researcher dentist, long-time fluoridation opponent, and former Director of the NY antifluoridationist group, FAN.

In a peer-reviewed article in the American Journal of Public Health, Broadbent dispelled this assessment by the fluoridation opponents. [\(18\)](#)

In addition, again contrary to the assertion of the authors, Broadbent is not the sole study cited by respected sources as clear evidence of the invalidity of IQ reduction claims. It is but one of several quality studies which have found no such association, not the least of which is the 2018 McPherson, et al. NTP study which was initiated at the request of fluoridation opponents, and promoted heavily by the antifluoridation group, FAN. [\(40\)](#) [\(42\)](#) [\(43\)](#) [\(44\)](#)

Also of note is Li, et al. 2016 which found that while chronic exposure to high fluoride levels may provide a potential risk to cognitive development, low dose fluoride “may play a potential protective rather than harmful role in cognitive functions.” [\(41\)](#)

Water is fluoridated at the minuscule level of 0.7 mg/liter.

5. *Authors: “CADTH also misrepresented the findings of at least one neurotoxicity study, Choi et al. 2014, which found a statistically significant correlation between dental fluorosis, a biomarker of excess fluoride ingestion, and impaired cognitive function.”*

Facts:

The 2014 Choi study cited by the authors as having been “misrepresented” by CADTH was of the effects of “exposure to elevated concentrations of fluoride in water” conducted in Sichuan, China, one of the most environmentally fluoride polluted areas in the world. It measured effects of exposure to high, uncontrolled levels of fluoride from well-water sources of this region, not from the minuscule, highly controlled levels of optimally fluoridated water as in Canada and the US. The effect it found was correlated with moderate and severe dental fluorosis, levels which do not occur in association with optimally fluoridated water. [\(45\)](#)

In regard to claimed associations of dental fluorosis, from the EPA:

“With regard to fluorosis, the degree of dental fluorosis is dependent not only on the total fluoride dose but also on the timing and duration of fluoride exposure. A person's individual response to fluoride exposure depends on factors such as body weight, activity level, nutritional factors, and the rate of skeletal growth and remodeling. These variables, along with inter-individual variability in response to similar doses of fluoride, indicate that enamel fluorosis cannot be used as a biological marker of the level of fluoride exposure for an individual. Hence, the petitioner's use of fluorosis levels as a surrogate for evidence of

neurotoxic harm to the U.S. population is inappropriate evidence to support an assertion of unreasonable risk to humans from fluoridation of drinking water.” (21)

6. *Authors: CADTH’s most striking bias is its omission of numerous strong, qualifying studies that showed significant neurotoxicity, including several conducted by Canadian researchers:*

Facts:

The plethora of neurotoxicity studies claimed by the authors to demonstrate cognitive development were cited by FAN in its most recent petition to the EPA for an end to fluoridation. In the 40 page rejection of this petition, EPA reviewers cited facts and evidence to dismantle the arguments of petitioners, including detailed explanations of the invalidity, irrelevance, and misrepresentation by petitioners of these studies. (21)

In regard to other studies cited by the authors:

A. 2006 NRC review: see item #13 in previous section

B. Xiang 2003: a study published in the antifuoridation journal, *Fluoride*. In an article addressing the misleading misuse of Xiang data by fluoridation opponents, New Zealand chemist, Ken Perrott PhD, explains:

“The Sydney audience could have been excused for thinking that Xiang’s data showed a very strong connection between IQ and drinking water fluoride – a relationship explaining almost all the variance. Completely misleading as this relationship probably only explains only about 3% of the variance in the original data.” (24)

C. Choi, et al: The “reduced IQ studies” are a reference to a 2011 review of 27 Chinese studies from obscure Chinese journals by researchers Phillippe Grandjean and Anna Choi. These studies were of the effects of high levels of fluoride (as high as 11.5 ppm) in the well-water of various Chinese, Mongolian, and Iranian villages.

By the admission of Grandjean and Choi, themselves, these studies had key information missing, inadequate control for confounders, and questionable methodologies. These 27 studies were so seriously flawed that Grandjean and Choi were led to issue a public statement in March, 2012 that the studies should not be used to judge water fluoridation in the US. This obviously has not stopped antifuoridationists from doing so anyway.

“These results do not allow us to make any judgment regarding possible levels of risk at levels of exposure typical for water fluoridation in the U.S. On the other hand, neither can it be concluded that no risk is present. We therefore recommend further research to clarify what role fluoride exposure levels may play in possible adverse effects on brain development, so that future risk assessments can properly take into regard this possible hazard.”

--Anna Choi, research scientist in the Department of Environmental Health at HSPH, lead author, and Philippe Grandjean, adjunct professor of environmental health at HSPH, senior author. (9)

Regarding the meta-analysis:

“EPA agrees with the conclusions by Choi et al. (Ref. 11) that the studies included in Table 1 of the petition are unsuitable for evaluating levels of fluoride associated with neurotoxic effects and for deriving dose-response relationships necessary for risk assessment. (21)

- D. Malin/Till 2015: this study concluding a correlation between fluoridated water and ADHD has been widely discredited in the peer-reviewed literature for its inadequate control for confounders, poor methodology, and reaching a conclusion not supported by the peer-reviewed science.

From Fluoride Science of the American Association of Public Health Dentistry:

"It's an ecological study design with 51 observations (50 states & DC), and is not appropriate to test a hypothesis. ADHD prevalence was based on self-reported data, and hence had a potential of misclassification of disorder status. State-wide fluoridation measures were used. Individuals' exposure to fluoridation were not measured. Due to ecological assessment of exposure to fluoride in drinking water and the use of prevalence data of self-reported ADHD and water fluoridation from different years, the findings are at high risk for ecological fallacy. Authors did not adjust for important confounders (smoking, low birth weight, age, sex etc.). Moreover, authors' poor literature review and skewed interpretation of literature concerning fluoride and neurodevelopmental defects may have introduced bias." [\(8\)](#)

Clear evidence of the inadequate for confounders was demonstrated in the Huber, et al study which, utilizing the same data as did Malin/Till, concluded the reported instances of ADHD to be due to elevation levels at which the children resided, not water fluoridation. [\(19\)](#)

- E. Bashash, et al. 2017: This study used data from a study of lead impact on pregnant women residing in non-fluoridated Mexico in an attempt to extrapolate impact of the urine fluoride level of these women on the IQ of their offspring. Water fluoridation is not technically feasible, so fluoridated salt was used instead at a concentration of 250-500ppm.

As clearly noted by the limitations expressed in this study itself, it has limited, if any, applicability to optimally fluoridated water in the US. Among other problems, the study was unable to adequately control for the impact of arsenic and other contaminants which were far more likely to have been the cause of any adverse effects on cognitive development than was fluoride.

As noted in an evaluation of this study by an expert panel of noted researchers:

"This [Bashash, et al.] is an observational study that by definition can only show a possible association between fluoride exposure and IQ – not cause and effect. The association between fluoride and cognitive abilities observed as the result of this analysis should not be interpreted to mean that drinking fluoridated water during pregnancy causes IQ deficits in children. Because not all potential confounders were adequately addressed in the study, there are other factors that might explain the association. There are many factors such as genetics, family, peer group, education, training and interventions, environmental enrichment, prenatal and postnatal nutrition, breast feeding, stress, maternal age, gestational age, birth weight, and exposure to lead, mercury, arsenic, iodine, alcohol, and drugs that affect IQ and other measures of cognitive ability." [\(20\)](#)

In a September 2017 statement, Dr. Angeles Martinez Mier, a co-author in the 2017 Bashash, et al, Mexican study, relayed:

"As an individual, I am happy to go on the record to say that I continue to support water fluoridation.

"You can also say that if I were pregnant today, I would consume fluoridated water, and that if I lived in Mexico, I would limit my salt intake."

E. Angeles Martinez Mier, DDS, MSD, PhD
Cariology, Operative Dentistry and Dental Public Health
Indiana University School of Dentistry

F. Petition to the EPA 2017: This petition filed by the NY antifuoridation group, FAN, and other antifuoridation groups was soundly rejected by the EPA. In a 40 page document, EPA reviewers cited facts and evidence to dismantle the arguments of petitioners, including detailed explanations of the irrelevance, invalidity, and misrepresentation by petitioners of the studies presented as their support. (21)

The lawsuit to which the authors refer is simply an appeal of the petition rejection by the antifuoridation groups. Such appeals are routinely offered as a matter of policy by the EPA for rejections of such petitions. As the facts and evidence have not changed in any significant manner since the petition was rejected, there is no reason to expect a different outcome with this appeal.

G. Till, et al. 2018: This study simply confirmed what is expected with, and is the intent of, fluoridation. the fluoride level in those residing in fluoridated areas is higher than that of those living in non-fluoridated areas. The study did not demonstrate fluoride level in any of the subjects to exceed safe levels, or to be within the range of adverse effects. As the Bashash 2017 study has no applicability to optimally fluoridated water, any comparison of the fluoride levels within these subjects to those within the Bashash subjects is moot.

H. Bashash, et al 2018: A review of this study demonstrating its flaws and limitations has been prepared by Public Health Ontario. (22)

III. Hypothyroidism

1. *Authors: "Based on studies done from 1960 to 2005, the NRC report conclusively determined fluoride was an endocrine disruptor and "The chief endocrine effects of fluoride . . . include decreased thyroid function."*

Facts:

As noted on page 352 of the 2006 NRC report, contrary to the implication of the authors, hypothyroidism was not cited in the final recommendation of the report as being of concern with fluoride at the level of 4.0 ppm or below in water. Had this committee viewed this to be of concern at this level, it would have been responsible for so noting and recommending accordingly. (17)

2. *Authors: "Numerous human, animal and epidemiological studies have found fluoride decreases thyroid function. In the 1940's and 1950's, fluoride was used as a treatment for hyperthyroidism (over-active thyroid)."*

Facts:

Outdated medical practices utilized 80 years ago, as cited by the authors, are of no relevance to community water fluoridation.

3. *Authors: "But even though scientific data linking fluoride ingestion with hypothyroidism is extensive, CADTH's summary on the subject was inconclusive: "Overall, there was insufficient evidence for an association between water fluoridation at the current Canadian levels and thyroid function." Unfortunately, CADTH's errors and omissions, which led to this statement, were especially glaring for this subject."*

Facts:

Contrary to the assertion of the authors, the statement by CADTH that "Overall, there was insufficient evidence for an association between water fluoridation at the current Canadian levels and thyroid function." is entirely accurate. As demonstrated in this response document, these authors have provided no credible evidence to dispute this statement. In regard to the studies cited by the authors:

a. The Malin 2018 study was of the effects of iodine deficiency on the thyroid, not of fluoride on the thyroid. The logical answer to this problem is to address dietary iodine deficiencies, not cease water fluoridation. While Malin, and anyone else, are certainly welcome to their personal opinions, there has been no valid scientific evidence of adverse effect on the thyroid from optimally fluoridated water in conjunction with that from all other normal sources of fluoride exposure.

b. As stated by the authors, the 2018 Indian review suggested a positive correlation between excess fluoride and hypothyroidism. Yes, there are adverse effects associated with excessive amounts of any substance, including plain water. (23) This is why concentration levels are closely monitored for the substances we consume. Water is fluoridated at 0.7 mg/liter, a minuscule level for which there is no valid scientific evidence of adverse effect on the thyroid.

c. The 2018 Kheradpisheh et al. study was performed in Iran, one of the areas with the highest levels of environmental fluoride pollution in the world. As stated in the study: "The main source of drinking water in Yazd city is surface water and well resources in different seasons; thus, differences in fluoride concentration are bound to exist."

Therefore, it was of the impact of exposure to excessive amounts of environmental fluoride, not of the minuscule amount of fluoride in highly controlled optimally fluoridated water systems.

"In areas that experience excess fluoride, especially from water, low iodine levels in the body can cause fluoride uptake into the thyroid gland."

Water is fluoridated at 0.7 mg/liter.

d. Singh, et al. 2014: A study of the effects of exposure to excessive levels of fluoride in India, another area with the highest level of environmental fluoridation in the world. The water fluoride levels of this study ranged from 2.6 mg/liter - 5.1 mg/liter, levels of no relevance to the 0.7 mg/liter at which water is fluoridated.

e. 2015 Peckham: This study has been widely discredited within the scientific literature for its inadequate control for confounders, poor methodology, and reaching a conclusion not supported by the scientific literature.

As concluded by Warren and Saraiva:

"In summary, this study is an ecologic one that has several significant flaws, making it almost meaningless with regard to assessing any possible association between water fluoridation and hypothyroidism. As such, this study provides no evidence of a causal relationship between water fluoride concentration and hypothyroidism." (25)

IV. Dental Fluorosis

Authors: Dental fluorosis is damaged tooth enamel, a visible sign of overexposure and toxicity, caused by an excess of swallowed fluoride by children up to 8 years of age. It comes from fluoridated water, food and drinks processed with it (including infant formula), food grown with fluoride pesticides, swallowed fluoridated toothpaste, fluoride tablets and other sources.

Facts:

Dental fluorosis is an effect of the teeth which is merely cosmetic in all but the severe level. Severe is the only level considered an adverse effect by the 2006 NRC Committee on Fluoride in Drinking Water, and as clearly noted on page 114 of that report, does not occur in communities with a water fluoride level below 2.0 mg/liter. Water is fluoridated at one third this level. (17)

Mild to very mild dental fluorosis, the level which may be associated with optimally fluoridated water, is a benign, barely detectable effect which causes no adverse effect on cosmetics, form, function, or health of teeth. The following images from the American Dental Association depict mild dental fluorosis.



Lutz ME, Briffle B, Marshall TA and colleagues. Association between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. JADA 2014;145(10):1085-1091. Copyright 2015 American Dental Association. All rights reserved. Reproduced by permission.



Lutz ME, Briffle B, Marshall TA and colleagues. Association between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. JADA 2014;145(10):1085-1091. Copyright 2015 American Dental Association. All rights reserved. Reproduced by permission.



Lutz ME, Briffle B, Marshall TA and colleagues. Association between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. JADA 2014;145(10):1085-1091. Copyright 2015 American Dental Association. All rights reserved. Reproduced by permission.

Contrary to the claim of authors, as can be seen in the images, there is no “damage” to the teeth, with the faint white streaks being barely detectable except under close examination. As peer-reviewed science has demonstrated mildly fluorosed to be more decay resistant, many consider this effect to not even be undesirable, much less adverse. [\(26\)](#) [\(27\)](#)

To gain proper perspective on dental fluorosis, while this effect has been demonstrated by peer-reviewed science to have no negative impact on oral health-related quality of life (OHRQoL), dental decay (caries) which can be, and is, prevented by water fluoridation does have such an impact.

As reported by Onoriobe, Rozier, et al. In 2014:

“Using a population- and person-centered perspective, we conclude that dental caries in school-aged children in North Carolina is a much bigger public health concern than enamel fluorosis. The prevalence of fluorosis is less than caries, and it had no impact on the OHRQoL of children or their families. Dental caries had a negative impact on OHRQoL for the majority of students and their families.” [\(28\)](#)

From a 2016 study reported in the Medical Journal of Australia:

“Conclusion: Very mild and mild dental fluorosis diminished with time. Dental fluorosis did not have a negative impact on perceptions of oral health.” [\(29\)](#)

Clearly, dental fluorosis is not an issue of concern in association with the minuscule amount of fluoride in optimally fluoridated water, even in conjunction with fluoride intake from all other normal sources. Efforts by these authors and other fluoridation opponents to combine and confuse the various levels of this effect do not change the findings of the 2006 NRC Committee and other peer-reviewed science which have determined that the only adverse level of this fluorosis is not associated with water fluoridation.

In regard to the cost-estimates cited by the authors to treat dental fluorosis, as can be noted in the above images, the mild dental fluorosis which may be associated with optimally fluoridated water requires no treatment. Implying that such teeth require expensive veneers and/or other treatment is an egregious breach of responsibility and intentional effort to mislead the public in regard to this effect.

V. Chemical Sensitivities/Immune and Inflammatory Responses

In this section, the authors cite half-century old, long since discredited studies, and unsubstantiated opinions of George Waldbott, a medical practitioner educated in the 1920s, leading activist against water fluoridation in the 1950s, and founder of an antifluoridation group which provides biased information against the initiative to this day.

As will be demonstrated in the following, this section provides an excellent example of the faulty "science" and dubious sources upon which fluoridation opponents rely for the misleading misinformation they disseminate.

1. *Authors: "Fluoridated water is no different than other drugs, chemicals, or various foods, such as peanuts or shell fish. There is a subset of the population that will have adverse reactions upon swallowing them. In some cases, even being exposed topically, such as in fluoridated toothpaste or mouthwash, will produce harmful effects."*

Facts:

The authors attempt to associate fluoride with drugs which have documented side effects. Fluoride in water supplies is not a drug. It is simply an ion that has always existed in water. The outdated, discredited studies presented by the authors notwithstanding, there is no valid, peer-reviewed scientific evidence of any "harmful effects" to anyone from ingestion of fluoride at the optimal level at which water is fluoridated. There is no such evidence of any "allergy" or "intolerance" to fluoride, nor is there any such evidence to support the "variety of symptoms" the authors attempt to associate with such "allergies".

2. In regard to the claims of Waldbott, the following is from a 1979 review of his book:

"Symptoms described by R. Finn and H.N. Cohen last year in a few tea drinkers are stated by Dr. Waldbott to be "probably due to fluoride". He does not mention that similar symptoms occurred in some people after drinking coffee which contains no fluoride".

"This book has already been widely publicised by the antifluoridation movement in Britain and is likely to have great influence in furthering their cause. Its tone is low-key, completely free from emotional outbursts and presents evidence on both sides of the argument with apparent impartiality. Laymen, including those concerned with decisions on fluoridation, will be impressed by what seems to be the reasonableness of the case, oblivious of the omissions and obsolete presuppositions upon which much of it is based." [\(30\)](#)

3. Feltman's 60 year old study was completely refuted by the American Academy of Allergies in 1971:

"The reports of fluoride allergy reviewed (3, 4, 5, 6, 7) listed a wide variety of symptoms including vomiting, abdominal pain, headaches, scotomata, personality change, muscular weakness, painful numbness in extremities, joint pain, migraine headaches, dryness in the mouth, oral ulcers, convulsions, mental deterioration, colitis, pelvic hemorrhages, urticaria, nasal congestion, skin rashes, epigastric distress and hematemesis."

"The review of the reported allergic reactions showed no evidence that immunologically mediated reaction of the Types I-IV had been presented. Secondly, the review of the cases reported demonstrated that there was insufficient clinical and laboratory evidence to state that true syndromes of fluoride allergy or intolerance exist."

"As a result of this review, the members of the Executive Committee of the American Academy of Allergy have adopted unanimously the following statement:"

'There is no evidence of allergy or intolerance to fluorides as used in the fluoridation of community water supplies.' " [\(31\)](#)

Feltman and Kosel were #'s 4 and 5 of the reports reviewed by the AAA.

4. Grimbergen was a 40 year old study from an antifluoridation publication. Moolenburgh upon whose works Grimbergen relied, was an antifluoridation, anti-vaccination activist involved with

a pseudo-science "healing sound movement." which claims that people can heal their health problems by listening to digital recordings of "ancient chants and cosmic sounds".

5. The Gutowska abstract provided by the authors theorizes an inflammatory response at some uncited level of fluoride.
6. The Follin-Arbelet abstract provided by the authors theorizes an association of chronic exposure to some uncited amount of fluoride with irritable bowel syndrome.
7. Ma, et al. assessed the impact of exposure of human endothelial cells to 1 mM of sodium fluoride, an equivalence of 19 ppm fluoride. This obviously has no relevance to water fluoridated at 0.7 ppm.
8. The 2006 NRC Committee reviewed a plethora of fluoride studies including those from sources of questionable quality, diligently reported what was in those studies, then made its final recommendation based on what it deemed to be of any concern with fluoride at the level of 4.0 mg/liter in drinking water. There was no mention of concern with adverse effects on the immune system in the final recommendation. Had the committee any such concern, it would have been responsible for so noting and recommending accordingly. It did not. [\(17\)](#)
9. The authors have presented no valid evidence to support their claim that optimally fluoridated water "will adversely affect 1% of Calgary's population"nor is there any such evidence to support this claim for any optimally fluoridated area.

VII. Effectiveness

1. *Authors: "There was insufficient evidence from studies on changes in cavity rates after a city had stopped fluoridating and no firm conclusions could be drawn."*

Facts:

This is false. Both of McLaren's Calgary studies demonstrated definitive evidence of adverse effect of cessation of fluoridation in that city, as did Myer, et al. in Juneau. [\(32\)](#) [\(33\)](#) [\(34\)](#)

The criticisms of the McLaren study expressed by the authors demonstrates a profound lack of understanding of this study, and raises legitimate questions as to whether they have even read the study as well as to their understanding of scientific study in general.

Authors: "McLaren's study only used data from two dental surveys in Calgary and Edmonton, one in 2004/2005, many years before Calgary stopped fluoridating in 2011, and the other from about 3 years after cessation. However, the study omitted a survey in Calgary from 2009/2010, just 1.5 years before cessation. When the cavity rate for primary teeth from this omitted survey is combined with the data used by McLaren, it is clear that decay had been increasing in Calgary at virtually the same rate before cessation as after cessation."

Facts:

First, the 2009/2010 "critical data" claimed by to have been "omitted" from McLaren's study of Calgary and Edmonton was not applicable for the following reasons:

- a. The 2009/2010 data was "apples to oranges" in regard to the data utilized by McLaren. McLaren utilized reported findings in units of decayed, missing, and filled *surfaces* of teeth. The 2009/2010 "critical data" was in the less sensitive units of decayed, missing and filled teeth. There is no reliable way to equate data per tooth surface of decay with that of reported per teeth decayed with no regard to the number of surfaces of those teeth which may be decayed. As standard studies evaluate 4 tooth surfaces, attempting such a comparison would mean one unit of the 2009/2010 data would be equivalent to as many as 4 units of the data utilized by McLaren. apples to oranges.

- b. The critical aspect of McLaren's study was comparison of decay trend data in Calgary which had ceased fluoridation, to that data from the similar city of Edmonton which had not. Having Edmonton provided the advantage of significantly improving control over variables involved in such trends. The 2009/2010 data was only for Calgary, with none for Edmonton. Obviously, without any Edmonton data, there could be no such comparison.

Unfortunately, fluoridation opponents still continue to make the claim of "omitted data" in spite of the inapplicability of this data to McLaren's study.

The claim that Edmonton "also experienced an increase in decay over the study period" is a superficial oversimplification that fails to understand the central point of difference in dental decay trends between the two cities, as demonstrated by McLaren.

As explained by McLaren, that while there was indeed an increase in decay in both cities during the examined time frame, the increase in Calgary was significantly greater in magnitude than that in Edmonton.

"This line of thinking was borne out in our results. In primary teeth, an increase in caries experience was observed in Calgary (where cessation occurred in 2011). A similar observation, which was smaller in magnitude, was noted in Edmonton (where fluoridation remained in place). Thus, for primary teeth, our results presented here and elsewhere (L. McLaren, S. Patterson, S. Thawer, P. Faris, D. McNeil, M. Potestio et al., unpublished results) provide consistent indication of an adverse short-term effect of cessation." [\(32\)](#)

2. *Authors: "As CADTH reported, a number of studies have shown decreased cavity rates in fluoridated water areas. They have typically been expressed by percentage, but almost always omit actual number of cavities. When these figures are reported, fluoridation's minimal effectiveness becomes clearer."*

Facts:

The attempt to trivialize the impact of a broad population-based public health initiative by utilizing averages of decay on an individual tooth level is naïve, misleading, and deceptive. Contrary to the assertion of the authors, assessing effectiveness of an initiative such as water fluoridation based on percentage impact on the entire population is far more informational than is use of averages for individuals.

As noted by Slade, et al, 2018:

"When considered at the level of an individual, these effect estimates represent clinical benefits that are either small (1.3 fewer dfs per child) or negligible (0.3 fewer DMFS per child). However, caries experience indices are more meaningfully interpreted for groups, just as clinical trials report number needed to treat. For example, effect estimates from this study translate as 13 fewer primary tooth surfaces and 3 fewer permanent tooth surfaces developing caries for every 10 children who gain access to CWF. The potential public health benefit is substantial in the United States, where 115 million people currently do not have fluoridated tap water. The Healthy People 2020 objective OH-13, if met, would extend CWF to 20 million more (Healthy People 2020 2018), and 24% of them would be children and adolescents based on the national age distribution. Hence, if CWF were extended to 4.8 million children, and they experienced the prevented fractions found here, it would translate to 6.2 million fewer primary tooth surfaces developing caries and 1.4 million fewer permanent tooth surfaces developing caries." [\(35\)](#)

As Slade has also stated:

"In summary, while Dr. Limeback is using the correct math for permanent teeth, he's disregarding the primary teeth, and he's disregarding the more important point that it's the water supply that's fluoridated, not a single child's water bottle, which means that the benefits are relevant for groups, moreso than for individuals."

3. *Authors: "The Cochrane Collaboration is considered the gold standard of evaluating effectiveness. Its 2015 analysis found a 26% DMFT (decayed, missing, filled permanent teeth) reduction in fluoridated areas. The U.S. CDC cites a similar 25% reduction. Cochrane also cited 'insufficient evidence' that 'fluoridation results in a change of disparities in caries levels across socio-economic status.' "*

Facts:

While the opinions of the Cochrane Collaboration are widely respected, there is no evidence to suggest that they are the "gold standard of evaluating effectiveness". Cochrane is simply one of numerous credible organizations which provides differing opinions on the scientific literature, subject to the same biases, inaccuracies, and limitations as is any other such group.

The Cochrane claim cited by the authors that there is "insufficient evidence that fluoridation results in a change of disparities in caries levels across socio-economic status." is belied by recent findings of Slade, et al. and Han-Na, et al. which have, indeed, demonstrated such a change. [\(36\)](#) [\(37\)](#).

4. *Authors: "The most recent relevant study from IFS, Curtis et al. 2018 (5) found no significant correlation between ingested fluoride and cavity reduction, further validating a 2009 study from IFS, Warren et al. that stated: 'Achieving a caries-free status may have relatively little to do with fluoride intake (emphasis in the original) . . . recommending an 'optimal' fluoride intake is problematic.' "*

Facts:

In regard to the misrepresentative out-of-context quote from Warren, Levy, provided by the authors, as have many other fluoridation opponents through the years, co-author Stephen Levy provided the following statement:

- 1) *"We looked at total F intake from almost all sources (water, beverages, selected foods that absorb water, dietary F supplements, dentifrice they acknowledge this ok in their point #3)*
- 2) *But we did not say that we "found no relation between tooth decay and the amount of fluoride swallowed", but that it is very complicated--e.g., those with caries but not mild dental fluorosis tended to have lower F intake than the other 3 sub-groups*
- 3) *And in many other published articles and abstracts as well as unpublished data, we consistently see ~14-20% less decay among those in F areas, across exams at several ages (for prevalence at 5, 9, 13 and 17 years and incidence across 4-year intervals) --even after adjusting for all that we can (brushing with F dentifrice, SES, dietary exposures, F supplements, etc.)*

*-Steven M. Levy, DDS, MPH
Wright-Bush-Shreves Endowed Professor of Research
Department of Preventive & Community Dentistry
University of Iowa
College of Dentistry*

5. *Authors: "Indeed, there is a consensus, including the CDC, NRC, Cochrane Collaboration, Iowa Fluoride Study and others that fluoride's effectiveness is mainly topical, not from ingestion"*

Facts:

This claim is misleading and false.

None have stated that fluoride's effectiveness is not from ingestion. What has been stated in a

2001 CDC report is that the effects of fluoride are “predominantly topical”. “Predominantly” does not mean “only”, and this statement includes the topical effect provided by fluoride incorporated into saliva through ingestion of that fluoride. [\(10\)](#)

6. *Authors: “There is little robust scientific evidence that swallowing fluoride provides any benefit over and above more appropriate topical applications.”*

Facts:

This is false. There is ample “robust scientific evidence that swallowing fluoride provides any benefit over and above more appropriate topical applications.”

The effects of fluoride are both topical and systemic. The systemic effects are demonstrated in the mild to very mild dental fluorosis which may be associated with optimally fluoridated water. Mild to very mild dental fluorosis is a barely detectable effect which causes no adverse effect on cosmetics, form, function, or health of teeth. As peer-reviewed science has demonstrated mildly fluorosed teeth to be more decay resistant, many consider this effect to not even be undesirable, much less adverse. Dental fluorosis can only occur systemically. [\(27\)](#)

Saliva with fluoride incorporated into it provides a constant bathing of the teeth in a low concentration of fluoride all throughout the day, a very effective means of dental decay prevention. Incorporation of fluoride into saliva occurs systemically.

From the CDC:

"Fluoride works to control early dental caries in several ways. Fluoride concentrated in plaque and saliva inhibits the demineralization of sound enamel and enhances the remineralization (i.e., recovery) of demineralized enamel. As cariogenic bacteria metabolize carbohydrates and produce acid, fluoride is released from dental plaque in response to lowered pH at the tooth-plaque interface. The released fluoride and the fluoride present in saliva are then taken up, along with calcium and phosphate, by de-mineralized enamel to establish an improved enamel crystal structure. This improved structure is more acid resistant and contains more fluoride and less carbonate. Fluoride is more readily taken up by demineralized enamel than by sound enamel. Cycles of demineralization and remineralization continue throughout the lifetime of the tooth." [\(10\)](#)

Cho, et al. found in 2014:

"Conclusions: While 6-year-old children who had not ingested fluoridated water showed higher dft in the WF-ceased area than in the non-WF area, 11-year-old children in the WF-ceased area who had ingested fluoridated water for approximately 4 years after birth showed significantly lower DMFT than those in the non-WF area. This suggests that the systemic effect of fluoride intake through water fluoridation could be important for the prevention of dental caries." [\(5\)](#)

VIII. Cost-Effectiveness

The cost- of water fluoridation has been well established within the peer-reviewed scientific literature.

Examples:

a. O'Connell J, et al. 2016:

“Savings associated with dental caries averted in 2013 as a result of fluoridation were estimated to be \$32.19 per capita for this population. Based on 2013 estimated costs (\$324 million), net

savings (savings minus costs) from fluoridation systems were estimated to be \$6,469 million and the estimated return on investment, 20.0.” (4)

b. Ran, et al 2016:

“Recent evidence continues to indicate that the economic benefit of community water fluoridation exceeds the intervention cost. Further, the benefit–cost ratio increases with the community population size.” (13)

c. Elmer, Langford, Morris 2014:

“After ranking by IMD, DSRs of hospital admissions for the extraction of decayed or pulpally/periapically involved teeth is lower in areas with a fluoridated water supply.” (38)

The sole study the authors present to contradict this is Thiessen, et al. which includes the false premise that mild dental fluorosis requires treatment. Aside from that, the rest of their claims are personal opinions and calculations based on false and unsubstantiated claims of adverse effects from water fluoridation.

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Speaking up for water fluoridation



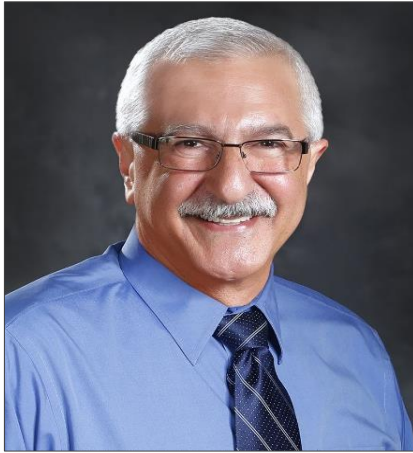
Scientific Facts vs Opinion



Calgary City Council, Community and Protective Services Committee

October 29, 2019 ♦ Calgary AB

Disclosures



Johnny Johnson, MS, DMD, is president of the American Fluoridation Society.

He has no financial or other conflicts to disclose related to the information cited in this presentation.

He is not paid for his work in helping municipal elected officials.

1. How did we discover fluoride's benefits?

Fluoride: A naturally occurring mineral



- 13th most abundant mineral in the earth's crust
- **Surface water** (rivers) — typically low concentrations, 0.2 mg/L (ppm) or less
- **Groundwater** (wells) — higher concentrations, 0.1 mg/L to over 5.0 mg/L
- **Ocean** is typically 0.8 to 1.4 mg/L

The early years of fluoride research

Dr. Frederick S. McKay

- **1901:** He established his dental practice in Colorado Springs, CO
- “Colorado Brown Stain” — Only life-long residents (or those who had moved there as infants) had it
- **1908** — He began to investigate the extent of fluorosis in surrounding areas



Key Observation: *Very few cavities in this population*

Intensive research begins

Objective: Explore the link between fluoride & cavity reduction

1.0 mg/L
fluoride led to
optimal cavity
reductions
without brown
staining

H. Trendley Dean

- 1931 begins to study epid. of F-
 - Improves technology of assay
 - Creates and index
- 1933 - Compares "High" and "Low" F- communities.
- 1939 - Compares "high" and "low" F- communities.
- 1941- Launches field investigation – "21 Cities" study.

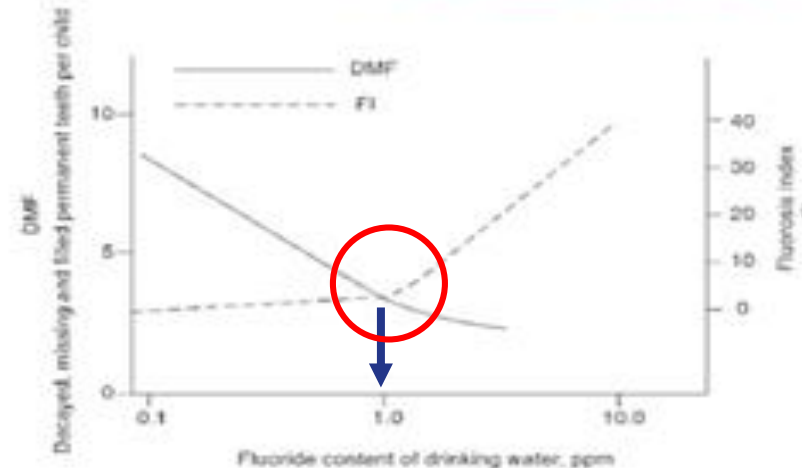


FIGURE 5.3 Relationship between the fluoride content of drinking water, caries occurrence, and dental fluorosis. (Source: H. C. Hodge, The concentration of fluorides in drinking water to give the point of minimum caries with maximum safety. *J. Am. Dent. Assoc.*, 40, 436–439, 1950. Copyright © 1950 American Dental Association. All rights reserved. Adapted 2008 with permission of the American Dental Association.)

Studies to replicate Mother Nature

1945, Brantford, Ontario, was the first Canadian city to add fluoride to its water.

Brantford was paired with neighbouring Sarnia in an 11-year case study of the effects of water fluoridation.



- Over this period, Brantford children had a 63% reduction in the severity of cavities; and
 - A 35% reduction in the prevalence of cavities.
- Cavity rates dropped dramatically!

How fluoride works

Topical Effect

- From the outside of the tooth
- Saliva, fluoridated toothpaste and other topical products

Systemic Effect

- From the *inside* and *outside* of the tooth
- Saliva bathes the teeth enamel 24/7 every day*



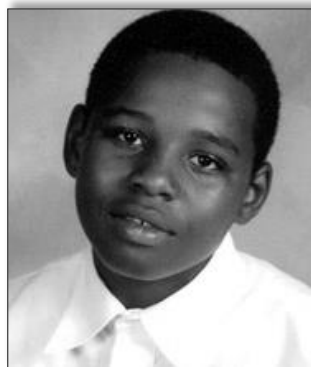
Adults also benefit, rather than only children (as was once assumed)

2. What are the health benefits of Fluoridation?

Why oral health matters

Dental cavities are the **most common chronic disease** for children and teens. It's significantly more common than *asthma*, *obesity*, and *diabetes*. **Infectious and Transmissible Disease**

- Severe pain (toothaches)
- Difficulty in chewing
- Poor weight gain
- Difficulty concentrating
- Predictor of cavities later in life
- Costly to treat
- Deaths



Why do cavities matter?

THEY CAUSE HARM

- Severe pain
- Difficulty chewing
- Lost sleep
- Delayed development
- Lower school attendance
- Adults, lost work time
- Risk of systemic infection
- Risk of death



Poor oral health most affects poor children



Low-income kids are more than twice as likely to experience tooth decay.

So, the already disadvantaged bear a disproportionate burden of cavities

In Calgary in 2015, more than 37,410 children were living in poverty (12.2%)

Poverty limits access to time for oral hygiene, fluoridated toothpaste, dental floss AND dental care.

Poor oral health is related to other harms

Removing decayed baby teeth causes:

- Ugly smile, low self esteem
- Inability to speak properly, eg. lisps
- Inability to eat nutritious food
- Deficient jaw developments
- Improper tongue position and swallowing
- Adult teeth don't erupt properly
- Poor school performance

***Children need
their teeth***

Avoiding the need for hospital treatment

- The average cost of treating early childhood decay in hospital operating rooms in Colorado ranged from **\$10,000 to \$15,000** per child
- A study in Israel estimated that water fluoridation may be preventing approximately **300 hospitalizations** each year from dental infections



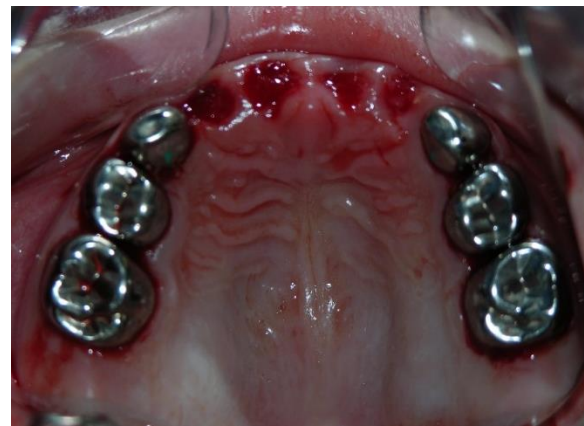
Dental decay is leading cause of general anaesthetic for children

- Fluoridation helps prevent need for general anaesthesia
- General anaesthesia has risks for children

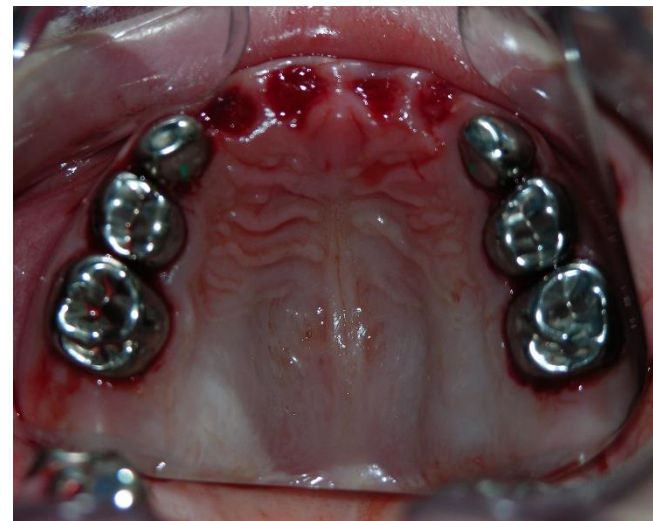


(Sources: An alternative marker for the effectiveness of water fluoridation: hospital extraction rates for dental decay, a two-region study, Elmer et al, British Dental Journal 2014; 216: E10; J. Dental services, costs, and factors associated with hospitalization for Medicaid eligible children, Louisiana 1996-97. Griffin SO, et al, Public Health Dent. 2000 Winter;60(1):21-7; Hospitalizations for dental infections - Optimally versus non-optimally fluoridated areas in Israel. Amir Klivitsky, MD; et al, [http://jada.ada.org/article/S0002-8177\(14\)00115-9/](http://jada.ada.org/article/S0002-8177(14)00115-9/))

Fluoridation can reduce need for hospital treatment under general anaesthetic by 66 to 75%



Reducing OR/GA full-mouth restorations by 2/3



Fluoridation reduces dental decay

- Dental decay is the **most common chronic disease** of children and teens.
- 5 times more common than asthma
- 4 times more common than obesity
- 20 times more common than juvenile diabetes



Everyone feels the financial impact

Treating a preventable disease financially punishes families and taxpayers

- CWF (or the lack of it) impacts the health and wealth of families and the community
- Average cost of a filling = **\$204**
- The lifetime cost of a single decayed molar can reach as high as **\$6,105**
- \$1 invested in fluoridation can yield between \$5.00 and \$93.00 of savings per person in dental treatment costs (16; 20-22)



(Source: Regional data from the ADA's "2016 Survey of Dental Fees"; estimate of the lifetime cost is based on an analysis of claims data by Delta Dental of California, 2011; the Texas report was released in 2000.)

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A form of prevention that reaches everyone

Impact of CWF: 25% cavity reductions for all, regardless of age, income level, race, ethnicity, education level, or access to dental care



Why do cavities matter?

THEY HARM THE ECONOMY

Economic burden of oral health disease in Canada:

- The percentage of Canadians who have experienced time-lost from normal activities for oral health reasons is 39.1%,
- It is estimated that 2.26 million school-days are lost annually due to dental visits or dental sick-days.
- It is estimated that 4.15 million working-days for adults are lost annually due to dental visits or dental sick-days,
- Overall, an average of 3.54 hours per year is lost per person due to dental disease in Canada, including professional treatment. *The State of Oral Health in Canada, Canadian Dental Association. March 2017*

***People don't go to
work or school because
of cavities or because
of caring for person
with cavities***



A window to overall health




The Mayo Clinic calls oral health a “Window to your Overall Health”

Why does oral health matter? BECAUSE SMILES MATTER



Which child will have an easier time in life?

A (big) ounce of prevention

- The CDC called water fluoridation one of “*10 great public health achievements of the 20th century.*” 
- Fluoridation reduces tooth decay by **25%** over a lifetime — protection **beyond** what is offered by **fluoride toothpaste** and other methods.
- Over 211 million U.S. residents have access to fluoridated water.

There is strong consensus of support for Fluoridation

- Health Canada
- Public Health Agency of Canada
- Canadian Dental Association
- Canadian Public Health Association
- Canadian Pediatric Society
- World Health Organization
- Centers for Disease Control & Prevention
- American Academy of Family Physicians
- American Academy of Pediatrics
- American Academy of Pediatric Dentistry
- American Association for the Advancement of Science
- American Dental Association
- American Medical Association
- American Osteopathic Association
- National Academy of Medicine
- AND MANY MORE



Public Health
Agency of Canada
Agence de la santé
publique du Canada



World Health
Organization



CANADIAN
PUBLIC HEALTH
ASSOCIATION

ASSOCIATION
CANADIENNE DE
SANTÉ PUBLIQUE

The Voice of Public Health
La voix de la santé publique



Canadian
Paediatric
Society



3. What happens when Fluoridation is stopped?

What happens when CWF ends



Major cavity increases after cessation:

- **Calgary**– Cavity rates among children skyrocketed 146% in 3 years
- **Juneau, Alaska** – Dental disease among preschool-age kids increased, requiring an average of 1 additional dental procedure *per child, per year*
- **Windsor, Ontario** – Cavity rates increased 51% in a 5-year period

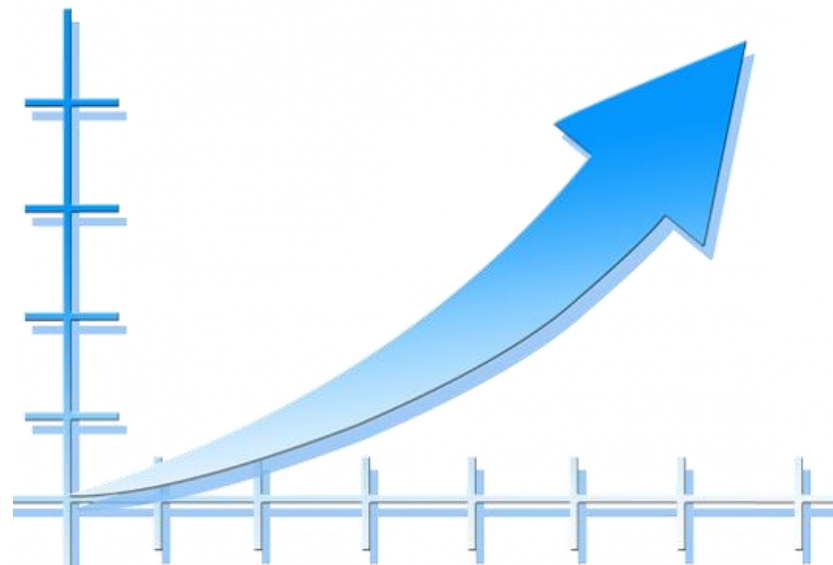
What happens when CWF ends

- In 2016, a study was published examining tooth decay trends among Grade Two children in **Calgary** and **Edmonton**.
- Calgary ceased fluoridation in 2011. Edmonton remained fluoridated throughout the period that was studied.



What happens when CWF ends

- In order to compare apples to apples, the study examined tooth decay rates in both cities at the same two points.
- The cavity rate for Calgary children jumped **146%** after fluoridation ceased.
- Although decay also rose in Edmonton during this period, cavities in Calgary rose at **3 times the rate** of Edmonton.



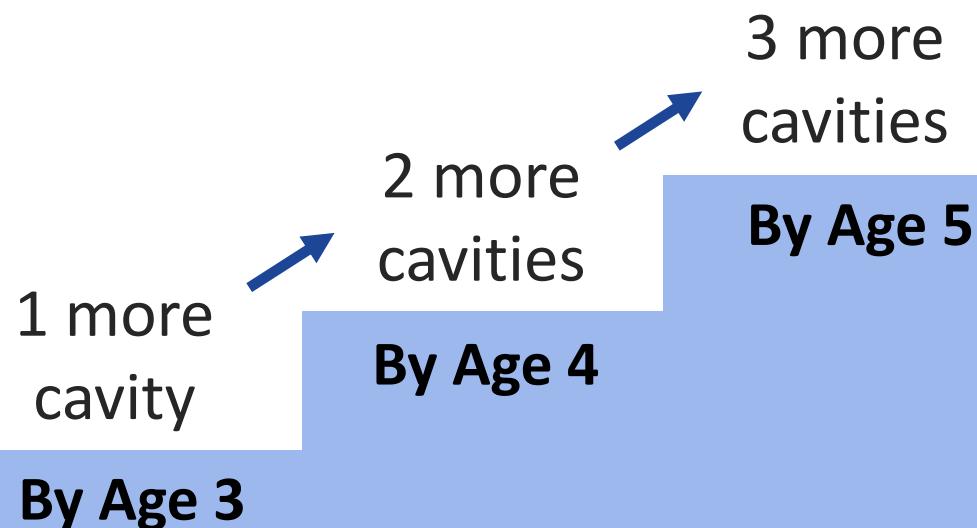
What happens when CWF ends

- Alaska's capital city **Juneau** stopped adding fluoride to its drinking water in 2007.
- Researchers carried out a study to examine Medicaid dental claims to explore the impact of cessation.



What happens when CWF ends

After fluoridation ended in Alaska's capital city, the average low-income child needed **1 additional procedure each year** to treat tooth decay



What happens when CWF ends

The city of **Windsor Ontario** voted to resume CWF after their public health unit released data showing a **51% increase** in cavities and emergency dental needs.



4. Why do we know that fluoridation is safe?

Numerous reviews and studies support CWF's safety

- **U.S. National Toxicology Program (2018)**
- Food Safety Authority of Ireland (2018)
- **U.S. Environmental Protection Agency (2017)**
- National Health & Medical Research Council of Australia (2016)
- **Water Research Foundation (2015)**
- Public Health England (2014, 2018)
- Royal Society of New Zealand (2014)
- Community Preventive Services Task Force (2013)
- Calif. Office of Environmental Health Hazard Assessment (2011)
- **U.S. National Research Council (2006, 1993, 1977 & 1951)**
- Irish Forum on Fluoridation (2002)
- U.S. Public Health Service (1991)
- Britain's Royal College of Physicians (1976)
- Univ. of Michigan School of Public Health (1960)

Research confirms fluoridation's safety

Opponents: *"Fluoride is a developmental neurotoxin."*

- 1** This is the only recent study done in a country where water fluoridation is common
- 2** This is the only study that tested people's IQs over a 30-year period
- 3** This study had a sample size that is much larger than any study cited by opponents



Community Water Fluoridation and Intelligence:

Prospective Study in New Zealand

OBJECTIVES:

This study aimed to clarify the relationship between community water fluoridation (CWF) and IQ.

METHODS:

We conducted a prospective study of a general population sample of those born in Dunedin, New Zealand, between April 1, 1972, and March 30, 1973 (95.4% retention of cohort after 38 years of prospective follow-up). Residence in a CWF area, use of fluoride dentifrice and intake of 0.5-milligram fluoride tablets were assessed in early life (prior to age 5 years); we assessed IQ repeatedly between ages 7 to 13 years and at age 38 years.

CONCLUSIONS:

These findings do not support the assertion that fluoride in the context of CWF programs is neurotoxic. Associations between very high fluoride exposure and low IQ reported in previous studies may

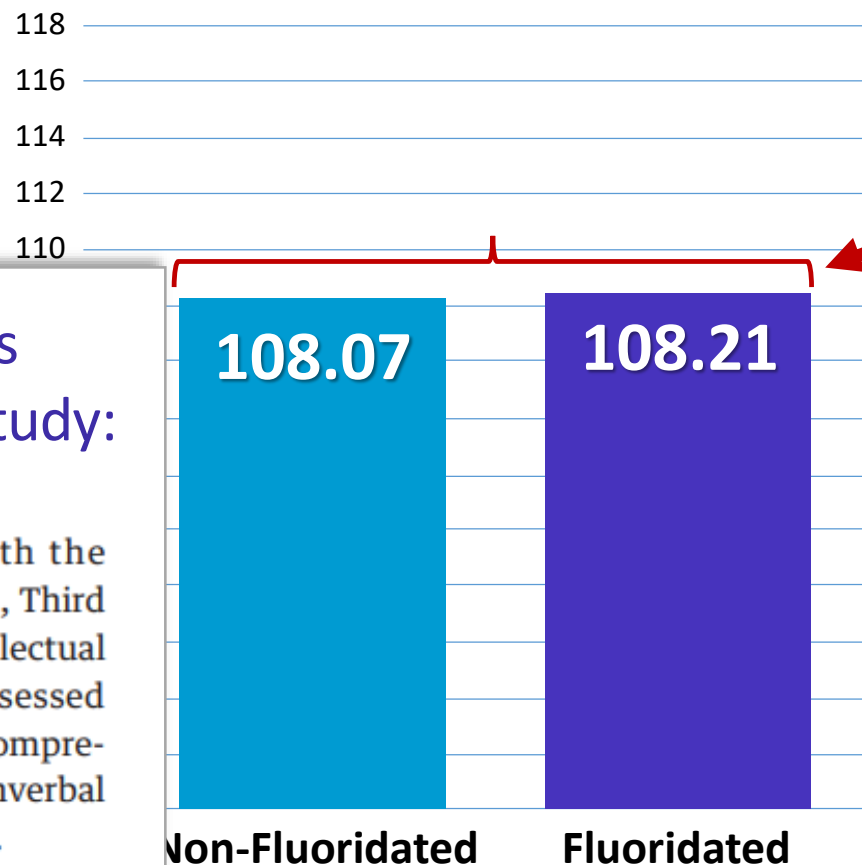
What did the Green study reveal?

The average IQ score
of 3 and 4 year-old
children in Canada by

Even the Green coauthors call this
“the primary outcome” of their study:

Primary Outcomes

We assessed children’s intellectual abilities with the Wechsler Preschool and Primary Scale of Intelligence, Third Edition. Full Scale IQ (FSIQ), a measure of global intellectual functioning, was the primary outcome. We also assessed verbal IQ (VIQ), representing verbal reasoning and comprehension, and performance IQ (PIQ), representing nonverbal reasoning, spatial processing, and visual-motor skills.



The difference
in the average
IQ score was
only **0.14 pts**,
slightly **HIGHER**
in fluoridated
cities

What did Till, Martinez Mier, and Green have to say?

August 19, 2019: *Christine Till, lead author*

Pregnant women should consider reducing their exposure to fluoride, Till said. That might include **avoiding public water sources that are fluoridated....**

September 7, 2019: *Angeles Martinez Mier, co-author*

That **DOES NOT MEAN** eliminating CWF, which benefits all and it the only public health program that is viable in the US given our current healthcare system. I disagree with Christine (Till)

September 14, 2019: *Christine Till-reverses her position on CWF*

“I think this message could be easily misconstrued as us saying don’t drink fluoridated water — **we’re not saying that,**” study author Christine Till, professor of psychology at York University in Toronto, told BuzzFeed News.

September 17, 2019: *Rivka Green, author, Facebook interview*

“Pregnant mothers can choose to limit their fluoride intake by **avoiding fluoridated water.....**”

Resources for you on the Green study:

Is Fluoridated Water Affecting Our Kids' Intelligence?

https://www.medscape.com/viewarticle/916971?nlid=131232_5322&src=WNL_mdplsnews_190823_mscpedit_wir&uac=127293MT&spon=17&impID=2070820&faf=1

International responses:

<https://www.sciencemediacentre.org/expert-reaction-to-study-looking-at-maternal-exposure-to-fluoride-and-iq-in-children/>

Here is a series of articles written by an Epidemiologist from Johns Hopkins University. He critiques Green's study in a way that leaves no doubt:

<https://epidemiological.net/2019/09/19/the-hijacking-of-fluorine-18-998-part-one/>

<https://epidemiological.net/2019/09/21/the-hijacking-of-fluorine-18-998-part-two/>

<https://epidemiological.net/2019/09/23/the-hijacking-of-fluorine-18-998-part-three/>

Great podcast:

<http://bodyofevidence.ca/podcast/053-sm>

ADA Statement (their own statement)

<https://www.ada.org/en/press-room/news-releases/2019-archives/august/ada-statement-on-study-in-jama-pediatrics>

ADA article on reactions to Green study by national and international groups (incl AFS):

https://www.ada.org/en/publications/ada-news/2019-archive/august/responses-to-fluoride-study-flood-in-from-all-over-the-globe?fbclid=IwAR1GM-T_4uX73L67w0kBpPYIfwDXeedQ5yK3k17HuiQMPfZmZETqPgwtVcg

American Association of Dental Research:

<http://ga.dentalresearchblog.org/?p=3409>

American Academy of Pediatrics:

<https://www.aappublications.org/news/2019/08/19/fluoride081919>

American Fluoridation Society:

<http://americanfluoridationsociety.org/wp-content/uploads/2019/08/AFS-on-Green-Study-2019-1.pdf>



Research confirms fluoridation's safety

Opponents: *"The US Environmental Protection Agency should review our petition."*

In 2017, the EPA carefully reviewed their petition — and rejected it.



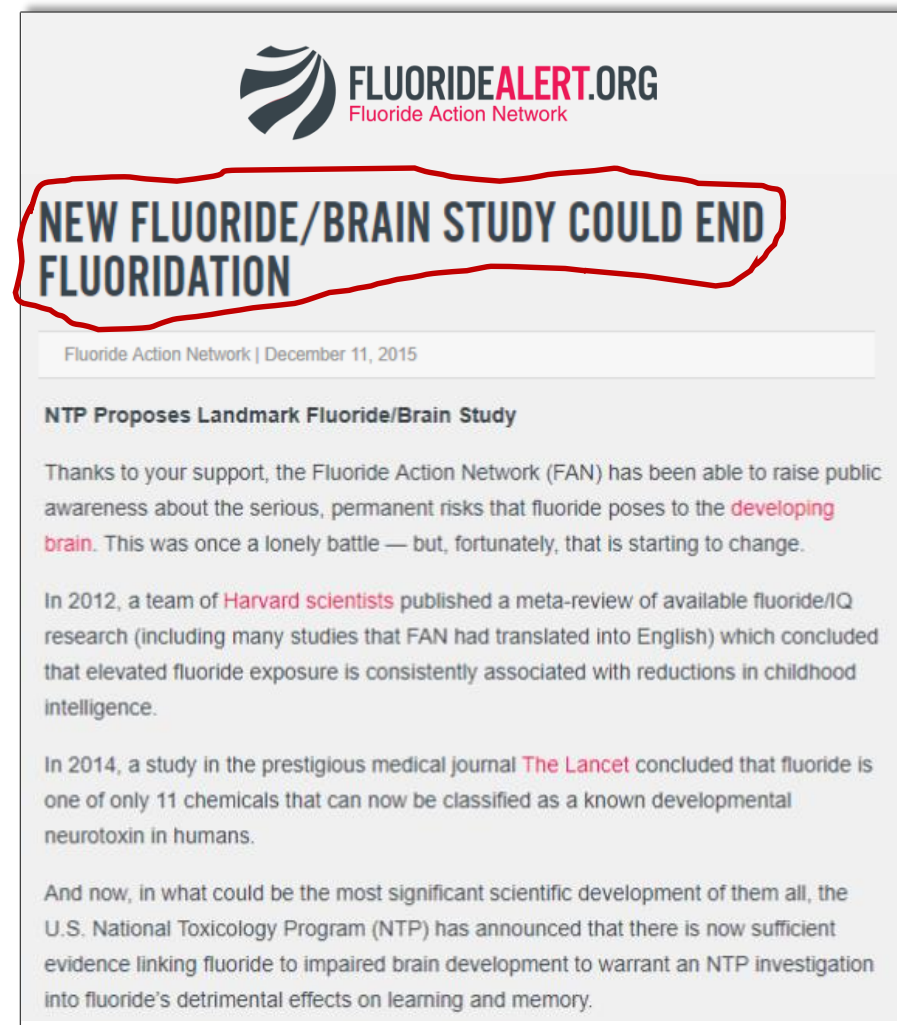
The petition “has **not** set forth a scientifically defensible basis to conclude that any persons have suffered neurotoxic harm” from water fluoridation.


Research confirms fluoridation's safety

Opponents: “The US NTP should conduct a study.”

(Source: C.A. McPherson et al., “An Evaluation of Neurotoxicity Following Fluoride Exposure from Gestational Through Adult Ages in Long-Evans Hooded Rats,” Neurotoxicity Research, 2018; Article from FAN’s website was written by Michael Connett, Dec. 11, 2015; Note: The statement in quotations is intended to paraphrase the kinds of assertions that opponents have made; it is not a verbatim quotation by a specific individual.)

- The US National Toxicology Program (NTP) conducted a study
- The NTP “observed no exposure-related differences in motor, sensory, or learning and memory performance” for any of the 9 tests they conducted
 - Thyroid hormone levels were **not** affected — even at levels of 0, 10 or 20 parts per million of fluoride



 **FLUORIDEALERT.ORG**
Fluoride Action Network

NEW FLUORIDE/BRAIN STUDY COULD END FLUORIDATION

Fluoride Action Network | December 11, 2015

NTP Proposes Landmark Fluoride/Brain Study

Thanks to your support, the Fluoride Action Network (FAN) has been able to raise public awareness about the serious, permanent risks that fluoride poses to the **developing brain**. This was once a lonely battle — but, fortunately, that is starting to change.

In 2012, a team of **Harvard scientists** published a meta-review of available fluoride/IQ research (including many studies that FAN had translated into English) which concluded that elevated fluoride exposure is consistently associated with reductions in childhood intelligence.

In 2014, a study in the prestigious medical journal **The Lancet** concluded that fluoride is one of only 11 chemicals that can now be classified as a known developmental neurotoxin in humans.

And now, in what could be the most significant scientific development of them all, the U.S. National Toxicology Program (NTP) has announced that there is now sufficient evidence linking fluoride to impaired brain development to warrant an NTP investigation into fluoride's detrimental effects on learning and memory.

Research confirms fluoridation's safety

Opponents: *“Mother nature protects babies from fluoride.”*

- Breast feeding is encouraged by leading scientific groups (nutrition, antibodies, etc.).
- **However** . . . breast milk is not perfect.*
For example, it lacks sufficient:
 - Vitamin D (brittle bones)
 - Vitamin K (clotting)
 - Iron (anemia)



Research confirms fluoridation's safety

Opponents: *"Fluoride harms the thyroid gland."*

This 2017 Canadian study showed **no link** between fluoridated water and thyroid problems.

"There was no evidence of a relationship between fluoride exposure (from urine and tap water) and the diagnosis of a thyroid condition."

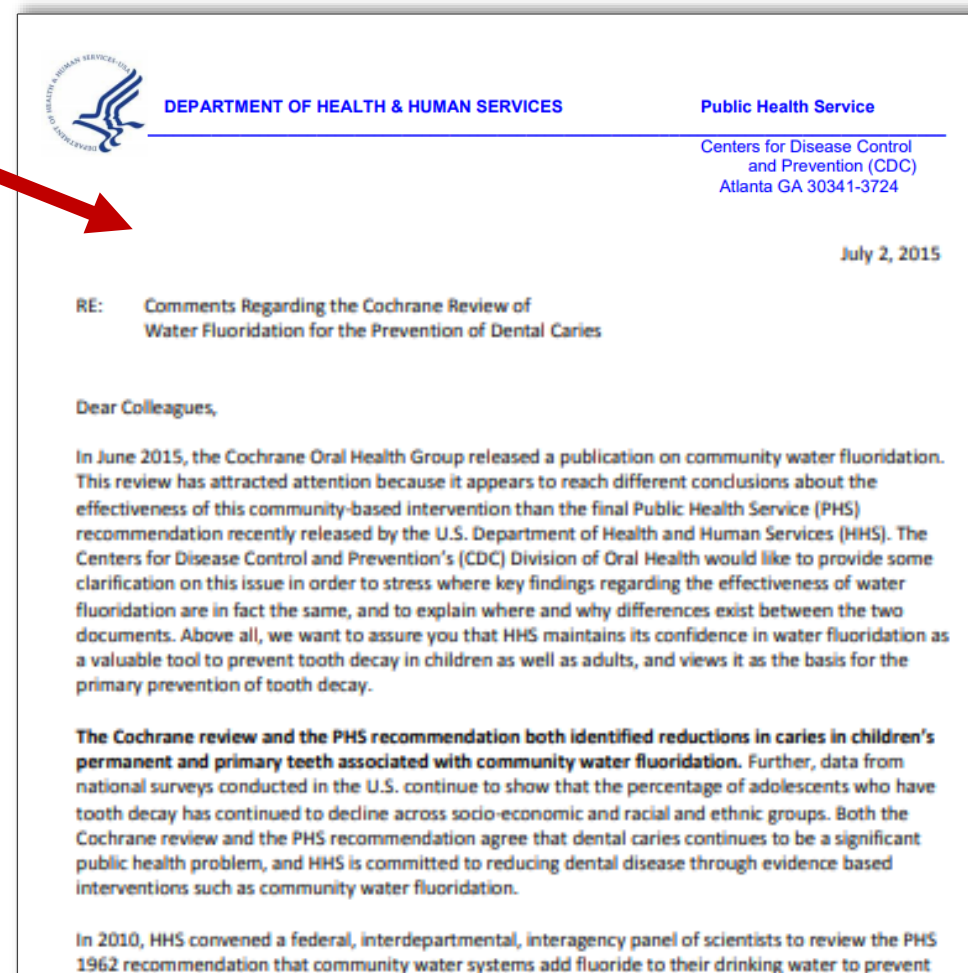
Research confirms fluoridation's safety

Opponents: *“Randomized controlled trials have never been done on fluoridation.”*

- RCTs are a form of research that “is often not feasible for interventions that occur on a community level, like community water fluoridation.”
- **Observational studies** are commonly used for CWF and have been used for:
 - ✓ Smoking & lung disease
 - ✓ Sexually Transmitted Diseases
 - ✓ Chronic Alcohol Use

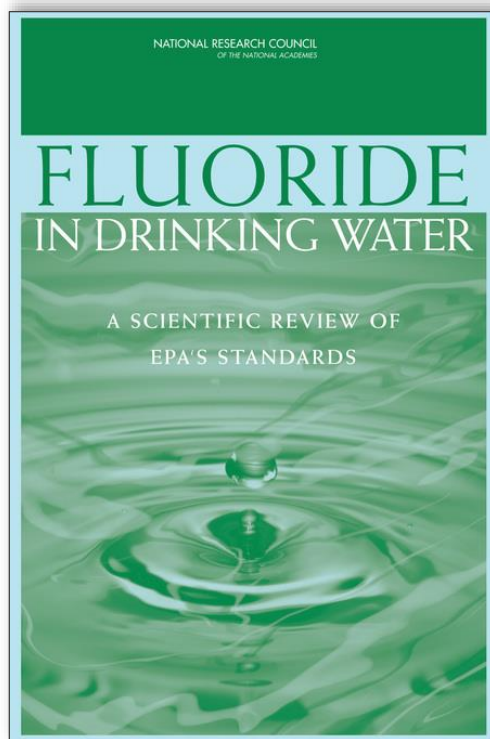


(Source: K. Weno, CDC, “Comments Regarding the Cochrane Review of Water Fluoridation for the Prevention of Dental Caries, July 2, 2015.)



Research confirms fluoridation's safety

Opponents: *"National Research Council's (NRC) 2006 report shows CWF is harmful."*

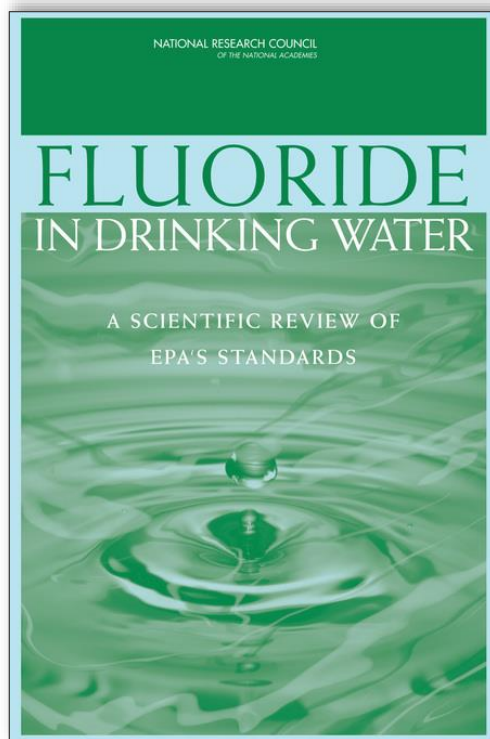


BACKGROUND:

- This study *was not* about CWF p. 20
- In 2006, NRC evaluated the appropriate limit on naturally occurring fluoride level* in water to confirm that current limit (4 mg/L) is still protective of health.
- 200,000+ Americans live in areas where the natural fluoride level exceeds 4 mg/L.

Research confirms fluoridation's safety

Opponents: *"NRC's 2006 report shows CWF is harmful."*



FACTS:

As the report explained, the EPA's maximum limit on fluoride is "set at a concentration at which **no adverse health effects** are expected to occur and the margins of safety are judged 'adequate'."

Research confirms fluoridation's safety

Opponents: *“NRC’s 2006 report shows CWF is harmful.”*

Was there
definitive
evidence at 4.0
ppm showing
that fluoride
had an effect
on...?

- Tooth enamel ✓
- Liver ✗
- Kidneys ✗
- Endocrine system ✗
- Gastrointestinal system ✗
- Immune system ✗
- Cancer ✗
- Musculoskeletal system ✗
- Reproduction and development ✗
- Neurotoxicity and neurobehavioral ✗
- Genetic damage ✗

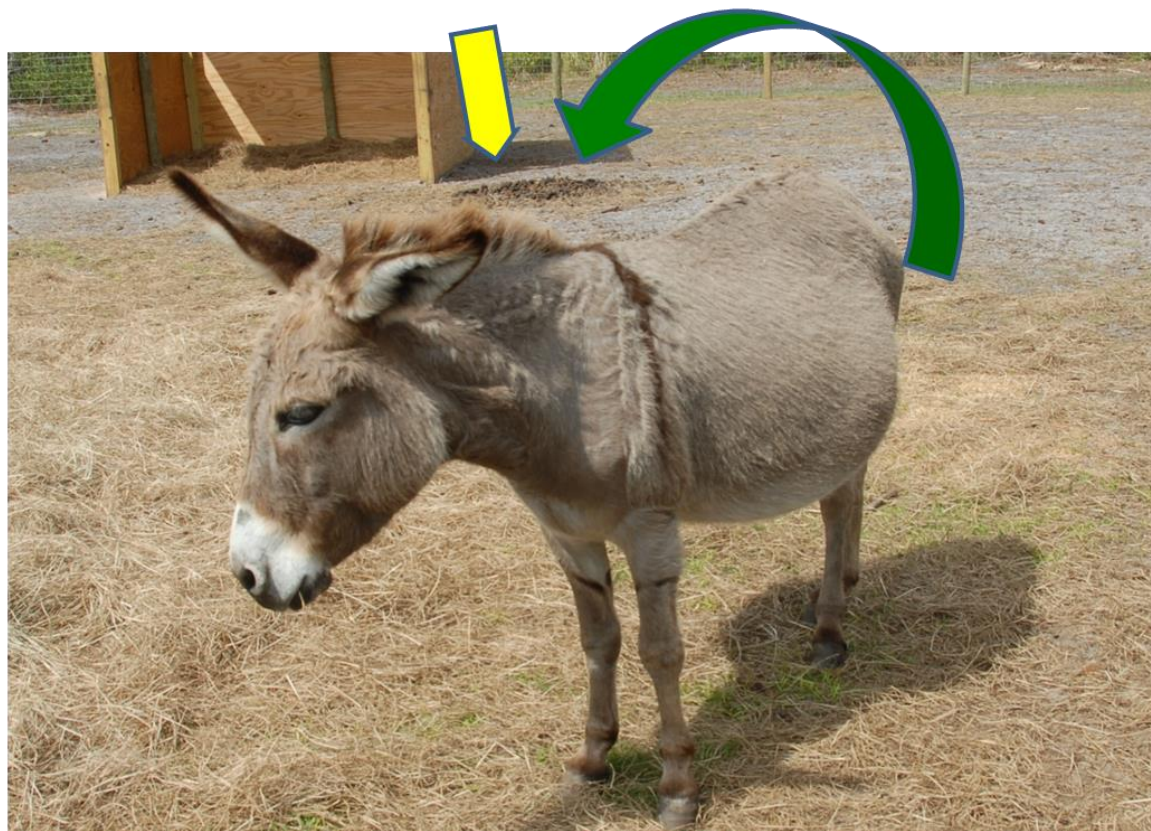
5. Why do a small group of people oppose fluoridation?

A long list of false claims by fluoridation opponents

- No toxicological testing has been conducted on fluoride
- The American Dental Association says it shouldn't be used in infant formula
- Fluorosis is a sign of toxic effects
- It causes ADHD
- It causes Alzheimer's
- It harms the kidney, the immune system and other systems
- It's a conspiracy — the phosphate fertilizer industry is disposing of its "hazardous waste"
- Cavities have fallen in all nations, so fluoridation must not matter
- Some people are allergic to fluoridated water
- It causes thyroid problems
- The only way fluoride works is by topical application
- This is "forced medication"
- The Cochrane Group says there's no evidence behind fluoridation
- Water systems should use a pharmaceutical grade of fluoride

Opponents to CWF: Strategies

Throw it at the wall often and hope something sticks



Critics call it “mass medication”

- Canada has a tradition of fortifying foods and drinks to improve human health:
 - ✓ Folic acid
 - ✓ Calcium
 - ✓ Vitamin D
 - ✓ Iodine
- Canadian courts have consistently **rejected** this argument against fluoridation.
- Fluoridation (like chlorination) is about **prevention**.



Critics distort oral health data

Figure 1: Data from WHO Database

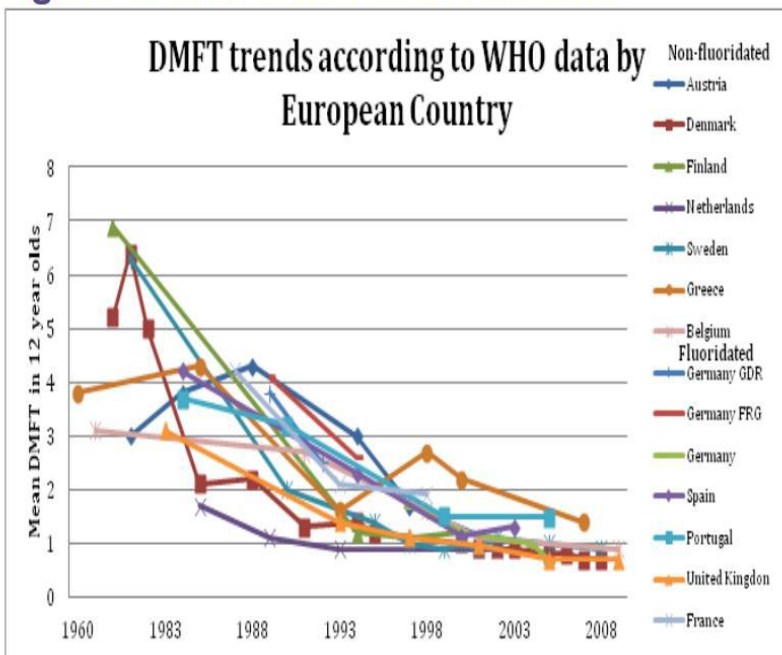


Figure 2: Data manipulated to show linear trend

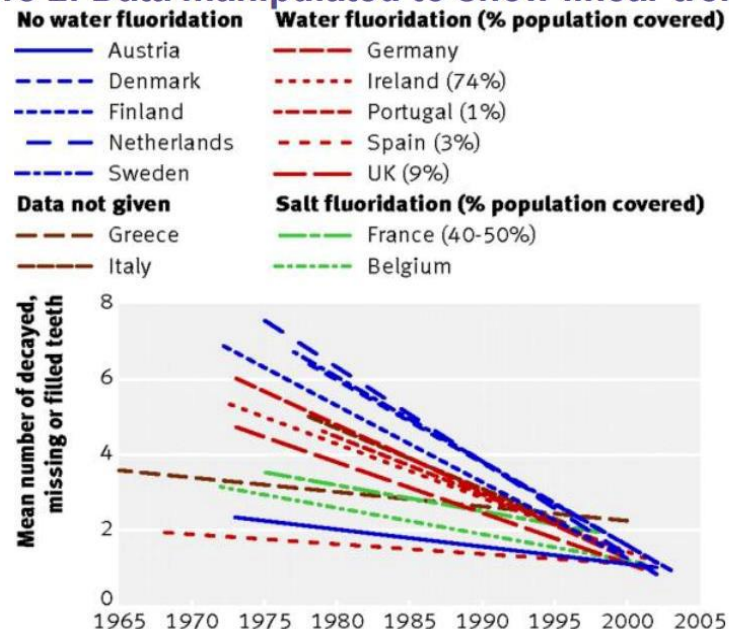
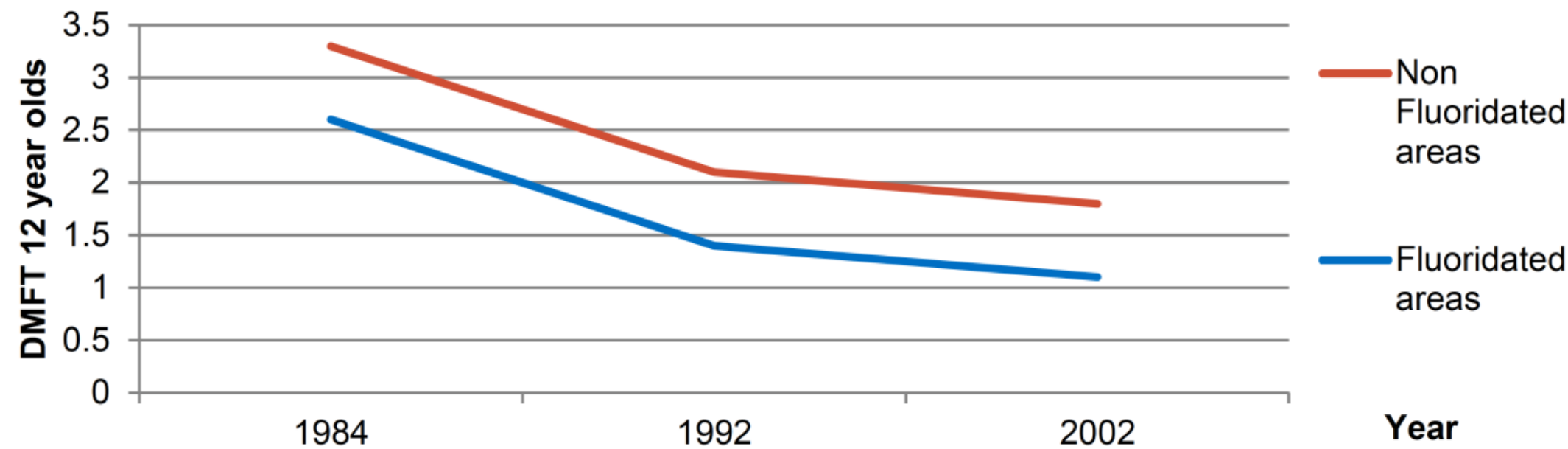


Figure 1 scatter-plot is drawn from data collected by the World Health Organization. Figure 2 is attributed to Cheng et al., "Adding fluoride to water supplies," BMJ, 2007, 335:7622.

- The chart on the left is data from the World Health Organization
- The chart on the right is by opponents of water fluoridation. Straightened out true data points

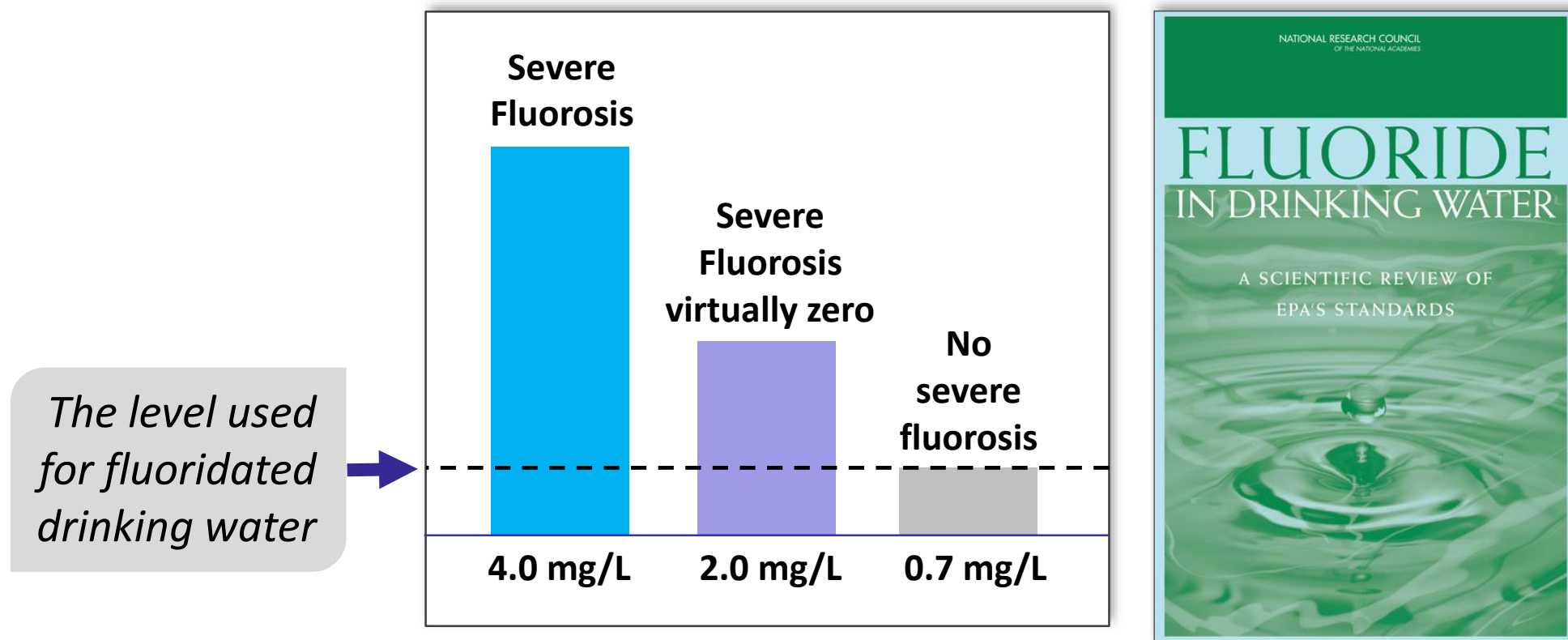
A clear benefit from fluoridation

A chart like this compares apples to apples. Children in Ireland who live in fluoridated areas have lower rates of decay



6. What do we know about dental fluorosis?

Critics distort the facts about dental fluorosis



Dental fluorosis

What is dental fluorosis?

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.

Dental fluorosis

**What effect
does it have?**

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.
- Dental fluorosis is typically a mild cosmetic effect:
 - It does not cause pain
 - It does not affect the health or function of teeth
 - It is so subtle most people don't even notice it

Dental fluorosis

When can
it occur?

- Dental fluorosis is a change in the appearance of tooth enamel caused by high intakes of fluoride during the tooth-forming years.
- Dental fluorosis is typically a mild cosmetic effect:
 - It does not cause pain
 - It does not affect the health or function of teeth
 - It is so subtle most people don't even notice it
- Dental fluorosis can only occur **up to 8 years of age** while permanent teeth are developing.

Critics distort the facts about dental fluorosis

Variations in tooth enamel (fluorosis)



Normal



Very Mild



Moderate

Improper
use of
fluoride
products



Questionable



Mild



Severe

Not
caused
by CWF

Critics distort the facts about dental fluorosis

Opponents
distort the
facts about
fluorosis

Which would you rather have?

Cavities



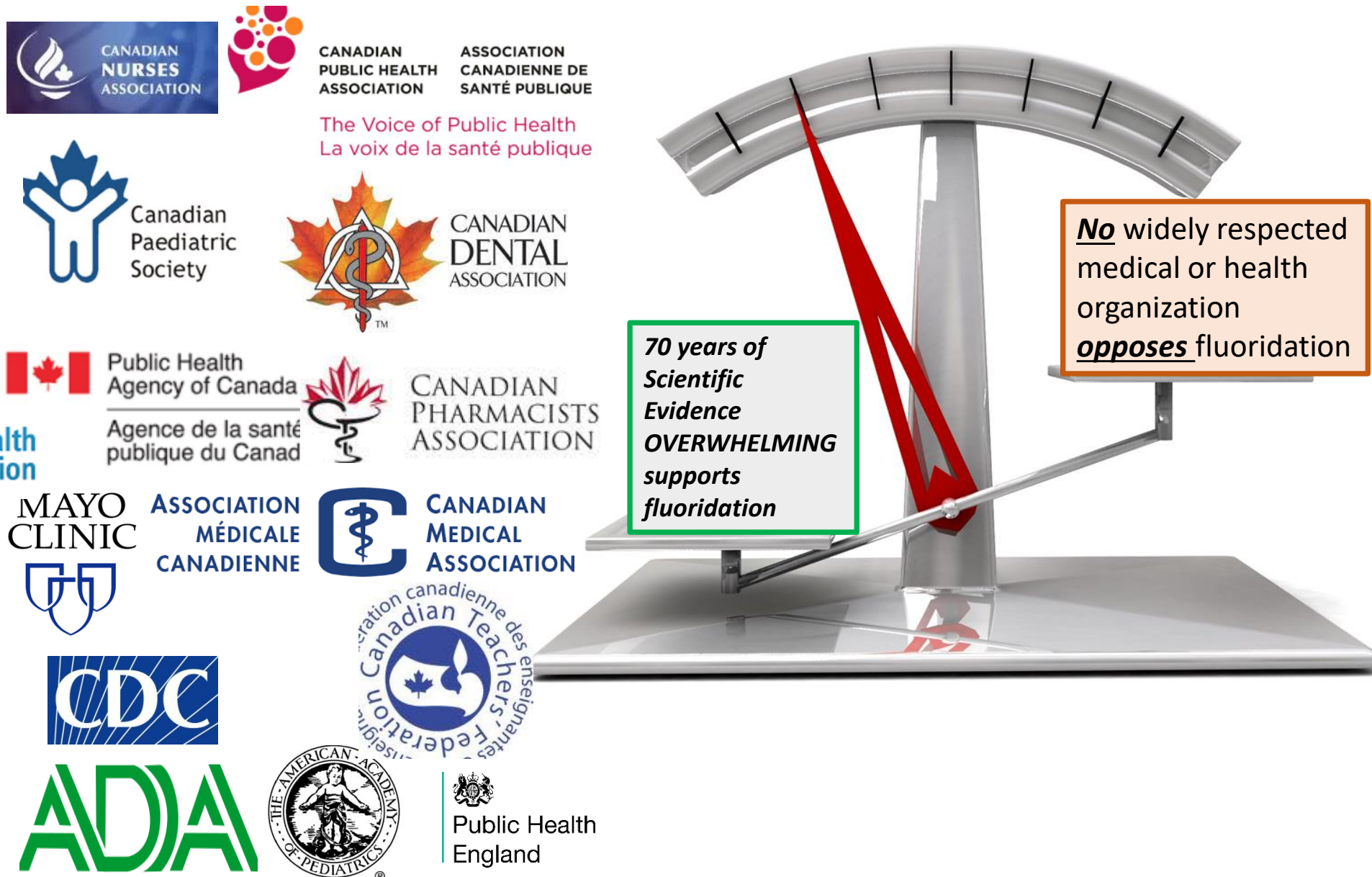
OR

Mild fluorosis



7. Final thoughts about fluoridation

Scientific evidence overwhelming supports fluoridation



Summary . . .

- ✓ **Effective** at reducing cavities
- ✓ **Safe** — no adverse health effects
- ✓ **Saves money** — in fact, the average person saves \$34 per year in dental costs. **Over \$45 million/year saved in dental treatment costs in Calgary**
- ✓ Prevention that **benefits everyone** in the community (just by turning on the tap)
- ✓ **Recommended by the most respected health/medical organizations:**
Public Health Agency of Canada, the US Centers of Disease Control,
Canadian Dental Association, Canadian Medical Association

You have a great opportunity to promote Calgarians' health

CPS2019-0965
Attachment 2
Letter 137d



Resources for you:

Alberta Health Services <https://www.albertahealthservices.ca/info/page5455.aspx>

Public Health Agency of Canada: <https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-position-statement.html>

Canadian Dental Association https://www.cda-adc.ca/en/about/position_statements/fluoride/

CDC: [Water Operators and Engineers](#)

CDC: [Water Fluoridation Information](#): General and specific information on CWF

[American Fluoridation Society:](#)

- For the latest information on studies, explaining them, refutations, and scientific hyperlinks
- **Our Water operators and directors hotline email for any questions:** Water@AFS-Fluoride.org

American Dental Association:

- [Frequently asked questions](#)
- [Mouth Healthy](#): More information on Fluoridation from ADA

American Academy of Pediatrics:

- [Campaign for Dental Health](#) Fluoridation Information and resources

Thank You!



Johnny Johnson

President American Fluoridation Society
Johnny@americanfluoridationsociety.com



From: [Chris Neurath](#)
To: [Public Submissions](#)
Subject: [EXT] Re: submission for Calgary City Council hearing on Fluoridation of Oct. 29, revised
Date: Tuesday, October 22, 2019 4:25:03 AM
Attachments: [Neurath submission to Calgary City Council, fluoridation, revised.pdf](#)

Dear City Council,

I have revised and updated my submission for the City Council hearing on Fluoridation scheduled for October 29, 2019. Please replace the previous PDF file that I submitted, with filename "Neurath submission to Calgary City Council, fluoridation.pptx.pdf" with this revised version titled:

Neurath submission to Calgary City Council, fluoridation, revised.pdf

The revised PDF file is attached here:

Please distribute this email and submission to the city council members.

I am planning to attend and make this presentation in person at the hearing and would like to reserve time for oral presentation.

I request that consideration be made for the great distance i will be traveling to make this presentation and that I be provided an early time slot. I am traveling from Boston, Massachusetts, USA. I am making this serious commitment to provide information to the Calgary City Council because I am the lead author of a critique of the McLaren studies that purport to show that cessation of fluoridation caused an increase in tooth decay in Calgary. The critique was published in the same peer-reviewed journal as McLaren's article. It is important to highlight the severe weaknesses in her study and to correct the misinterpretations about it that have been common in the media in Calgary and throughout Canada.

Please confirm your receipt of this message and the revised submission.

I understand the deadline for submission of material was modified and is now noon on October 22.

Sincerely,

Chris Neurath

Research Director

AEHSP - American Environmental Health Studies Project

cneurath@AmericanHealthStudies.org

CONFIDENTIALITY NOTICE: This email is confidential and intended only for the addressed recipient(s). It is not to be disclosed to others without permission.

On Oct 22, 2019, at 1:59 AM, Chris Neurath
<cneurath@AmericanHealthStudies.org> wrote:

Dear City Council,

I am attaching a written submission for the City Council for the Public Hearing on Fluoridation scheduled for October 29, 2019. This is for the distribution to city council members.

<Neurath submission to Calgary City Council, fluoridation.pptx.pdf>

I am planning to attend and make this presentation in person at the hearing and would like to reserve time for oral presentation.

I request that consideration be made for the great distance i will be traveling to make this presentation and that I be provided an early time slot. I am traveling from Boston, Massachusetts, USA. I am making this serious commitment to provide information to the Calgary City Council because I am the lead author of a critique of the McLaren studies that purport to show that cessation of fluoridation caused an increase in tooth decay in Calgary. The critique was published in the same peer-reviewed journal as McLaren's article. It is important to highlight the severe weaknesses in her study and to correct the misinterpretations about it that have been common in the media in Calgary and throughout Canada and even the world.

Please confirm your receipt of this message and submission.

Sincerely,

Chris Neurath

Research Director

AEHSP - American Environmental Health Studies Project

cneurath@AmericanHealthStudies.org

CONFIDENTIALITY NOTICE: This email is confidential and intended only for the addressed recipient(s). It is not to be disclosed to others without permission.

Evaluation of Studies from the University of Calgary on Fluoridation and:

Tooth Decay



ADHD



Hypothyroidism



Presentation for Calgary City Council
October 29, 2019



Chris Neurath
American Environmental Health Studies Project

University of Calgary studies by Lindsay McLaren flawed:

- **They do not show stopping fluoridation caused increase in tooth decay**
- **They do not exonerate fluoride of increasing risk of ADHD**
- **They do not exonerate fluoride of increasing hypothyroidism**

McLaren papers:

- McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, Shwart L. 2016. Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices. *Community Dent Oral Epidemiol*. ePub:1–9. doi:10.1111/cdoe.12215.
- McLaren L, McNeil DA, Potestio M, Patterson S, Thawer S, Faris P, Shi C, Shwart L. 2016. Equity in children's dental caries before and after cessation of community water fluoridation: differential impact by dental insurance status and geographic material deprivation. *Int J Equity Health*. 15:1–9. doi: 10.1186/s12939-016-0312-1.
- McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, Shwart L. 2017. Exploring the short-term impact of community water fluoridation cessation on children's dental caries: a natural experiment in Alberta, Canada. *Public Health*. 146:56–64. doi:10.1016/j.puhe.2016.12.040.
- Barberio AM, Quiñonez C, Hosein FS, McLaren L. 2017. Fluoride exposure and reported learning disability diagnosis among Canadian children: Implications for community water fluoridation. *Can J Public Heal*. 108:e229–e239. doi:10.17269/CJPH.108.5951.
- Barberio AM, Hosein FS, Quiñonez C, McLaren L. 2017. Fluoride exposure and indicators of thyroid functioning in the Canadian population: implications for community water fluoridation. *J Epidemiol Community Heal*. 71:1019–1025. doi:10.1136/jech-2017-209129.

McLaren study claimed to find increase in tooth decay due to stopping fluoridation

CBC | MENU ▾

news

Sections ▾

Calgary

Lack of fluoride in Calgary drinking water leads to rise in kids' tooth decay, study indicates

University of Calgary study shows rise in decay worst in baby teeth

[The Calgary Eyeopener](#) • CBC News •
Posted: Feb 17, 2016 5:00 AM MT | Last Updated: February 19, 2016

McLaren said the study is clear about the cause and effect at play.

"We designed the study so we could be as sure as possible that [the increased tooth decay] was due to [fluoride] cessation rather than due to other factors," she told the CBC.



UNIVERSITY OF CALGARY

UCALGARY NEWS

Feb. 17, 2016

Study shows tooth decay worsened in Calgary children after fluoride removal

Cumming researcher Lindsay McLaren finds fluoridation is a public health measure worth maintaining

Critique of McLaren study published in peer-reviewed journal (Community Dentistry & Oral Epidemiology)

COMMENTARY

WILEY COMMUNITY
DENTISTRY AND
ORAL EPIDEMIOLOGY

Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada

Christopher Neurath¹  | James S. Beck² | Hardy Limeback³ | W. Gary Sprules⁴ |
Michael Connett⁵ | Bill Osmunson⁶ | Donald R. Davis⁷

Neurath C, Beck JS, Limeback H, Sprules WG,
Connett M, Osmunson B, Davis DR. 2017.
Limitations of fluoridation effectiveness
studies: Lessons from Alberta, Canada.
Community Dent Oral Epidemiol. 45:496–502.
doi:10.1111/cdoe.12329.



McLaren Study Omitted Crucial Data

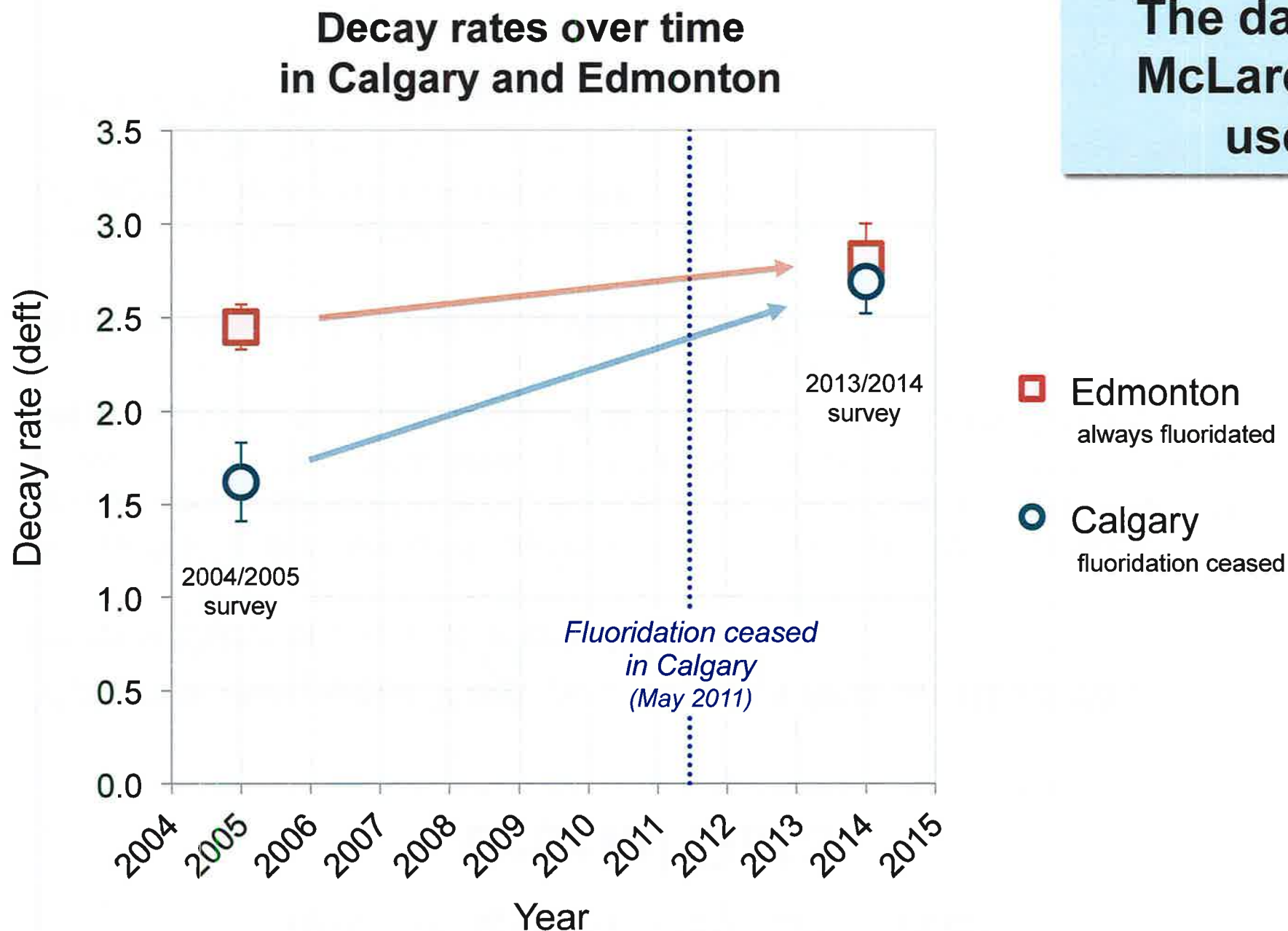
McLaren used data from two surveys and omitted data from a third survey at a crucial time.

McLaren's analysis compared decay rates from a survey in 2004/2005 before cessation to a survey in 2013/2014, after cessation. Fluoridation ceased in May 2011. A third survey in 2009/2010, just 1.5 years before cessation, reveals that tooth decay was rising steadily in Calgary during the period when Calgary was still fluoridated.

Why is this such a serious weakness?

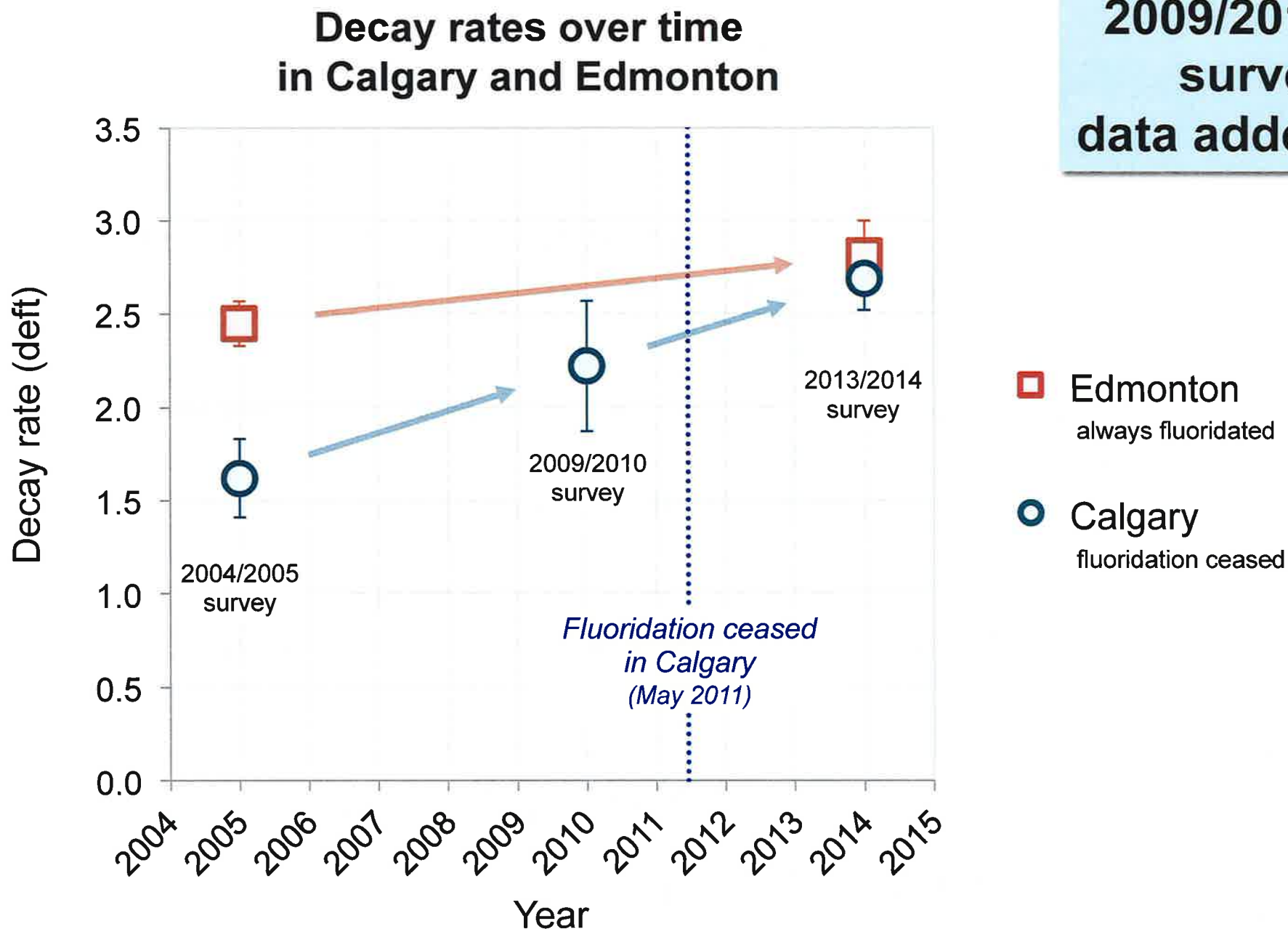
When the data from the third survey is added, it can be seen that decay was increasing at the same rate regardless of fluoridation. *Factors besides fluoridation must have been causing this rise in decay and are a more likely explanation of the continued steady rise in decay following cessation.*

The data McLaren used



History of tooth decay measured as: **deft** = decayed, extracted due to decay, and filled baby teeth; data from McLaren

**2009/2010
survey
data added**



History of tooth decay measured as: **def** = decayed, extracted due to decay, and filled baby teeth; data from McLaren

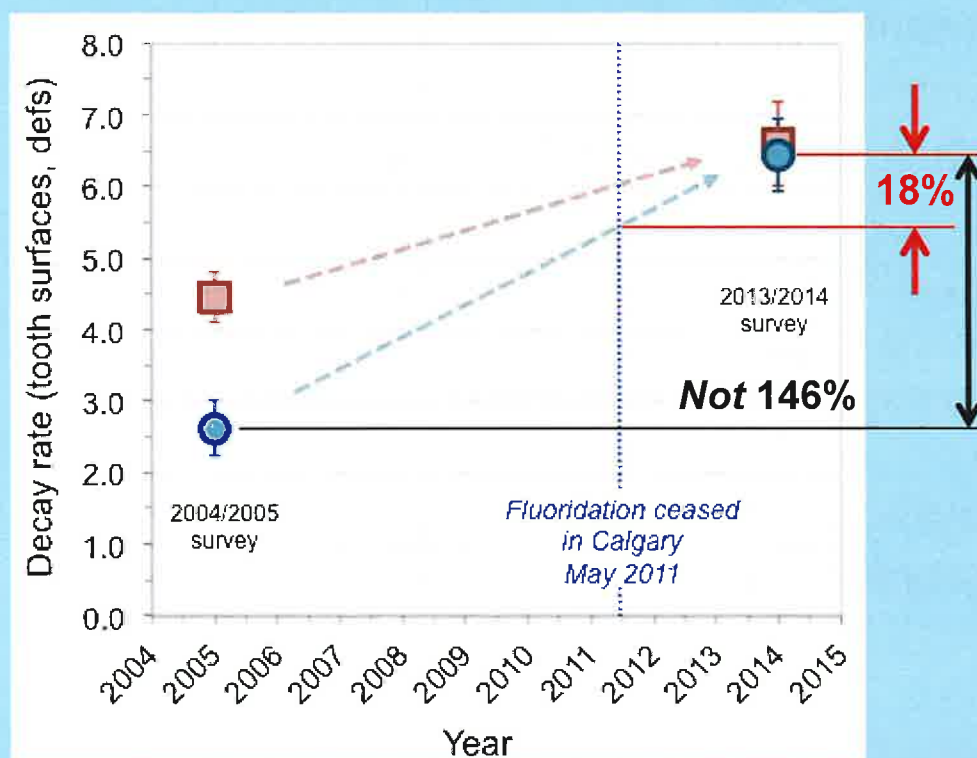
When the 2009-2010 survey is included, *NO EFFECT* of fluoridation on tooth decay is seen

Factors besides fluoridation cessation likely account for all of the increase in decay in Calgary.

Decay increased substantially in Edmonton despite it being fluoridated for the entire time. Decay increased substantially in Calgary during the time it was fluoridated, before cessation. Decay continued to increase at the same or lower rate after cessation in Calgary.

Edmonton has been fluoridated for over 50 years yet tooth decay has increased rapidly and is higher than in Calgary.

Even with 2009/2010 data omitted, the rise in decay is much smaller than claimed



After cessation, decay increased from about 5.5 to 6.5 defs, an increase of only 1.0 defs, or 18%, not the 146% claimed by Calgarians for Kid's Health and Juliet Guichon.

Furthermore, when the Edmonton increase is controlled for, **the increase above Edmonton's is only 0.4 defs, or 7%.**

This increase is unlikely due to the absence of fluoridation, but to other factors that had been causing increases over the 6.5 years previous to cessation in Calgary, and over 9 years of fluoridation in Edmonton.

McLaren Study Not Blinded

*“our outcome assessment was not blind and could have some bias”
[McLaren et al 2017]*

The dental examiners knew they were in Calgary or Edmonton and therefore knew whether the children they were examining were fluoridated or not.

Furthermore, the existing fillings made up a large proportion of what they counted as decay history. The decisions to place those fillings were made by the child's dentist who also knew the fluoridation status of the child.

Why is this such a serious weakness?

Blinding is a minimal requirement for valid research. Meta-reviews (studies of studies) have found that unblinded studies typically overstate the effect by 20-30% in the direction the researchers expect¹⁻³. In other words, if the patients' dentists and the survey dentists expect to see an increase in tooth decay in non-fluoridated kids, their subjective measurement can be biased by roughly 20-30% in the direction of more decay.

¹Holman et al. (2015) Evidence of Experimental Bias in the Life Sciences: Why We Need Blind Data Recording. PLoS Biol 13(7): e1002190. doi:10.1371/journal.pbio.1002190. ²Saltaji et al. (2018) Influence of blinding on treatment effect size estimate in randomized controlled trials of oral health interventions BMC Medical Research Methodology 18:42 <https://doi.org/10.1186/s12874-018-0491-0>. ³Schulz et al. (1995) Empirical Evidence of Bias: Dimensions of Methodological Quality Associated With Estimates of Treatment Effects in Controlled Trials. JAMA 273(5):408–412. doi:10.1001/jama.1995.03520290060030

Failure to blind could explain all of the findings

Calgary decay increased **7%** more than in Edmonton following fluoridation cessation.

Even if the 2009/2010 survey is ignored, when using only the other two survey times, and assuming steady increase in decay between those times, Calgary had a 7% greater increase in decay compared to Edmonton following cessation of fluoridation in Calgary.

The typical amount of bias found in unblinded studies is **20-30%** so this could more than explain the effect claimed to be due to fluoridation cessation.

*“our outcome assessment was not blind and could have some bias”
[McLaren et al 2017]*

McLaren study did not control for any confounding factors

McLaren's study of tooth decay was published in three separate articles in three journals. The first and main paper controlled for no factors, not even age and sex. Her third paper, published a year later, considered some potential confounding factors, but only for one survey period. Her analyses of the association between fluoridation and tooth decay were not able to control for any of these factors because they were not available for the other comparison survey periods.

Tooth decay is a multi-factorial disease so factors besides fluoridation must be considered for a valid analysis. This is especially true when only two cities are being compared, because any factor that differs between the cities that might affect decay (ethnicity, socio-economic status, diet, nutrition, access to dental care, local dental practices, etc) can be a confounder and produce an alternative explanation for any differences in decay seen.

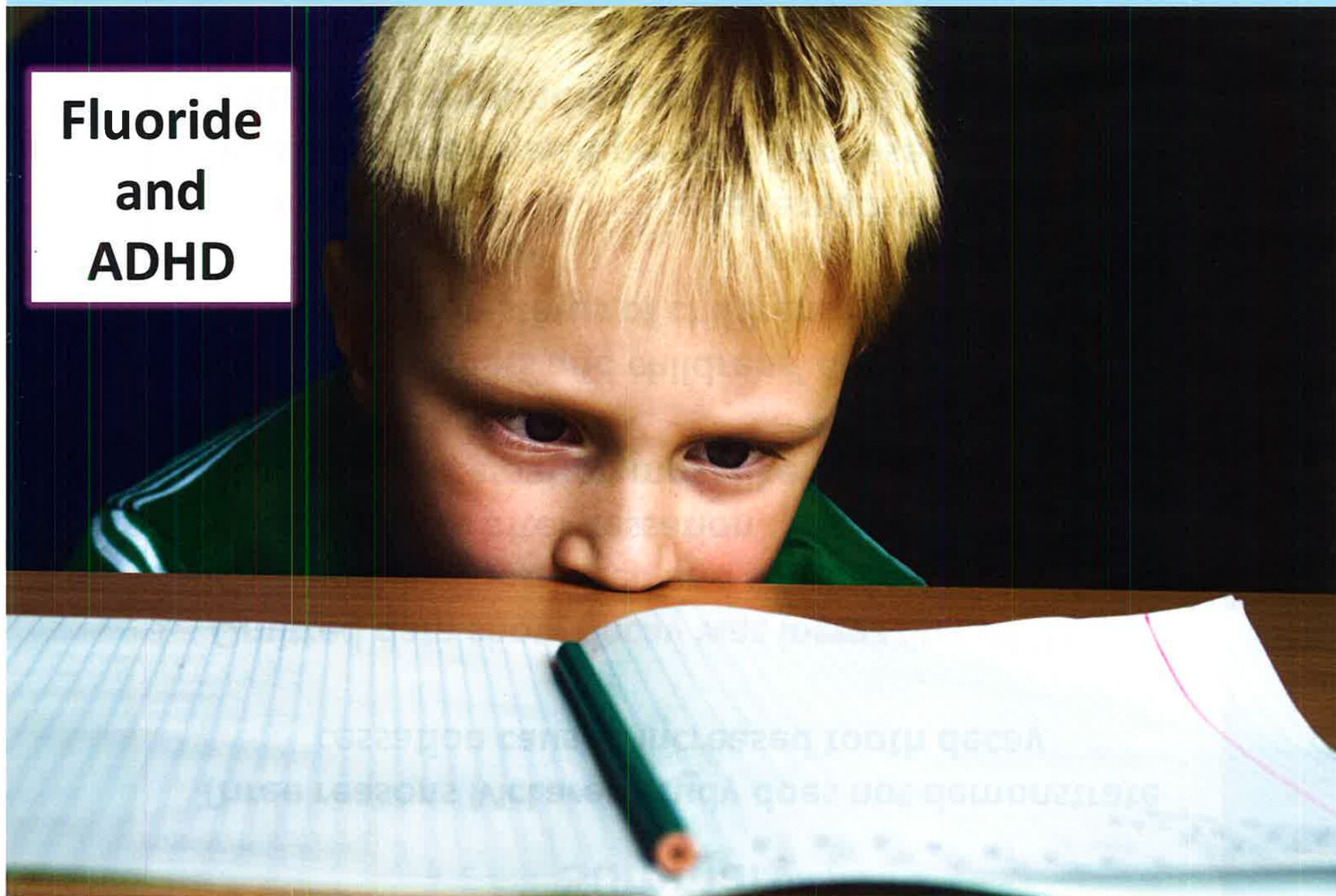
As discussed above, there must have been confounding and alternative explanations for changes and differences in decay because both Calgary and Edmonton experienced substantial increases in decay during the time each was fluoridated. Also Edmonton had a higher rate of decay when both were fluoridated.

Summary

Three reasons McLaren study does not demonstrate cessation caused increased tooth decay

1. Omitted data show **decay was increasing while Calgary was fluoridated** and continued increasing at the same rate after cessation. Factors other than fluoridation cessation most likely responsible.
2. Dental examiners and childrens' dentists **not blinded** to fluoridation status of children.
3. **No control of confounding** (alternative explanations) was done, nor was it possible because data on potential confounders not available.

Fluoride and ADHD



McLaren's "no effect" study of fluoride and ADHD is relatively weak

Superseded by a two stronger studies that found clear associations (Bashash 2018, Riddell 2019)

The study by Bashash et al (2018) is much stronger, being a mother-child cohort design rather than a cross-sectional design. The Bashash study found an effect. This suggests McLaren's study may not have been sensitive enough to detect an effect.



For example, McLaren's study used less reliable self- or parent-reported diagnosis of ADHD while Bashash used validated tests. Bashash also had maternal urine F exposure McLaren had only the child's urine F level. Maternal urine F would better reflect fetal exposures than child urine F.



UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

Higher levels of urinary fluoride associated with Attention Deficit Hyperactivity Disorder (ADHD) in children



HOME / WHAT'S NEW / FACULTY

October 10/2018

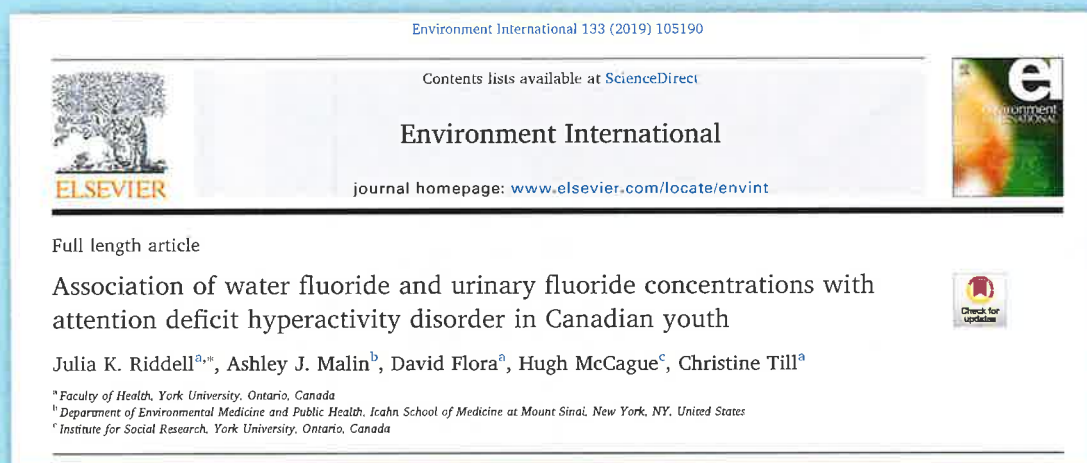
Higher levels of urinary fluoride during pregnancy are associated with more ADHD-like symptoms in school-age children, according to University of Toronto and York University researchers.

Bashash M, Marchand M, Hu H, Till C, Martinez-Mier EA, Sanchez BN, Basu N, Peterson KE, Green R, Schnaas L, et al. 2018. Prenatal fluoride exposure and attention deficit hyperactivity disorder (ADHD) symptoms in children at 6-12 years of age in Mexico City. *Environ Int.* 121:658–666. <https://doi.org/10.1016/j.envint.2018.09.017>.

Recent
Study

Published This Week!!! (Oct. 22, 2019)

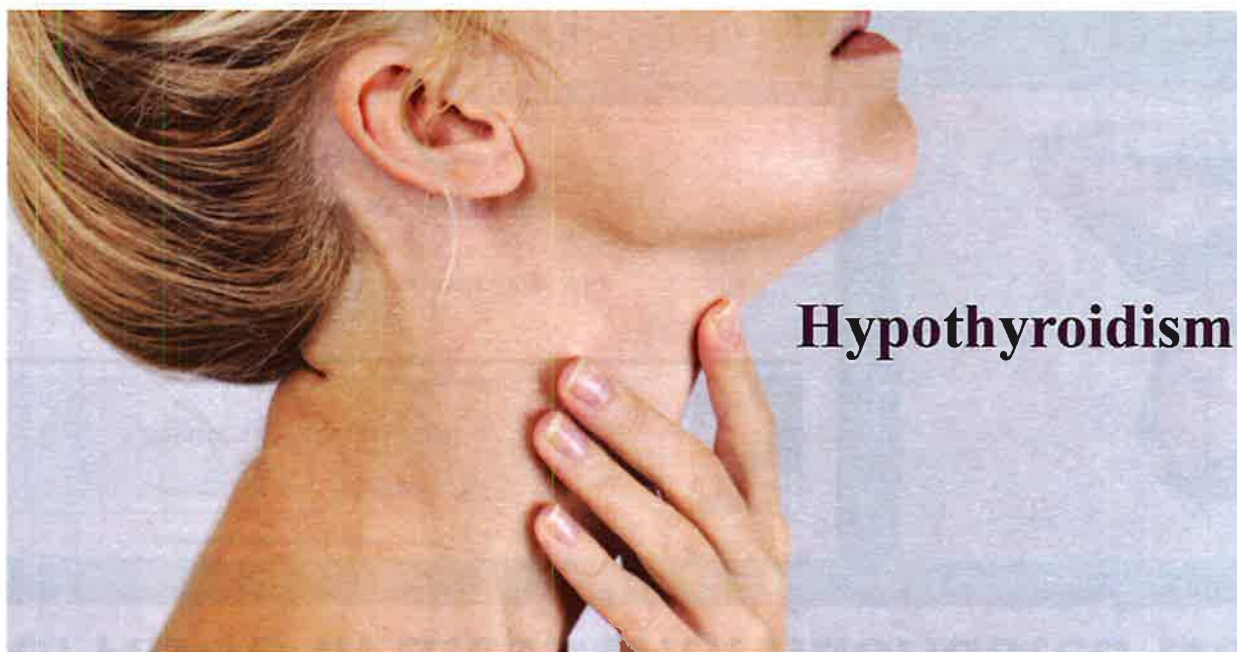
Study using same Canadian survey data as McLaren, but stronger design, found much higher risk of ADHD in those with fluoridated water



This study by Riddell et al (2018) uses the same data source (CHMS) but used a stronger design than McLaren's study of ADHD. It found 6-fold higher risk of ADHD for a 1 mg/L increase in water fluoride and 3-fold higher risk for those living in fluoridated versus non-fluoridated cities.

McLaren has also studied fluoride and hypothyroidism

Thyroid Disease



The thyroid plays an important role in regulating metabolism. Hypothyroidism is reduction in thyroid function. In pregnant women, even sub-clinical hypothyroidism may harm fetal neurological development.

Hypothyroidism: McLaren vs Peckham

McLaren's "no effect" study in Canada weak compared to Peckham study in England

McLaren's study (Barberio et al 2017) was cited by CADTH and O'Brien Institute reports as "counter-evidence" to the Peckham et al (2015) study from England that found a clear link between fluoridated water and hypothyroidism. However, the McLaren study is much weaker:

Peckham had much larger sample size. McLaren had very small sample sizes: less than 15 subjects in the most relevant subsample analyses and no more than 2,000 for less relevant analyses. Peckham's study included 56 million people in almost 8,000 medical practice locations covering the entire English population.

Peckham had more reliable outcome measures. McLaren defined hypothyroidism only by self-reported "thyroid condition", which could include hyperthyroidism and other thyroid conditions that would dilute an association between fluoride and hypothyroidism. McLaren's alternate outcome measure was serum TSH hormone levels, but in treated hypothyroidism TSH levels should be close to normal, so this measure would miss most people with diagnosed hypothyroidism. Peckham, in contrast used hypothyroidism diagnosed by each patient's doctors, which is much more reliable.

Peckham S, Lowery D, Spencer S. 2015. Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water. *Epidemiol Community Health*. 69:619–624.

McLaren's hypothyroidism analysis using TSH hormone levels could not detect sex and age as risk factors

McLaren's analysis using TSH hormone levels to assess hypothyroidism found no association with sex and age which goes against well established understanding that these are important risk factors for hypothyroidism. Older women have much higher risk of hypothyroidism than younger women and males.

McLaren's inability to detect an association between TSH hormone and sex or age suggests her use of this hypothyroidism biomarker may not have been reliable, perhaps for the reasons stated above: those with diagnosed hypothyroidism are usually treated and their TSH levels are brought back to normal.

Both of McLaren's measures of hypothyroidism may have been unreliable:

- 1. Self-reported "thyroid condition"**
- 2. TSH hormone levels.**

A more careful recent analysis of the same Canadian data found that fluoride increased hypothyroidism risk in those with iodine deficiency



A study by Malin et al (2018), using the same CHMS data as McLaren, but also considering iodine status, did find an association between higher F exposure and risk of hypothyroidism in those women who had iodine deficiencies.

Pregnant women with undiagnosed hypothyroidism and iodine deficiency are precisely those whose children are at risk from impaired neurodevelopment, so this is an especially troubling finding. Malin found **18% of Canadians deficient in iodine**. This study supports the possibility that a mechanism for prenatal fluoride to lower IQ, as now being found in other studies, may be via fluoride's effect on thyroid function during pregnancy.

Malin AJ, Riddell J, McCague H, Till C. 2018. Fluoride exposure and thyroid function among adults living in Canada: Effect modification by iodine status. *Environ Int.* 121:667–674. doi:10.1016/j.envint.2018.09.026.

Conclusions about McLaren's Studies:

- McLaren's studies do not provide evidence that stopping fluoridation caused an increase in tooth decay in Calgary. Other factors are more likely to explain the differences.
- Higher quality studies, including one *published just this week* with Canadian data, have shown fluoride is associated with ADHD.
- Higher quality studies have superseded McLaren's studies on hypothyroidism and found associations with fluoridation.



From: [Riley Krumes](#)
To: [Public Submissions](#)
Subject: [EXT] Fluoride Hearing Submission
Date: Tuesday, October 22, 2019 5:40:19 AM

----- Forwarded message -----

From: **Riley Krumes** <rileyannkrumes@gmail.com>
Date: Mon, Oct 21, 2019 at 2:47 PM
Subject: No Fluoride In Our Drinking Water.
To: <themayor@calgary.ca>, <ward.sutherland@calgary.ca>, <joe.magliocca@calgary.ca>, <jyoti.gondek@calgary.ca>, <sean.chu@calgary.ca>, <george.chahal@calgary.ca>, <jeff.davison@calgary.ca>, <Druh.Farrell@calgary.ca>, <Evan.woolley@calgary.ca>, <Giancarlo.carra@calgary.ca>, <ray.jones@calgary.ca>, <Shane.keating@calgary.ca>, <Peter.demong@calgary.ca>, <diane.colley-urquhart@calgary.ca>, <Jeromy.farkas@calgary.ca>, <cityclerk@calgary.ca>

Dear Mayor and Council,

I live in the community of Westgate in Calgary, Alberta.

I ask you do not favour water fluoridation to be reintroduced in Calgary. It has been proven that fluoride is beneficial for teeth, yes, but it has also been proven to affect hormonal balances in the body, slows metabolism and function of the liver, and accumulation of fluoride in the liver converts into the same chemical make up as formaldehyde, which is used for embalming purposes for the deceased. Now I ask you, why would you want this in your liver, not being able to be expelled out of the body. Fluoride and artificial water fluoridation are neither safe, effective, nor ethical. Fluoride is not needed for a single body function.

I will only vote for Council representatives that support freedom of choice, and Water Fluoridation denies a person's right to chose and their informed consent. You cannot guarantee that fluoride is safe and effective for everyone. Carbon filters, including Brita filters and household filters, do NOT filter out fluoride in the drinking water, and therefore, I Do not HAVE A CHOICE.

I look forward to your response, and again, beg you to vote NO.

Thank you for your time,

--

Riley Krumes - CHN - JC

--

Riley Krumes C.H.N.

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: Submission for Hearing on Water Fluoridation
Date: Monday, October 21, 2019 8:27:36 AM

From: M Lee [mailto:thegoofyone@hotmail.com]
Sent: Sunday, October 20, 2019 10:14 PM
To: Sutherland, Ward <Ward.Sutherland@calgary.ca>; Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Submission for Hearing on Water Fluoridation

Greetings Mayor and fellow City Councillors,

I'd like to voice my OPPOSITION to the fluoridation of our Calgary drinking waters.

To me, this matter is not whether you believe that fluoride is a poison or not. Or whether we should be wasting our hard earned tax dollars to implement such poison into our clean waters.

My biggest concern about all of this, is the fact that you're taking away our freedom of choice. Our freedom as a Canadian Citizen to choose ..as an individual..what goes into our bodies.

This is a very slippery slope we are riding. When you cross that line and start mandating, then where's the next line you're going to draw? Then what else will you start mandating next? What will happen to our Canadian Charter of Rights and Freedom Act?

Please..please remember, that when you cast your vote, you are voting for every single resident in Calgary. And if you choose to enforce fluoride back into our clean drinking water, you are taking away all of our rights...over 1.2 million individuals. You are taking away the freedom to choose for every single individual.

There are so many other cheaper and morally acceptable choices other than fluoridation. Please do NOT take away our Freedom of Choice. I beg of you..please vote with your conscience.

Thank you for your time.

Mary Lee
Ward 2
403.305.7954

Sent from [Outlook](#)

From: [Paul Connett](#)
To: [Public Submissions](#); [City Clerk](#); [Maria Castro](#)
Subject: [EXT] Paul Connett's Submission for Hearing on Water Fluoridation"
Date: Sunday, October 20, 2019 10:26:51 PM
Attachments: [Calgary - Connett- Arguments against water fluoridation.docx](#)

To the City Clerk,

I would be grateful if you would a) acknowledge receipt of this submission (see attached) and b) confirm that I am registered to give a 5 minute presentation on Oct 29 on the panel also containing Maria Castro and Dr. Robert Dickson and c) confirm that I will be allowed to use a short power point presentation to support my statement. I will bring the ppt with me on a USB pen drive.

Thank you
Paul Connett, PhD

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Paul Connett's submission on water fluoridation
Date: Monday, October 21, 2019 12:14:15 PM
Attachments: [Calgary - Connett- Mayor and Councillors Arguments against water fluoridation.docx](#)

From: Paul Connett [mailto:pconnett@gmail.com]
Sent: Monday, October 21, 2019 12:04 PM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>; Maria Castro <safewatercalgary@gmail.com>; Paul Connett <pconnett@gmail.com>
Subject: [EXT] Paul Connett's submission on water fluoridation

Dear Mayor and Councillors,

I hope you can find the time to read my concerns on this very serious matter. We can repair a child's damaged tooth but not a damaged brain, Please exercise the upmost due diligence on this matter..

Many thanks,

Paul Connett, PhD

Paul Connett, PhD,
104 Walnut Street,
Binghamton, NY 13905
1-607-217-5350
Pconnett@gmail.com

Oct 21, 2019.

Scientific reasons why Calgary should not re-fluoridate its water
By Paul Connett, PhD

1. Preliminary note

In a five-minute presentation I can hardly do justice to my 23-year-involvement with this issue, so I hope that prior to the hearing committee members (as well as the mayor and full council) will have time to review a pdf file of the power point presentation I gave before the public in the Calgary Public Library on May 30, 2019, "Water Fluoridation: A Reckless Medical Practice." Can be accessed here: https://docs.wixstatic.com/ugd/1eaedc_c8e8a6a81d3c40baa05bd8230cfeab55.pdf

2. Personal Introduction.

I am a graduate of Cambridge University and hold a Ph.D. in chemistry from Dartmouth College, Hanover, NH, USA.

From 1983 until May 2006, I taught chemistry at St. Lawrence University in Canton, NY where I specialized in Environmental Chemistry and Toxicology.

Over the past 35 years my research on waste management has taken me to 49 states in the US, 7 provinces in Canada and 67 other countries, where I have given many hundreds of pro bono public presentations. Much of this activity is summarized in the book ***The Zero Waste Solution: Untrashing the Planet One Community at a Time*** (Chelsea Green, 2013).

I have researched the literature on fluoride's toxicity and the fluoridation debate for 23 years. I helped found the Fluoride Action Network (FAN) see <http://www.fluorideACTION.net> for which I am currently the executive director. I have given invited presentations on the dangers of fluoridation in many communities and countries.

In 2010, with James Beck, MD. PhD and Spedding Micklem, D.Phil (Oxon), I co-authored the book, **"The Case Against Fluoride..."** (Chelsea Green), which contains 80 pages of citations to the scientific literature.

3. The many health concerns about fluoride and water fluoridation.

The many health concerns are spelled out in our book and within the website of the Fluoride Action Network (www.FluorideAlert.org) which contains the largest health data base available on this subject worldwide. In this submission I would like to focus on one single health concern, the impact of fluoride on the developing brain.

4. The impact of fluoride on the developing brain.

4.1 Human studies from 1996-2019, a timeline.

1996. My introduction to this issue was in 1996, which coincided with the publication of the second Chinese IQ study made available in English (Zhao, et al., 1996). The first in English was published a year earlier (Li et al., 1995).

2003. In August 2003, I was invited to testify before a panel appointed by US National Research Council to review the toxicology of fluoride in water. By this time five fluoride IQ studies had been published, including the very important study by Quanyong Xiang et al. (**Xiang 2003a, b**).

2006. The US NRC published its landmark review of the toxicology of fluoride in water in 2006 and concluded based on many animal and five human studies that “it is apparent that fluorides have the ability to interfere with the functions of the brain and the body” and recommended more human brain studies be conducted (NRC, 2006).

2006-2010. Subsequently the *Fluoride Action Network* has had many more Chinese studies (including those published before 1995) translated into English. These were subsequently were published in the journal *Fluoride* in 2008.

2010. By the time our book *The Case Against Fluoride* was published in 2010, we were able to reference a total of 23 human IQ studies and dozens of animal studies which showed that fluoride can enter the brain and impact many sensitive biochemical mechanisms.

2012. Availing itself of the many of the studies FAN had translated from Chinese, a team from Harvard which included Philippe Grandjean, a world authority on mercury’s neurotoxicity, published a meta-analysis of 27 fluoride IQ studies (25 from China and two from Iran) (**Choi et al., 2012**). While Choi et al. noted weaknesses in the methodology of many of the studies, they were struck by the **remarkable consistency** of the findings. Even though the studies were conducted over a period of 21 years by different research teams in many different geographical areas, they found that 26 out of the 27 studies found a lowered IQ in the children in the high fluoride village compared with the low fluoride village in each case. The average lowering of IQ was 7 IQ points.

Harvard Meta-analysis of IQ studies

Review

Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis

Anna L. Choi,¹ Guifen Sun,² Ying Zhang,³ and Philippe Grandjean^{1,4}

¹Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts, USA; ²School of Public Health, China Medical University, Shenyang, China; ³School of Stomatology, China Medical University, Shenyang, China; ⁴Institute of Public Health, University of Southern Denmark, Odense, Denmark

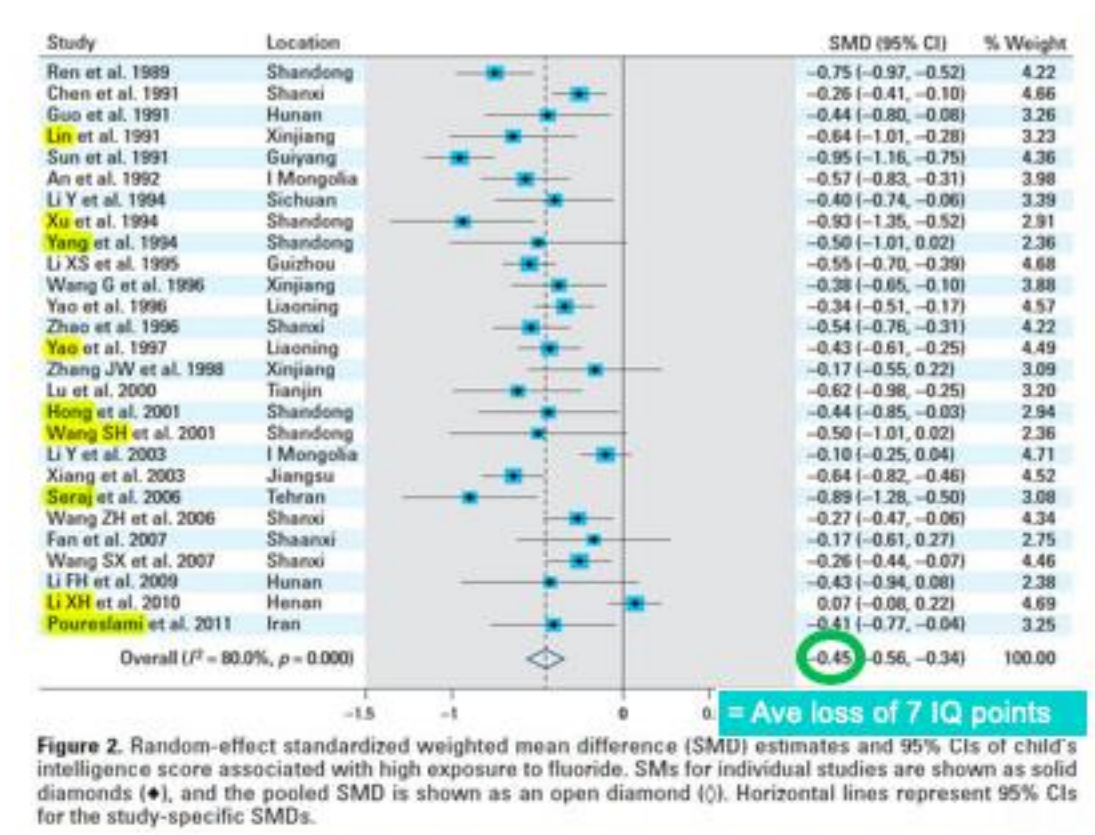
BACKGROUND: Although fluoride may cause neurotoxicity in animal models and acute fluoride poisoning causes neurotoxicity in adults, very little is known of its effects on children's neurodevelopment.

OBJECTIVE: We performed a systematic review and meta-analysis of published studies to investigate the effects of increased fluoride exposure and delayed neurobehavioral development.

METHODS: We searched the MEDLINE, EMBASE, Water Resources Abstracts, and TOXNET databases through 2011 for eligible studies. We also searched the China National Knowledge Infrastructure (CNKI) database, because many studies on fluoride neurotoxicity have been published in Chinese journals only. In total, we identified 27 eligible epidemiological studies with high and reference exposures, and points of IQ scores, or related cognitive function measures with means and variances for the two exposure groups. Using random-effects models, we estimated the standardized mean difference between exposed and reference groups across all studies. We conducted sensitivity analyses restricted to studies using the same outcome assessment and having drinking-

water (2003). Fluoride exposure to the developing brain, which is much more susceptible to injury caused by non-cases than is the mature brain, may possibly lead to permanent damage (Grandjean and Landrigan 2006). In response to the recommendation of the NRC (2006), the U.S. Department of Health and Human Services (DHHS) and the U.S. EPA recently announced that DHHS is proposing to change the recommended level of fluoride in drinking water to 0.7 mg/L from the currently recommended range of 0.7–1.2 mg/L, and the U.S. EPA is reviewing the maximum amount of

Environmental Health Perspectives,
2012 Oct;120(10):1362-8.



While promoters have attempted to dismiss these studies stressing methodological limitations and the “high concentrations” of the fluoride in the studies in which water was the exposure route. In reality, the average concentration in these studies was less than 4 ppm, which is the current “safe” drinking water standard for fluoride in the USA. Moreover, such criticisms gloss over the fact that when making comparisons between these study findings and the situation in fluoridated communities the key parameter is not **concentration** (as measured in mg of fluoride per liter or ppm), but **total dose of fluoride** in mg of fluoride consumed per day. When such calculations are made it is apparent that the dose range experienced in some of these studies which have found a loss of IQ overlap the dose range experienced by children in fluoridated communities.

2017. The first bombshell came in Sept 2017, when the [Bashash et al., 2017](#) was published in *Environmental Health Perspectives* (the publication of the National Institute of Environmental Health Sciences (NIEHS)). This 12-year study was funded by several US agencies including the NIH, NIEHS and the EPA. The researchers were drawn from many prestigious universities and research institutions including Toronto, McGill, Indiana, Illinois, Harvard and Mount Sinai. The study examined 299 Mother-infant pairs in Mexico City, and found – after controlling for many potential confounding factors - a strong relationship between fluoride exposure (as measured in their urine) of pregnant women and lowered IQ in their offspring at aged 4 and again at age 6-12.

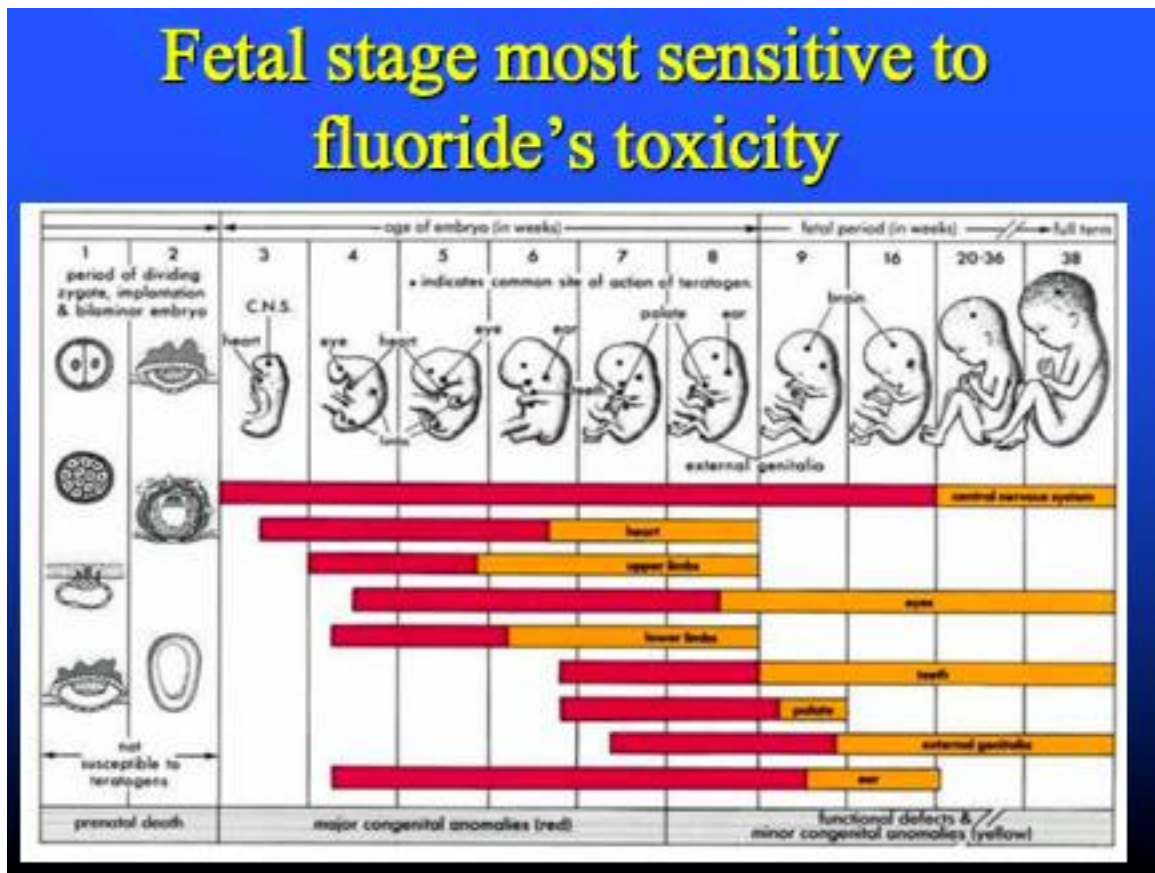
4.2 The importance of the Bashash study cannot be overstated.

Three things should be stressed:

4.2.1 The study was based on individual measurements of fluoride exposure as opposed to community water levels.

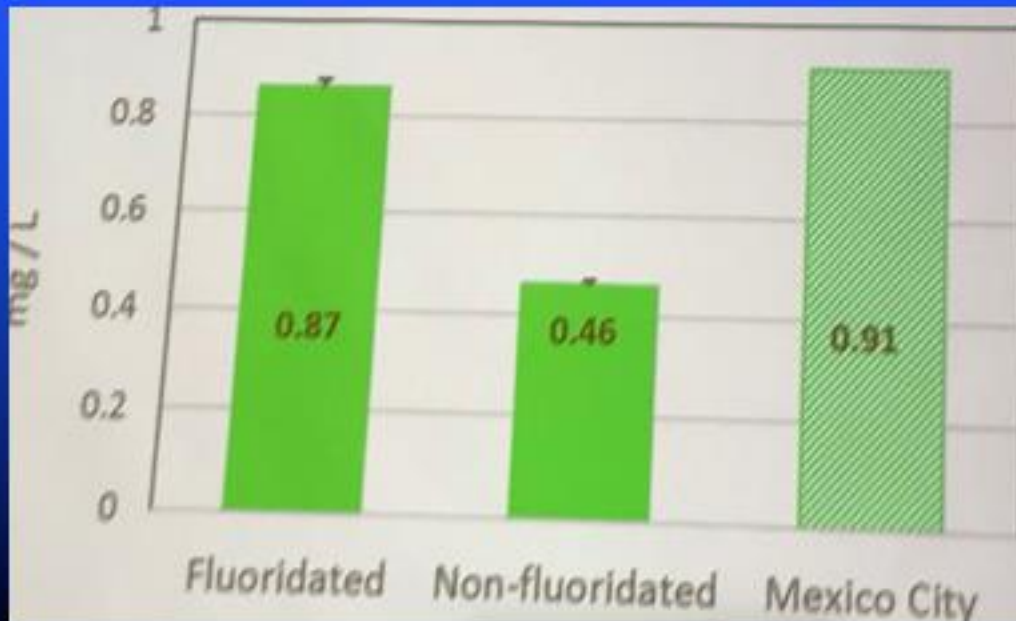
4.2.2 Urine levels are an indicator of total fluoride dose from all sources, and even though the largest source in this case came from fluoridated salt, the findings can be related to other communities - regardless of the actual source of fluoride - if you know the pregnant women's urine levels.

4.2.3 This was the first study which found that the critical period of exposure was during fetal development. Hitherto, potential impacts on the fetus have never been included in any health risk assessment on water fluoridation.



With respect to point 2) in 2018 a study was published in Canada by **Till et al** which showed that the fluoride levels in pregnant women in fluoridated communities was almost identical to the fluoride levels in the pregnant women in this Bashash study (0.87 ppm versus 0.91 ppm) and were twice as high in fluoridated communities compared non-fluoridated communities.

Urinary fluoride levels in pregnant women in Canada (Till, 2018)



With respect to point 3) it is now accepted that the placenta does not prevent fluoride's access to the fetus. This adds a whole new dimension to the dose of fluoride likely to cause harm to a human. Most people easily understand that a dose of a toxic substance that harms a child is less than the dose that harms an adult, and that the dose that harms an infant is likely to be less than the dose that harms a child and now we can assume that the dose that harms a fetus is likely to be less than the dose that harms an infant. Toxicologists try to take this stage of life vulnerability into account when considering the toxicity of a substance by introducing a calculation involving bodyweight. For this we use two terms **dose** and **dosage**. Dose is measured in mg/day. Dosage is measured in mg/kg bodyweight/ day. This becomes highly significant when we consider the very small bodyweight of the fetus, especially in the first trimester.

Thus, this study, and other later studies, will be key in determining a new **safe reference dose** (RfD). Assuming a rigorous application of standard risk assessment procedures, it will be far lower than the current US EPA RfD of 0.08 mg/kg/day, which was based on the estimated dose causing severe dental fluorosis, derived from Dean's 1940's data with no safety margin applied!

It should also be pointed out that no risk assessment for fluoride conducted by any government agency in any of the fluoridated countries (including Australia, Canada, Ireland, New Zealand, the UK and the USA) has ever considered exposure to the fetus.

The same Bashash team produced a second NIH-funded study in 2018 using the same ELEMENT cohort., but this time focusing on ADHD symptoms instead of IQ (Bashash et al., 2018). This second study found that prenatal fluoride exposure (as measured in the urine of the mother) was significantly associated with increased symptoms (i.e., inattention) of ADHD in the offspring. According to Dr. Howard Hu, **the results from the ELEMENT studies “are consistent with and support the conclusion that fluoride is a developmental neurotoxicant at levels of exposure seen in the general population in artificially fluoridated communities.”**

4.3 Biological plausibility

No epidemiological study can ever prove cause and effect, but confidence in findings like this (Bashash et al., 2017, 2018) is strengthened if the studies:

- a) Are replicated, as was Bashash et al, 2017 by Green et al, 2019 (discussed below)
- b) Are consistent with a large body of other human studies (i.e. over 60 cross-sectional studies) and
- b) Can be shown to be biologically plausible.

This is where the many (over 200) animal studies come into the picture. There are many aspects of brain function that have been shown to be impacted by fluoride exposure in animal experiments. These include:

- reduction in nicotinic receptors,
- reduction in protein content,
- alterations in protein expression
- damage to the hippocampus,
- inhibition of cholinesterase activities
- increase in oxidative stress, and
- neuronal degeneration.

There is also an **indirect mechanism** whereby some mother’s exposure to fluoride might compromise the brain development of the fetus. When the fetus comes into existence it has no thyroid gland. It is thus totally dependent on the mother’s production of thyroid hormones for the regulation of its brain development. It is well known that a woman with lowered thyroid function is likely to produce a child with lowered IQ. These well-known facts help to explain the significance of the findings of **Malin et al. in 2018**.

Malin found that TSH (thyroid stimulating hormone) levels (a measure of underactive thyroid – the higher the levels of TSH the lower the activity of the thyroid gland) in the Canadian population were further increased in women with low or borderline iodine exposure (an estimated 18% of the Canadian population) *if they were also exposed to fluoride*.

Joining the dots, it is plausible that women in Canada – who already have lowered thyroid function caused by low or borderline iodine intake – will have their condition made worse by living in a fluoridated community, which will in turn increase their likelihood of producing children with lowered IQ.

4.4 The O'Brien Institute

Here I will pause the timeline of IQ (and related) studies and applaud the integrity of the O'Brien Institute.

A summary of the science on neurotoxicity as outlined above was presented before members of the O'Brien Institute (i.e. Dr. William Ghali and a colleague) in May, 2019. Both listened very attentively to my summary, took many notes and then followed up with interviews with both Dr. Bashash and Dr. Christine Till. I am thankful for their subsequent withholding of an endorsement of water fluoridation until the neurotoxicity risk has been resolved. ***Since their report was made public the evidence of risk to the fetal brain has become even stronger.*** See the critically important **Green et al, 2019** study (discussed below) which replicated the Bashash findings using a Canadian cohort and another study in press (**Till et al, 2019**) which found a relationship of lowered IQ with infant exposure (see below).

4.5 The timeline continued

2019. The [Green et al., 2019](#) study was published in the journal *JAMA Pediatrics* on August 19, 2019. This study, [Association Between Maternal Fluoride Exposure During Pregnancy and IQ Scores in Offspring in Canada](#), was funded by the Canadian government and the U.S. National Institute of Environmental Health Sciences. The study essentially replicated the findings of the Bashash et al., 2017 study (discussed above) using the Canadian MIREC cohort .

The study followed 512 mother-child pairs from six major Canadian cities. As in the Bashash et al. 2017 study the researchers measured fluoride in women's urine samples during pregnancy. They found that a 1 mg per liter increase in concentration of fluoride in mothers' urine was associated with a 4.5 point decrease in IQ among boys, though not girls.

The researchers also calculated fluoride exposure based on how much was in the city's water supply and how much women reported drinking. Using this exposure method they found lower IQs in both boys and girls: A 1 mg increase per day was associated with a 3.7-point IQ deficit among both genders.

Making the publication of this study in *JAMA Pediatrics* even more impactful was that it is accompanied by:

- 1) an editor's note,
- 2) a podcast featuring the journal's editors, and
- 3) an editorial from world-renowned neurotoxicity expert Dr. David Bellinger.

This reaction by the JAMA editors shows just how important the study is, as most studies in their journal don't receive this kind of treatment.

4.6 More details on the publication of the Green et al., 2019 study

This was the first time in his career that the editor of *JAMA Pediatrics*, included an [editorial note](#). He did this knowing how controversial the issue of fluoridation was and correctly assuming that proponents would attack the study. In his note he stressed the study's rigor, the journal's triple-checking of the data, and definitive nature of the evidence:

This decision to publish this article was not easy. Given the nature of the findings and their potential implications, we subjected it to additional scrutiny for its methods and the presentation of its findings. The mission of the journal is to ensure that child health is optimized by bringing the best available evidence to the fore. Publishing it serves as testament to the fact that JAMA Pediatrics is committed to disseminating the best science based entirely on the rigor of the methods and the soundness of the hypotheses tested, regardless of how contentious the results may be. That said, scientific inquiry is an iterative process. It is rare that a single study provides definitive evidence. This study is neither the first, nor will it be the last, to test the association between prenatal fluoride exposure and cognitive development. We hope that purveyors and consumers of these findings are mindful of that as the implications of this study are debated in the public arena.

Other statements were made by other important scientists:

JAMA Pediatrics editor, **Dimitri Christakis, MD, MPH**, a pediatrician at Seattle Children's Hospital, said during the podcast, which accompanied the study, that he would not have his wife drink fluoridated water if she was pregnant.

David Bellinger, PhD, one of the world's authorities on lead's neurotoxicity said when commenting on the size of fluoride's effect on neurotoxicity, "It's actually very similar to the effect size that's seen with childhood exposure to lead." (quoted on NPR).

Philippe Grandjean, MD, PhD, a Harvard professor, Danish National Board of Health consultant, co-editor of *Environmental Health* and author of over 500 scientific papers, is one of the world's leading scientists on neurotoxicity. Based on numerous previous studies, he had already concluded in 2012 that "Fluoride seems to fit in with lead, mercury, and other poisons that cause chemical brain drain." After the latest study, he went further, saying "I think the time has come for us to ask the CDC to reconsider fluoridation."

4.7 Media attention and unwarranted criticisms of the Green study

This article received more media attention than any other fluoride-IQ study to date – and possibly any other study on the harmful effects of fluoride.

However, the media coverage included a number of largely ill-informed criticisms from fluoridation proponents and a number of experts in what appears to have been an organized response by the largely industry-funded Science Media Center in the UK. Here is a response to some of those criticisms:

Critics claim: “It is only one study.” The truth is that over 60 studies have found a lowering of IQ associated with fluoride exposure including another high-quality US-government funded study ([Bashash et al., 2017](#)) using similar methodology as the JAMA Pediatrics study. (See other Mother-Offspring fluoride studies at <http://fluoridealert.org/issues/moms2b/mother-offspring-studies/>)

Critics claim: “It doesn’t prove cause and effect.” No epidemiological study can and experiments on humans to see if harmful effects will occur are unethical. However, over 400 animal and cell studies underline the JAMA study’s biological plausibility.

Considering the Hill Criteria for causality, the current body of evidence, including the *JAMA Pediatrics* study, provides strong support for causality. Focusing on the most important of these criteria:

Strength. The 60+ studies, including the recent mother-child cohort studies, have found a large and statistically significant effect. An average IQ loss of 7 points in the cross-sectional studies and about 4-6 points per 1 mg/L increase in maternal urine F for the mother-child studies. All of these findings have been statistically significant.

Consistency. In the Choi meta-analysis, 26 of 27 studies found a loss of IQ. All of the mother-child studies have found a loss of IQ. This is a remarkable degree of consistency across studies done by many different researchers in many different countries, using a wide range of methods.

Temporality. The cause must precede the effect. The mother-child studies virtually prove that exposure preceded the outcome (reduced IQ). Many of the cross-sectional studies, where F exposure was only measured at the same time as the outcome also contribute to the evidence for temporality. Many of these studies restricted the subjects to those with lifetime residence with a known water fluoride level. Therefore, many will have been exposed from conception because their mothers likely resided in the same place as they lived and their exposure will have preceded the outcome.

Biological Gradient. The mother-child studies and several of the cross-sectional studies used continuous measures of exposure and found increasing loss of IQ with increasing F exposure. Similarly, animal experiments have found greater neurotoxic harm at greater doses.

Critics claim: “A loss of 3-4 IQ points is not enough to be concerned.” This is a predicted average drop for the whole population – such a shift could dramatically reduce the percentage of very bright children and increase the number of mentally handicapped. Furthermore, **the US EPA, when conducting risk assessments for other neurotoxins such as lead and mercury considers an average drop of just 1 IQ point to be an unacceptable risk.** Economists estimate that a loss of 1 IQ point represents a loss of lifetime earnings of about \$20,000 per person. When this is applied to the millions of people exposed to fluoridated water, the total economic loss is billions of dollars a year.

Critics claim: “Table 1 shows IQ was virtually the same in the fluoridated and non-fluoridated communities”. Table 1 gives only the unadjusted values that do not account for any of the other factors that can affect IQ and that were controlled for in the study. The adjusted results show a large and statistically significant effect.

Critics claim: “Figure 1 shows so much scatter in the data that the results could not be reliable”. Just as with the claim about Table 1, the individual data points in the graphs are unadjusted observed values. They do not take into account the adjustment for all the other factors that can affect IQ, that were controlled for in the regression analyses. The results of the regression analyses are clear: large and statistically significant losses of IQ were found after controlling for numerous potentially confounding factors.

Critics claim: “Loss of IQ cannot be sex-related.” Numerous studies of other developmental neurotoxins, like lead, have found sex-related differences. The study authors reference several such examples and discuss reasons for sex differences. At least one animal study of fluoride also found sex differences. Christine Till the lead author responds to this and other criticisms in an interview on [Canadian TV](#).

Contradicting other claims, the mothers were **not** exposed to high fluoride levels and the study **did** control for lead, mercury, manganese, perfluoro-octanoic acid, and urinary arsenic.

Critics claim: Thousands of studies show fluoridation is safe. This is not true. In fact, public health has been negligent about examining the health of people living in fluoridated communities.

4.8 New important study accepted for publication

2019. An important new study from **Till et al.** has been accepted for publication. This study examines the association between IQ and fluoride intake during infancy. This new study of 398 Canadian children found a significant association between fluoride ingestion during infancy and reduced non-verbal IQ. According to Dr. Bruce Lamphear, one of the authors of the study, “this association remained significant after controlling for fetal fluoride exposure and other relevant covariates, suggesting that the susceptibility to fluoride’s adverse neurological effects may extend into infancy.”

4.9 Lawsuit: Food and Water Watch et al., versus the US EPA

In November 2016, citizens petitioned the US EPA under provisions in the Toxic Substances and Control Act (TSCA) to ban the deliberate addition of fluoride into drinking water because of the neurotoxic threats it poses. All the evidence outlined above (and more) will be presented by some of the world's leading experts in the fields of neuroscience and risk assessment in federal court in February 2020. This event should witness the most rigorous scientific analysis ever presented in public on this issue, with the experts – on both sides – examined under oath (for more details see [Lawsuit: Food and Water Watch et al., versus the US EPA](#))

5. Conclusions

5.1 A large body of evidence indicates that fluoride is neurotoxic and is associated with lowered IQ in children at doses commonly experienced in fluoridated communities. This body of evidence includes:

- Over 200 animal studies showing that prolonged exposure to varying levels of fluoride can [damage the brain](#), particularly when coupled with an iodine deficiency, or aluminum excess;
- 61 human studies linking moderately high fluoride exposures with [reduced intelligence](#);
- 45 animal studies reporting that mice or rats ingesting fluoride have an impaired capacity to [learn and/or remember](#);
- 12 studies (7 human, 5 animal) linking fluoride with [neurobehavioral deficits](#) (e.g., impaired visual-spatial organization);
- 3 human studies linking fluoride exposure with impaired [fetal brain development](#).
- 6 Mother-child studies linking [certain levels of fluoride in the urine of pregnant women to reduced IQ in their offspring](#)

5.2 The weight of evidence of these studies - especially now that it includes meticulously conducted US government funded studies - should make it unthinkable that fluoride be deliberately added to the public drinking water.

5.3 The evidence that swallowing fluoride lowers tooth decay is weak. There have been no randomized clinical trials (RCT) demonstrating effectiveness and the Cochrane review in 2015 found few studies demonstrating benefits which were not likely subject to bias, [Cochrane, 2015](#).

5.4 It is generally agreed that the dental benefits of fluoride are predominantly topical, not systemic (CDC, 1999). In other words, one does not need to swallow fluoride to get the benefit, and thus there is no need to add fluoride to the public water supply.

5.5 Fluoridation is unwise and unnecessary. Any reasonable **risk-benefit analysis** favors ending fluoridation. There are only very small benefits (and none from exposing the fetus) but serious risks. Moreover, the benefits can be secured in other simple – and safer – ways.

5.6 Cost-effective alternatives are available

Instead of the very clumsy method of delivering fluoride to the whole body (especially to the fetus and infant) via the public water supply, authorities and parents should support and use the more rational and ethical approach of delivering fluoride directly to the surface of the teeth via fluoridated toothpaste. **Such an approach is not only more rational in terms of fluoride's mechanism of action but it is more ethical since it does not force medication on people without their informed consent.** It is also the approach used in the vast majority of countries worldwide and WHO data available online yields no convincing evidence of a difference in tooth decay in 12-year-olds when comparing fluoridated and non-fluoridated countries.

The [Childsmile](#) program in Scotland has shown how effective it is to instill the habit of toothbrushing at the nursery school level. Such programs are **highly cost-effective** on two fronts. Firstly, encouraging parents to participate in the program is a good way of fighting off **baby bottle tooth decay**, the treatment of which often involves extractions under anesthetics and is the **most expensive** – and traumatic – part of early child dental care. Secondly, any early education to discourage **over-consumption of sugar** will pay huge dividends in the future by reducing childhood obesity and reducing the huge lifetime costs of treating Type 2 diabetes.

6. My recommendations.

- 6.1 I urge the select committee members not to support the re-introduction of fluoride into Calgary's water supply. **No dental benefit to children's teeth** – even if it could be rigorously demonstrated - **could possibly justify the serious risks you will be taking with their mental development.**
- 6.2 I urge decision makers who have any doubts about the serious threat that fluoridation poses to the mental development of the children of Calgary (as outlined above) to exercise the **precautionary principle** and not take **unnecessary risks** by re-fluoridating their water supply when cost-effective alternatives for fighting tooth decay are available.
- 6.3 Should select committee members have any doubts about which side is presenting the more convincing case on the fluoride's threat to the brain, **I urge them to hold off their decision until the court case (Food and Water Watch et al. versus US EPA) is held in Federal court in February 2020** (discussed above). I think we can safely assume that this issue will get no more rigorous examination, in the near future, than that which will occur in this two-week case where the world's leading experts on neurotoxicity and risk assessment will be providing testimony under oath.
- 6.4 Finally, I urge the select committee to **Beware of the mantra**

Doubtless at the public hearing on Oct 29, 2019, the members of the select committee will hear from many dentists, dental groups and even some medical associations, repeatedly **claiming that water fluoridation is "safe and effective."** However, such repetitive claims should only be

taken seriously if they are accompanied by citations from the scientific literature which refute the evidence cited above.

Unfortunately, most dentists and doctors have supported fluoridation because they are only provided with one side of this debate in dental and medical school and early on it becomes part of their “**belief system**.” We need more scientists who are not trapped by such a belief system to read the literature on fluoride’s impact on the brain and to help end this practice.

Paul Connett, PhD,
Director, Fluoride Action Network (www.FluorideAlert.org)

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From: [Robert C Dickson](#)
To: [Public Submissions](#)
Cc: [Maria Castro](#)
Subject: [EXT] SUBMISSION FOR HEARING ON WATER FLUORIDATION
Date: Sunday, October 20, 2019 12:31:21 PM
Attachments: [Alberta Dental Assoc. response - 2 10-18-19.docx](#)

THIS SUBMISSION IS FROM SAFE WATER CALGARY
October 20, 2019

Recently, the Alberta Dental Association sent an e-mail to its members regarding the fluoridation issue coming before the Calgary city council on October 29.

Unfortunately, it contained unsubstantiated misinformation on both effectiveness and worldwide fluoridation practices.

Safe Water Calgary wants city councillors, and the public, to know the truth. The attached chart shows the difference between ADA's statements and the facts.

Please confirm that this submission is included in the agenda for the October 29 Fluoridation hearing.

Thanks.

Robert C Dickson, MD, CCFP, FCFP
Founder SAFE WATER CALGARY
www.safewatercalgary.com
111-3437-42 St NW
Calgary, AB T3A 2M7
Home: 403-242-4403 Cell: 403-560-4574
drbobdickson@shaw.ca

ALBERTA DENTAL ASSOCIATION'S STATEMENT IS INCORRECT

Alberta Dental Association

1. ***"Schoolchildren living in fluoridated communities on average have 2.25 fewer decayed teeth compared with similar children not living in fluoridated communities."***

(There was no source cited for this statement.)

2. ***"Nearly all developed countries practice fluoridation, just not always through water. Instead, salt is often used as the primary way of providing fluoride to the public."***

(There was no source cited for these statements.)

The Facts

1. According to the most recent Canadian Health Measures Survey (http://publications.gc.ca/collections/collection_2010/sc-hc/H34-221-1-2010-eng.pdf) on oral health, the average decayed, missing, filled permanent tooth rate (DMFT) for children aged 6-19 is 3 cavities. Even if there was a 25% decrease in cavities, as claimed by ADA, this is only .75 of one cavity less.

Even the 25% decrease is questionable. For instance, Statistics Canada reported little difference in cavity rates in school children between Ontario (70% fluoridated) and Quebec (6% fluoridated then, 2% now). (<https://www.theglobeandmail.com/life/health-and-fitness/fluoridation-may-not-do-much-for-cavities/article4315206/>)

In the U.S., the latest report (Curtis et al - 2018) (<https://www.ncbi.nlm.nih.gov/pubmed/29752831>) from the Iowa Study, the most comprehensive study available, found no significant correlation in school children between ingested fluoride and cavity reduction.

World Health Organization data shows cavity rates in children (age 12) have dropped as much in nations that don't fluoridate as in nations that do. (<https://fluoridealert.org/studies/caries01/>)

2. **This statement from ADA also has NO factual basis.** Out of 196 nations, only 24 have any artificial water fluoridation. In Europe, only four out of 48 nations have any. None of the largest Asian nations fluoridate in any way, including China, India or Japan. Out of 54 countries in Africa, only one fluoridates. 95% of the world's population drinks unfluoridated water. (British Fluoridation Society, Fluoride Action Network) (<https://www.bfsweb.org/> and <http://fluoridealert.org/>)

For the other 172 nations, only 19 have fluoridated salt, 12 in Central or South America, according to the most recent authoritative review on salt fluoridation (Marthaler – 2013) (<https://www.ncbi.nlm.nih.gov/pubmed/24308394>)

In Europe only seven nations have fluoridated salt. Only two have more than half their population consuming fluoridated salt. Three of the seven that offer salt – Austria, Spain and Slovakia – have almost none.

Moreover, less than 4 million out of 741 million people in Europe have water with natural fluoride levels equal to artificially fluoridated levels. (British Fluoridation Society figures)

BOTTOM LINE: Fluoridation is one of the most widely *rejected* health interventions in the world.

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Say no to Water Fluoridation in Calgary
Date: Tuesday, October 22, 2019 9:08:23 AM

From: Ruth Bednar [mailto:ruth.bednar@sympatico.ca]
Sent: Monday, October 21, 2019 1:56 PM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Say no to Water Fluoridation in Calgary

Dear Mayor and Councillors of Calgary:

Since 2006 epidemiological studies have included fluoride as a developmental neurotoxicant.

The intentional addition of industrial fluoridation chemicals, Hydrofluorosilicic acid (HFSA), to community drinking water to purportedly reduce cavities, continues today in a few remaining communities in Canada.

The City of Calgary stopped fluoridating Calgary's drinking water on May 19, 2011, following direction from City of Calgary Council. A very wise decision!

Fortunately, in Muskoka, where I live, Huntsville and Baysville stopped adding industrial grade HFSA fluoridation chemicals to their community drinking water 5 years ago, and continue to be fluoride free! Except, of course, the natural occurring less toxic calcium fluoride remains in the drinking water as it does in Calgary.

When adding HFSA the dose of fluoride cannot be controlled and infants should not be given tap water to reconstitute their formulas. At the level added to our drinking water, 0.7mg fluoride/litre, it is easy to exceed Health Canada's Maximum Contaminant Level (MCL) of 2.0, that will cause Fluorosis, just by drinking 3 litres of water per day including reconstituting soups, beverages etc. And dental fluorosis has increased in a alarming rate over the past 40 years!

Dumping HFSA in the environment is already illegal (per the federal Hazardous Waste and Species At Risk Acts) so how is it OK (without safety studies) to dump truck loads of this industrial waste via our water supply year after year?

The NSF60** certification for this chemical, used to justify the addition of this additive, does NOT have any safety studies for its intended use. Health Canada and FDA do NOT have safety studies for HFSA.

The above violates Ontario's Safe Drinking Water Act of 2002, which states, Dilution is NO defense for adding a contaminant to drinking water.

Approximately 70% of Canada's drinking water is free from fluoridation chemicals and water fluoridation has been banned, rejected or stopped in 99% of western continental Europe AND according to statistics, their dental health is just as good or even better than fluoridated communities.

The former mayor of Huntsville, Claude Doughty, a retired dentist and former President of Royal College of Dental Surgeons of Ontario thoroughly reviewed the fluoridation program and said "...***fluoride's best-before date had passed and it was time that it should come out of the drinking water.***" Municipalities have been "***playing doctor***" he said, by deciding if fluoride — which he calls a medication — should be added to an entire community's drinking water.

Our family MD, Dr. Z. Rona, and Dentist, Dr. Tsang, have warned about the dangers of drinking fluoridated tap water, a cumulative toxin causing many adverse health effects.—

"When there is too much fluoride intake, this can actually lead to a weakening of enamel and a white or yellow or brown discolouration called dental fluorosis. This is actually a sign that toxic levels have been reached. Because our teeth and bones are the areas that absorb calcium and fluoride the most, too much fluoride can also be absorbed into our bones leading to osteoporosis. Studies have shown that our bones become brittle because the tensile strength and elasticity are reduced".

With more and more recent valid substantiated information refuting the safety and effectiveness of fluoridation chemicals, my question is: Why would you reintroduce fluoridation chemicals, HFSA, to Calgary's clean and safe potable drinking water?

Sincerely,

Ruth Bednar R.H.N., R.N.C.P., R.O.H.P.
181 Pineridge Gate, Gravenhurst P1P 0A3 (416-579-9357)

references:

[https://www.thelancet.com/journals/laneur/article/PIIS1474-4422\(13\)70278-3/abstract](https://www.thelancet.com/journals/laneur/article/PIIS1474-4422(13)70278-3/abstract)

<http://www.dentistry-holistic.com/holistic-dentistry/fluoride-q-a>

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Green et al. (2019) reported lower IQ at between 3 and 4 years of age.

Bashash et al. (2017) reported lower IQ at 4 years of age and between 6 to 12 years of age.

Thomas et al. (2018) reported lower IQ in children between 1 to 3 years of age.

Valdez Jiménez et al. (2017) reported lower IQ between the ages of 3 to 15 months.

Li et al. (2004) reported significant differences in the behavioral neurological assessment score in 1 to 3 day-old offspring

Chang et al. (2017) reported significant differences in the mental development index and psychomotor development index of the offspring at 3, 6, 9, and 12 months of age.

From: [Barbaatar, Davaa](#)
To: [Public Submissions](#)
Subject: FW: Fluoride in our drinking water
Date: Tuesday, October 22, 2019 9:08:52 AM

From: louise prenovost [mailto:louiseprenovost@hotmail.com]
Sent: Monday, October 21, 2019 5:16 PM
To: Office of the Mayor <TheMayor@calgary.ca>; Davison, Jeffrey R. <Jeff.Davison@calgary.ca>; City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Fluoride in our drinking water

Dear Mayor Nenshi and Councillor Davison:

I am writing to you today because I am very opposed to having fluoride added to our drinking water. As a resident of Glenbrook for 20 years and a retired teacher with 40 years experience, I have 3 main reasons to implore the city NOT to add the neurotoxin fluoride:

1. I have a serious endocrine health issue (pituitary cysts removal in 2015)
2. As a special education teacher, I have observed an alarming increase in ADHD. Although no one can prove a definite link, I read research that clearly identifies the risk. It seems wise not to place developing brains at potential risk of developing this disorder.
3. I believe any increase in dental tooth decay is caused by an increase in sugary snacks and fast foods. This can be offset by increased nutrition and dental care education and free provision of topical fluoride treatments for low-income families. Consuming massive amounts of fluoride will not eliminate the problem.

The enormous expense of adding a dubious chemical to EVERYONE'S drinking water is dangerous, nonsensical and unethical.

Thank you for considering my concerns,

Sincerely,

Louise Prenovost
3108-47 St. SW
Calgary, AB T3E 3X1
403-249-6139

From: [Chris Carruthers PhD](#)
To: [Public Submissions](#); [City Clerk](#); [Ward11 - Lindsay Seewalt](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation - Oct 29
Date: Tuesday, October 22, 2019 9:53:09 AM

Special Attention: Jeromy Farkas - Ward 11 - Palliser

I am soon to be a grandmother, and I am VERY concerned that people of ALL ages in Calgary will be exposed to fluoridation, receiving a drug and dosage that is not individualized and appropriate, and that we have no control over this.

When medicine is delivered by water, there is no safe method of controlling the dosage. Will my newborn grandchild receive the same dosage of fluoride in drinking water that I receive at age 64 and 164 pounds?

Public health issues do not necessarily benefit by broad stroked solutions. Historically this has been demonstrated again and again.

There are safer and more targeted ways to consume fluoride if appropriate.

Please be VERY THOUGHTFUL in this decision.

Chris Carruthers PhD
2160 - Paliswood Road SW, Apt 1608
Calgary AB T2V 4S5
403-870-5097

From: [Stevens, Jodie](#) on behalf of [City Clerk](#)
To: [Public Submissions](#)
Subject: FW: [EXT] Fluoride In Calgary's Drinking Water
Date: Tuesday, October 22, 2019 10:05:41 AM

Greetings Public Submissions,

Please see the below concern regarding Fluoride.

Thank you

Jodie Stevens

Business & Logistics Liaison – Planning, Reporting, Finance, 311 & Safety
City Clerk's Office - Citizen and Corporate Services
313 – 7 Ave SE
P.O Box 2100, Stn M Mail Code #8007
Calgary, AB T2P 2M5
P: 403-268-5851
E: jodie.stevens@calgary.ca

One City, One Voice



ISC: Protected

From: Donna <donnabreen@ued.ca>
Sent: Tuesday, October 22, 2019 9:36 AM
To: Office of the Mayor <TheMayor@calgary.ca>; Sutherland, Ward <Ward.Sutherland@calgary.ca>; Magliocca, Joe <Joe.Magliocca@calgary.ca>; Gondek, Jyoti <Jyoti.Gondek@calgary.ca>; Chu, Sean <Sean.Chu@calgary.ca>; Chahal, George <george.chahal@calgary.ca>; jeff.davidson@calgary.ca; Farrell, Druh <Druh.Farrell@calgary.ca>; Woolley, Evan V. <Evan.Woolley@calgary.ca>; Carra, Gian-Carlo S. <Gian-Carlo.Carra@calgary.ca>; EAWard10 - Lesley Stasiuk <EAWARD10@calgary.ca>; Keating, Shane <Shane.Keating@calgary.ca>; Demong, Peter <Peter.Demong@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>; Farkas, Jeromy A. <Jeromy.Farkas@calgary.ca>; City Clerk <CityClerk@calgary.ca>; 'Cc:' <pat.fule@strathmore.ca>; lorraine.bauer@strathmore.ca; tari.cockx@strathmore.ca; denise.peterson@strathmore.ca; melanie.corbiell@strathmore.ca; bob.sobol@strathmore.ca; jason.montgomery@strathmore.ca; jthackray@strathmore.ca; mchalmers@chestermere.ca; lbold@chestermere.ca; cburness@chestermere.ca; mfoat@chestermere.ca
Cc: 'Donna Breen' <donnabreen@ued.ca>
Subject: [EXT] Fluoride In Calgary's Drinking Water

Dear Mayor Nenshi and Council:

I live in the neighbourhood of Inglewood, and am very concerned about the possibility that we may once again have fluoride in our drinking water.

We feel that is just too dangerous, and do not consent.

Thank you!

Donna Breen



Virus-free. www.avg.com

From: [Anise Thorogood](#)
To: [Public Submissions](#)
Subject: [EXT] Water fluoridation
Date: Tuesday, October 22, 2019 10:34:19 AM

Good Morning,

I am writing to request fluoride not be added back to Calgary's water supply. The detrimental effects are horrifying and this would be taking a huge step backwards to add it back in. Please consider this submission as I see the deadline was only 12 hours ago!

Thank you for your time!

Anise Thorogood

From: [Habkirk, Bobbi](#)
To: [Public Submissions](#)
Cc: [City Clerk](#)
Subject: FW: [EXT] Fluoride accumulates in the body
Date: Wednesday, October 09, 2019 3:31:25 PM

Bobbi Habkirk
Business & Logistics Liaison
City of Calgary
City Clerk's Office | Mail Code #8007
P.O Box 2100, Stn M
Calgary, AB T2P 2M5
P: 403-268-8885
E: bobbi.habkirk@calgary.ca

One City, One Voice

-----Original Message-----

From: Susanne Rohrlach [<mailto:sus.roh@gmail.com>]
Sent: Wednesday, October 09, 2019 2:40 PM
To: City Clerk <CityClerk@calgary.ca>
Subject: [EXT] Fluoride accumulates in the body

Calgary City Clerk

RE: Fluoride accumulates in the body

null

Dear Councilors,

Say NO to fluoridation chemicals!

Something so controversial must be an individual choice, not left up to governing officials. People can choose to use fluoride and fluoride products, but if you add it to the water then I can't choose not to consume it.

I was fluoridated heavily as a child and I now have thyroid disease, and the research is very clear on the connection between fluoride and thyroid, so if there is fluoride added to the water, it will make my health worse. In spite of being fluoridated, my teeth were still very poor, even with regular dental appointments and proper hygiene.

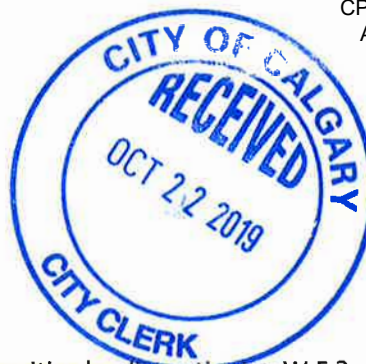
Healthy adult kidneys excrete only 50 to 60% of the fluoride ingested each day (Marier & Rose 1971). The remainder accumulates in the body, largely in calcifying tissues such as the bones and pineal gland (Luke 1997, 2001). Infants and children excrete less fluoride from their kidneys and take up to 80% of ingested fluoride into their bones (Ekstrand 1994). The fluoride concentration in bone steadily increases over a lifetime (NRC 2006).

Please don't force residents to avoid our drinking water.

Vote No!

Sincerely,
Susanne Rohrlach

Calgary, AB



October 20, 2019

Re: **Water Fluoridation**- Did we really cause \$14 Million dollars in cavities by discontinuing W.F.?

cc/ Councillors Sutherland, Magliocca, Gondek, Chu, Chahal, Davison, Wooley, Carra, Jones, Keating, Demong, Farrell.

Dear City Clerk,

As the Fluoridation Lobby (Councillor Diane Colley-Urquhart, Councillor Jeremy Farkas, Mayor Nenshi, Juliet Guichon – U of C, Obrien Institute – U of C., American Fluoridation Society- Johnny Johnson, local media, and others) prepare for the Public Hearing on Water Fluoridation, I hope that any decision you might be asked to make on the issue is unbiased, and based on independent well informed information.

Thank you to the members of council who made the most important political decision in the history of this city, by voting to stop adding hydrofluorosilicic acid to our drinking water, for saving taxpayers millions of dollars, and for giving me, my family, and my dogs 8 years free of this industrial contaminant.

With constant media censorship on this issue, how is it possible for voting Calgarian's to become educated on this issue and start to question what they thought they knew about W.F.? How is possible that Calgarian's can be notified they are able to make a submission to the City Clerk on the issue by noon on October 21? How many Calgarian's will be aware that there is a Public Hearing on the issue on Oct. 29?

I am guessing that we saved around \$14 million dollars since 2011 by stopping W.F., so did we really cause \$14 million dollars in cavities?

If there is an attempt to force another plebiscite on W.F. during the 2021 election, Calgarian's (including low income) deserve to know how it is possible that if you dispose of hydrofluorosilicic acid (the industrial waste bi-product from the Mosaic Phosphate Fertilizer Industry in Florida) into our drinking water, it will reduce tooth decay in low income children.

Since W.F. is sold on the backs of low income children, give the \$6 million needed for the W.F. equipment, and the \$1 million+ for the chemical and program (every year), to the Alex Dental Program. Maybe then low income families can afford dental care in a province that has the highest dental fees in Canada.

Thankyou,

A handwritten signature in black ink that reads "Colleen Cran". The signature is written in a cursive, flowing style.

Colleen Cran

200 Gallons of Sulfuric Acid Spilled After Pipeline Leak at Mosaic



Mosaic New Wales

Mulberry (WTFF) – Approximately 200 gallons of sulfuric acid was released last Tuesday after a pipeline leaked at Mosaic's New Wales facility.

The Florida Department of Environmental Protection posted this **pollution notice** after an operator of the facility reported the incident:

Sulfuric Acid Release

07/16/2019 10:30 EDT

A pipeline leaked and released approximately 200 gallons of sulfuric acid at the Mosaic New Wales facility. Mosaic worked to recover free product and mitigated localized impact to soil via neutralization.

Mosaic's New Wales facility is located in Polk County at 3095 CR 640 West, Mulberry, Florida.

Mosaic is one of the world's largest producers of finished phosphate products, according to their **website**. They were **formerly known** as IMC Phosphates MP, Inc.

Back in 2016, the same facility leaked 215 million gallons of "slightly radioactive water" into the aquifer. (**Reuters**)

MOSAIC UPDATE.

Why would council want to

buy their industrial waste bi-product

for Water Fluoridation?

From: [David Tremblay](#)
To: [Public Submissions](#)
Cc: [City Clerk](#); safewatercalgary@gmail.com; [Office of the Mayor](#)
Subject: [EXT] Submission for Hearing on Water Fluoridation
Date: Tuesday, October 22, 2019 11:46:37 AM

I am strongly opposed to the fluoridation of our water. Scientific research support against the fluoridation is incredibly strong. It's also a highly controversial topic and would divide the city even further if reversed. There's enough fluoride in toothpastes and other products to satiate those who'd like to have fluoride so it makes no sense to force it on a large percentage of us who don't want it. It'll save the city money too by not having to add fluoride to the water. Maybe you could give access to information on how to access fluoride products if they do want some.

Thank you and have a nice day

David Tremblay
587-576-1057



Virus-free. www.avast.com

Palaschuk, Jordan

From: Rita Ann Watterson <rawatter@ucalgary.ca>
Sent: Wednesday, July 17, 2019 8:19 PM
To: Schmick, Andrea M.
Subject: [EXT] Re: Fluoride

Follow Up Flag: Follow up
Due By: Wednesday, October 16, 2019 1:30 PM
Flag Status: Flagged

Dear Ms. Schmick,

I am writing in whole hearted support of adding fluoride to the municipal water in Calgary. Since the addition of fluoride was stopped in 2011, we are seeing more and more dental carries - particularly in children in our city. While health care is not a municipal issue, drinking water certainly is. The City takes pride in other public health initiatives (such as the Mental Health and Addiction Strategy) recognizing the benefit for the population.

Dental carries are particularly difficult for low income families and severely developmentally disabled children to cope with. The cost of dental care is not covered by provincial health care, and often when it falls to individual families they simply cannot afford what is needed. Adding fluoride to the water to therapeutic levels will reduce the additional burden placed on low income families from increased dental carries.

Dental carries have been linked to poor growth, behavioural problems, learning problems, and poor self-esteem among other things. Putting children on IV antibiotics in increasing numbers because of increased carries is not acceptable when there is a clear simple alternative: adding fluoride back into the water.

There is no evidence that therapeutic levels of fluoride in municipal water has any deleterious effect, despite what the anti-fluoride activists would have you believe (they are not basing their arguments in science, and are sadly uninformed about the actual benefits and risks of fluoridation). Not adding fluoride into the water clearly has had significant health effects on Calgarian children. The number of carries in Calgary is nearly double that of Edmonton (where they continue to add fluoride to their water). (Study by Dr. L McLaren, showed an increase in tooth surface decay in Calgary by 3.8 compared with 2.1 in Edmonton during a similar time frame)

I ask you to seriously consider the health of Calgarians, particularly our younger generation, as you debate adding fluoride back into the water. For me the science is very clear, there are no risks to the population, and the benefit is a significant reduction in carries. I would love to have less patients in my department requiring interventions for horrible tooth, gum, abscesses, and skin and bone infections which have resulted from dental carries.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Rita Watterson, MD, FRCPC, MPH
Consultant Psychiatrist
Clinical Assistant Professor | University of Calgary
www.kolabo.org

Palaschuk, Jordan

From: EAWard13 - Choi Lee
Sent: Wednesday, July 17, 2019 1:58 PM
To: Schmick, Andrea M.
Subject: FW: Water Fluoridation Analysis and Review
Attachments: Klearwater - Fluoridation Information .pdf

Follow Up Flag: Follow up
Due By: Wednesday, October 16, 2019 1:30 PM
Flag Status: Flagged

Hi Andrea,

May I submit written submissions to you? Please see below and attached and let me know! This is the first that I have received..

Thank you!

Choi Lee

Ward 13 Office Manager
For Councillor Colley-Urquhart
Direct: 403.268.2290

From: Doug Riddell <doug@klearwater.ca>
Sent: July 17, 2019 10:00 AM
To: Public Submissions <PublicSubmissions@calgary.ca>
Cc: EAWard13 - Choi Lee <EAWARD13@calgary.ca>; Colley-Urquhart, Diane <Diane.Colley-Urquhart@calgary.ca>
Subject: [EXT] Water Fluoridation Analysis and Review

Hello,

We would like to submit the attached letter for introduction to the record and submission to the councillors and committee hearing the Water Fluoridation Analysis Review. We had previously submitted this information to both Councillor Dianne Colley-Urquhart and the O'Brien Institute, and have been recommended to submit by this method.

We would also like to express interest in speaking to the group on July 24th, 1pm at the review meeting, for the purpose of introducing an opinion on the chemical market and available products should the city pursue fluoridation once again. We would request approximately a 10 minute window should that be available.

Please advise as to the schedule and location on the 24th, and acceptance or denial of our request to speak.

Thank you,

--

Doug Riddell
(403) 462-2246
Klearwater Equipment & Technologies Corp
Water Is Life, We Treat It Accordingly



KLEARWATER
Equipment & Technologies

July 16, 2019

Dear Water Fluoridation Analysis and Review Committee,

We have submitted the below information to Councillor Dianne Colley-Urquhart for their review and have been encouraged to submit this letter for review by the committee and the general purpose of council to receive adequate information on fluoridation and the chemical market associated.

Klearwater is a Calgary based company founded in 2000 that supplies Water and Wastewater treatment chemicals to many municipalities, including Calgary. Just last year we became the exclusive distributor in Western Canada for a product called 'Pure HFSA'. This product was a major component and consideration in the fluoridation study conducted by Peel Region in 2016/2017 and is now used by over 20 municipalities in Canada (including City of Toronto, Peel, Durham, Halton, etc). It is becoming widely known for its unique to the market level of purity and chemical properties making it a much healthier option for municipal water fluoridation than what was previously available.

Manufactured from a purified Calcium Fluoride source, it has 50X less heavy metal contaminants (Arsenic, Lead) than traditionally used fluoridation products in North America that is made as a by-product in the phosphate mining industry. It is also available at higher concentrations which provides a number of logistical and cost advantages vs. traditional products.

At Klearwater we try not to have a strong opinion on the highly political discussion involving whether or not to fluoridate, but more so continue to have the stance that if you are going to fluoridate, this is by far the most responsible and healthy product to do so with. As mentioned, the result of the study in Peel (Ontario) was the recommendation of the committee to continue fluoridation in the region ONLY with Pure HFSA, and no other product.

Thank you for receiving this letter and introducing it into the record for councillors and committee members to review. If you require additional information, we would be happy to speak at the meeting July 24th, 1pm. Alternately we are willing to meet with the high qualified water and environmental management team in Calgary to discuss implementation of this product into our great city.

Doug Riddell - Business Development Manager
Office: 403-254-4240 Cell: 403-462-2246,
doug@klearwater.ca

Water is Life, We Treat it Accordingly

Palaschuk, Jordan

From: Ian Mitchell <ianfromcalgary@me.com>
Sent: Wednesday, July 17, 2019 1:20 PM
To: Palaschuk, Jordan; Schmick, Andrea M.
Subject: [EXT] Fluoride, Meeting July 24
Attachments: Ian to C &PS committee July 2019.docx

Follow Up Flag: Follow up
Due By: Wednesday, October 16, 2019 1:30 PM
Flag Status: Flagged

Please find a letter for the Community and Protective Services Committee meeting July 24

Ian Mitchell

To Community and Protective Services Committee
City of Calgary.

Dear Councillors,

Re Fluoride in City of Calgary Water

I write to you as an ethicist and as a paediatrician regarding an important topic for children (dental caries) that will have consequences for their entire life.

Fluoridation in water is an effective and safe way to reduce the incidence of dental caries, the most common chronic disease in children.

As an ethicist, I recognize the responsibility borne by the Mayor and members of City Council to do the right thing for the whole population. In other words, you will receive submissions that offer many options to you. Fluoridation has been proven to be one of the most effective public health interventions in the 20th Century. It has also been shown to be safe. In public health ethics, the use of safe measures that help the vast majority, especially the vulnerable, must be used.

As a paediatrician, I recognise that dental caries in early childhood is about much more than teeth.

The child's psychosocial development is affected by chronic pain and the unwillingness to smile. Diet is affected by the inability to chew food. Soft foods, always loaded with sugar are preferred by a child with a sore mouth. Such foods have many well-known consequences to the child's general health. Moreover, these soft, sweet foods increase the risk of caries, leading to a vicious circle.

An increasing number of children require general anesthesia to deal with caries. General anesthesia carries its own short and long term risks, whatever the indication even with the highly skilled medical teams we have in Calgary. Some children develop painful abscesses, also requiring general anesthesia and intravenous antibiotics. Some children with dental abscesses have extension of infection to adjacent structures, such as bone infection in the jaw or into nasal sinuses or rarely to the brain. Infection may also be spread to the blood stream with generalised sepsis. We are fortunate that, so far, no children have died recently as a consequence of dental infection.

Please ensure our water has enough fluoride to prevent dental disease by increasing the naturally existing levels by less than one part in a million parts of water.

Yours truly,

Ian Mitchell, MB, MA, DCH, FRCPCH, FRCPC, FAAP
Bioethicist
Clinical Professor of Paediatrics
Cumming School of Medicine, University of Calgary

Palaschuk, Jordan

From: Christine East <cleast@gmail.com>
Sent: Tuesday, July 23, 2019 2:21 PM
To: Schmick, Andrea M.; adium@albertadoctors.org
Subject: [EXT] Water Fluoridation

Follow Up Flag: Follow up
Due By: Wednesday, October 16, 2019 1:30 PM
Flag Status: Flagged

Dear Ms. Schmick,

I am writing in support of adding fluoride to the municipal water in Calgary. As an emergency physician and a mother, this is an important issue to me.

Scientific evidence strongly supports water fluoridation. Rather than re-hashing the science in this email, I would draw your attention to [this succinct statement](#) by the Centers for Disease Control and Prevention which summarizes the evidence in support of water fluoridation. The [excellent work](#) done by local researcher Dr. McLaren and her colleagues demonstrates the negative impact that removing fluoride from Calgary's water supply has had in only a few short years. Less easy to quantify would be the multifaceted impact on Calgary's most underprivileged families and individuals - those without access to dental care. Poor dental health impairs good nutrition, function at school and work, sleep, and social interactions, and the health impacts go beyond the mouth, including increased risk of cardiovascular disease, respiratory infection, and complications of diabetes.

Ultimately, this issue has a significant socioeconomic element; anti-fluoridation activists who argue (incorrectly) that water fluoridation has negative health effects are likely able to afford adequate dental care and thus underestimate the impact this has on those without equal opportunities.

From a professional perspective, I see many patients in the emergency department with terrible dental infections and gum disease, which at best is very painful for the patient, and at worst is deadly (I have had several patients end up in the ICU with severe dental infections that spread to impair their breathing, and one patient who unfortunately passed away due to a severe dental infection that had entered the blood). I ask you to seriously consider the health of Calgarians, particularly children and those less fortunate as you debate adding fluoride back into the water.

Thank you in advance for your consideration of this important health initiative.

Dr. Christine East | MD CCFP(EM)
Emergency Physician
Clinical Lecturer, University of Calgary

Submission for Hearing on Water Fluoridation

As a dentist practising in Calgary since 1977, I would like to present my thoughts on fluoridation of Calgary's water for your consideration. Contrary to what many of my colleagues opine, I do not believe the practice of fluoridating public water supplies is either a safe or effective measure in attempts to reduce rates of tooth decay.

All health professionals have an obligation to first do no harm. They in fact swear an oath to this effect. Therefore, when credible evidence comes to light that questions the efficacy of a particular treatment or health practice, as health professionals, we are all ethically obligated to reevaluate our practices.

Moreover when credible evidence emerges that a specific treatment may actually be doing harm, we must discontinue such treatments until further scientific investigation either confirms or rules out said harm. In health care this is known as the precautionary principle.

These considerations are especially pertinent to the question of fluoridation of a public water supply. In the last years, careful reevaluation of many of the epidemiological studies that supposedly proved that fluoridation was an effective method of reducing tooth decay and which were conducted decades ago, has revealed that there were significant flaws in the methodology used in data analysis. Correction of these errors altered the outcomes to reveal that water fluoridation had little to no effect in reducing tooth decay.

Moreover there are now several epidemiological studies which create serious questions about the safety of water fluoridation.

If because of new scientific research, a previously accepted public health measure is now not only questionable in its efficacy, but also may cause serious adverse health effects in certain members of the population, then it is truly time to abandon such practices.

Some members of my profession may present to you their own observations regarding increased incidence of dental decay in their practices since water fluoridation was discontinued in Calgary. I could do the same thing about my observations of a higher incidence of dental fluorosis during the years when Calgary's water supply was fluoridated. I would remind you (and them) however, that personal observations do not constitute scientific investigation. Opinions based on personal observation are anecdotal at best, and most often are coloured by personal biases. **In making decisions that have the potential to affect the health of millions of our citizens, we must always limit our deliberations to factual evidence, not opinion. Health professionals should know this better than anyone.**

Here are some of the real facts concerning water fluoridation:

When medicine is delivered by water, there is no control of dose or dosage for a drug, no matter what the concentration. No control of dosage will inevitably result in some cases of overdose.

Dental Fluorosis, or toxic damage to teeth from too much fluoride, has skyrocketed among teens in fluoridated cities in the USA. Dental Fluorosis is actually the only visible aspect of this health issue. Skeletal Fluorosis also occurs when there is fluorosis of the teeth, but it is invisible. Some studies of found higher incidences of types of bone cancer in young males, and hip fractures in the elderly in fluoridated populations. Also, correction of unsightly dental fluorosis is a very expensive undertaking, hardly fair to anyone who suffers from this condition through no choice of their own.

Water fluoridation denies a person's right of choice and informed consent. This presents a serious ethical dilemma when mass medication is invoked on a population.

There are alternative strategies to reduce incidence of tooth decay. An example is the proven effective Scottish Child Smile program. This alternative to water fluoridation was designed to make children healthier from head to toe, including their teeth.

A very high percentage of fluoridated water (99% by some estimates) is not consumed. It goes back into our environment. The tax dollars saved from putting a known toxic substance into our water could be better utilized by directing them to more effective programs.

In summary I would like to again emphasize that there is by no means irrefutable evidence that water fluoridation is either effective in reducing tooth decay or safe and without health risks. There are many recent studies that call into question both efficacy and safety. In light of this, I believe it makes no sense to be reconsidering adding fluoride back into Calgary's water supply.

Dr. David MacLean

19-10-15

Re-Submission to Calgary Council

For Oct. 29,2019

(this replaces the June 2019 submission
which was not posted)

Dr. Hardy Limeback BSc PhD (Biochem) DDS
Professor Emeritus, University of Toronto
Former Head of Preventive Dentistry
Member of the 2006 NRC Committee
on Fluoride in Drinking Water

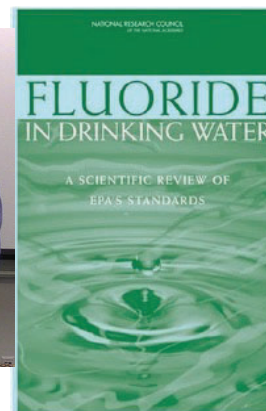
Dr. Limeback was a member of the
2003-2006 Committee on Fluoride in Drinking Water
US National Academies of Sciences (National Research Council)

-which was completely ignored by the CADTH reports

Jay Kumar, Tom Webster, Hardy Limeback, Judith Klotz, Bob Isaacson
Ruby Reed, John Doull, Barb Farishian, Susan Martel,, Kim Boekelheide, Ed Puzas



"Fluoride appears to have the potential to
initiate or promote cancers, particularly of
the bone, but the evidence to date is
tentative and mixed." p.286



**Published
Mar.2006**

19-10-15

**This re-submission by Dr. H. Limeback
to Calgary Council summarizes:**

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
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- how the CADTH report is biased and misleading

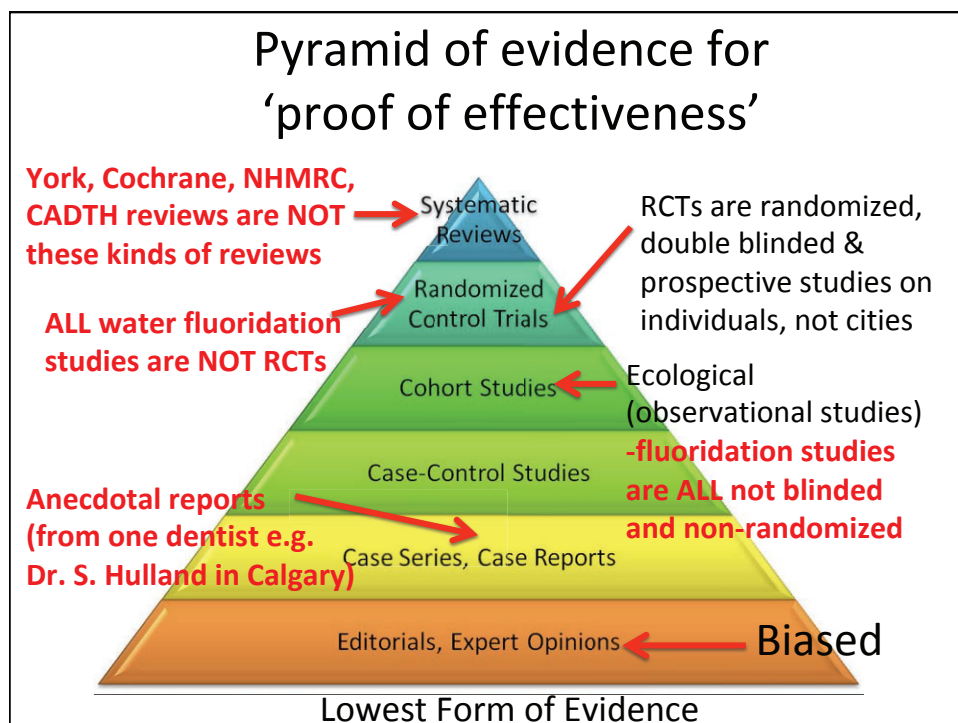
19-10-15

WHAT IS THE EVIDENCE THAT FLUORIDATION IS EFFECTIVE? if there are NO RCTs?

There is **not a single** prospective randomized (double-blinded) controlled trial (RCT) on fluoridation

-this is the usual evidence needed for approval of medications

-ALL the evidence of 'safe and effective' comes from weak UNBLINDED cross-sectional studies or non-randomized before and after studies



19-10-15

Even if there were benefits from
 fluoridation they are very minor
from 2012 textbook by Dr. H. Limeback

Table 16-4 A summary of recent publications on surveys of the dental decay rates in children

Study author	Country	Number of subjects	Age of subjects (years)	Surfaces saved with optimum fluoridation
Heller <i>et al.</i> 1997	US	18,755	12	0.5*
Brunelle and Carlos 1990	US	16,498	12	0.5*
Angelillo <i>et al.</i> 1990	Italy	643	12	0.6
Selwitz <i>et al.</i> 1998	US	495	8–16	1.2
Ismail 1991	Canada	219	10–12	0.7
Clark 1991	Canada	1131	6–14	0.8
Slade <i>et al.</i> 1995	Australia	9,690 vs 10,195	5–15	0.2 1.1
Jackson <i>et al.</i> 1995	US	243	7–14	2.0*
Kumar <i>et al.</i> 1998	US	1,493	7–14	–0.2
Armfield and Spencer 2004	Australia	5129 4803	4–9 10–15	1.5 NS
Komarek <i>et al.</i> 2005	Belgium	4468	7–12	NS
Spencer <i>et al.</i> 2008	Australia	8183 (SA)	5–15	NS
Nyvad <i>et al.</i> 2009	Lithuania	300	12–15	NS
Ekstrand 2010	Denmark	191 municipalities	15	1.0–2.0
Armfield 2010	Australia	128,990	5–15	0.5

* Difference was statistically significant.

“They always use % reduction, but
 what does that really mean?”

- *IF* fluoridation reduces dental decay by 25%
 how many teeth are saved per person from
 decay?
- recent studies suggest that **at most** 40 years
 of fluoridation saves *maybe* 1 tooth from
 dental decay (Slade, 2014; Do, 2017: Slade,
 2018)

19-10-15

The 'benefit' of fluoridation can be explained
almost entirely by biased *un-blinded* examiners

Holman L, Head ML, Lanfear R, Jennions MD (2015) Evidence of Experimental Bias in the Life Sciences: Why We Need Blind Data Recording. PLoS Biol 13(7): e1002190. doi:10.1371/journal.pbio.1002190

"Our meta-analysis thus shows that a lack of blindness is associated with an increase in effect size of approximately 27%.... This figure is comparable to estimates from all past meta-analyses on clinical trials of which we are aware. These meta-analyses suggested that a lack of blinding exaggerates the measured benefits of clinical intervention by 22% [11], 25% [12], 27% [10], 36% [8], and even 68% [9]."

8. Hróbjartsson A, et al (2012). BMJ 344: e1119.
9. Hróbjartsson A, et al. (2013) CMA Journal 185: E201–E211.
10. Hróbjartsson A, et al. (2014) Int J Epidemiol 43: 937–948.
11. Savović J, et al. (2012) Ann Intern Med 157: 429–438.
12. Wood L, et al. (2008) BMJ 336: 601–605.

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
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19-10-15



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HEALTH

June 1, 2019 4:40 pm

Reports exaggerating the
benefits of fluoridation

Updated: June 2, 2019 12:03 pm

Should Calgary bring fluoridated water back? Council expected to review new study this month



By Carolyn Kury de Castillo
Reporter Global News

“[The] money that it will save people is about \$64 for every dollar invested. So it’s a minor budget matter that will promote and protect the health of Calgarians,” Guichon said.

2014: Anecdotal reports (no studies) of increase in dental decay after Calgary ended fluoridation makes national news

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Reports exaggerating the
benefits of fluoridation

Calgary

Dental decay rampant in Calgary children, pediatric dentist says



Dentist says cavities in kids on the rise 3 years after Calgary stopped adding fluoride to drinking water

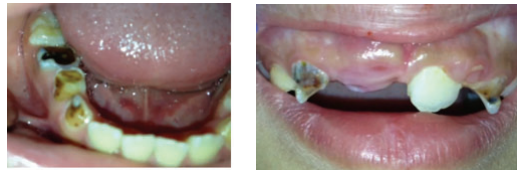
CBC News · Posted: Dec 08, 2014 11:19 AM MT | Last Updated: December 8, 2014

19-10-15

News reports showing rampant dental decay unrelated to lack of fluoride was irresponsible

Reports exaggerating the benefits of fluoridation

These pictures provided to the CBC are designed to instill fear: no amount of fluoride in the the drinking water can stop rampant dental decay like this.



CBC News
Dec. 8, 2014

CBC Journalist failed to uphold standards

"In matters of human health we will take particular care to avoid arousing unfounded hopes or fears in persons living with or close to those living with serious illnesses. **We will also avoid suggesting unproven benefits or risks to health related to changes in habits of consumption of food or pharmaceutical products.**" CBD Journalistic Standards and Practices.

Scaremongering re: lack of fluoridation -used by Medical Officers of Health across Canada

The great fluoride debate

By Denis Langlois, Sun Times, Owen Sound
Friday, January 31, 2014 10:18:40 EST AM

Dr. Hazel Lynn,
Medical officer of health
Owen Sound, Ontario



Medical officer of health Dr. Hazel Lynn holds up a picture of a child's teeth. Lynn said water fluoridation prevents tooth decay and is a safe practice. Others disagree. (JAMES MASTERS/QMI AGENCY)

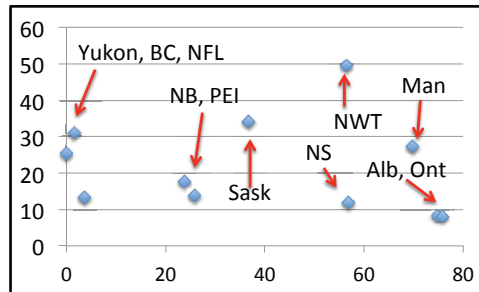
This kind of dental decay is not caused by a "fluoride deficiency" in the drinking water.

This is scaremongering!

19-10-15

Fluoridation in Canada DOES NOT reduce day surgeries required to treat rampant dental decay

Day
 surgeries
 per 1000
 (2011)



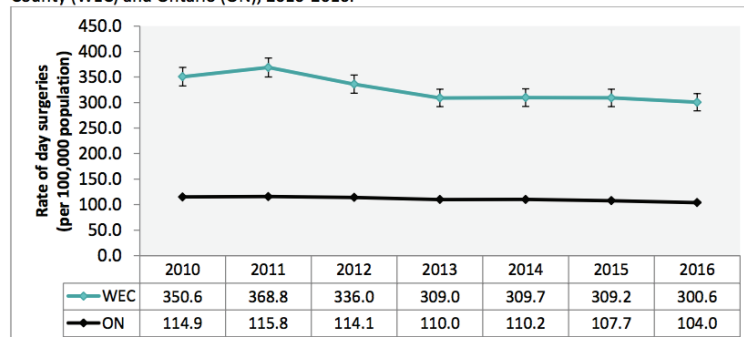
% fluoridation in each province (2007)

http://www.hc-sc.gc.ca/ahc-asc/alt_formats/pacrb-dgapcr/pdf/branch-dirgen/wfc-efc-eng.pdf
<https://www.cihi.ca/en/access-data-reports/results?query=surgeries%2C+dental%2C+province&Search+Submit=>

Day surgeries in Windsor for oral health issues related to dental decay actually declined when fluoridation stopped

from the Windsor Essex County 2018 Oral Health report

Figure 8. The rate of day surgeries for oral health (caries-related) issues in Windsor-Essex County (WEC) and Ontario (ON), 2010-2016.



Source: Ambulatory Emergency External Cause [2010-2016], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO, Date Extracted: [March 19, 2018].

19-10-15

O'Brien's Institute Lindsay McLaren's Study: What was claimed? What was actually shown?

Huffington Post Feb. 17, 2016

**Bold
claim**

"We systematically considered a number of other factors ... and in the end, everything pointed to fluoridation cessation being the most important factor," she said.

O'Brien Institute for Public Health website:

**Bold
claim**

"This study points to the conclusion that tooth decay has worsened following removal of fluoride from drinking water, especially in primary teeth, and it will be important to continue monitoring these trends," says Lindsay McLaren, PhD, from the University of Calgary's Cumming School of Medicine, and O'Brien Institute for Public Health.

**McLaren
admission
of what
was
actually
shown**

cheminst.ca/magazine/article/the-great-fluoride-debate/

"We were not able to answer the question, 'what has happened since cessation?' We were able to answer the question, 'what has happened between 2004-05 and 2013-14?' when cessation happened in one community and not the other." (McLaren)

Calgary Herald, Licia Corbella: The science is not settled –Oct.12, 2017

"For all tooth surfaces among permanent teeth, there was a statistically significant **decrease** in Calgary . . . which was not observed in Edmonton." (study)

Admissions in an article McLaren wrote for the Canadian Association of Public Health Dentistry 2017 Fall Newsletter



McLaren: " Some of the coverage was positive and accurate, but in other cases the study findings were misreported and the conclusions overstated; for example, suggesting that 'cavities spiked since fluoridation was stopped'. There was no spike but rather a gradual increase, **and the trend observed was not since fluoridation was stopped, but rather over a time period during which cessation occurred: 2004/05 to 2013/14 (cessation occurred in 2011).**"

19-10-15

What was actually shown by McLaren

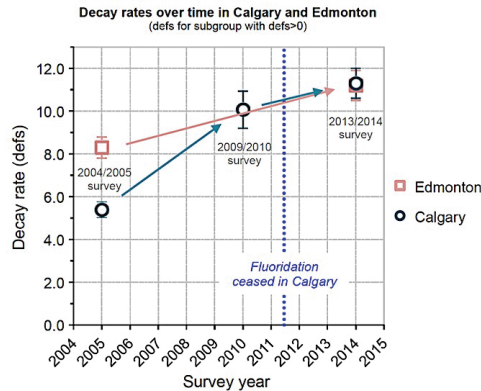


FIGURE 2 Dental decay rates for subgroup of those children with at least one defs (defs>0). Data for 2004/2005 and 2013/2014 from CDOE paper. Data for 2009/2010 from IJEH paper, but converted from deft to defs using conversion method described in text. Error bars indicate 95% CIs.

Neurath C, Beck JS, Limeback H, et al. Limitations of fluoridation effectiveness studies: Lessons from Alberta, Canada. Community Dent Oral Epidemiol. 2017;00:1–7

Neurath: “In summary due to the omission of key data that contradict the authors’ conclusion, inadequate control of confounding factors, and limitations in the design of the study that were largely unacknowledged, we believe that the claim by McLaren et al that their study supports the hypothesis that fluoridation cessation causes an increase in decay, is unjustified.”

What Calgary’s Juliet Guichon (a lawyer who admitted she doesn’t understand the science) is willing to say to see fluoridation reinstated

“Decayed primary tooth surfaces had risen 145% 3 years after fluoridation cessation.”

-The McLaren study was debunked by Neurath et al, 2017

“\$1 spent on fluoridation (including capital equipment and annual operating costs) saves between \$68 and \$140 in dental care”

-that’s impossible –that’s up to \$4700 saved per tooth

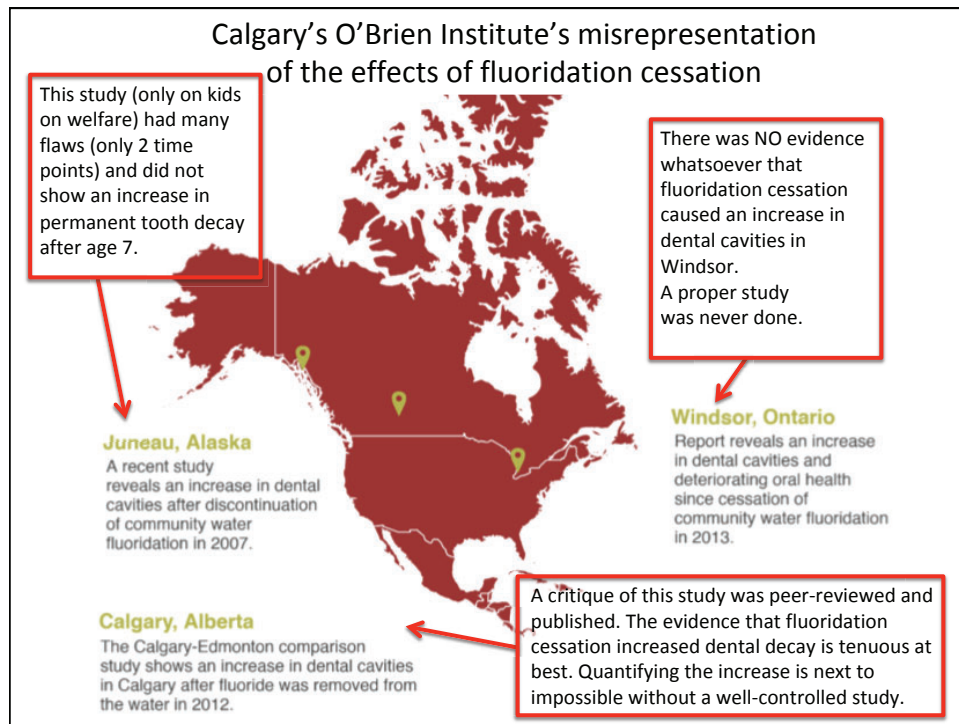
“No evidence of harm at 4.0 ppm (fluoride) and below”

- complete fabrication and does not reflect our 2006 NRC report

“Dental fluorosis produced from water fluoridation is seen as mild while flecks on teeth that can only be seen by the dentist. It does not affect the form and function of the tooth”

-this FALSE and it is an insult to those families who can clearly see the dental fluorosis damage from fluoridation

19-10-15



Why the Juneau AK Medicaid study failed to show effect of fluoridation cessation

- only 2 time points chosen; before (2003) and after (2012) the year fluoridation ended (2006)
- almost a decade between points: too long (anything could have happened)
- year to year variation was not known –the increase seen could have occurred during fluoridation
- 6 yrs of fluoridation cessation did not affect > 7 yr olds. That was plenty of time to see an effect
- other explanations:
 - dentists were NOT blinded to fluoridation status and could have treated more aggressively because fluoridation halted
 - dentists could have been maximizing dental treatment in Medicaid patients to maintain income and Medicaid reimbursement could have increased
 - decline in oral home care in the younger children (older children not affected)
 - worsening of sugar abuse (this seems to be worldwide trend)
 - there could have been more Medicaid fraud (it happened in Anchorage)

Study: Meyer J, et al. BMC Oral Health. 2018 Dec 13;18(1):215

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Why the Windsor-Essex County Health Unit report failed to show fluoridation cessation increased dental decay

- hygienists were not trained to properly measure dental decay rates (10- 30 sec., no-touch exam –mouth mirror and a light source at school)
- survey was unscientific, no adjustments for confounders like socio-economic status (the population of poor increased during the time of no fluoridation)
- before and after fluoridation based only on % caries free with no statistical analysis
- report was not peer-reviewed or published in a journal
- numerous mistakes were found including reporting of zero fluorosis where no permanent teeth existed

Calgary's O'Brien Institute's misrepresentation of the effects of fluoridation cessation

"we are aware of two other North American studies on cessation of water fluoridation" (referring to the Juneau study and the Windsor survey)

This is evidence of *bias* ("cherry picking" only helpful studies)

Why did they miss these fluoridation cessation studies?

1. Comox/Courtney and Campbell River BC

"The prevalence of caries (assessed in 5,927 children, grades 2, 3, 8, 9) *decreased* over time in the fluoridation-ended community while remaining unchanged in the fluoridated community."

-cavities DROPPED after fluoridation cessation

Maupomé et al.CDOE, 2001, 29(1):37-47.

2. Durham NC

"It was concluded that *while the break had little effect on caries*, dental fluorosis is sensitive to even small changes in fluoride exposure from drinking water, and this sensitivity is greater at 1 to 3 years of age than at 4 or 5 years."

-fluorosis dropped but cavities did not change after fluoridation cessation

Burt et al. J Dent Res. 2000,79(2):761-9.

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The O'Brien report to Calgary incorrectly states that fluoridation benefits adults

"Again, drawing most heavily from the CADTH Report (Sub-Report on Dental Caries and Other Health Outcomes) we find evidence that community water fluoridation is also beneficial to adult populations. The extent of research evidence is somewhat less than for children, but studies of adults still show benefit:

♣ Systematic reviews suggest a 35% relative reduction in the number of teeth affected by decay and cavities."

More "cherry picking" (the CADTH report ignored the conclusion of the Cochrane systematic review in 2015)

"Within the 'before and after' studies we were looking for, we *did not find any on the benefits* of fluoridated water for adults."

- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- **how humans react to swallowing fluoridated water**
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

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Where does fluoridated water go?

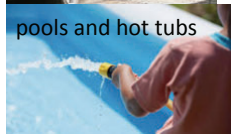
outdoor uses
 (storm runoff added to sewage?)



gardens & lawns



car washing



pools and hot tubs



Water main losses

personal hygiene
 (added to sewage)



bathroom



laundry



kitchen



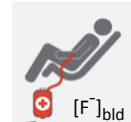
drinking, cooking =
 only 1% of fluoridated
 household water

(a VERY small
 amount is filtered
 through humans but
 eventually ends
 up in the environment)

How humans deal with fluoride



Example: drink 1.0L of H₂O with
 0.7 mg fluoride/L (or 0.7 ppm)
 means 0.7 mg F⁻ is ingested



[F⁻]_{bid} < 0.01ppm

F⁻ is converted to HF
 (at pH 1.5 in the stomach)
 90% (0.63 mg) F⁻ is absorbed into blood

≈ 1% is excreted by
 breast milk,
 sweat,
 saliva



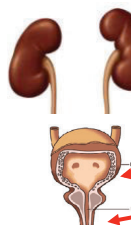
10% (0.07 mg) F⁻ is excreted in the feces

40% (0.28 mg) F⁻ ACCUMULATES in teeth
 and bones

45% (0.32 mg) F⁻ is filtered in kidneys

then stored in the bladder

and finally excreted in the urine



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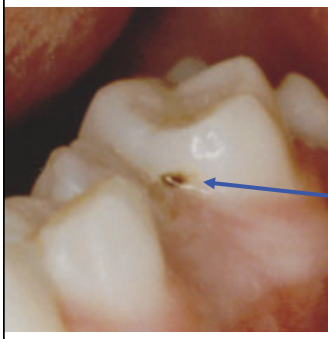


Fig (2): Non cavitated white spot caries



How fluoride works (it's topical !!)

Fluorapatite builds up in areas of demineralization-remineralization

-swallowing fluoride only causes tissue damage

$$\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2 \text{ (hydroxyapatite)} + 2\text{F}^- \rightarrow \text{Ca}_{10}(\text{PO}_4)_6(\text{F})_2 \text{ (fluorapatite)} + 2(\text{OH}^-)$$

Fluoride ppm


- < 25
- 25-45
- 45-65
- > 65

Cross-sectional fluoride profile of a molar

Fluoridation does not protect babies fed infant formula made with tap water!


The Canadian Dental Association recommends "the total daily fluoride intake from all sources should not exceed 0.05 -0.07 mg/kg/day"

infant formula
0.5 ppm



+


Fluoridated water
0.7 ppm



=

400% higher

0.20 mg/kg/day



Who monitors my fluoride intake?

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Fluoride from tap water

-babies fed formula made with fluoridated tap water are overdosed on fluoride

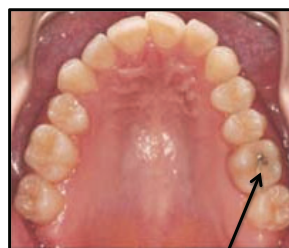
subject	volume fluid intake	fluoride concentration in liquid consumed	fluoride DOSAGE* (µg/ kg per day)
5 kg baby fed breast milk	up to 1 L	≈ 0.005 ppm	1
70 kg adult	1 L	0.7 ppm	10
70 kg adult	4 L	0.7 ppm	40
70 kg adult	2 L	2.0 ppm	57
70 kg adult	1 L	4.0 ppm	57
5 kg baby fed infant formula made with tap water	up to 1 L	0.7 ppm	140

*A **dose** refers to a specified amount of medication taken at one time.
 By contrast, **dosage** is the prescribed administration of a specific amount, number, and frequency of doses over a specific period of time. AMA Manual of Style

Fluoridation- a poor tradeoff from 40 years of exposure

One tooth might have been saved from dental decay

.....but look at the dental fluorosis that children have to deal with



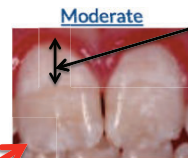
A lifetime of fluoridation MIGHT save one tooth from dental decay

10%
-if only front scored



Mild

This is ONLY from excess fluoride during first 6 mo. -NOT added toothpaste exposure



Moderate

This is where F-toothpaste swallowing starts to show up (age 1.5 – 3 yrs) -it's additive



Severe

This is from excess fluoride that was in the child's bone from birth and from external sources (water, toothpaste, supplements, pollution)

Cochrane Review, 2015

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Published studies (Canada vs elsewhere): prevalence of fluorosis of esthetic concern

Study	fluoridated	% esthetically objectionable dental fluorosis	non-fluoridated	% esthetically objectionable dental fluorosis
Clark 1997	BC cities	up to 5%		
Brothwell 1999	Ontario towns	19%	Ontario towns	5%
Leake 2002	Toronto	14%		
Ito 2007	Brampton	9%	Caledon	3.6%
Cochrane 2015	worldwide data	12%		
Neurath 2019	NHANES (US)	10%		

CADTH: "the prevalence of dental fluorosis of "any level" at 0.7 ppm and 1.0 ppm was 40% and 48%, respectively, while the prevalence of dental fluorosis of "aesthetic concern" was 12.0% and 12.5%, respectively."


The cost to treat dental fluorosis was not considered by CADTH

Many studies show fluoridation increases the risk of getting porcelain veneers at the dentist




© JGillisDDS
 Fluorosis stains prior to treatment.

Mild **fluorosis** appears as barely noticeable white spots or white streaks in the tooth's enamel. These spots or blotches become more noticeable in cases of moderate **fluorosis** and they are especially noticeable as the teeth become dry as may happen during exercise or any prolonged period of mouth breathing.



© JGillisDDS
 A much more attractive smile after treatment of fluorosis with porcelain veneers.



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**Research ignored by CADTH
 ...may induce malignant tumours!**

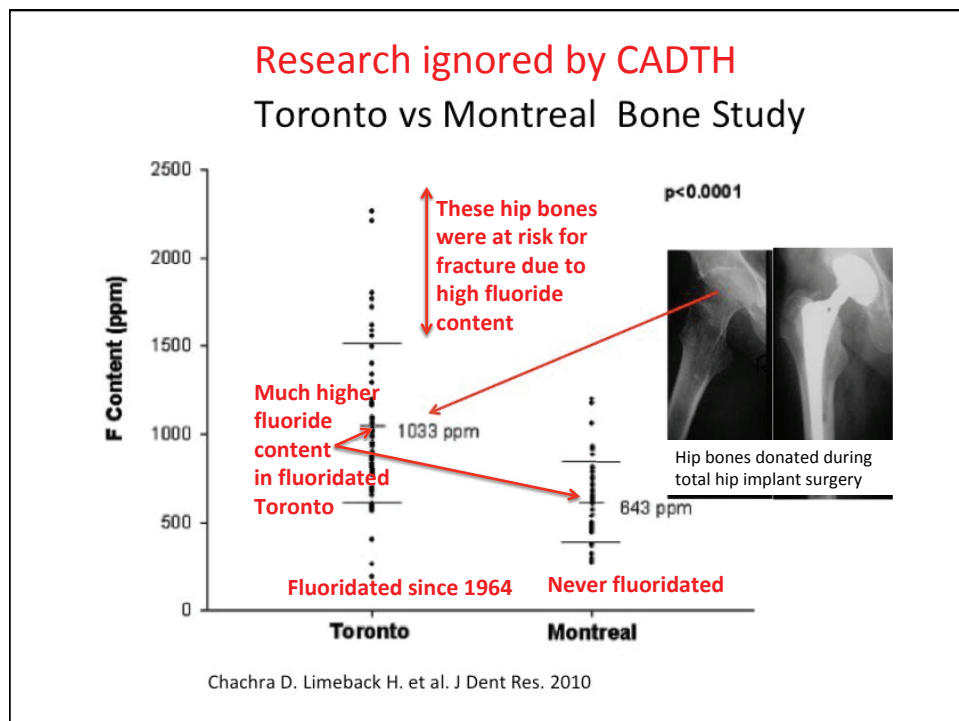
[AREA OF CONCERN]

IS FLUORIDE WEAKENING BONE?

Scientists have focused on fluoride's effects on bone because so much of the chemical is stored there. Studies have shown that high doses of fluoride can stimulate the proliferation of bone-building osteoblast cells, raising fears that the chemical may induce malignant tumors. Fluoride also appears to alter the crystalline structure of bone, possibly increasing the risk of fractures.

Normal Bone Formation **Effects of Excessive Fluoride**

Fagan, D. Second thoughts about fluoride. Sci. Amer Jan, 2008, 74-81.



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- the weak evidence of fluoridation's effectiveness
- the exaggeration of the reports that stopping fluoridation dramatically increases dental decay
- how humans react to swallowing fluoridated water
- a realistic cost-benefit estimate of fluoridation
- adverse health effect of swallowing fluoride
- how the CADTH report is biased and misleading

Realistic Cost-Benefit analysis of fluoridation in Calgary for 40 years

Equipment upgrade = \$6 million

Cost to fluoridate for 40 years (assuming equipment lasts)
≈ \$50 million

Claimed savings ≈ \$50 million X **\$64** ≈ \$3.2 BILLION

Population of Calgary = 1.2 million

Claimed savings ≈ \$2,670/person

If one tooth is saved by fluoridation, then \$2670 to fix
ONE tooth in EVERY SINGLE Calgarian is CLEARLY

FALSE

One must deduct the cost to treat dental fluorosis, and
the costs of the OTHER ill-health consequences of fluoridation
(brain problems, endocrine effects, side effects in kidney
patients etc.)

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The cost of treating dental fluorosis if Calgary re-instates fluoridation

1. in 40 yrs., 650,000 children under age 6 will be exposed to fluoridated water
2. 1 in 10 (65,000) will end up with objectionable dental fluorosis
3. if half (32,500) get microabrasion and or bleaching, this will cost \$32.5 - \$50 million
4. if 40% (26,000) get bleaching/microabrasion PLUS some cosmetic fillings, this will cost up to \$75 million
5. if the remaining 10% elect to have porcelain veneers the cost is up to \$130 million

Total cost to treat dental fluorosis = \$255million

6. The ACTUAL cost savings of fluoridation is (AT MOST) is one tooth saved from dental decay/person after 40 yrs
-this costs \$175 to repair, so the total dental cost savings is $1.2 \text{ M} \times \$175 = \263 Million

It is cost prohibitive to fluoridate especially when dental fluorosis is considered

Sources:

1. www12.statcan.gc.ca/census
2. www.cochranelibrary.com, CDC
- 3, 4, 5. www.alberta.ca/dental-fees.aspx
6. Slade et al, 2013 J Dent Res

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CADTH Dismisses ALL Non-dental Side Effects of Ingested Fluoride

The evidence for EVERY side effect was dismissed by the un-named CADTH authors

Mortality
Atherosclerosis
Hypertension
Cancer
Hip Fracture
Osteoporosis
Musculoskeletal Pain
Neonatal Height and Weight
Down Syndrome

IQ and Cognitive Function
Thyroid Function
Kidney Stones
Chronic Kidney Disease
Gastric Discomfort
Headache
Insomnia
Reproduction
Refractive Errors
Diabetes
Myocardial Infarction

SUMMARY

"There was **insufficient evidence** for an association between water fluoridation at the current Canadian levels and all-cause mortality, atherosclerosis, hypertension, skeletal fluorosis, osteoporosis, musculoskeletal pain, newborns' height and weight, thyroid function, CKD, self-reported health outcomes (gastric discomfort, headache, insomnia), reproduction (fertility, abortion), refractory errors, diabetes, and myocardial infarction."

CADTH completely ignored the 2006 NRC Report and studies that were published after it

Effects of low dose chronic fluoride exposure	what was reported in the 2006 NRC Report	examples of studies published since the 2006 NRC Report
contributing to skeletal fluorosis	-stage II skeletal fluorosis (arthritis) at < 2 ppm fluoride in drinking water	Chachra 2010
negative brain effects	"...IQ deficits in children exposed to fluoride at 2.5 to 4 mg/L in drinking water....the consistency of the results appears significant enough to warrant additional research on the effects of fluoride on intelligence."	Bashash 2017, 2018 NTP review 2018 Yu 2018 Russ 2018 Cao 2019 Green 2019
negative endocrine effects	-decreased thyroid activity, -impaired glucose metabolism, -increased Calcitonin, PTH, -changes in sexual maturity	Malin 2018 Liu 2019
cancer	"Fluoride appears to have the potential to initiate or promote cancers, particularly of the bone, but the evidence to date is tentative and mixed"	Bassin 2006 Alarcón-Herrera, 2019

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This slide from J. Johnson of the America Fluoridation Society, is a falsification. The CDATH reports did not bother to look at the original literature and relied on reviews since 2006

Was there evidence at 4.0 ppm showing that fluoride had an effect on ...?

- | | |
|-----------------------------|---------------------------------------|
| • Tooth enamel ✓ | • Cancer ✗ |
| • Liver ✗ | • Musculoskeletal system ✗ |
| • Kidneys ✗ | • Reproduction and development ✗ |
| • Endocrine system ✗ | • Neurotoxicity and neurobehavioral ✗ |
| • Gastrointestinal system ✗ | • Genetic damage ✗ |
| • Immune system ✗ | |



(Source: "Fluoride in Drinking Water: A Scientific Review of EPA's Standards," National Research Council of the National Academies Press, 2006)
 PAGE 439 OF 462

Conclusions of the 2006 NRC Report re: fluoride and stage II skeletal fluorosis

"The current MCLG (4 mg/L) was designed to protect against stage III skeletal fluorosis. As discussed above, the committee judges that stage II is also an adverse health effect, as it is associated with sporadic pain, stiffening of joints, and occasional osteophyte formation on articular joint surfaces. The committee found that bone fluoride concentrations estimated to be achieved from lifetime exposure to fluoride at 2 mg/L (4,000 to 5,000 mg/kg ash) ... fall within or exceed the ranges historically associated with (stage) II... skeletal fluorosis. This suggests that fluoride at 2 mg/L ...might not protect all individuals from the adverse stages of the condition."

Fluoride intake causing moderate dental fluorosis



can lead to Stage II skeletal fluorosis



Bone spurs

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Research ignored by CADTH

Low level fluoride exposure can affect sexual development in humans

Study	subjects	fluoride exposure	effect on sexual development
Schlessinger et al, 1956	girls 7-18 yrs. (Newburgh NY)	1.2 ppm in drinking water	earlier menarche by 5 mo.
Farkas et al, 1983	girls 10-19 yrs. (Hungary)	1.09 ppm in drinking water	no significant difference
Liu et al, 2019	girls 10-17 yrs. (Mexico City)	mean urine F = 0.59 ppm	trend is earlier menarche but no significant difference
Liu et al, 2019	boys 10-17 yrs. (Mexico City)	mean urine F = 0.59 ppm	later pubertal development

Research ignored by CADTH

Studies shows teeth are more yellow in fluoridated areas

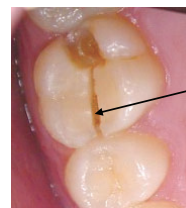
AND more prone to catastrophic fractures

Perceptions of desirable tooth color among parents, dentists and children

JAY D. SHULMAN, D.M.D., M.A., M.S.P.H.;
 GERARDO MAUPOMÉ, C.D., M.Sc., Ph.D.;
 D. CHRISTOPHER CLARK, D.D.S., M.P.H.;
 STEVEN M. LEVY, D.D.S., M.P.H.

(31.6 percent) were dissatisfied with their tooth color, and of those subjects, 552 (70.0 percent) felt that their teeth were too yellow.

JADA, Vol. 135, May 2004 **595**



vertical fracture of the 1st molar in a 14 yr. old

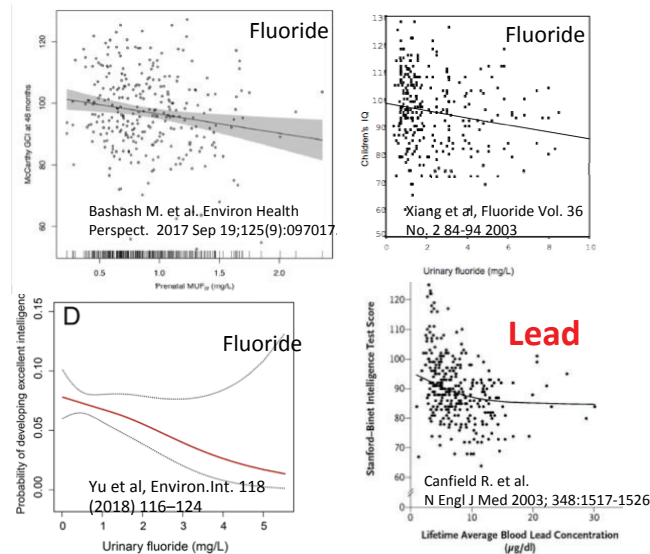


Expensive fracture repair

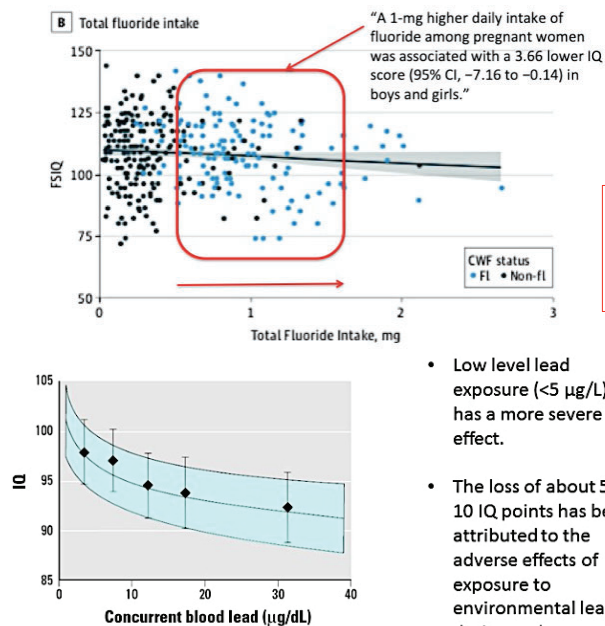
Vieira A et al. J. Dent Res. 2005, 84(10):951

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Fluoride & IQ studies: **these studies were NOT reviewed by CADTH** (compare to the Lead-IQ studies that contributed to the banning of lead in drinking water, paint, gasoline etc.)



Fluoride
 is just as
 neurotoxic
 as lead
 according
 to recent
 studies



Green et al study
 the most recent
 one showing fluoride
 is as bad as lead

**Prenatal Fluoride
 (from fluoridated water)
 = lowered IQ by 3.7 points
 (Green et al, JAMA Ped-2019)**

- Low level lead exposure (<5 µg/L) has a more severe effect.
- The loss of about 5 to 10 IQ points has been attributed to the adverse effects of exposure to environmental lead during early childhood.

**Environmental lead
 = lowered IQ by
 5 to 10 points
 Lanphear et al,
 EnvHealthPersp.2005)**

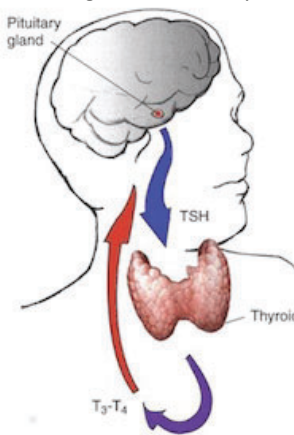
Figure 1: Full IQ vs Concurrent blood lead level (Lanphear et al., 2005)

19-10-15

Canadian Fluoride and Thyroid Study:

“Fluoride exposure among adults with moderate-to-severe iodine deficiencies living in Canada may **increase risk for underactive thyroid gland activity.**”

Synthroid (levothyroxin) is the most prescribed drug in the US (for treating underactive thyroid)



Underactive thyroid leads to



- higher cholesterol
- depression
- fatigue
- hair loss
- weight gain
- memory loss
- sensitivity to cold

In children:

- delayed puberty,
- delayed growth,
- delayed tooth development

Study: Malin AJ, Riddell J, McCague H, Till C. Fluoride exposure and thyroid function among adults living in Canada: Effect modification by iodine status. *Environ Int.* 2018 Dec;121(Pt 1): 667-674. **Not reviewed by CADTH**

Prenatal exposure from fluoridated water is now linked to increased ADHD in children

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Not reviewed by CADTH

Higher levels of urinary fluoride associated with Attention Deficit Hyperactivity Disorder (ADHD) in children

October 10/2018

Higher levels of urinary fluoride during pregnancy are associated with more ADHD-like symptoms in school-age children, according to University of Toronto and York University researchers.

Study: Bashash M, Marchand M, Hu H, Till C, Martinez-Mier EA, Sanchez BN, Basu N, Peterson KE, Green R, Schnaas L, Mercado-García A, Hernández-Avila M, Téllez-Rojo MM. Prenatal fluoride exposure and attention deficit hyperactivity disorder (ADHD) symptoms in children at 6-12 years of age in Mexico City. *Environ Int.* 2018 Dec;121(Pt 1):658-666. doi: 10.1016/j.envint.2018.09.017.

19-10-15

BJPsych

The British Journal of Psychiatry (2018)
Page 1 of 6. doi: 10.1192/bjp.2018.287

Not reviewed by CADTH

Aluminium and fluoride in drinking water in relation to later dementia risk

Tom C. Russ, Lewis O. J. Killin, Jean Hannah, G. David Batty, Ian J. Deary and John M. Starr

“our findings suggest that even these relatively low levels of aluminium and fluoride are associated with deleterious effects on dementia risk, which should be weighed against their beneficial uses.”

**Fluoride is neurotoxic. So is Aluminum
Together they are associated with dementia!**

New Study Links Low Fluoride Exposure to Alzheimer’s Disease

“Fluoride raised the numbers of senile plaque in (brains of) mice carrying APP/PS1 double-transgenic mutation”

“long-term exposure to fluoride may be considered a risk factor in the development of Alzheimer’s Disease.”

...the doses of fluoride exposed to mice were equivalent to 1.5 ppm (close to the drinking water standard set by WHO) and 15 ppm, respectively, in drinking water for humans.

CADTH did not review ANY animal research


open access paper

<https://alzres.biomedcentral.com/articles/10.1186/s13195-019-0490-3>

Cao K, et al. Exposure to fluoride aggravates the impairment in learning and memory and neuropathological lesions in mice carrying the APP/PS1 double-transgenic mutation. *Alzheimers Res Ther.* 2019 Apr 22;11(1):35

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Posted on CADTH.ca Apr.2019

EVIDENCE HIGHLIGHTS Highlighting the Evidence

Community Water Fluoridation Programs



Bottom Line

There is consistent evidence to support CWF's benefits in reducing dental caries, and insufficient or no evidence to suggest that it leads to adverse health outcomes.

This is more of a political statement than a scientific one since so much science was ignored.

CADTH's fluoridation report cannot be trusted. It DOES NOT protect Canadians.

19-10-15

Promotion of fluoridation but advising to limit fluoride swallowing from toothpaste makes no sense

Advice: **Limit fluoride toothpaste to avoid swallowing fluoride.**

But encourage toddlers to drink fluoridated water?

What kind of a mixed message is that?



Summary

Why the CADTH reports are biased and not scientific

- the authors (still un-named) relied heavily on previous biased government reviews
- they “cherry picked” studies that only focused on showing safety (e.g. citing Broadbent IQ study as high quality without citing the published critique showing that it was not)
- when the studies were claimed irrelevant to the Canadian setting they were ignored but when they deemed important (e.g. hospital admissions in the UK due to dental decay) they were included
- rigorous studies on fluoride and lowered IQ were ignored (see IQ studies in previous slides of this submission)
- CADTH completely ignored the 2006 NRC report and ALL animal evidence
- CADTH authors made numerous serious errors (e.g. claiming the Peckham study did not cover the entire country when it did, or misinterpreting the results of the Choi fluoride and IQ studies.)
- when there were studies of concern (e.g. 2 studies showing a link to diabetes) they were dismissed as not providing enough proof
- the CADTH’s entire cost analysis was based on ONE weak study in Australia (Arrow et al, 2016) and did not include the cost to treat dental fluorosis
- **In my opinion, the CADTH reports are biased and designed to promote fluoridation, not look at the fluoride science rigorously**

19-10-15

Bottom Line for Calgary Council

- the CADTH reports (and the O'Brien Institute report which is based on CADTH reports) are biased and flawed to promote fluoridation
- the evidence for fluoridation benefit is very weak, and the benefit is incredibly minor if there is one
- it will cost Calgary a lot of money to restart fluoridation and continue it for years; that will NOT be cost effective
- the evidence is mounting that children will be harmed by fluoridation
- if the O'Brien Institute for Public Health wants to protect Calgarians, it should recommend the status quo (no fluoridation). This would mean Calgary will continue to stand with BC, Quebec and most of the rest of the world outside of the US (+ New Zealand, Ireland & Australia) in NOT adding industrial waste fluoride to drinking water