AGENDA

SPC ON COMMUNITY AND PROTECTIVE SERVICES

July 24, 2019, 1:00 PM

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 Regular Meeting of the SPC on Community and Protective Services, 2019 June 12

5. CONSENT AGENDA

   5.1 DEFERRALS AND PROCEDURAL REQUESTS
   None

   5.2 BRIEFINGS
   None

6. POSTPONED REPORTS
   (including related/supplemental reports)

   None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

Note: Members of the public wishing to address Committee concerning an item on this Agenda, may pre-register by contacting the City Clerk's Office at PublicSubmissions@calgary.ca or by calling 403-268-5861

7.1 Response to Water Fluoridation in The City of Calgary, CPS2019-0965

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

June 12, 2019, 9:30 AM
IN THE COUNCIL CHAMBER

PRESENT:	Councillor D. Colley-Urquhart, Chair Councillor S. Chu Councillor J. Gondek Councillor R. Jones Councillor J. Magliocca Councillor E. Woolley Councillor D. Farrell
ALSO PRESENT:	Acting General Manager K. Black Acting City Clerk L. Gibb Legislative Advisor D. Williams

1. CALL TO ORDER

Councillor Colley-Urquhart called the Meeting to order at 9:30 a.m.

2. OPENING REMARKS

Councillor Colley-Urquhart provided opening remarks.

3. CONFIRMATION OF AGENDA

Following nomination procedures, Councillor Chu was elected Acting Vice-Chair for the 2019 June 12 Regular Meeting of the Standing Policy Committee on Community and Protective Services.

Moved by Councillor Magliocca

That the Agenda for the 2019 June 12 Regular Meeting of the Standing Policy Committee on Community and Protective Services be confirmed.

MOTION CARRIED

4. CONFIRMATION OF MINUTES

4.1 Minutes of the Special Meeting of the SPC on Community and Protective Services, 2019 May 07

Moved by Councillor Gondek

That the Minutes of the Special Meeting of the Standing Policy Committee on Community and Protective Services held 2019 May 07 be confirmed.

MOTION CARRIED

4.2 Minutes of the Regular Meeting of the SPC on Community and Protective Services, 2019 May 08

Moved by Councillor Chu

That the Minutes of the Regular Meeting of the Standing Policy Committee on Community and Protective Services held 2019 May 08 be confirmed.

MOTION CARRIED

5. CONSENT AGENDA

Moved by Councillor Magliocca

That the Administration Recommendations contained in the following Reports be approved in an omnibus motion:

5.1 Status of Outstanding Motions and Directions (as of 2019 June 12), CPS2019-0778

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

5.3 4th Avenue Flyover Land Disposition Update, CPS2019-0773

5.4 Saddleridge Road Right of Way as Park Space, CPS2019-0769

5.5 Rail Corridor Emergency Response Plan, CPS2019-0780

MOTION CARRIED

6. POSTPONED REPORTS

None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

7.1 2018 Calgary Combative Sports Commission Annual Report, CPS2019-0776

A handout entitled "Calgary Combative Sports Commission 2018 Annual Report CPS2019-0776" dated 2019 June 12 was received for the Corporate Record.

Speakers

1. Shirley Stanzi

2. T.J. Madigan

Moved by Councillor Jones

That with respect to Report CPS2019-0776, the following be approved:

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

1. Give three readings to the proposed amendment to the Combative Sports Commission Bylaw 53M2006 (Attachment 1) to facilitate a reduced fee for one day licence, decreasing the overall cost for hosting a combative sports event.

MOTION CARRIED

7.2 Community Action on Mental Health and Addiction Strategic Framework, CPS2019-0755

The following items were distributed with respect to Report CPS2019-0755:

- A presentation entitled "CPS2019-0755 Community Action on Mental Health and Addiction, June 12 2019;" and
- A handout of panel member biographies entitled "Community Action on Mental Health and Addiction Panel Members."

Speakers

1. Karen Cosbee
2. Janet Chate
3. Husan Sheikh
4. Bob Wilkie

Moved by Councillor Farrell

That Councillor Gondek's proposed motion with respect to Report CPS2019-0755, be amended as follows:

4. Approve the terms of reference for the Community Action on Mental Health and Addiction Leaders Forum (Attachment 3) to guide the development of the associated strategy and direct Administration to develop a list of recommended members.
5. Forward this report (CPS2019-0755) to the 2019 July 29 Combined Meeting of Council with a supplemental attachment including the names of proposed members of the Community Action on Mental Health and Addiction Leader Forum as per the above recommendation.
6. Direct that Administration report back no later than Q4 2020 with a Community Action on Mental Health and Addiction Strategy and collaborative implementation plan guided by the strategic framework (Attachment 1).
7. Approve the terms of reference for the Mental Health and Addiction Collaborative Investors Table (Attachment 4).
8. Authorize Administration to allocate $1 million of the previously earmarked funds to test promising initiatives through a fast pilot process, to be developed in collaboration with other potential funding partners who will form part of the Mental Health and Addiction Collaborative Investors Table.

MOTION CARRIED

Moved by Councillor Magliocca

That Committee reconsider Councillor Farrells's previous amendments to the Recommendations with respect to Report CPS2019-0755.

ROLL CALL VOTE

For: (5) Councillor Chu, Councillor Gondek, Councillor Magliocca, Councillor Colley-Urquhart, Councillor Jones

Against: (2) Councillor Farrell, Councillor Woolley

MOTION CARRIED

Moved by Councillor Farrell

That Councillor Gondek's proposed motion with respect to Report CPS2019-0755, be amended as follows:

4. Approve the terms of reference for the Community Action on Mental Health and Addiction Leaders Forum (Attachment 3) to guide the development of the associated strategy and direct Administration to develop a list of recommended members.

5. Forward this report (CPS2019-0755) to the 2019 July 29 Combined Meeting of Council with a supplemental attachment including the names of proposed members of the Community Action on Mental Health and Addiction Leader Forum as per the above recommendation.

6. Direct that Administration report back no later than Q4 2020 with a Community Action on Mental Health and Addiction Strategy and collaborative implementation plan guided by the strategic framework (Attachment 1).

7. Approve the terms of reference for the Mental Health and Addiction Collaborative Investors Table (Attachment 4).

8. Authorize Administration to allocate $1 million of the previously earmarked funds to test promising initiatives through a fast pilot process, to be developed in collaboration with other potential funding partners who will form part of the Mental Health and Addiction Collaborative Investors Table.

RECORDED VOTE

For: (3): Councillor Jones, Councillor Woolley, and Councillor Farrell

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

MOTION DEFEATED

Moved by Councillor Farrell

That Councillor Gondek's proposed motion with respect to Report CPS2019-0755, be amended by adding a new recommendation 4, as follows:

4. Authorize Administration to allocate up to $3 million of the previously earmarked funds for 2020, to maintain current programs funded through the

Prevention Investment Framework with Mental Health and Addiction Lens that are demonstrating positive results.

For: (7): Councillor Colley-Urquhart, Councillor Chu, Councillor Gondek, Councillor Jones, Councillor Magliocca, Councillor Woolley, and Councillor Farrell

MOTION CARRIED

Moved by Councillor Gondek

That with respect to Report CPS2019-0755, recommendations 1 and 4 be approved, **as amended**, as follows:

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

1. Receive this report for information; and

4. Authorize Administration to allocate up to $3 million of the previously earmarked funds for 2020, to maintain current programs funded through the Prevention Investment Framework with Mental Health and Addiction Lens that are demonstrating positive results

Against: Councillor Farrell

MOTION CARRIED

Moved by Councillor Gondek

That with respect to Report CPS2019-0755, recommendations 2 and 3 be approved, as follows:

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

2. Request that the Mayor's Office coordinate a meeting between the Alberta Associate Minister of Mental Health and Addictions and the Community Action on Mental Health and Addiction Panel to outline the approach Calgary has created and encourage the Associate Minister to lead a province-wide plan with attention to the work Calgary has done to date.

3. Administration to report back to the SPC on Community and Protective Services after the meeting with the Associate Minister has taken place, no later than Q42019.

Against: Councillor Woolley

MOTION CARRIED

That pursuant to Section 134(a) of Procedure Bylaw 35M2017, Councillor Farrell requested that the lost motion be forwarded to Council for information.

7.3 Gender Equity, Diversity and Inclusion Strategy, CPS2019-0729

The following items were distributed with respect to Report CPS2019-0729:

- A presentation entitled “Gender Equity, Diversity and Inclusion Strategy”, 2019 June 12;
- Speaking Notes from Esmahan Razavi on behalf of Equal Voice Alberta South; and
- Speaking Notes from Jason Kingley, Chair of the Social Wellbeing Advisory Committee.

Speakers

1. Esmahan Razavi
2. Jason Kingsley

Moved by Councillor Farrell

That with respect to Report CPS2019-0729, the following be approved:

That the Standing Policy Committee (SPC) on Community and Protective Services (CPS) recommend that Council:

1. Approve the Gender Equity, Diversity and Inclusion Strategy and direct Administration to implement the actions outlined (Attachment 1);
2. Accept this report as the report back on the Gender Equity and Diversity Baseline Assessment Council Innovation Fund application (PFC2018-0910); and
3. Direct Administration to develop a measurement plan and report back to Council with results to date on progress of implementation through the SPC on CPS no later than Q4 2020.

MOTION CARRIED

7.4 Multilingual Communications and Engagement Policy Report, CPS2019-0366

Moved by Councillor Gondek

That with respect to Report CPS2019-0366, the following be approved:

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

1. Directs Administration to continue to develop standards of service for equitable communications and engagement, including multilingual considerations, as guided by the Social Wellbeing Policy, and not proceed with a stand alone new policy for Multilingual Communications and Engagement;
2. Directs Administration to develop measures of success related to the delivery of equitable communication and engagement services in alignment with the Social Wellbeing Principles; and

3. Directs Administration to report back to the Standing Policy Committee on Community and Protective Services by Q2 2020.

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

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

None

10.2 URGENT BUSINESS

None

11. ADJOURNMENT

Moved by Councillor Magliocca

That this meeting adjourn at 12:03 p.m.

MOTION CARRIED

The following items have been forwarded to the 2019 July 22 Combined Meeting of Council:

Consent

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

Community Action on Mental Health and Addiction Strategic Framework, CPS2019-0755

Gender Equity, Diversity and Inclusion Strategy, CPS2019-0729

Multilingual Communications and Engagement Policy Report, CPS2019-0366

ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

2018 Calgary Combative Sports Commission Annual Report, CPS2019-0776

The following items have been forwarded to the 2019 July 29 Combined Meeting of Council:

Consent

Saddleridge Road Right of Way as Park Space, CPS2019-0769

The next regular Meeting of the Standing Policy Committee on Community and Protective Services is scheduled to be held on 2019 July 24 at 1:00 p.m.

CONFIRMED BY COMMITTEE ON

CHAIR

ACTING CITY CLERK

Community Services Report to **ISC: UNRESTRICTED**
SPC on Community and Protective Services **CPS2019-0965**
2019 July 24

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
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2019 July 24

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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 pursing specific interventions.

Community Services Report to
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2019 July 24

ISC: UNRESTRICTED
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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

UNIVERSITY OF CALGARY | O'Brien Institute for Public Health

COMMUNITY WATER FLUORIDATION

A REPORT FOR CALGARY CITY COUNCIL

Prepared for:

City Council
The City of Calgary

July 2019

TABLE OF CONTENTS

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 initiaties 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.

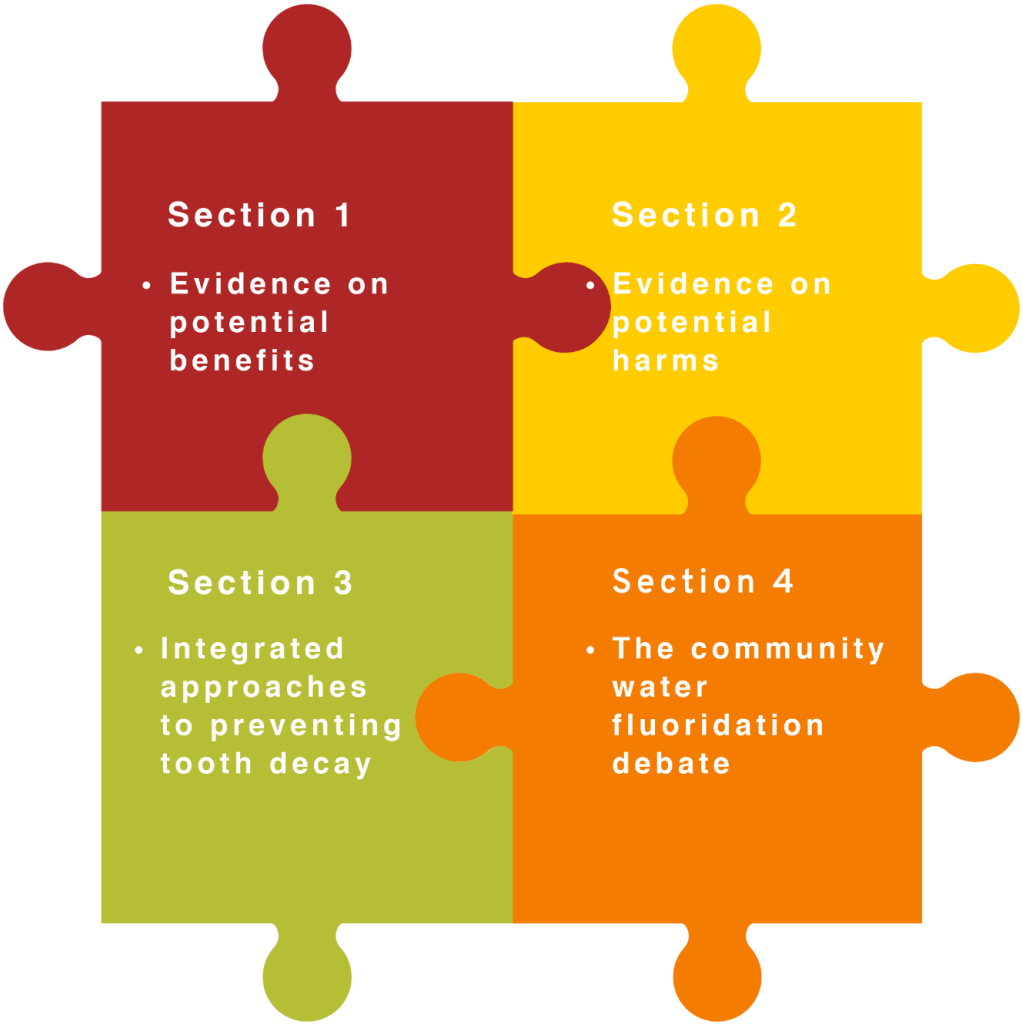
- Submissions of supporting documents and reference materials were welcomed from all sources. These included materials provided by any or all of the above-mentioned individuals, as well as document submissions from external stakeholders who were not interviewed. For the latter, Councillor Colley-Urquhart 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.

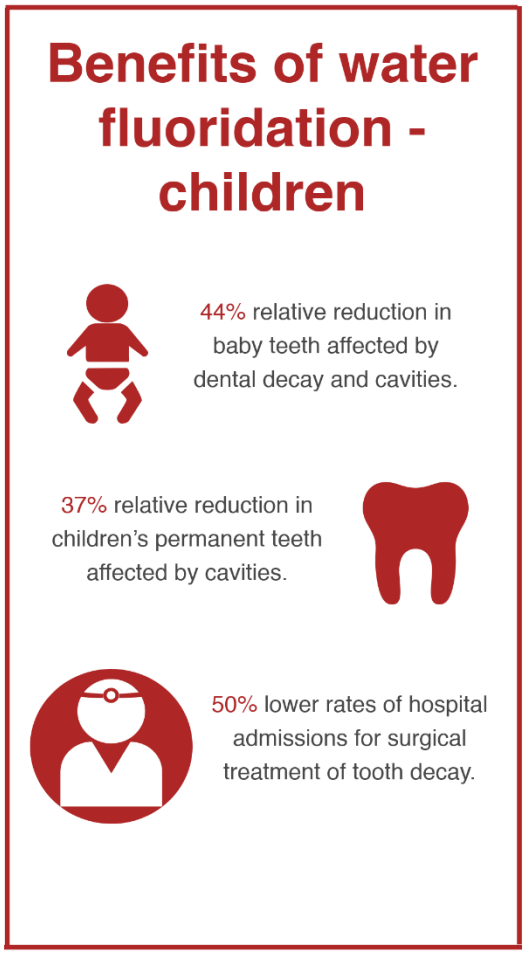
The City of Calgary Notice of Motion very explicitly tasks the O'Brien Institute with providing information, *but not recommendations*, for City decision-makers to consider. This report therefore stops short of ending with a simplistic "yes" or "no" recommendation for community water fluoridation. Our 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:



- 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?*

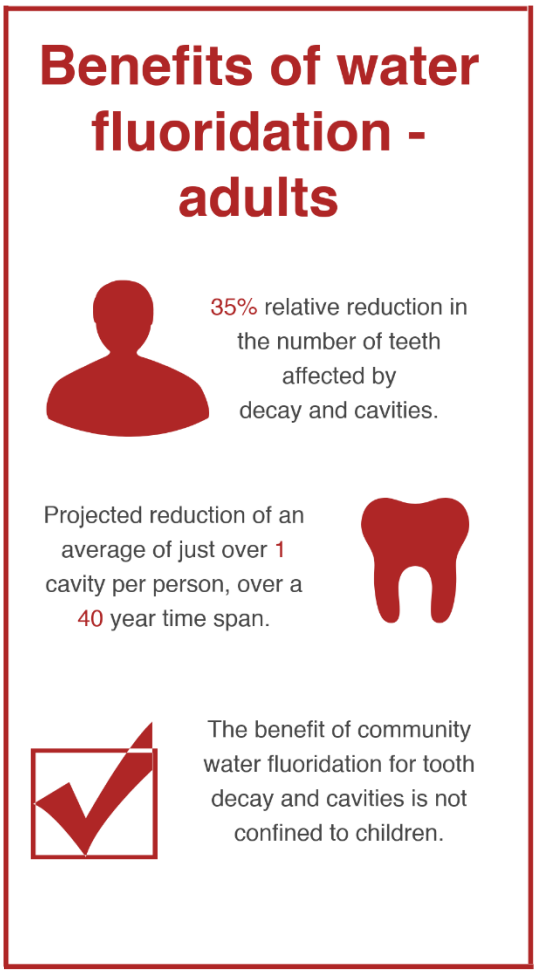
Again, drawing most heavily from the CADTH Report (Sub-Report on Dental Caries and Other Health Outcomes) we find evidence that community water fluoridation is also beneficial to adult populations. The extent of research evidence is somewhat less than for children, but studies of adults still show benefit:

- 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 fluidation for tooth decay and cavities is not confined to children.



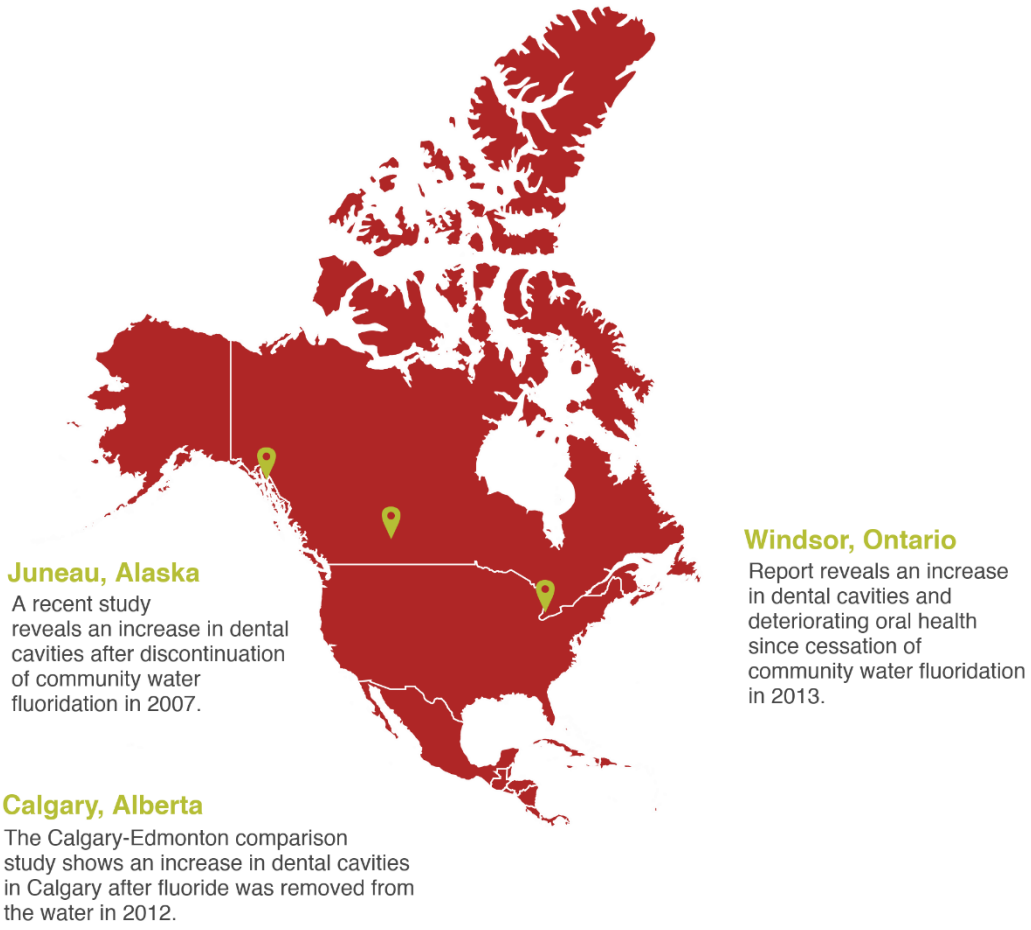
❖ *What are the effects of removing a community water fluoridation program?*

- 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:

- 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.

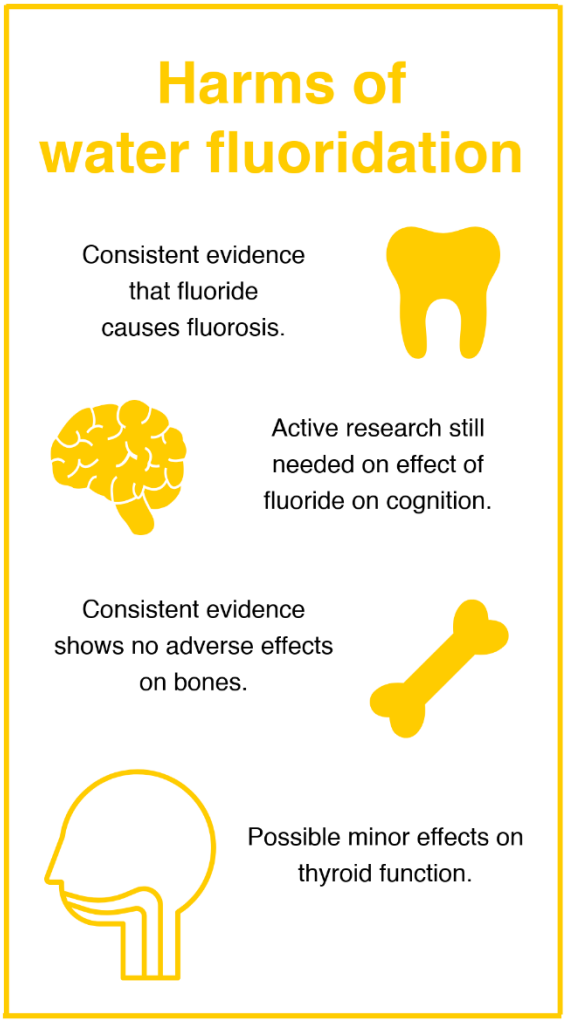
It is important not to confuse ‘equity’ with ‘poverty’. Fluoridation has historically been viewed as being beneficial for health equity because it has potential to benefit everyone for oral health, and especially those who have limited resources for oral hygiene and dental care. Programs or policies 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%.

- 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 Heath 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 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 the 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	• 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	• 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 heath 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

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.

Gibb, Linda A.

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 Hydroflourisillsic 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

Gibb, Linda A.

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 unbiassed 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

Gibb, Linda A.

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 unbiassed 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.

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· 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

Gibb, Linda A.

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

Gibb, Linda A.

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

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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/

Gibb, Linda A.

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

Gibb, Linda A.

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 there 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 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 there 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?

I conclusion, I just want to reiterate that I am opposide 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

Gibb, Linda A.

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

ALBERTA MEDICAL ASSOCIATION | Office of the President
12230 106 Ave NW
Edmonton AB T5N 3Z1
T 780.482.2626
F 780.482.5445
TF 1.800.272.9680
amamail@albertadoctors.org
www.albertadoctors.org

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: *albertapatients* Views on Water Fluoridation in Calgary

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

ALBERTA MEDICAL ASSOCIATION | Office of the President
12230 106 Ave NW
Edmonton AB T5N 3Z1
T 780.482.2626
F 780.482.5445
TF 1.800.272.9680
amamail@albertadoctors.org
www.albertadoctors.org

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.

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,

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapatients* Views on Water Fluoridation in Calgary

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

albertapatients
Your Voice Matters

albertapatients
Views on Water Fluoridation in Calgary

May 2019

www.albertapatients.ca

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

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

Please attribute any research findings to albertapatients.ca.

albertapatients
Your Voice Matters

Research Methodology

- Online survey was fielded via the albertapatients 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

albertapatients
Your Voice Matters

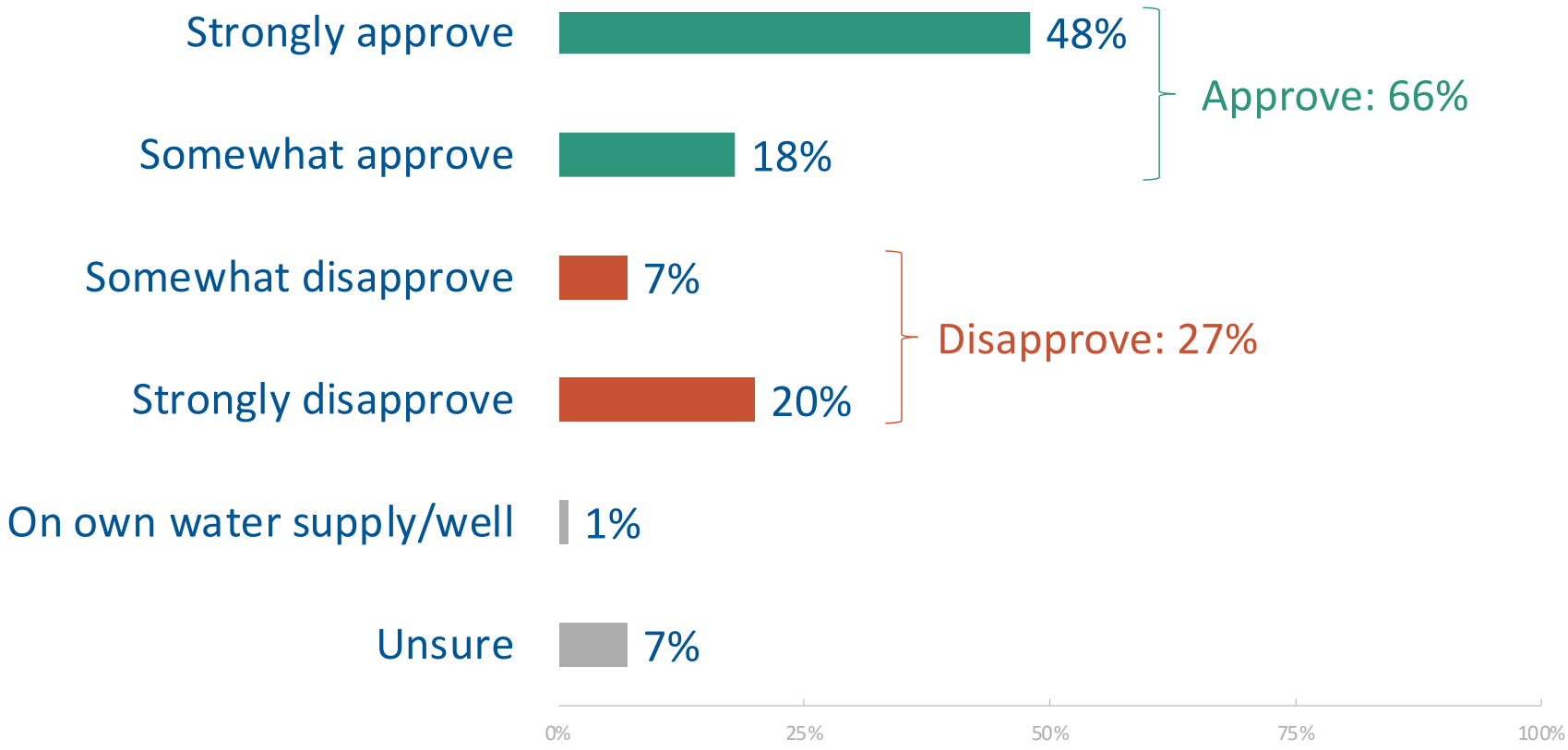
Water Fluoridation
-Key Findings

- 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

albertapatients
Your Voice Matters

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)

albertapatients
Your Voice Matters

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

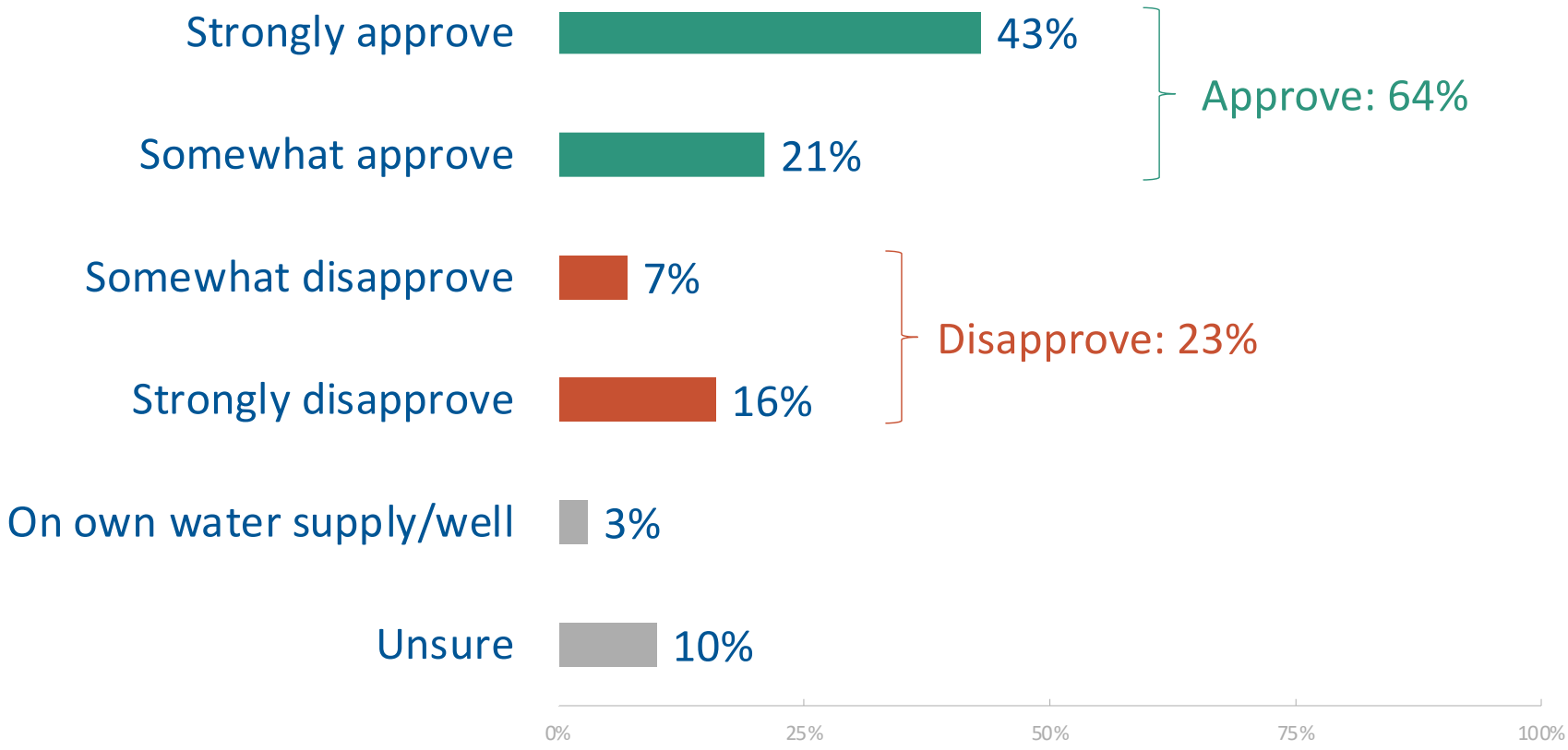
Base: Calgary Proper

albertapatients
Your Voice Matters

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)

albertapatients
Your Voice Matters

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

albertapatients
Your Voice Matters

www.albertapatients.ca

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

ALBERTA MEDICAL ASSOCIATION

ThinkHQ PUBLIC AFFAIRS INC.

Gibb, Linda A.

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.

Gibb, Linda A.

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

Gibb, Linda A.

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

Gibb, Linda A.

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=IwAR1CIxl41wzSB0A47TIasq-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!

Gibb, Linda A.

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

Gibb, Linda A.

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; lbold@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

Gibb, Linda A.

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

-

Gibb, Linda A.

Subject: FW: [EXT] I'm Opposed to Adding Artificial Fluoride to Calgary's Water

From: Margaret Fong [mailto:mjfhello@yahoo.ca]
Sent: Wednesday, July 10, 2019 3:22 PM
To: Farrell, Druh
Cc: City Clerk
Subject: [EXT] I'm Opposed to Adding Artificial Fluoride to Calgary's Water

Dear Councillor Farrell,

I am opposed to Artificial Water Fluoridation for three main reasons:
- risk of fluoride toxicity for chemically sensitive people like myself,
- the economic/ethical inefficiency of targeting children during formative years of dental health while forcing fluoride into adults, pets, gardens, farms, via consumption, laundry, bathing/showering, swimming, etc for a much longer time span; and
- please do not ruin the reputation of Calgary water purity by adding an artificial chemical from a foreign source.

As a city taxpayer and long-time resident of Ward 7, I respectively request that the motion to add fluoride to the city's drinking water be rejected.

Yours truly,
Margaret Fong
2827 7 Avenue NW
Calgary

Gibb, Linda A.

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

LIBIN CARDIOVASCULAR INSTITUTE of Alberta

Foothills Interventional Cardiology Service

UNIVERSITY OF CALGARY

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,

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

Heart Health

Alberta Health Services
Calgary Health Region

Gibb, Linda A.

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

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
Home: 403-242-4403 Cell: 403-560-4574
drbob_is@me.com

CPS2019-0965
Attachment 2
Letter 19a

SAFE WATER
CALGARY

In Collaboration With

SCIENTISTS, RESEARCHERS, PHYSICIANS, TOXICOLOGISTS, AND DENTISTS ACROSS NORTH AMERICA, IRELAND, 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 2019

Contents

Email: safewatercalgary@gmail.com

https://www.safewatercalgary.com/

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, 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 CADTH report (1) on fluoridation 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 IQ's 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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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 IQ's 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 IQ's, 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 IQ's 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 IQ's. 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, it afflicts up to 5% of all 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 National Research Council report Fluoride in Drinking Water (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 (p. 8) conclusively determined fluoride was an endocrine disruptor and **"The chief endocrine effects of fluoride . . . include decreased thyroid function."**

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 by Malin et al. 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)

It also omitted a systematic review of 10 studies, Chaitnaya et al. 2018, that **"suggested a positive correlation of excess fluoride and hypothyroidism"** and another 2018 study, Kumar et al., 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:

In the 2018 Kheradpisheh et al. study (1), CADTH said, **"Multivariable logistic regression analysis revealed no relationship between drinking water fluoride and hypothyroidism."** The author, however,

came to the opposite conclusion: **"Cases tend to have higher TSH values (greater impairment of thyroid function) with higher fluoride concentrations in the water."**

In the 2014 Singh et al. study (2), CADTH said **"There was no significant difference in any of the thyroid function tests between groups."**
The author's 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 . . ."**

In the 2015 Peckham study**,** 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.

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 my 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.

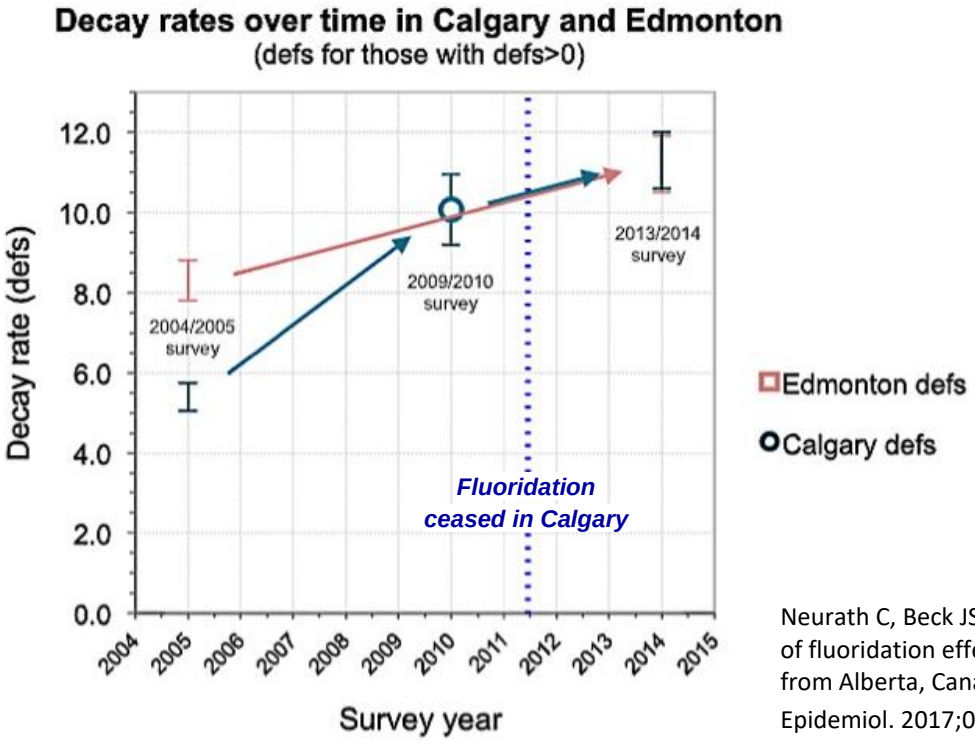
EFFECTIVENESS

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

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.

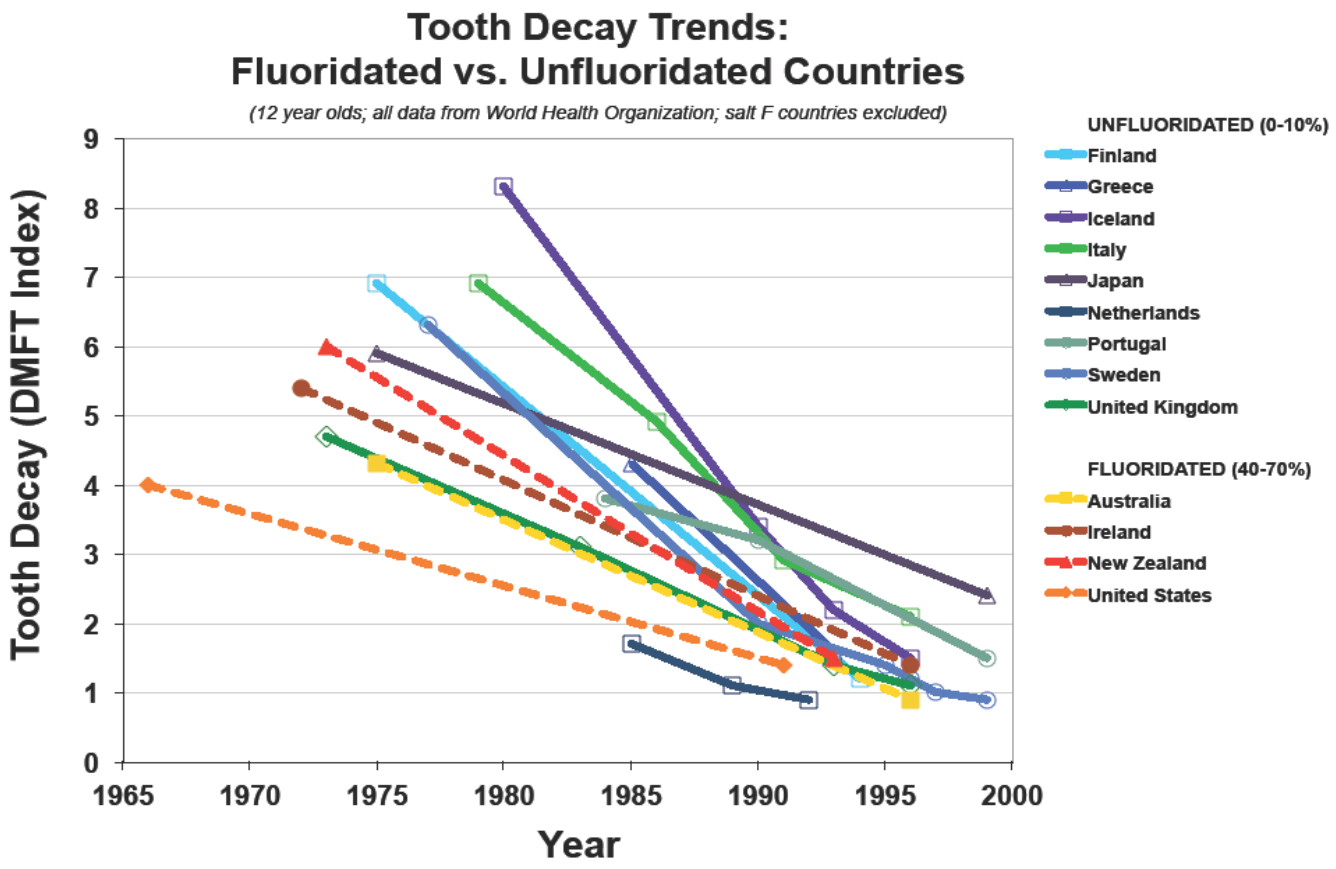
The Iowa Fluoride Study (IFS), funded by the U.S. National Institutes of Health, is the most comprehensive, ongoing research project in the U.S. - the only study in the U.S. or Canada measuring all sources of fluoride ingestion. CADTH, however, did not include any studies from IFS.

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.


Tooth Decay Trends:
Fluoridated vs. Unfluoridated Countries
(12 year olds; all data from World Health Organization; salt F countries excluded)
Tooth Decay (DMFT Index)
0
1
2
3
4
5
6
7
8
9
1965
1970
1975
1980
1985
1990
1995
2000
Year
UNFLUORIDATED (0-10%)
Finland
Greece
Iceland
Italy
Japan
Netherlands
Portugal
Sweden
United Kingdom
FLUORIDATED (40-70%)
Australia
Ireland
New Zealand
United States

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 Broffit 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 ÷ 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:
1. https://www12.statcan.gc.ca/census-recensement/index-eng.cfm
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3, 4, 5. https://www.alberta.ca/dental-fees.aspx
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
Lowered estimate from bottled water drinking	233 million
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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Gibb, Linda A.

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

Office of the Prime Minister's
Chief Science Advisor

the ROYAL SOCIETY of NEW ZEALAND
TE APĀRANGI

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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ISBN- 978-1-877317-08-8

Office of the Prime Minister's
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the ROYAL SOCIETY of NEW ZEALAND
TE APĀRANGI

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.

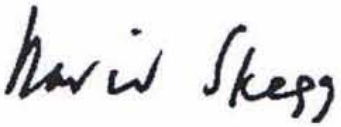
The use of fluoridated toothpastes does not change these conclusions or obviate the recommendations.

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 Heath, 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



Sir Peter Gluckman
Prime Minister's Chief Science Advisor

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 (≥1000ppm) 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.

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

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
• 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	• 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 (H2SiF6; also known as hexafluorosilicate [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 biovailability 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 >17µg of fluoride per 100 kilojoules (prior to reconstitution), or 'ready to drink' formulas containing >0.15mg 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
Infants				
0-6 months		0.01		0.7
7-12 months (9kg)	0.05	0.5	0.1	0.9
Children				
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
Adolescents				
14-18 years boys (64kg)	0.05	3.0	0.1	10
14-18 years girls (57kg)	0.05	3.0	0.1	10
Adult males				
19+ years (76kg)	0.05	4.0	0.1	10
Adult females				
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 [$Ca_5(PO_4)_3F$] in tooth enamel, replacing hydroxyapatite [$Ca_5(PO_4)_3OH$]. 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 *in utero*	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 rigourously 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 ditribution 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 EPAs 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 toothbrushing, 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
• 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
• 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
• 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.	- 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	- 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	- 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 EPAs 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 eveidence 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.	- 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.	- 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	CWF areas vs non CWF areas −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)	−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

Gibb, Linda A.

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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www.albertadoctors.org

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: *albertapatients* Views on Water Fluoridation in Calgary

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

ALBERTA MEDICAL ASSOCIATION | Office of the President
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T 780.482.2626
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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.

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,

Alison M. Clarke, MD, CCFP, FCFP
President

Attachment: *albertapatients* Views on Water Fluoridation in Calgary

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

albertapatients
Your Voice Matters

albertapatients
Views on Water Fluoridation in Calgary

May 2019

www.albertapatients.ca

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

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

Please attribute any research findings to albertapatients.ca.

albertapatients
Your Voice Matters

Research Methodology

- Online survey was fielded via the albertapatients 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

albertapatients
Your Voice Matters

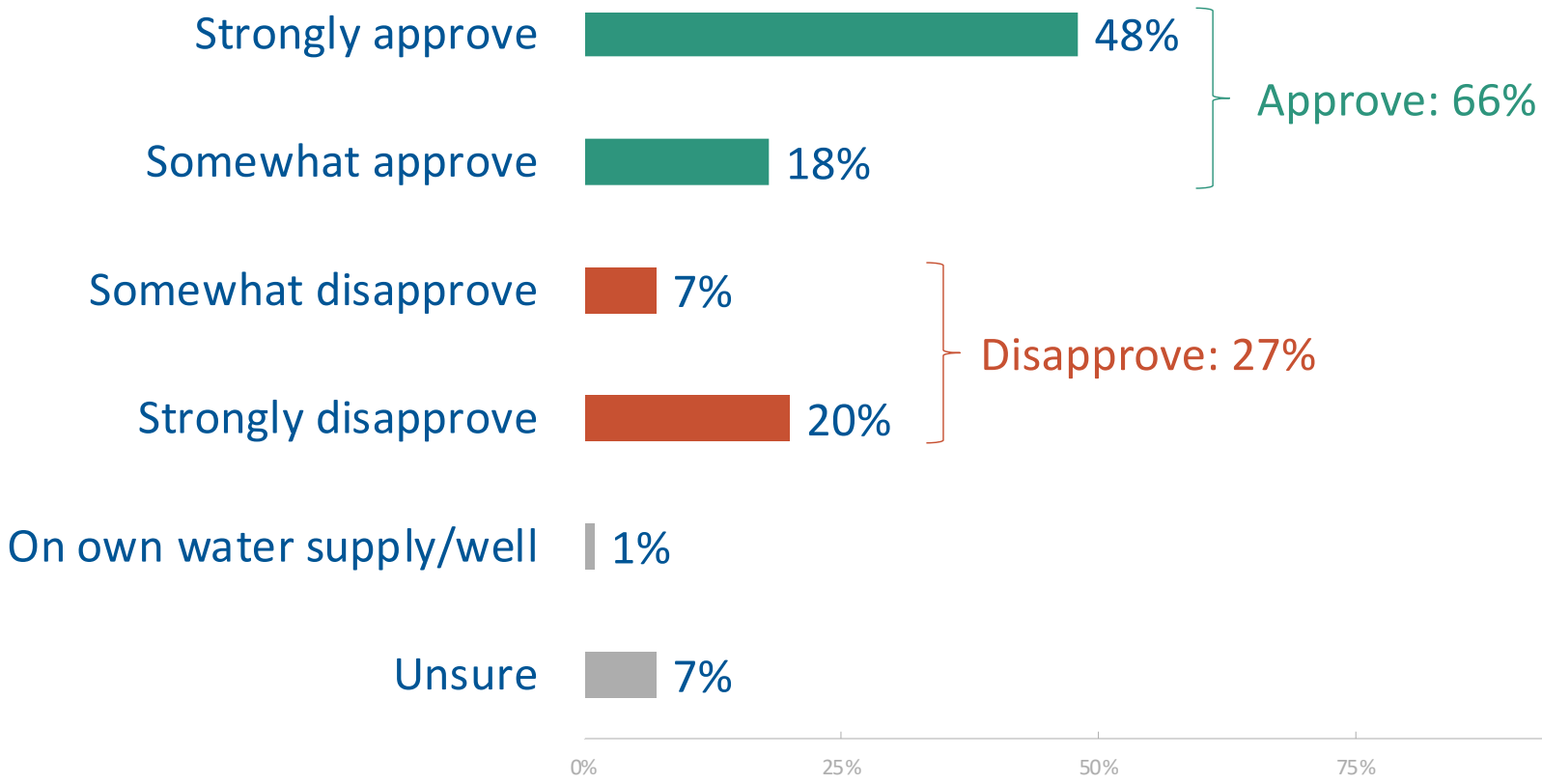
Water Fluoridation
-Key Findings

- 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

albertapatients
Your Voice Matters

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)

albertapatients
Your Voice Matters

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

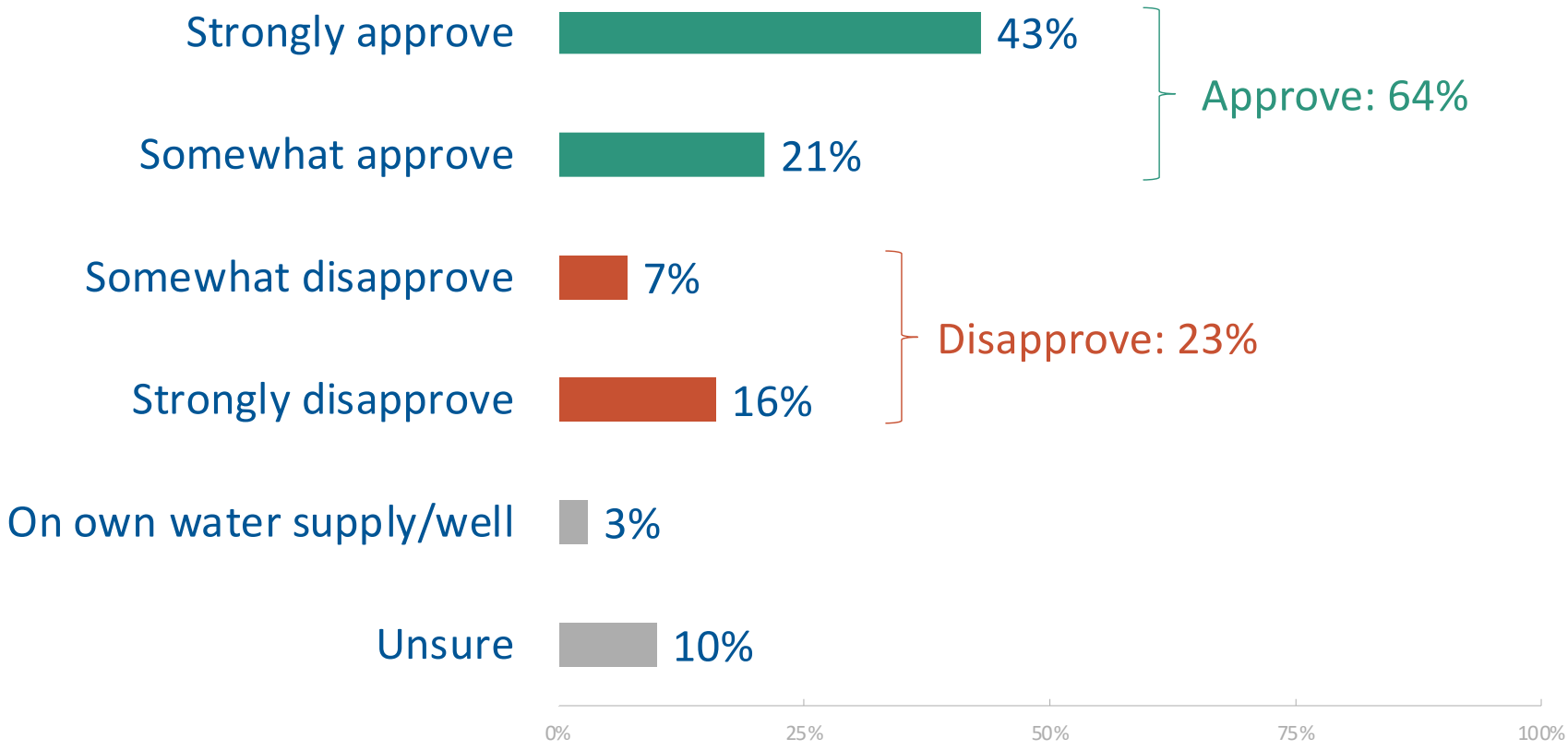
Base: Calgary Proper

albertapatients
Your Voice Matters

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)

albertapatients
Your Voice Matters

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

albertapatients
Your Voice Matters

www.albertapatients.ca

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

ALBERTA MEDICAL ASSOCIATION

ThinkHQ PUBLIC AFFAIRS INC.

Gibb, Linda A.

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

Universal Journal of Public Health 2(4): 125-130, 2014
DOI: 10.13189/ujph.2014.020403
http://www.hrpub.org

It's about More Than Just Baby Teeth: An Examination of Early Oral Care in Canada

Leonard Smith[1], Larry Katz[2,*] ,Herbert Emery[3], Jackie Sieppert[4], Zoe Polsky[5], Kimberly Nagan[6]

[1]Department of Pediatrics in the Faculty of Medicine, the University of Calgary, Calgary, T2N 1N4, Alberta, Canada
[2]Faculty of Kinesiology, University of Calgary, Calgary, T2N 1N4, Alberta, Canada
3Department of Economics, University of Calgary, Calgary, T2N 1N4, Alberta, Canada
[4]Faculty of Social Work, University of Calgary, Calgary, T2N 1N4, Alberta, Canada
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*Corresponding Author: katz@ucalgary.ca

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 lead 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.

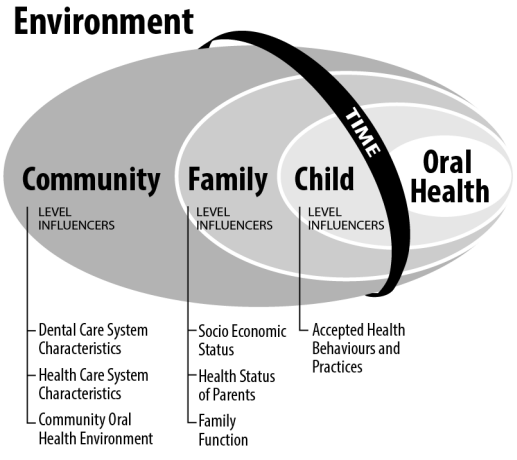

Figure 1. Child, family, and community influences on oral health outcomes of children. Adapted from Fisher-Owens, et al. (2007).

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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ESSENTIAL DENTAL KNOWLEDGE

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 professions[21] 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 colleagues[12] 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 avenues[26] (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

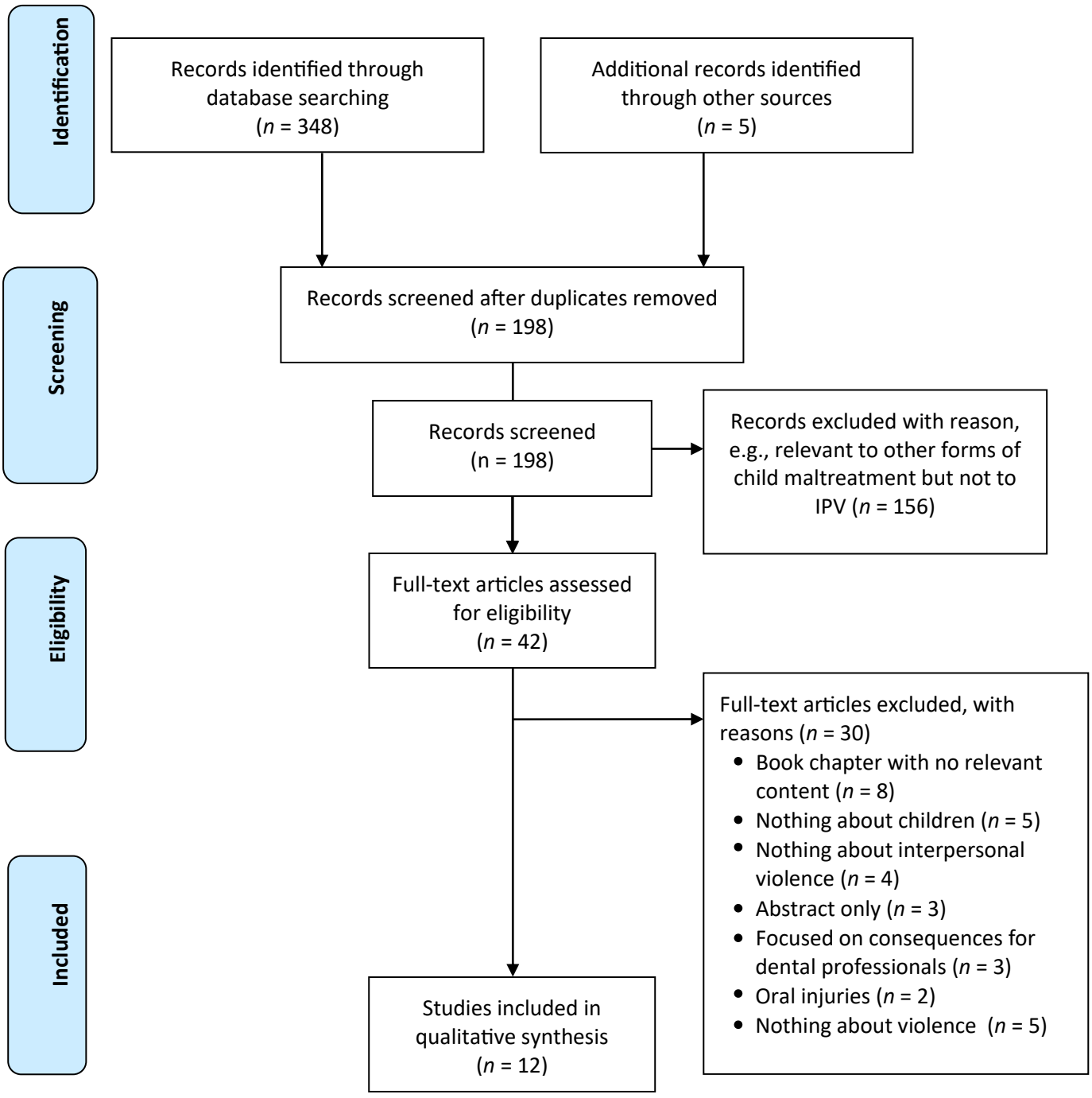
Identifying relevant studies, screening and selection

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 IPV[31] 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)	• 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.	• 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)	• Victimization was a predictor variable (i.e., history of physical, emotional and sexual abuse).	• 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)	• DV described as a noxious family environment and measured as observed hostility and aggression between parents.	• 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)	• Adverse childhood experiences (ACES), one of which was exposure to domestic violence.	• 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)	• 20 of 65 participants categorized as having "exposure to domestic violence against the mother."	• 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)	• Looking at female-to-male emotional aggression and pathways to ECC.	• 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)	• 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	• 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	• 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)	• Evaluated the above-noted program[37] 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)*	• 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	• 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 reflection[33] 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 document[33] 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 document[32] 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 group[42] 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 study[39] 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 develop[37] and evaluate[38] 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 residents[37] 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 lens[46] 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 care[43] 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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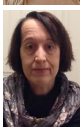

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This article has been peer reviewed.

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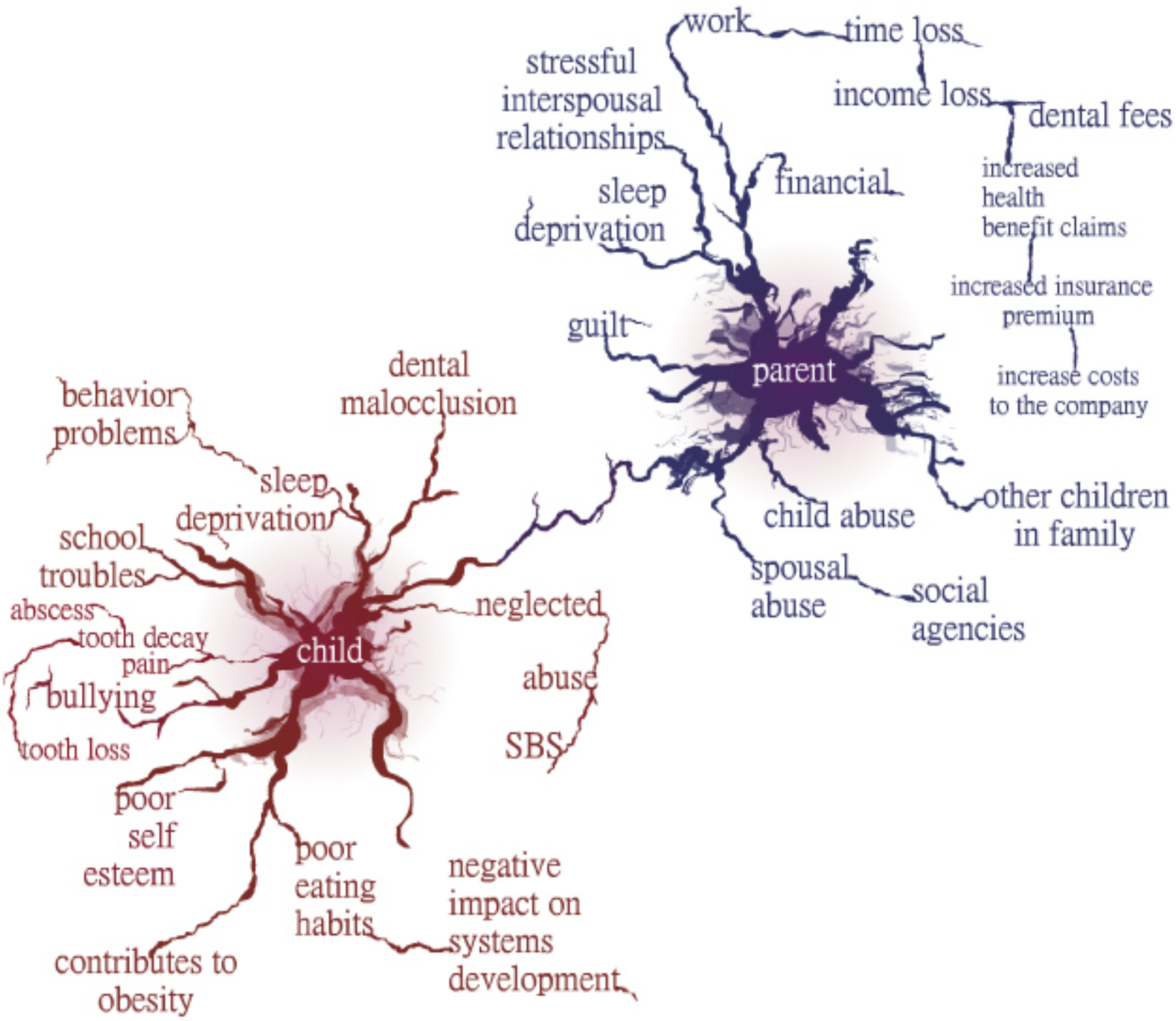


Gibb, Linda A.

From: Vickie McKinnon <vickiemckinnon@gmail.com>
Sent: Saturday, July 13, 2019 11:32 PM
To: Public Submissions
Subject: [EXT] Fwd: Public Submission July 24 Meeting of the Calgary Community and Protective Services Committee to Address Fluoridation
Attachments: Submission to Community and Protective Services Committee.docx

My email to Andrea Schimick was returned. Please confirm that I now have the correct email address.
Thanks.
VM

---------- Forwarded message ---------
From: **Vickie McKinnon** <vickiemckinnon@gmail.com>
Date: Sat, Jul 13, 2019 at 11:22 PM
Subject: Public Submission July 24 Meeting of the Calgary Community and Protective Services Committee to Address Fluoridation
To: <Andrea.Schimick@calgary.ca>
Cc: Vickie McKinnon <vickiemckinnon@gmail.com>

Hello Andrea,

Please accept the attached Submission for the July 24th Meeting of the Calgary Community and Protective Services Committee to Address Fluoridation. As I am unsure that I will be able to attend the meeting and present my submission, I am sending it to you now to meet the July 13 deadline, so it can be provided to the committee members should I not be able to be at the committee meeting.

I assume I can withdraw the written submission with reasonable notice?

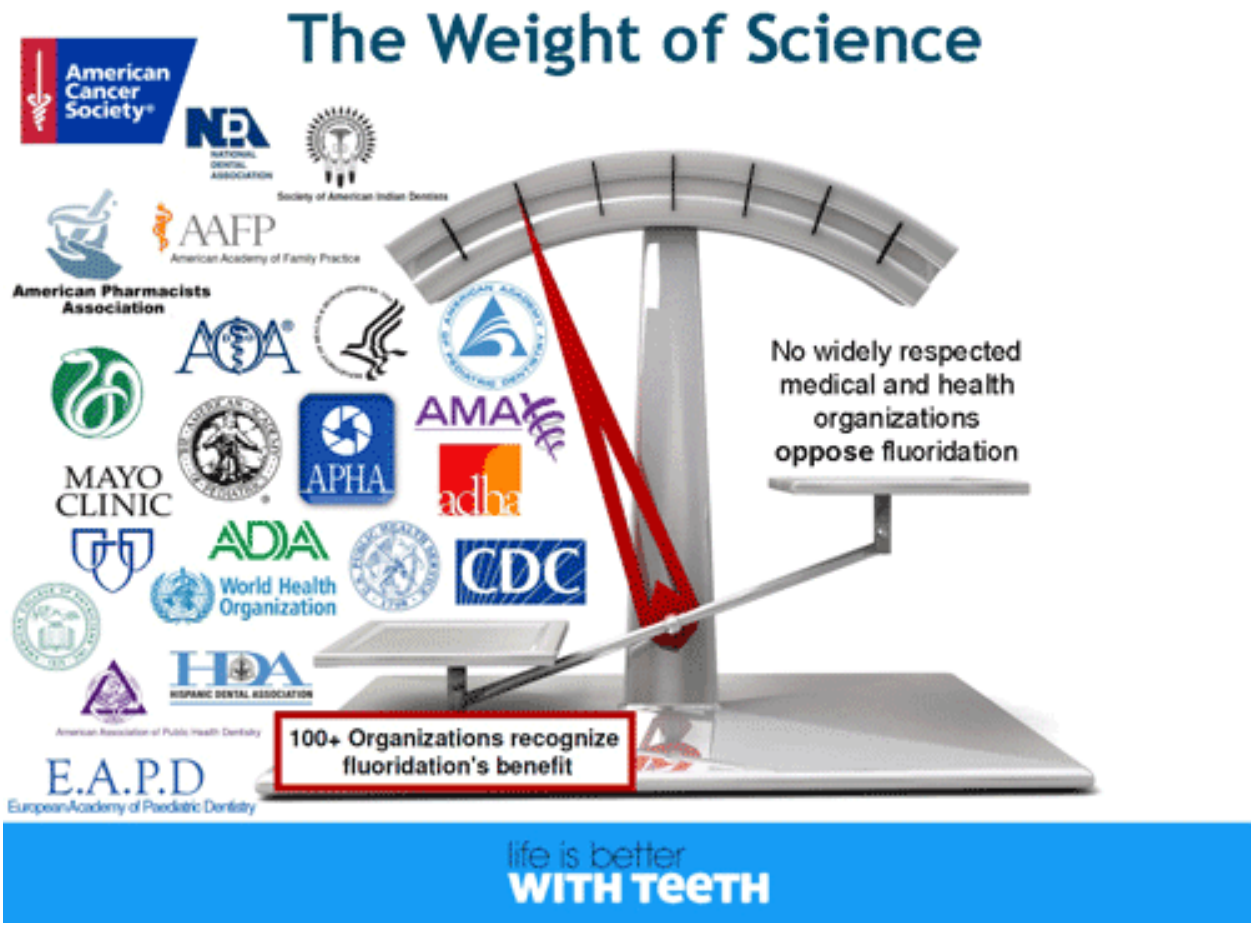
Sincerely,
Vickie McKinnon
403 253-3814

Submission to Community and Protective Services Committee
Re: Reinstating Water Fluoridation in Calgary
July 13, 2019

I make this submission from three perspectives: a retired public health dental professional; a grandmother of six young children, all living in Calgary; and a voting citizen of this city.

1. On the basis of extensive research and recent reviews, fluoridation has been deemed safe, effective and cost-effective. My plea to this committee is to pay attention to legitimate and recognized scientific evidence presented by those whose job it is, through their training, skill and responsibility, to ensure that the health (in this case dental health) of the population is protected. If you can't trust these esteemed health organizations, whom do you trust?!

"No widely respected health organization opposes it." **Stephen Barrett, M.D**



Stephen Barrett, M.D.

2. Three of my six grandchildren have had cavities in spite of their parents being conscientious about their diet, oral hygiene and early dental visits. Fluoridation is the protective factor that they are missing because they were born since water fluoridation, democratically initiated, was arbitrarily removed from Calgary water by city council. Why is it not available for them? And more importantly, why is it no longer available for disadvantaged children? Fluoridation is a great equalizer, giving all children the advantage of this preventive modality.

3. As a Calgary citizen for more than seventy years, I want a city that is run by enlightened leaders who have the courage to make evidence-based decisions so that Calgary will be the healthiest place in the world to live. Ensuring that children of all means have the opportunity for good oral health should be the aspiration of all members of Council.

While the fluoridation conversation most often centres on the benefits for children's oral health, the benefits to seniors must not be overlooked. With age, gum recession exposes cementum, the root surface of teeth, which decays more easily than enamel does. Fluoridation helps protect the cementum from dental caries.

Respectfully submitted,

Vickie McKinnon

Gibb, Linda A.

From: Julianne McKinnon <julianne@prospectorsearch.com>
Sent: Saturday, July 13, 2019 11:50 PM
To: Public Submissions
Subject: [EXT] Bring back fluridation

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 the 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

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Gibb, Linda A.

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 (H_2SiF_6) 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

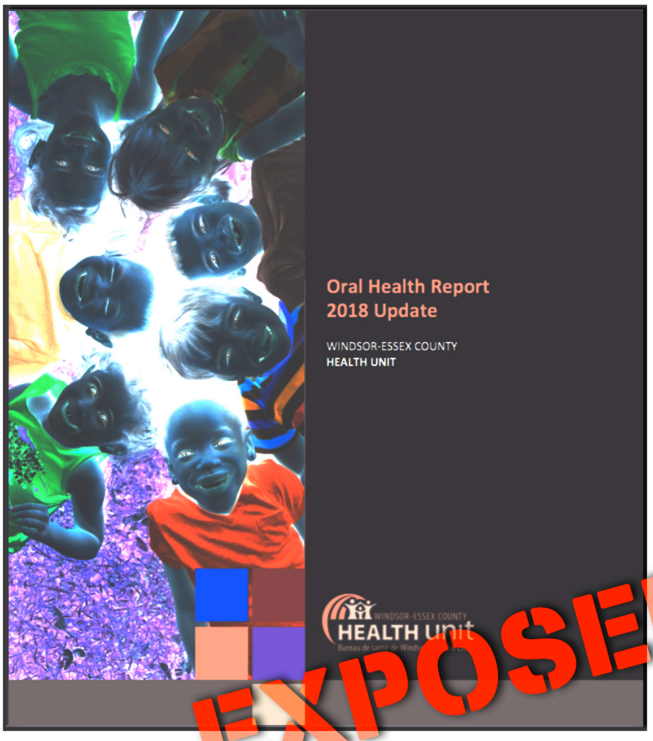
37 professionals, including dentists, doctors, and various scientists believe the report:

- 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 Councillior 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 <u>decreased 38.1%</u> 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 **<u>reduced by 13.8%</u>** 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 <u>always</u> 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. **<u>Therefore, one can make the argument that our rate of day surgeries has improved since fluoride has been removed from the water</u>**!

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 <u>*not a random survey*</u> 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. ***<u>This is direct manipulation of the statistics in an effort to mislead the reader at large, and public policy makers specifically</u>***. Further, Dr. Ahmed **<u>repeatedly cited the manipulated poll results</u>** 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 issue 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 excaberates 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 ketoprofin. They conducted more studies to see if ketoprofin was efficient in off-setting the damaging fluoride affects, and in 1996 filed a patent on their new concoction now containing both fluoride and ketoprofin. 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.

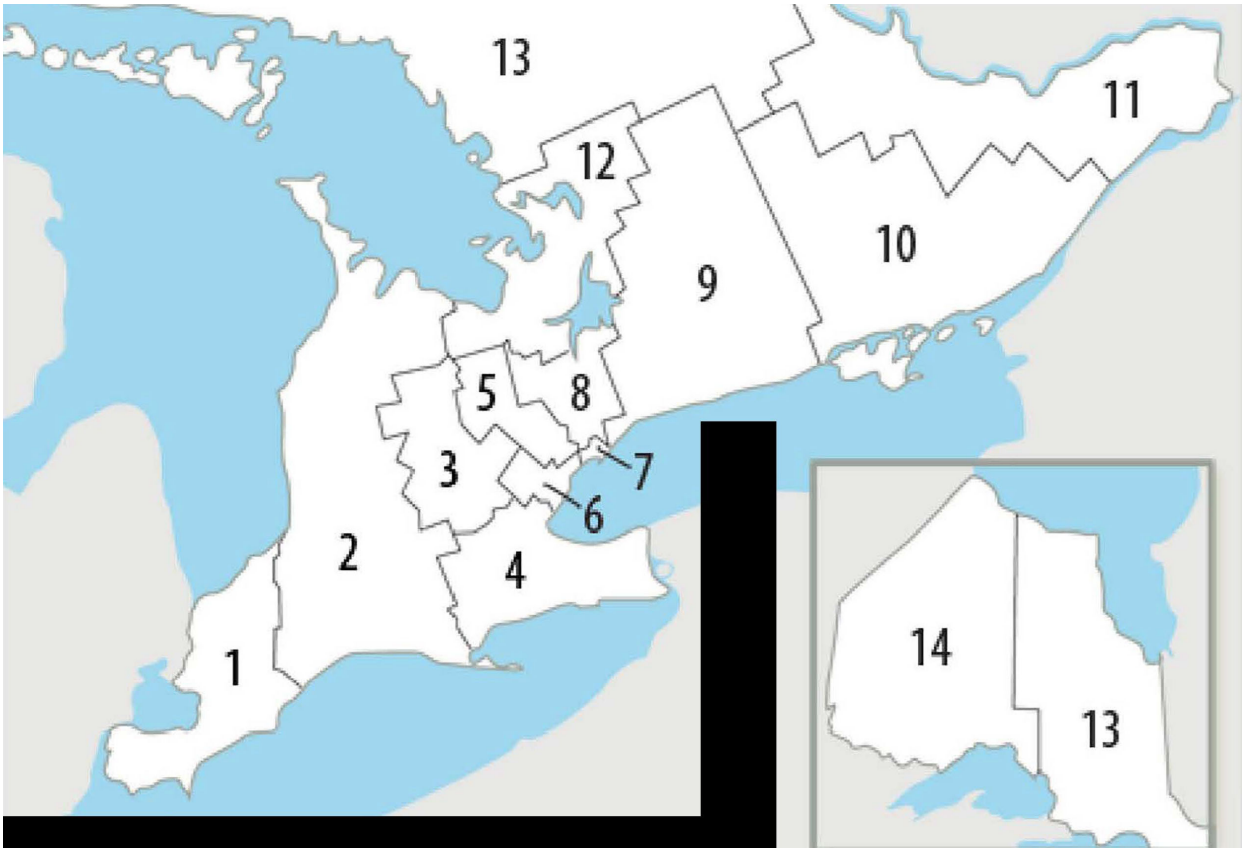
Therefore, it is a misleading for the WECHU to conflate AWF with negative health effects associated with poor Oral Health. It is a mistake by lawmakers to interpret the recommendation by the WECHU for AWF to have any positive effect on the underlying periodontal disease that is associated with respiratory 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.*"

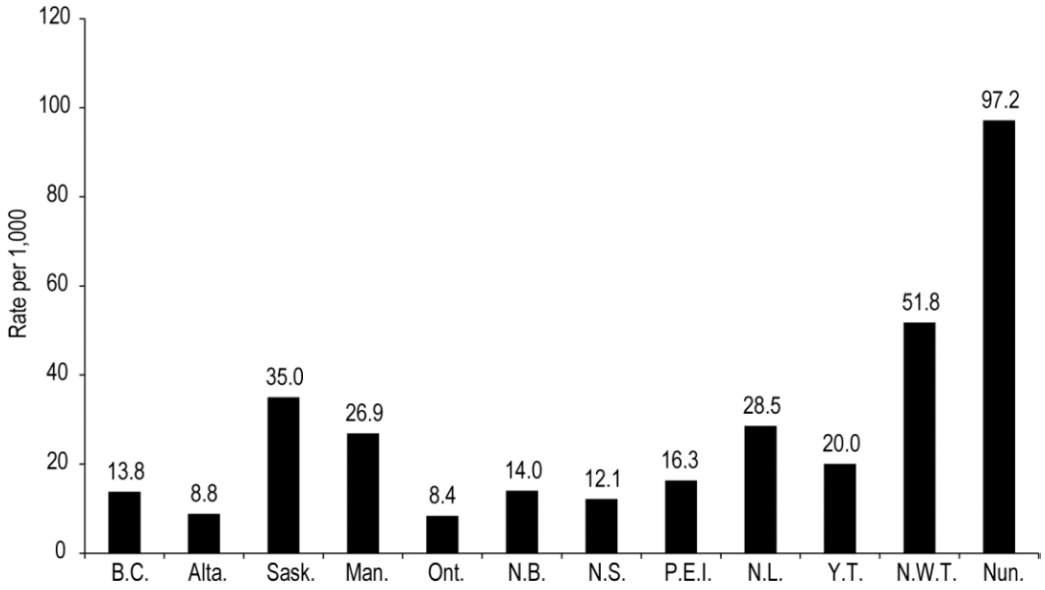
As for the early childhood caries (ECC) that require surgery, it is noted that the highest rate of surgery is found in the Aboriginal population and that our Local Health Integration Network (LHIN) is third highest. *This is consistent with economic data having the single, largest effect on dental health, 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.

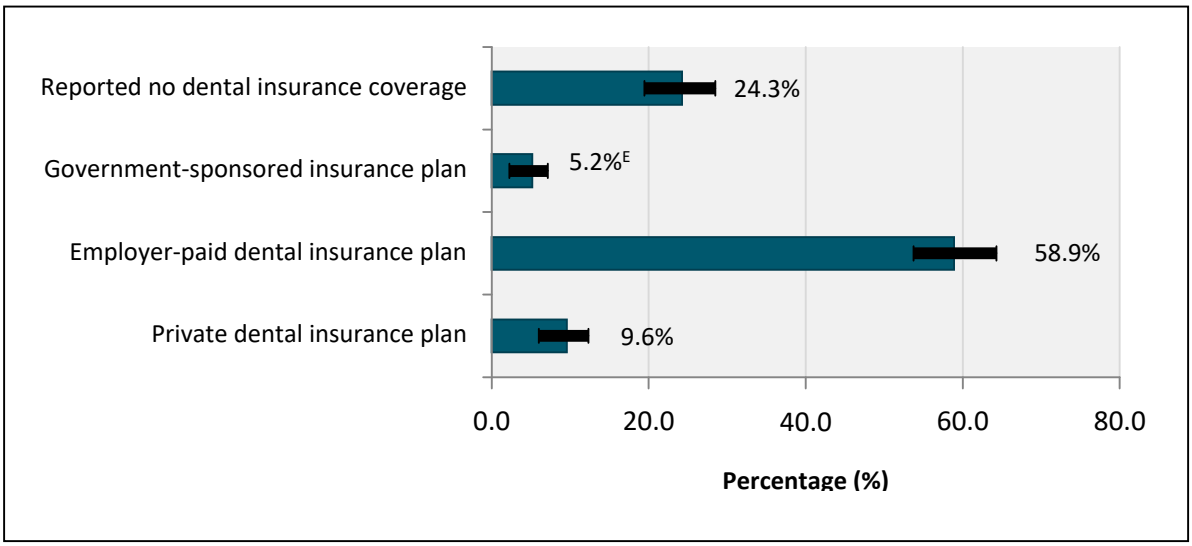
6. **The reporting that dental decay had increased using this crude 'assessment' technique is not only flawed, but scientifically fraudulent to insinuate that the increase was due to the cessation of fluoridation**. The report presents no data to support that. In fact, the report does show that the crude 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.

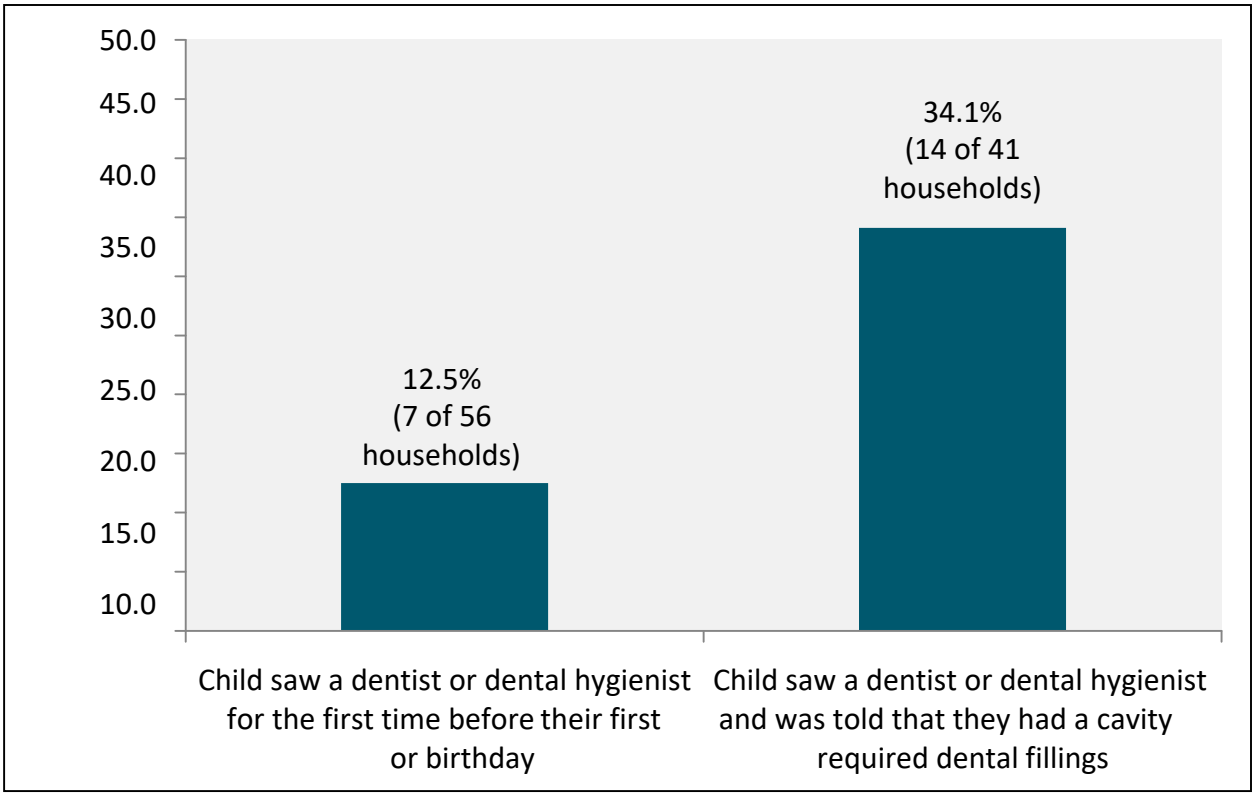
Oral Health Profile of Windsor-Essex County

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).

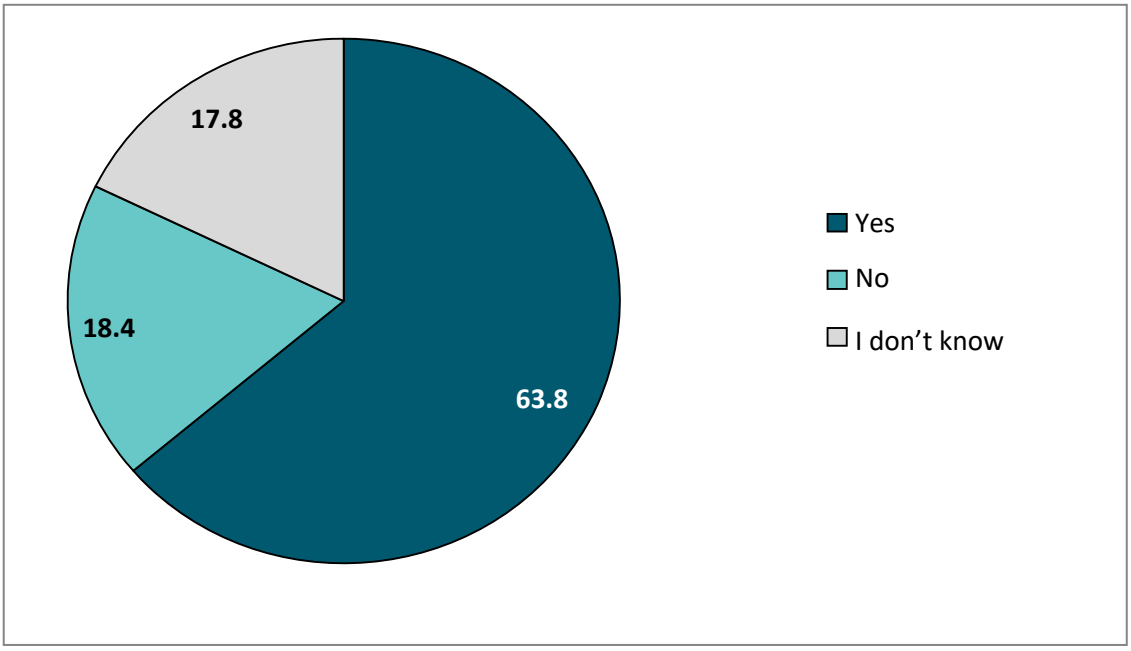
Community Support for Water Fluoridation

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***!

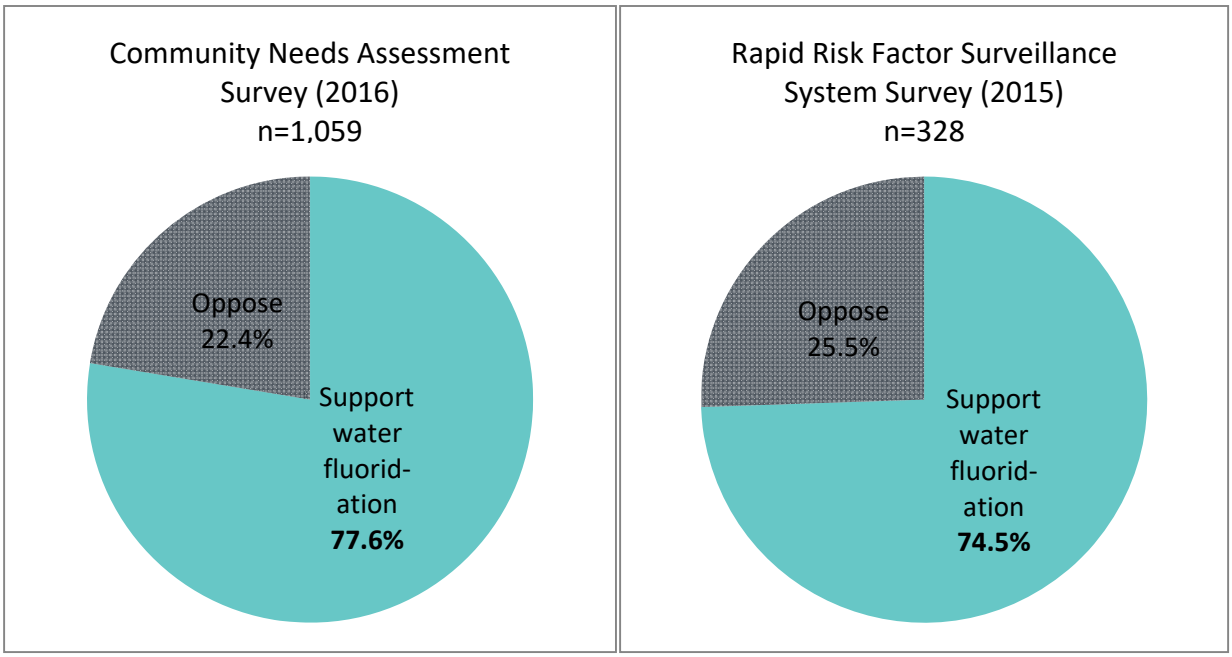
This is the chart from the Community Needs Assessment Survey (21):

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 where 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

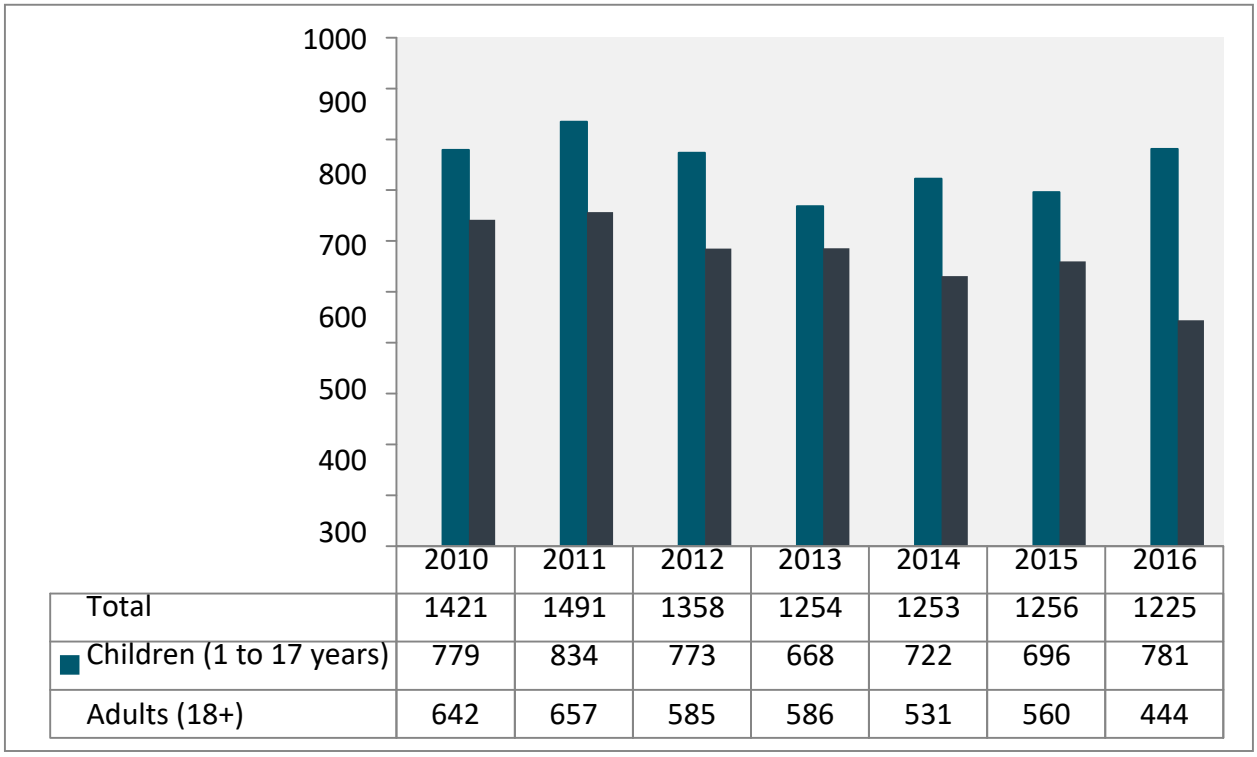
As noted at the beginning of this rebuttal, the trend is **decreasing after removing fluoride** from the water. There are fewer people of all ages going to the ED for oral health related concerns from the peak totals.

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*.

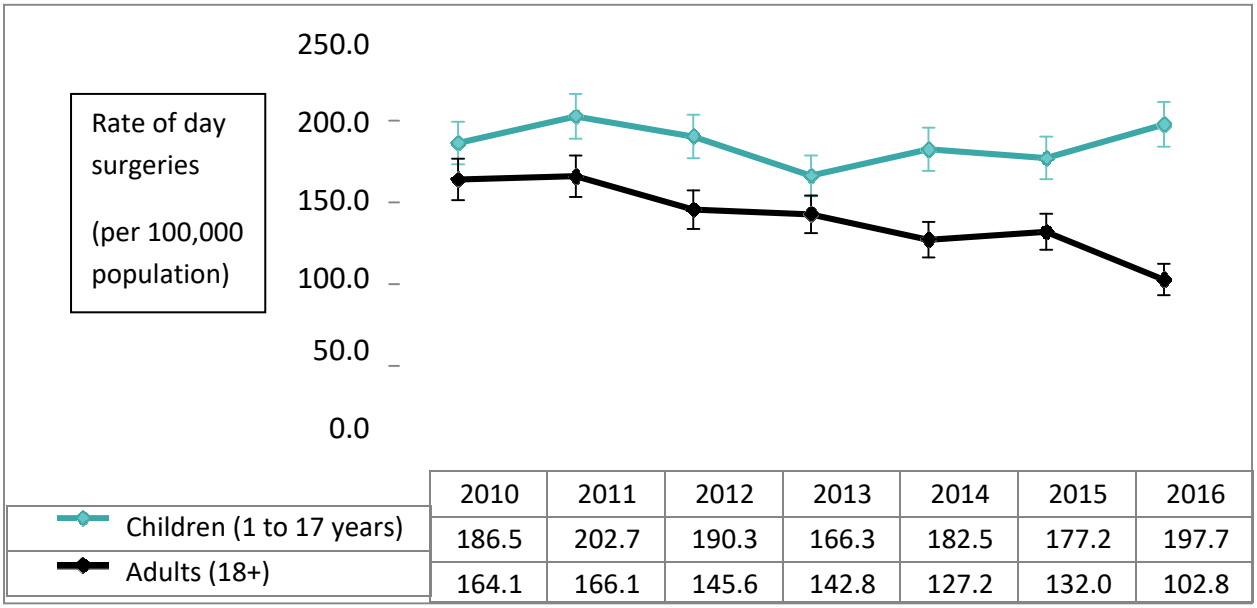
Figure 7. The number of day surgeries for oral health (caries-related) issues among children (1 to 17 years old) and adults (≥ 18 years old) in Windsor-Essex County (WEC), 2010-2016.



	2010	2011	2012	2013	2014	2015	2016
Total	1421	1491	1358	1254	1253	1256	1225
Children (1 to 17 years)	779	834	773	668	722	696	781
Adults (18+)	642	657	585	586	531	560	444

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.



	2010	2011	2012	2013	2014	2015	2016
Children (1 to 17 years)	186.5	202.7	190.3	166.3	182.5	177.2	197.7
Adults (18+)	164.1	166.1	145.6	142.8	127.2	132.0	102.8

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?

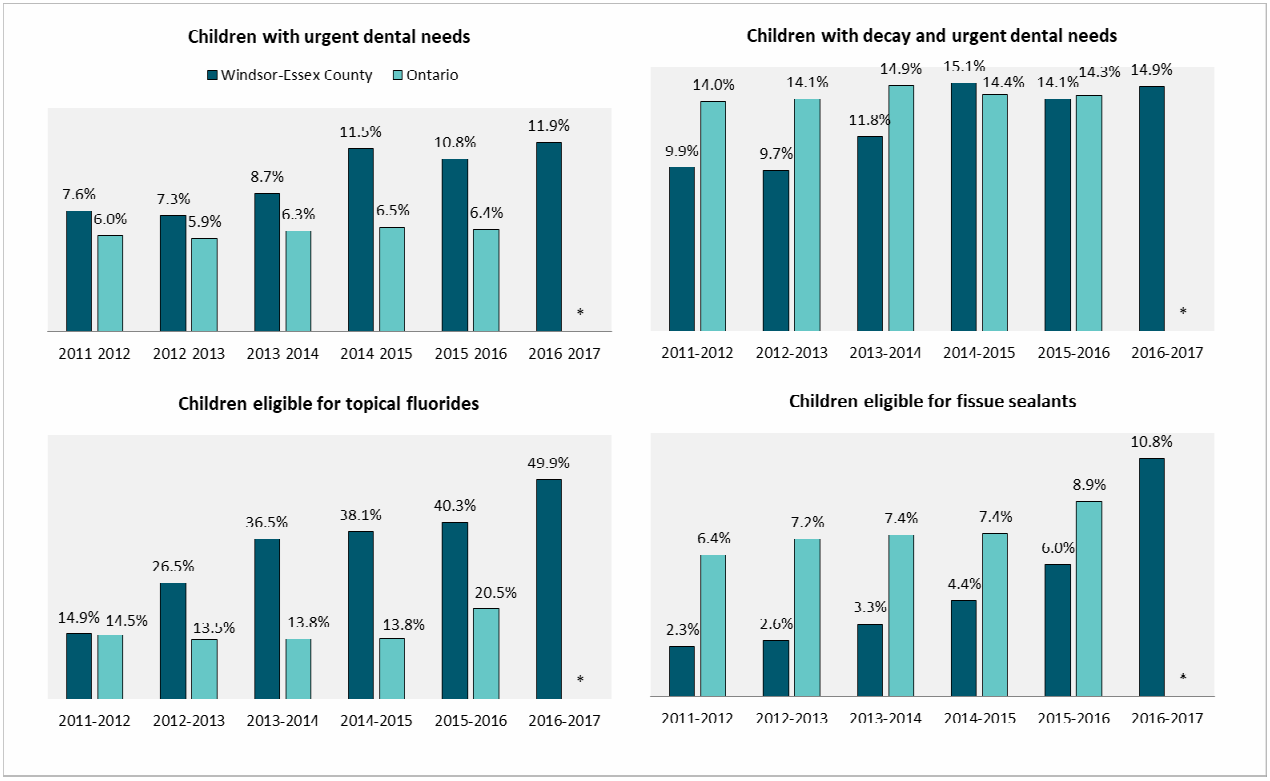
2. It is important to note that if a child is recommend for topical fluorides, fissure sealants or for scaling, then they are not put into this category of 'no care required'. This category is only meant for children that do not have an apparent cavity AND are not recommend for topical fluorides. According 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?*"

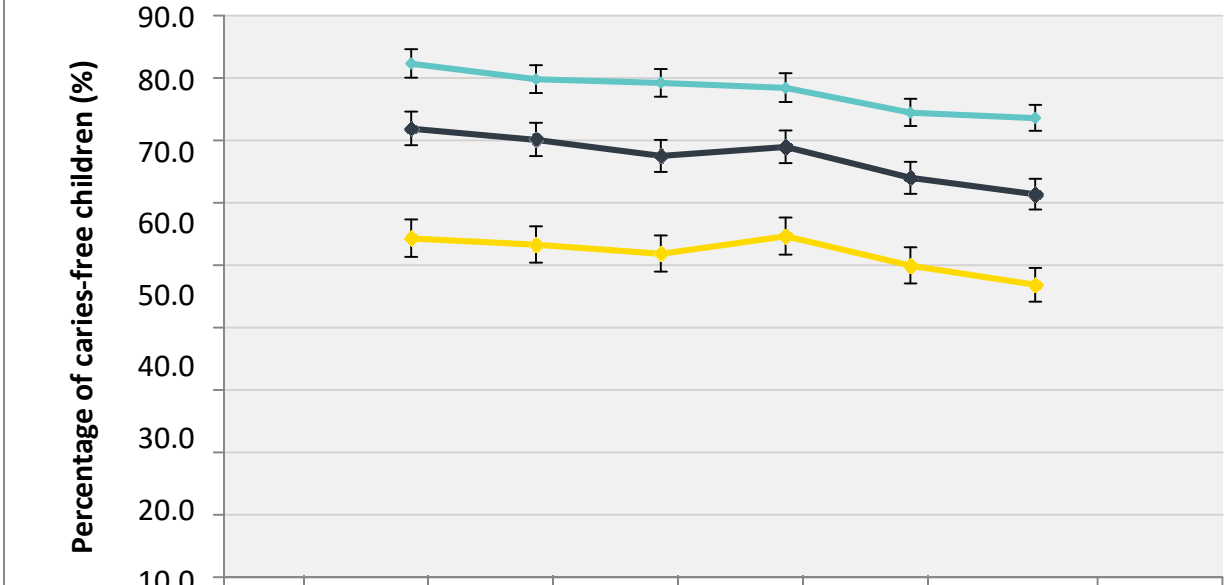
Also telling is that by the years 2014-2015 and 2015-2016, we were right in line with the provincial average of percentage of screened children with decay and urgent dental needs

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 quality for *both* Professionally Applied Topical Fluoride and Pit and Fissure Sealants. (22)

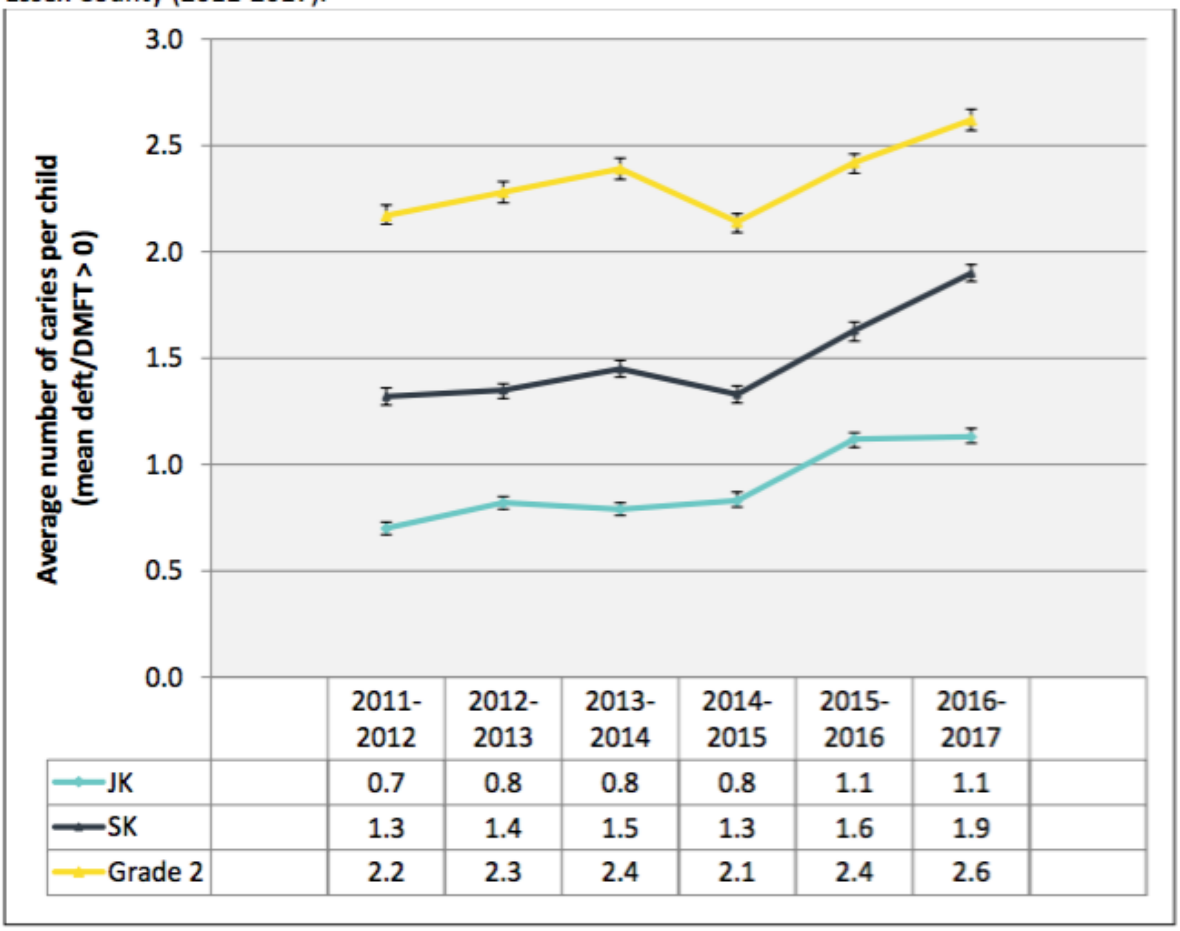
The graph below shows that the rate of the percentage of caries-free children was decreasing BEFORE fluoride was removed from the water. The rate actually INCREASED AFTER fluoride was removed for SK and Grade 2. **This data does NOT reinforce the notion that the removal of fluoride from the water is 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).



	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
JK	82.3	79.8	79.2	78.4	74.4	73.6
SK	71.9	70.1	67.5	68.9	64.0	61.3
Grade 2	54.3	53.3	51.8	54.6	49.9	46.8

Figure 13. The deft/DMFT index of screened children by school grade and school year, Windsor-Essex County (2011-2017).

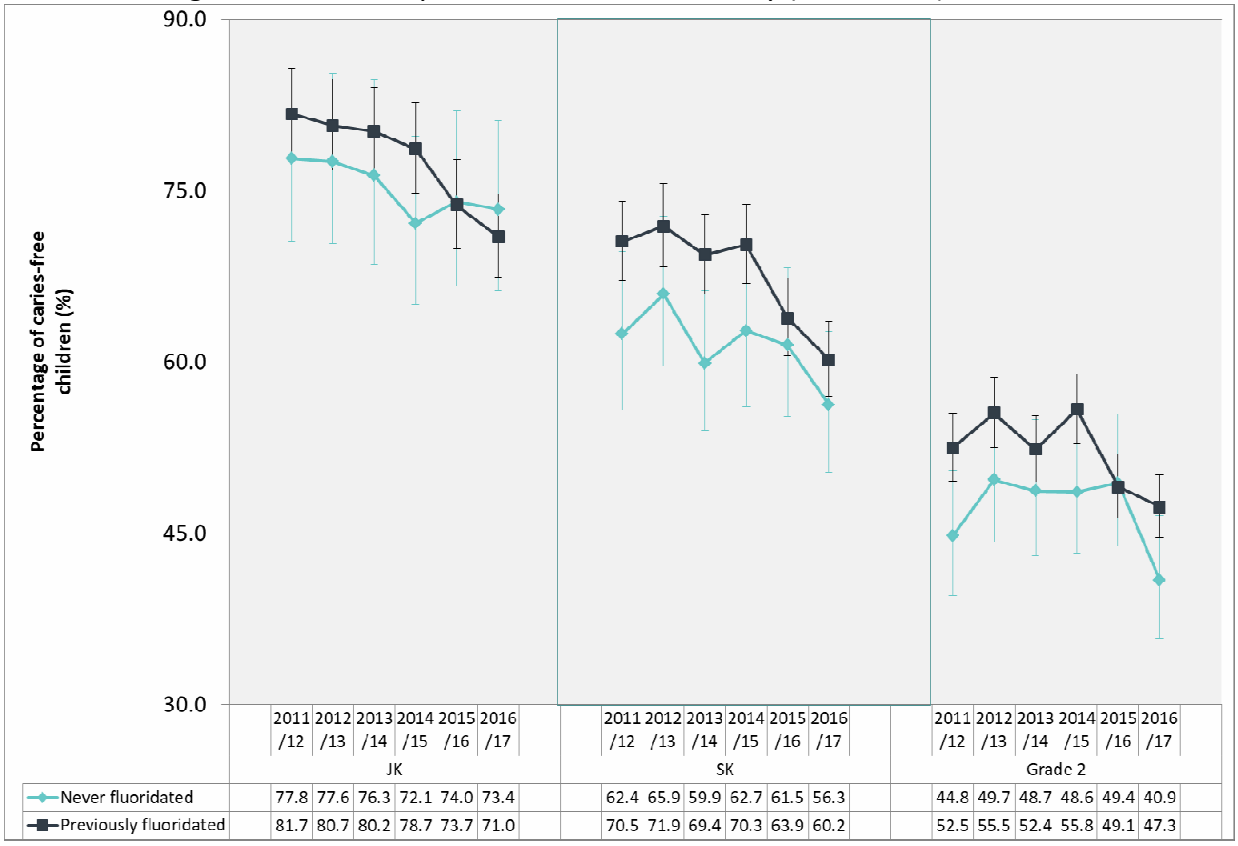


	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
JK	0.7	0.8	0.8	0.8	1.1	1.1
SK	1.3	1.4	1.5	1.3	1.6	1.9
Grade 2	2.2	2.3	2.4	2.1	2.4	2.6

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 in **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).



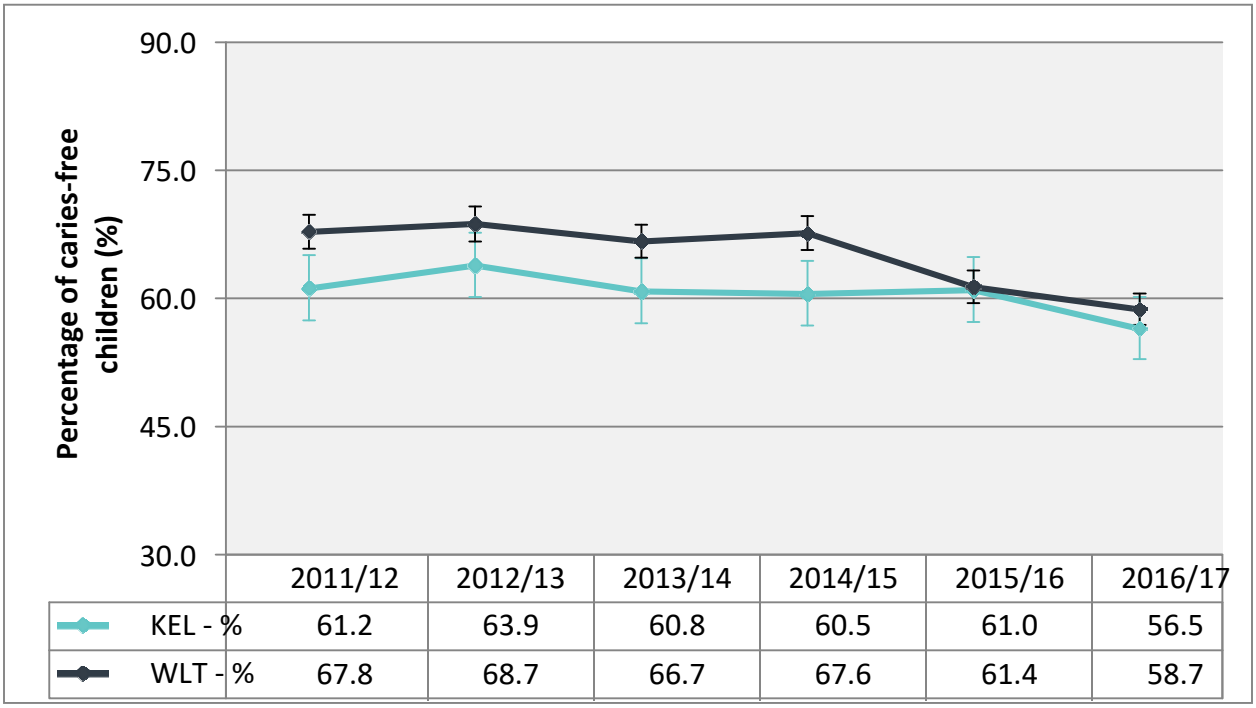
Source: Oral Health Information Support System [2011-2017], Ministry of Health and Long-Term Care (Accessed April 12, 2018).
Note: KEL refers to Kingsville, Essex, and Leamington; WLT refers to Windsor, LaSalle, and Tecumseh. Pelee was excluded to low sample size.

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)



	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
KEL - %	61.2	63.9	60.8	60.5	61.0	56.5
WLT - %	67.8	68.7	66.7	67.6	61.4	58.7

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. T*he 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)
Contact details: pconnett@gmail.com, phone 607-217-5350.

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Professor Emeritus and Former Head, Preventive Dentistry
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Bruce Spittle MB ChB (with distinction), DPM (Otago).
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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(2) https://ehp.niehs.nih.gov/doi/10.1289/ehp655
(3) https://www.ncbi.nlm.nih.gov/pubmed/30316181
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(12) http://core.apheo.ca/index.php?pid=157
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(16) https://www.ncbi.nlm.nih.gov/pubmed?term=((Mostefaoui)%20AND%20dentifrice)%20AND%20fluoride
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(22) http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/protocols_guidelines/Oral_Health_Protocol_2018_en.pdf)
(23) https://www.newsweek.com/fluoridation-may-not-prevent-cavities-huge-study-shows-348251
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Gibb, Linda A.

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.

Gibb, Linda A.

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

Gibb, Linda A.

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

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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

Gibb, Linda A.

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

Gibb, Linda A.

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 authourities. 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 authourities 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.

Gibb, Linda A.

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 it's 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 organization 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

Gibb, Linda A.

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

Gibb, Linda A.

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

Gibb, Linda A.

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.

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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

Gibb, Linda A.

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

Gibb, Linda A.

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 regrding 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

Gibb, Linda A.

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

Gibb, Linda A.

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

Gibb, Linda A.

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 bicuspids (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.

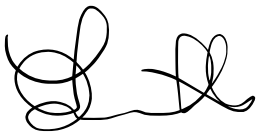
CONCLUSION

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

Gibb, Linda A.

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

Gibb, Linda A.

From: Elizabeth Kelly <ejkelly.kelly@gmail.com>
Sent: Monday, July 15, 2019 2:18 PM
To: Schmick, Andrea M.
Subject: [EXT] In support of fluoridation

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 a family doctor and mother of two children, I am also seeing more serious dental infections as a result of these increased carries. 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.

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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.

Thank you in advance for your consideration of this important health initiative.

Sincerely,

Dr. Elizabeth Kelly

MD, MSc

Community Family Physician

Clinical Instructor, University of Calgary

June 18, 2019

To- City Clerk's Office

cc/ Councillor Peter Demong

Councillor Druh Farrell

Councillor Sean Chu

Councillor Ray Jones

Councillor Ward Sutherland

Councillor Joe Magliocca

Councillor Jyoti Gondek

Councillor George Chahal

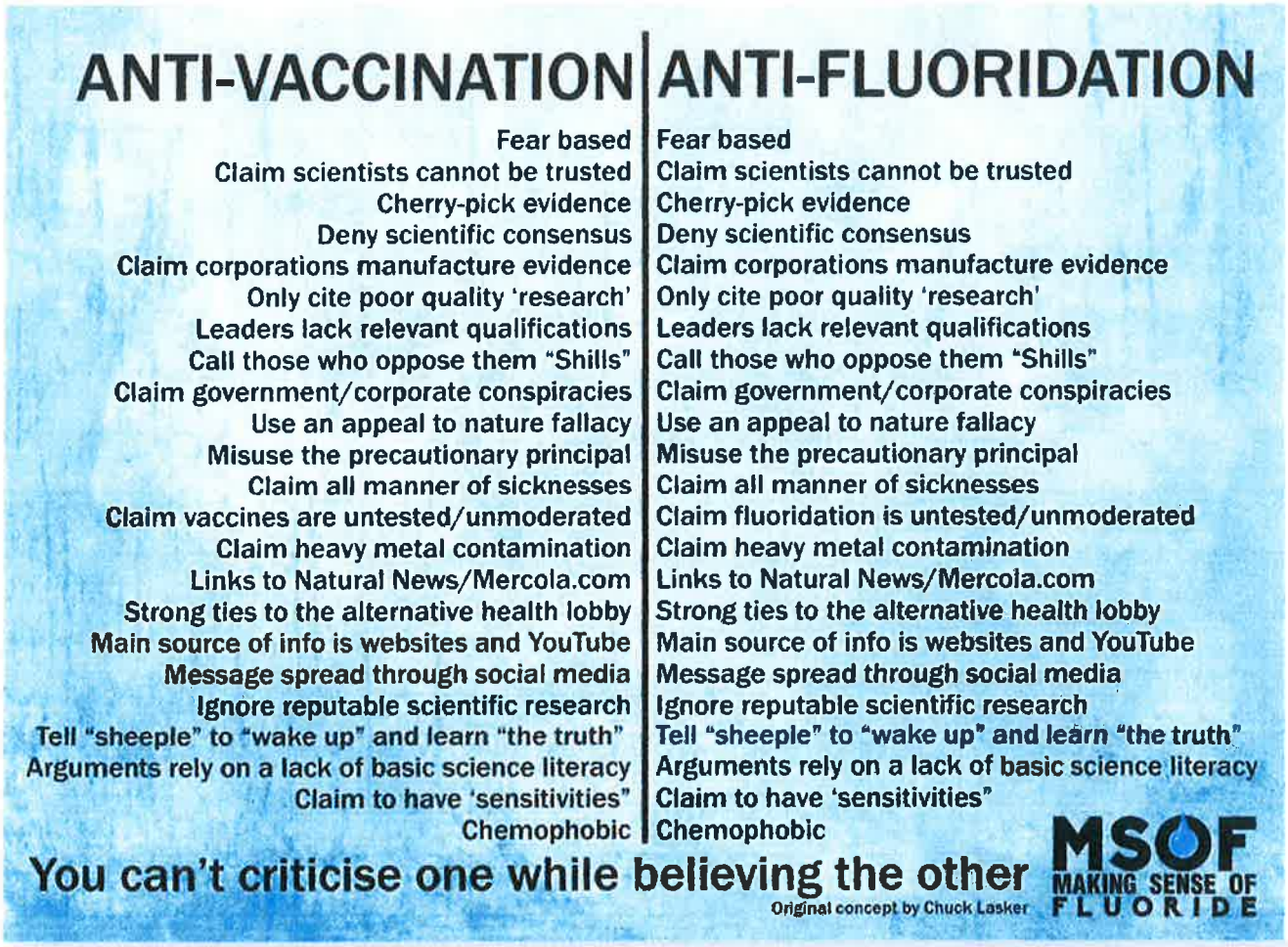
Councillor Evan Woolley

Councillor Gian-Carlo Carra

Councillor Jeff Davison

American Fluoridation Society

Canadian Fluoridation Lobby



Some new "science" to prove to Calgarians that Water Fluoridation is safe and effective in reducing tooth decay in low income children.

June 18, 2019

To- City Clerk's Office

cc/ Councillor Peter Demong

Councillor Druh Farrell

Councillor Sean Chu

Councillor Ray Jones

Councillor Ward Sutherland

Councillor Joe Magliocca

Councillor Jyoti Gondek

Councillor George Chahal

Councillor Evan Woolley

Councillor Gian-Carl Carra

Councillor Jeff Davison

PHOSPHATE MINING

FLORIDA'S DIRTY LITTLE SECRET

THE INDUSTRY THAT SELLS THEIR INDUSTRIAL WASTE BI-PRODUCTS TO CITIES IN NORTH AMERICA FOR THEIR WATER FLUORIDATION PROGRAMS

POLICY

NOT

SCIENCE

USED TO PROMOTE

WATER FLUORIDATION

FLUORIDE

Industrial Waste in Your Water?


Where you think
Fluoride comes
from.

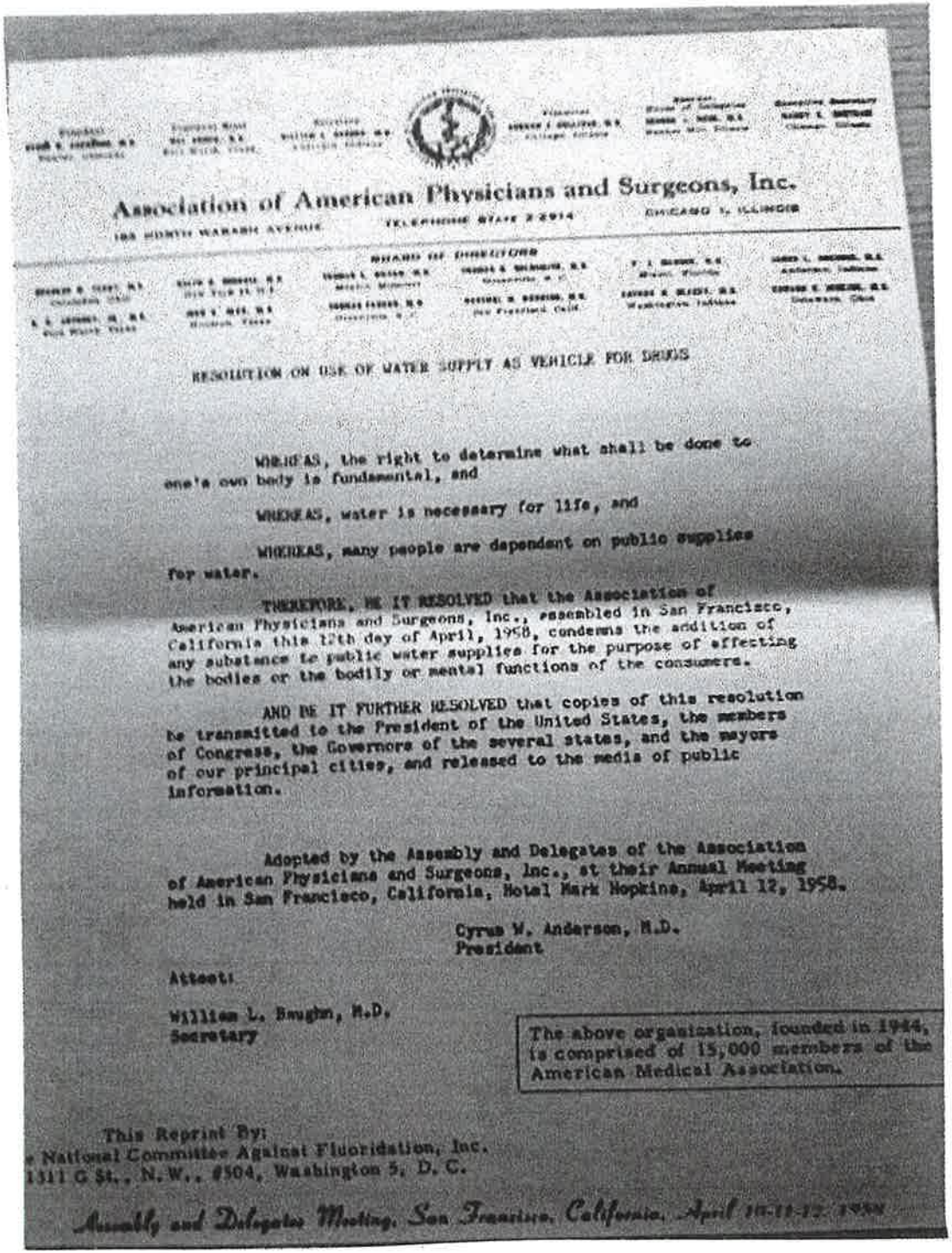

Where it really
comes from.
facebook.com/nofluorideaustralia

Mosaic Phosphate Fertilizer Mining Industry (Florida)- Polluting the air and water, and destroying the environment in the state of Florida. Like Water Fluoridation most people in Florida are unaware of the situation, because of media censorship.

Mosaic's phosphoric acid production consumes water as part of its chemical process. The slipping 140-acre lake is part of that collecting and recycling system for the plant, serving both as a kind of giant rain-gathering cistern and a cooling pond to recycle water.

The promoters of Water Fluoridation have always stated that the industrial chemical used in W.F. is the same as the "natural" occurring fluoride found in the rivers flowing from the west into Calgary. Does anything about this plant look "natural" to you?

MOSAIC Phosphate Fertilizer Plant- New Wales



Association of American Physicians and Surgeons, Inc.

RESOLUTION ON USE OF WATER SUPPLY AS VEHICLE FOR DRUGS

WHEREAS, the right to determine what shall be done to one's own body is fundamental, and

WHEREAS, water is necessary for life, and

WHEREAS, many people are dependent on public supplies for water.

THEREFORE, BE IT RESOLVED that the Association of American Physicians and Surgeons, Inc., assembled in San Francisco, California this 12th day of April, 1958, condemns the addition of any substance to public water supplies for the purpose of affecting the bodies or the bodily or mental functions of the consumers.

AND BE IT FURTHER RESOLVED that copies of this resolution be transmitted to the President of the United States, the members of Congress, the Governors of the several states, and the mayors of our principal cities, and released to the media of public information.

Adopted by the Assembly and Delegates of the Association of American Physicians and Surgeons, Inc., at their Annual Meeting held in San Francisco, California, Hotel Mark Hopkins, April 12, 1958.

Cyrus W. Andersen, M.D.
President

Attest:

William L. Baughn, M.D.
Secretary

The above organization, founded in 1944, is comprised of 15,000 members of the American Medical Association.

This Reprint By:
National Committee Against Fluoridation, Inc.
1311 G St., N.W., #504, Washington 5, D.C.

Assembly and Delegates Meeting, San Francisco, California, April 10-11-12, 1958

Fluoride Free Greenwood, Mississippi
Like This Page · January 28 ·

There has always been professional medical opposition to #fluoridation policy. The attached is the 1958 opposition statement from the American Association of Physicians & Surgeons who represented 15,000 medical doctors at that time. The AAPS has since its 1944 founding championed patient's rights and professional ethics. Their opposition against using water supplies to drug the populace is consistent with the 1947 Nuremberg Code and with 21st Century UNESCO documents on Bioethics.

The most recent professional organization to oppose fluoridation policy is the Children's Health Defense in 2019.

https://childrenshealthdefense.org/news/u-s-water-fluoridation-a-forced-experiment-that-needs-to-end/

CPS2019-0965
Attachment 2
Letter 43

Dr. Deena Hinshaw- 2019

New Chief Medical Officer of Health for Alberta

with a classic case of Dental Fluorosis.

New Chief Medical Officer of Health named for Alberta

Category: Local News
Published: Monday, 04 February 2019 09:56
Written by Jordan Davidson

Dr. Deena Hinshaw, the new Chief Medical Officer of Health for Alberta. Photo courtesy of the government of Alberta

Some impressive examples of investigative journalism on the issue of Water Fluoridation.

Anti-fluoride beliefs based on irrational fears

CATHERINE FORD

One finds like-minded citizens in the strangest places. For me, it came when I agreed with Calgary city council's enfant terrible, Ward 11 Coun. Jeromy Farkas. Knock me over with a feather. From the mouth of someone whom, I believe, is still growing his last set of molars, comes an adult opinion about fluoride.

During his campaign for office, he said fluoridation of water is "one of modern society's premier innovations in health sciences." Most scientists, doctors and dentists would agree with him. The result of Calgary arbitrarily removing fluoride from our water in 2011 has been an alarming increase in cavities among young children.

It seems silly to be debating proven science, something like questioning whether the Earth is round, whether vaccinating children is good for their health, or whether evolution is more than a "theory."

When last I railed about fluoride being debated as a health issue, Jeromy was 10. For the first three (of five) plebiscites he hadn't been born. He was one year old when Calgary voters finally approved adding fluoride to city water. That decision allowed him and his generational cohort the privilege of being raised with the same advantages as children in Edmonton, which not only has naturally fluoridated water from the North Saskatchewan but adds the mineral to bring the level up to the optimal amount of 0.7 parts per million.

How Calgary could have bowed to irrational fears and voodoo science and arbitrarily removed fluoride from our water is nothing short of ridiculous.

Now we are back in the heart of the original debate. A report from University of Calgary scientists on the efficacy of fluoridated water is expected within weeks. (There was no such science-based study done when city council voted to remove fluoride from our water.)

And coming out of the woodwork like a plague of termites are the anti-fluoride activists with their fearmongering. (No names; no details. I won't be party to giving them any publicity.)

Two activists (both bearing the honorific of Dr., although only one has a medical degree) ar being given space in the new library on Saturday to present their backward views, including that fluoride can damage the brain. The laughable part of this (if fomenting fear is ever funny) is that such claims are based on "scientific" studies conducted in China, India and Mexico, as reported in the Herald last week. I'd suggest if the IQs of children under age 12 in those countries are being lowered and their cognitive functions harmed that science look at the toxicity of the occasionally fetid air — among other environmental disasters — rather than blaming fluoride.

Anti-vaxxers and those who believe there is a worldwide conspiracy to poison their children won't be swayed by logic or genuine science. They will remain willing sycophants. And will turn out to have their fears compounded.

Curiously, those who worry inordinately are often the same people who have never actually seen the devastating, life-threatening complications of childhood diseases such as polio or measles. They only hear the risks. They choose only to listen to the negatives without considering the statistical chances of being harmed from getting a needle are so minute as to be irrelevant. It's the same with fluoride.

Life's risks are endless if you choose to look at them as likely promises instead of unlikely possibilities. Those who oppose fluoride have adopted the former approach, and, because of that, are willing to put the assured dental health of Calgary's children in second place to the possibility of a rare condition known as dental fluorosis, a discolouring or (at worst) pitting of the tooth enamel.

This thinking believes in such silliness as a whiff of smoke causes cancer; aluminum pots will give you Alzheimer's; post-menopause hormone-replacement therapy brings on breast cancer; cellphones and overhead power lines cause brain tumours; vaccinations and inoculations are more dangerous than the diseases they prevent.

They would willingly place their children and others in harm's way, especially those children who can least afford to be penalized — children whose parents don't care or can't afford regular dental checkups or treatments.

I have no time for them or their misguided opinions.

Catherine Ford is a regular columnist for the Calgary Herald.

May 29/19

Scare tactics on fluorides hornswoggle some smart people too

Jon Lord was my friend long before he became my Ward 8 alderman, which is one reason I'll vote for him despite his aberration of believing fluoride in the water is no more than the "poisoning of 300 million people."

CATHERINE FORD

The other reason I'll vote for him is that he has well fulfilled the obligations of alderman, willing to listen to community concerns whether they come from Victoria Park or Mount Royal.

But then there's his opinion on fluoride...

I choose to believe my friend — a businessman of probity and sound judgment — has fallen into the trap of so many other seemingly sensible people who see risk in terms of black and white; yes or no; cause or cure. His hyperbole would indicate so. It is the kind of exaggeration that scares people and should be beyond a man of such intelligence. It just goes to show that smart people, too, can be hornswoggled.

The orthodoxy of this thinking believes in such silliness as a whiff of smoke causes cancer; aluminum pots will give you Alzheimer's; post-menopause hormone-replacement therapy brings on breast cancer; cell phones and overhead power lines cause brain tumours; vaccinations and inoculations are more dangerous than the diseases they prevent.

The list of the risks in life are endless, if you choose to look at them as likely promises instead of unlikely possibilities. Those who oppose fluoride have adopted the former approach, and, because of that, are willing to put the assured dental health of Calgary's children in second-place to the possibility of a rare condition known as dental fluorosis, a discolouring or (at worst) pitting of the tooth enamel.

The list of the risks in life are endless, if you choose to look at them as likely promises instead of unlikely possibilities

They would use their fearmongering to harm children who can least afford to be penalized — children whose parents don't care or can't afford regular dental checkups or fluoride treatments.

As a child who grew up drinking Calgary's non-fluoridated water and spent what seemed like most of my early childhood in dentists' chairs having the effects of non-fluoridated water dealt with, I wouldn't wish that on other people's children.

Some of those people use the advice that the level of fluoride added to Calgary's water be reduced — from the current 1.0 parts per million to 0.7 — as a recommendation that it be eliminated. They choose to ignore the advice of public health officials and dentists and doctors, in favour of their own chosen "science."

Those who do not understand the statistics don't need much more than a lesson in risk assessment.

Nonetheless, when people such as Jon start believing that fluoride added to the water presents a greater risk than the clear evidence that it prevents dental decay in children, it is time for the rest of us to get out and vote and squash this movement once and for all.

That's going to make Monday a busy day. It will, hopefully, also be productive — returning Al Duerr as mayor; telling the provincial government that its "vote" for senators is a waste of taxpayers' money; telling the churches and the other do-gooders that ridding our cities of VLTs does not in any way stop, cure or address the issue of problem gambling; and, most importantly in Calgary, keeping fluoride in our water.

Those who choose to believe that fluoride presents a risk are within their rights to buy and drink and use bottled water. They should feel free to exercise their power of choice in that way.

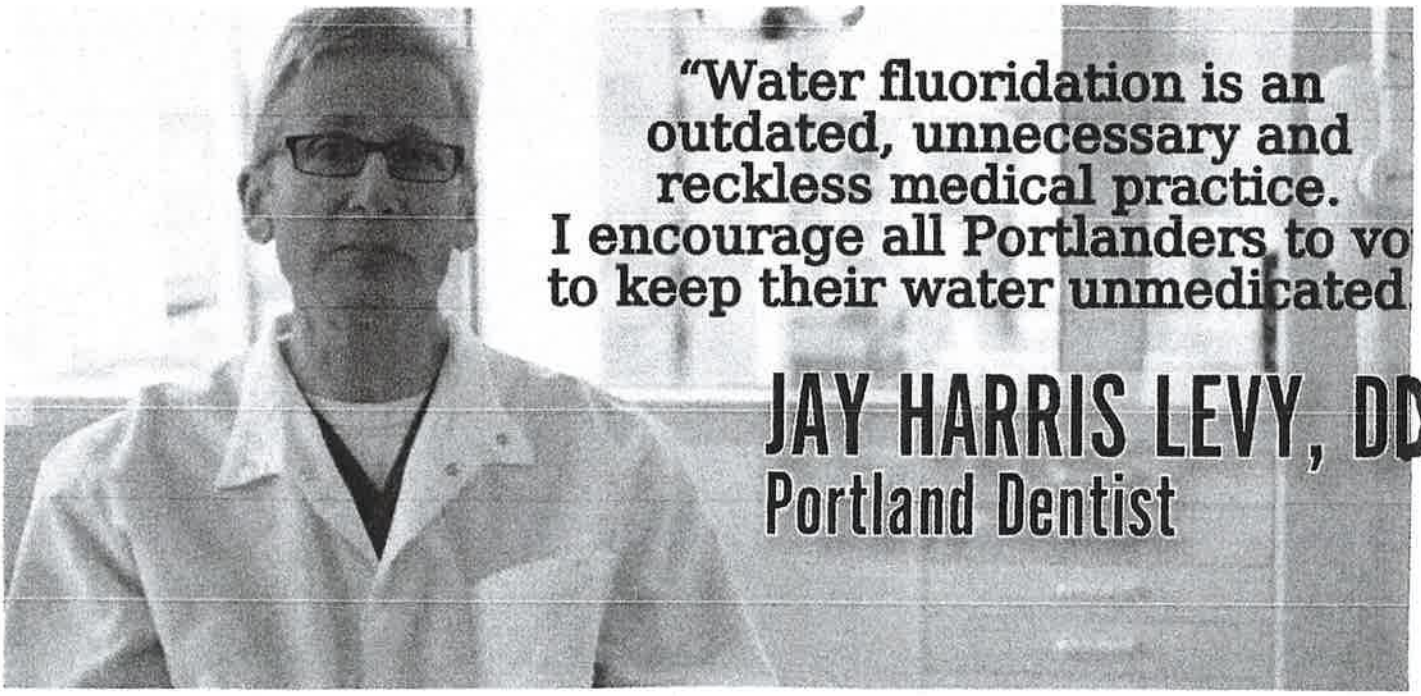
Also, on Monday, I'll do something I've never done before — spoil a ballot as a message to the provincial government which believes it right to use $3.5 million of our money to finance a useless ballot on senatorial appointments. I had initially believed refusing to vote would be a message, but those aren't counted. Spoiled ballots are.

Make no mistake: Senate reform is important, but this is not reform. This is a useless attempt to pretend that the people of Alberta are being given a voice in who should sit in the Red Chamber. This is cheap pretense: there is no easy way to change the Constitution of this country. If the people of Alberta are — as our politicians are fond of telling us — in favour of Senate reform, it is up to us to insist that the tough negotiations be entered into.

There is no easy way and no easy out. We are fools if we believe there is.

Officials believe Monday's election turnout will be upward of 40 per cent, in comparison to 24 per cent in 1995. More than 50 per cent would be even better.

CATHERINE FORD CAN BE REACHED BY E-MAIL AT FORDC@THEHERALD.SOUTHAM.CA


"Water fluoridation is an outdated, unnecessary and reckless medical practice. I encourage all Portlanders to vo to keep their water unmedicated.
JAY HARRIS LEVY, DDS
Portland Dentist

American Environmental Health Studies Project

Our Projects

- Work on Waste
- Fluoride Action Network
- Fluoride Pesticide Project
- BurnBarrel.org
- Radiation Research

Dr. Paul Connett Fighting Water Fluoridation for 23 years.

He is known around the world for his work on Zero Waste Management, and was invited to meet the Pope. Yet with his work on W.F. he is attacked and discredited by the Promoters of W.F.

Paul Connett, PhD: Curriculum Vitae

Updated August 2013.

Paul Connett is Professor Emeritus in Environmental Chemistry at St. Lawrence University in Canton, NY. For the past 30 years, Paul has put his scientific knowledge to work by helping (without fee) communities around the world understand the science of controversial issues like incineration and fluoridation. In addition to explaining the dangers of these practices he offers details of the alternatives.

Degrees:

B.A. (Honors) in Natural Sciences from Cambridge University, England (1962).
Ph.D. in Chemistry from Dartmouth College, Hanover, New Hampshire (1983).

Specialty Areas:

1. Interaction of metals with biological systems (chromium, lead).
2. Build-up of dioxins in food chains.
3. Health Risk Assessment.
4. The problems, dangers and alternatives to incineration.
5. Resource management for a sustainable society (Zero Waste).
6. The toxicity of fluoride and the dangers of fluoridation.

Teaching Experience:

33 years total. 4 years High School; 7 years Technical College, 22 years University level.
1983-2006, Chemistry Department, St. Lawrence University, Canton, NY.

INCINERATION AND WASTE.

Paul's research on waste management has taken him to 49 states in the US, 7 provinces in Canada and 60 other countries. He was co-editor of the the newsletter Waste Not with his wife Ellen from 1988 to 2000. He has co-authored 6 peer reviewed and published articles on dioxin and numerous other articles on waste management. In the past 30 years he has given approximately 2500 public presentations. Ralph Nader said of Paul, "He is the only person I know who can make waste interesting." His most recent publication on waste is the book "The Zero Waste Solution" (Chelsea Green, 2013). Paul has also co-produced over 50 videotapes on waste management and a 10-part series on the dangers of dioxin.

Paul's other research interests have focussed on the mechanism of action of toxic substances on the body. These substances include PCDDs (dioxins), PCDFs (furans), PCBs, chromium VI, lead, and fluoride.

FLUORIDE/ FLUORIDATION.

Paul has researched the literature on fluoride's toxicity and the fluoridation debate for 17 years. He helped to found the Fluoride Action Network (FAN) at http://www.fluoridealert.org/.

In the summer of 2000 he was invited by the York University team, which reviewed fluoridation for the British government, to peer review their report. His critique can be found at http://www.fluoridealert.org/york-critique.htm

In October 2000, he was invited by the Irish government to present his views on fluoridation before the Fluoridation Forum, a panel established by the Irish Ministry of Health.

In June 2001, Paul (together with Dr. William Hirzy) was invited to debate proponents of fluoridation at the annual conference of the Association for Science in the Public Interest (ASIPI) in Richmond, Virginia. The proponents refused to participate in this debate.

In October, 2001, Paul was invited by the Japanese Society for Fluoride Research to address a meeting of their society in Tokyo.

(2)

In November 2001, Paul (together with Dr. Phyllis Mullenix) was

proponents, but they again refused. On both the above occasions Dr. Connett gave a presentation of the arguments against fluoridation in lieu of the debate.

In January of 2003, Paul presented a keynote address on a weight of evidence analysis of the impact on water fluoridation on bone quality at the XXVth Conference of the International Society for Fluoride Research held in Dunedin, New Zealand.

In March 2003, Paul was invited by the US EPA to present the opponent's position in a one-on-one debate on fluoridation to be held at their annual Science Forum in Washington, DC, on May 6, 2003. Despite a six week effort by the organizers of this event, no scientist or official holding a pro-fluoridation position was willing to participate in this debate. In lieu of this debate, Paul provided a power-point presentation to a packed audience, which included 8 congressional aides, representatives from major environmental organizations, EPA officials and the media. The title of Paul's talk " Fluoridation: The Undefendable Practice."

On August 12, 2003, Paul gave an invited presentation to the US National Research Council committee reviewing the safety of the US EPA's Maximum Contaminant Level (MCL) for fluoride in drinking water.

On May 13, 2004, Paul gave an invited presentation on the dangers of fluoridation to the Irish Parliamentary Committee on Health and Children.

In 2005, Paul presented a paper on Fluoridation and Osteosarcoma to a conference organized by the International Society for Fluoride Research and held in Wiesbaden, Germany.

In 2007, Paul presented the case against fluoridation to a conference organized by the International Society for Fluoride Research and held in Beijing, China.

In 2008, Paul presented the case against fluoridation to a parliamentary committee in the Knesset, Israel.

In 2009, Paul was an invited panelist in three public fora organized by the South Central Strategic Health Authority (SHA) in Southampton, UK.

In 2010, Paul provided testimony in a public consultation organized by the Science Committee on Health and the Environmental Research (SCHER) of the EU in Brussels.

(3)

PUBLICATIONS

The Zero Waste Solution (Chelsea Green, 2013)

The Case Against Fluoride (Chelsea Green, 2011, co-authored with James Beck & H. Spedding Micklem)

Papers on Dioxin co-authored with Tom Webster:

1987, An estimation of the relative human exposure to 2,3,7,8-TCDD emissions via inhalation and ingestion of cow's milk. Chemosphere, 16, 2079-2084.

1989, Critical factors in the assessment of food chain contamination by PCDD/PCDF from incinerators. Chemosphere, 18, 1123-1129.

1989, Cumulative impact of incineration on agriculture: a screening procedure for calculating population risk. Chemosphere, 19, 597-602.

1990, The use of bioconcentration factors in estimating the 2,3,7,8-TCDD content of cow's milk. Chemosphere, 20, 779-786.

1991, Estimating bioconcentration factors and half-lives in humans using physiologically based pharmacokinetic modeling, Part 1: 2,3,7,8-TCDD. Chemosphere, 23, 1763.

1996, Dioxin emission inventories: the importance of large sources. Dioxin '96, Amsterdam, Aug. 12-16, 1996.

1997 An expanded version of the Dioxin '96 paper published in Chemosphere.

Papers on Risk Assessment co-authored with Tom Webster:

1990, Risk Assessment: A Public Health Hazard? Journal of Pesticide Reform, 10, 2631.

1991, Municipal Waste Incineration and Risk Analyses: The Need to Ask Larger Questions. Floridawatch Institute, P.O. Box 7211, Gainesville, FL 32605. 11 pages.

Papers on Waste Management:

1991, The Disposable Society, a chapter in Ecology, Economics and Ethics: The Broken Circle, Borman, F.H. and Kellert, S.R. (eds.), Yale University Press.

4

1994, Municipal Waste Incineration: Wrong Answer to the Wrong

1994, 7 pages.

1997, Medical Waste Incineration: A Mismatch Between Problem and Solution. The Ecologist (Asia) 5 (2) 31-36, March/April 1997.

1997, Science Education, Overconsumption and Survival on a Finite Planet. Frontiers: The Interdisciplinary Journal of Study Abroad, 3, 132-149, Boston University.

2001, A Citizens' Agenda for Zero Waste, Paul Connett and Bill Sheehan, available at http://www.grrn.org/zerowaste/community/citizens_agenda_4_zw.html.

Papers on Chromium:

1983, Connett, P.H. and Wetterhahn, K.E., Metabolism of the carcinogen chromate by cellular constituents, Structure and Bonding, 54, pp 93-124.

1984, Wetterhahn, K.E., Cupo, D.Y. and Connett, P.H., Metal Carcinogens: Metabolism and interaction with protein and DNA. Missouri's 18th Annual Conference on Trace Substances in Environmental Health, June 4-7, 1984, ed. D.D. Hemphill pp 154-162.

1985, Connett, P.H. and Wetterhahn, K.E., In vitro reaction of the carcinogen chromate with cellular thiols and carboxylic acids, Journal of the American Chemical Society, 107, 4282-4288.

1986, Connett, P.H. and Wetterhahn, K.E., Reaction of chromium (VI) with thiols: pH dependence of chromium (VI) thio ester formation. Journal of the American Chemical Society, 108, 1842-1847.

Papers on Nucleic Acids:

1967, Madison J.T., Holley, R.W., Poucher, J.S. and Connett, P.H., Use of polynucleotide phosphorylase in the sequence determination of oligonucleotides. Biochem. Biophys. Acta, 145, 825.

Papers on Fluoride:

2006, Connett P, Water fluoridation: Critical difference was overlooked. British Medicalk Journal, Jun 16;322(7300):1486-7.

2006, Connett P, Water fluoridation--a public health hazard, Int J Occup Environ Health, Jan-Mar;12(1):88-91.

With Tom Webster, co-authored six papers on dioxin, presented at the 6th, 7th, 8th, 9th, 10th and 16th International Symposia on Dioxin, held in Japan, Las Vegas, Sweden, Toronto, Germany, and The Netherlands. These papers have all been peer reviewed and published in *Chemosphere*.

1991, 1994, 1996: Co-organizer of the First, Second, and Third Citizens' Conference on Dioxin, held in Chapel Hill, NC; St. Louis, MO; and Baton Rouge, LA, respectively.

2004: Co-organizer of the First Citizens Conference on Fluoride held at St. Lawrence University and at Akwesasne (July 30-August 2).

Newsletters:

1988–2000, co-editor with wife Ellen Connett, of the newsletter *Waste Not*, published 48 times per year. *Waste Not* documented the incineration issue and other related issues (heavy metals, dioxin, etc.) that provided citizens the information they were not getting from the waste disposal industry and governmental agencies..

Videotapes:

1986-1996: with Roger Bailey of Video-Active Productions, produced 41 videotapes on various aspects of waste management, including a 10 part series on dioxin. Over 5,000 of these tapes have been distributed worldwide.

1997-2006: Executive producer for Grassroots and Global Video; produced 26 videos tapes on environmental justice, waste issues and fluoride toxicity with several more in production.

Public Lectures:

1985â€"present, given over 2500 public presentations in 49 states in the U.S, 7 provinces in Canada and 60 other countries (Argentina, Australia, Bangladesh, Belgium, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Czech Republic, Dubai, El Salvador, England, Estonia, France, Germany, Guam, Guatemala, Guernsey, Honduras, Hong Kong, Hungary, India, Ireland, Isle of Man, Israel, Italy, Japan, Lebanon, Lithuania, Malaysia, Mauritius, Mexico, Mozambique, Netherlands, New Zealand, Northern Ireland, Norway, the Philippines, Poland, Portugal, Puerto Rico, Romania, Russia, Scotland, Serbia, Slovakia, Slovenia, South Korea, South Africa, Spain, St. Croix, St. Martin/St. Maarten, Sweden, Switzerland, Taiwan, Thailand, Uruguay and Wales).

1998–1990: Member of advisory panel to the OTA (Office of Technology Assessment, Washington DC – an arm of the U.S. Congress) for their study of solid waste management in the U.S.

1989-1990: Member of the New York State Senate advisory panel on solid waste management.

1992–present: Editorial Advisory Board of E Magazine.

1995–1997: member of the "December" group, overseeing the reviewing stages of the US EPA's "Reassessment of Dioxin."

Sworn Testimony:

1986–present in the following states: Arkansas, Connecticut, Maine, Maryland, New Mexico, New York, Pennsylvania, Oklahoma, Rhode Island, Texas.

Media Appearances:

1986–present, appeared on many national radio and TV programs, including: Donohue, McNeil–Lehrer Report, Frontline (PBS), Currents (PBS), All Things Considered (National Public Radio), As It Happens (CBC–Canada), Dispatches (Channel 4, UK), BBC–Radio, Here and Now (ITV–UK), and radio and TV interviews in most of the 47 countries visited.

Awards:

1986: Award of Appreciation from the Ironbound Committee Against Toxic Waste, Newark, New Jersey.

1987: Public Citizenship Award presented by New York Public Interest Research Group.

1987: Citizen of the Year Award presented by the Canton Rotary Club, Canton, NY.

1988: The Giltz Award presented by St. Lawrence University, Canton, NY, for "outstanding service to the community."

1989: Special Appreciation Award from Citizens' Clearinghouse for Hazardous Waste Inc., Movement for Environmental Justice, Arlington, VA, along with Dr. Barry Commoner, Dr. Samuel Epstein, Dr. Peter Montague, and Ralph Nader.

1990: Conservationist of the Year with Ellen Connett, presented by the Environmental Planning Lobby, Albany, New York.

1992: Appointed Chair of the Environment by the Center for Creative Communications in Derry, Northern Ireland, as part of their Impact '92 program.

1997: Certificate of Recognition for Environmental Achievement from the New Jersey Environmental Federation, awarded to Paul and Ellen Connett, "In appreciation for your visionary commitment to protect and preserve our environment. Your Waste Not newsletter empowers us with knowledge and your extraordinary and selfless contribution to struggling people worldwide will continue to make ours a safer world now and into the twenty first century."

2000: First Annual GAIA (Global Anti-Incinerator Alliance) award, "Putting Out the Flames".

2008. Made an honorary citizen of Monte Maggiore in Italy in recognition of work on Zero Waste education and promotion.

2013. Made an honorary citizen of Grave in Chianti, Italy in recognition of work on Zero Waste education and promotion.

Other Interests:

1983-1990: Weekly host of a one-hour radio program on North Country Public Radio, Canton, NY, entitled Hooked on Voices.

1992–1998: Weekly host of a 2-hour radio program on North Country Public Radio, entitled Music and Company.

Nice Quotes:

1987: Ralph Nader: "Paul Connett is the only person I know who can make waste interesting."

1990: Louis Blumberg and Robert Gottlieb (authors of War on Waste) wrote in The Nation, 5-28-90, pp. 742-744:

> "Three of the most influential of the activist experts are Peter Montague, editor of "Rachel's Hazardous Waste News," a provocative, informative and feisty weekly newsletter published from Princeton, New Jersey, and Paul and Ellen Connett, editors of "Waste Not", another weekly newsletter published from Canton, New York. These publications have become essential reading for community groups, making obscure documents and reports accessible, covering project battles and revealing information the waste industry would rather keep hidden..."

Dr. Paul Connett has 88,000 followers on Fluoride Action Network.

WATER FLUORIDATION

FOLLOW THE $$$$$$$$$$

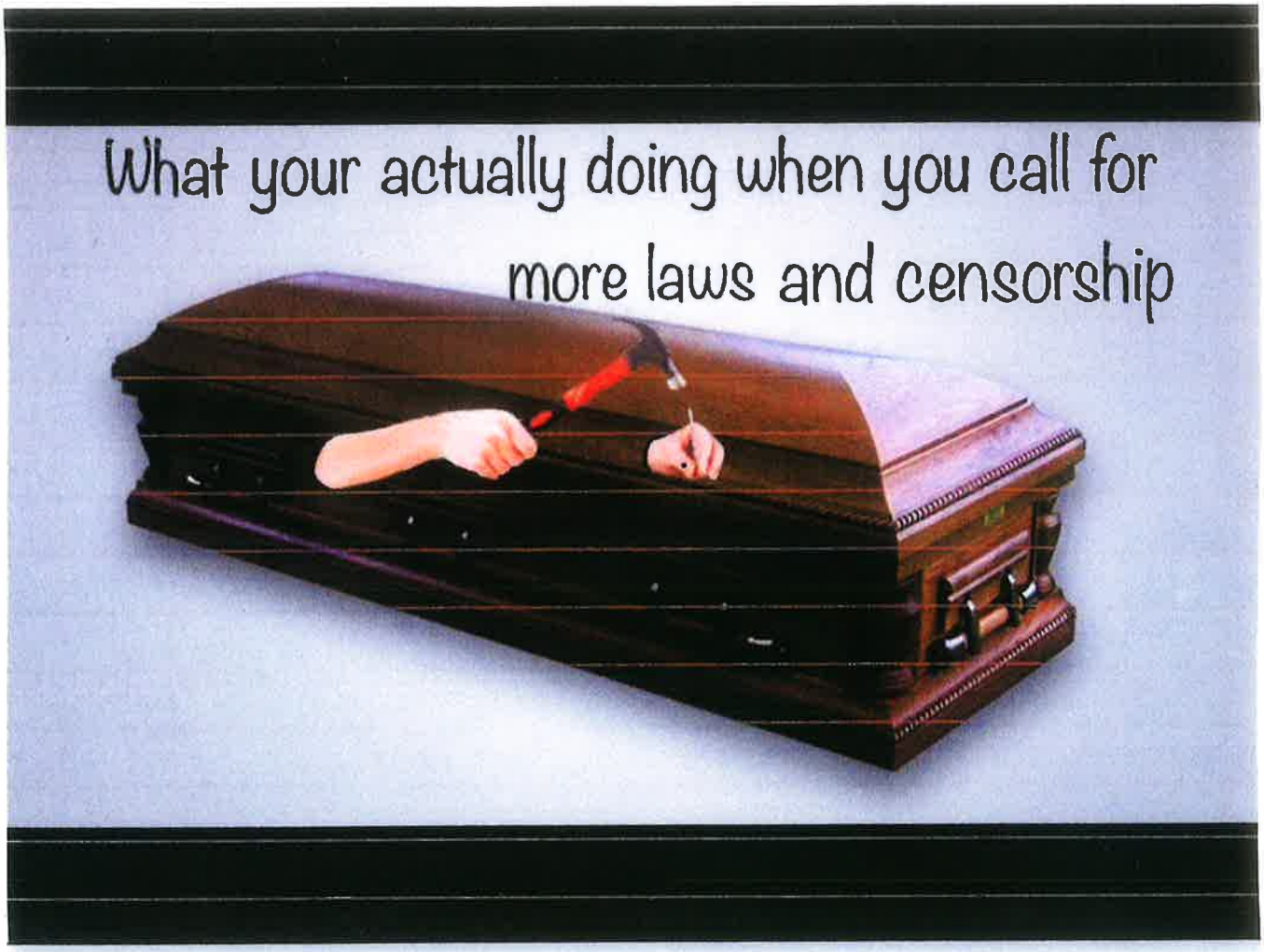
From left: Steve Slott, Chuck Haynie, Johnny Johnson, Kurt Ferré, Myron Allukian

Our Founders

The American Fluoridation Society was founded in 2014 by a group of concerned professionals anxious to see all residents of the United States served by community water systems enjoy the benefits of community water fluoridation (CWF). Equally important to this society is to prevent rollback attempts by opponents of CWF, as well as to initiate CWF where it has not been previously available.

American Fluoridation Society joins the fight to get Hydrofluorosilicic Acid back into Calgary's drinking water. Johnny Johnson (president) does public presentations, and Steve Slott's job is to go after anyone making comments opposing Water Fluoridation in any form of media or social media (in the U.S. or Canada).

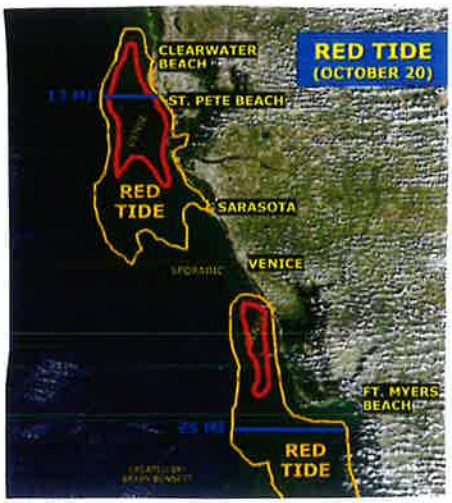
A vote for a Water Fluoridation plebiscite is a vote for the Fluoridation Lobby.



It will be the final nail in the coffin guaranteeing this industrial chemical ends up back in our water.

PROTECT OUR LAND AND WATER
STOP MOSAIC
PHOSPHATE MINING

PROTECT OUR LAND AND WATER
STOP MOSAIC
PHOSPHATE MINING



BRADENTON HERALD

LETTERS TO THE EDITOR

Mosaic phosphate mining leaves permanent damage

MAY 10, 2015 12:00 AM, UPDATED MAY 10, 2015 06:25 AM

The praise for the Mosaic Company in the Herald's May 2 editorial is just what the company wants to buy with contributions for the nature center at Robinson Preserve, the expansion at the South Florida Museum and donations to many other organizations.

The funds are placed by Mosaic to deceive the public about the harm caused by Mosaic's business in Florida, which is strip mining for phosphate ore.

Close to home, in the Four Corners area, private wells near mining sites are contaminated by excess radiation, causing health problems for residents and their animals.

Mosaic's name on environmental facilities distorts these realities:

Phosphate mining's massive groundwater withdrawals are linked to the loss of springs, reduction of fresh water flows to rivers and dewatering of wetlands and other lands.

Agriculture and tourism are decimated when areas are mined. The environment is worth more than its destruction.

Synthetic fertilizer is not the best way to grow crops (organic fertilizer can be used) and overuse has led to a massive Dead Zone in the Gulf of Mexico and many other impaired water bodies around the world.

Phosphate mining causes destruction of wildlife and degradation of water quality and quantity. Most of this damage is permanent. Moonscapes of unreclaimed land are left for years in spoil piles and deep pits.

Phosphogypsum is the hazardous waste created when phosphate ore is processed into fertilizer. It is stored in mountain-like structures that will be here forever.

One of these, at Piney Point, has overflowed several times, polluting Tampa Bay and costing the state of Florida more than $200 million. There are now 25 phosphogypsum stacks in Florida, disasters waiting to happen.

The vast expenditures by Mosaic for image boosting are for the purpose of blunting criticism of the destruction that mining brings to our county and state.

Sandra Ripberger, Manatee-Sarasota Sierra Group Bradenton

[CANCER RESEARCH 48, 7298–7303, December 15, 1988]

Cancer Morbidity and Mortality in Phosphate Workers[1]

Gladys Block,[2] Genevieve M. Matanoski, Raymond Seltser,[3] and Thomas Mitchell

Departments of Epidemiology [G. B., G. M. M., R. S.] and Environmental Health Sciences [T. M.], The Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland 21205

ABSTRACT

Phosphate ore mining and processing operations are associated with dusty conditions and potential exposure to γ radiation and radon daughter products. Although most current measurements are within Occupational Safety and Health Administration (OSHA) guidelines, no measurements exist for the era preceding modern standards of industrial hygiene and workplace ventilation. All workers employed by the participating phosphate company between 1950 and 1979 were ascertained, and 3451 males employed for approximately 6 months or more comprise the study population. Statistically significant elevations in lung cancer (standardized mortality ratio = 1.62) and emphysema were observed in white but not in black workers, in relation to U. S. rates. Among workers for whom 20 years had elapsed since first employment, there was a dose-response trend of increasing lung cancer risk with increasing duration of employment (standardized mortality ratio = 2.48 with 20 years of employment). There was no evidence of excess lung cancer risk among employees hired after 1960. Multivariate analyses and internal comparisons of risk by job type are consistent with a hypothesis of occupationally related lung cancer, but small numbers prevent firm conclusions.

INTRODUCTION

In recent years, the possibility of adverse health effects arising from exposure to phosphate mining and phosphate fertilizer production has become of increasing interest (1), with concern focussing on the possibility of a lung cancer risk. In addition, concern about nonoccupational radon exposure has directed attention to occupational populations for information about potential health effects. Potential exposures in the phosphate industry include chemical fumes (*e.g.*, sulfuric acid, fluorides, sulfur dioxide) from the beneficiation and fertilizer manufacturing processes; high silica dust levels in some job areas; and radiation resulting from uranium and radon daughter products associated with phosphate ore (2). The study reported here was undertaken at the request of a Florida phosphate company to determine whether there is an excess cancer risk among its workers.

METHODS

Workers employed between 1950 and 1979 were ascertained from company and union records, supplemented by a census of all of the company's IRS 941 Quarterly Reports from 1950 to 1978, a process which assured complete ascertainment. Workers employed for 6 months or more were included. Mortality follow-up was through 1981. Females accounted for only about 5% of the study population, and were not included in these analyses.

The study group was characterized with respect to age, sex, race, date of employment, and duration of employment using company records, if available, supplemented by reference to Florida Motor Vehicle records, death certificate information, and by direct questionnaire. If date and duration of employment were unavailable from company records, they were calculated from the dates in which an individual appeared on the Quarterly Reports referred to above. Table 1 presents the distribution of the study population by race and duration of employment (defined by the number of Quarterly Reports on which the individual appeared). Workers with five or more quarters of employment are referred to below as the long-term cohort.

For some analyses, missing values were imputed using the study population distribution, and the individual's Social Security number. Thus, for external SMR analyses (but not for the internal comparisons shown in Tables 6 and 7) approximately 30% of the years of birth were estimated, using a method described elsewhere (3). To investigate potential bias, an entirely different imputation method was also evaluated, which was based on the age distribution by race, year hired, and duration of employment. The impact on risk estimates of excluding all workers with missing values is addressed in the "Discussion" below.

Vital status was ascertained using Social Security Administration data, supplemented by motor vehicle and vital statistics records and personal contact, and confirmed by death certificate. Results are summarized in Table 2. Causes of death were coded by trained nosologists according to the Ninth Revision of the International Classification of Diseases. Data on nonfatal cancer morbidity were obtained by a search of the records from all of the major central Florida tumor registries, and from questionnaire information confirmed by physician or hospital records. All current workers and a large majority of retired workers lived in Central Florida.

An industrial hygiene analysis was conducted, in which detailed job descriptions covering the entire study period were examined, current plant conditions were inspected at the job site, and recent radiation measurements in this and other phosphate companies were ascertained. A job coding system was developed based on this industrial hygiene analysis, which characterized each job with respect to major plant area, dust exposure, chemical fumes, and several other exposures. Because processes and practices had changed over time and no historical data on radiation levels existed, it was not possible to assign quantitative radiation levels to jobs or work areas. Jobs were characterized with respect to their exposure to dust as a proxy measure, since phosphate dust had been shown to be highly correlated with radon daughter level.[4] Individual job histories were recorded directly from company records, and individuals were categorized according to the job area in which they had worked for the longest time.

As a result of this industrial hygiene analysis, only Drying/Shipping, Chemical/Fertilizer, and Maintenance job categories were found to have the potential for exposure to high levels of dust, chemical fumes, or radiation. Other job types were found to have minimal risk of such exposures. The Drying/Shipping area had jobs with potential for intermittent exposure to severe or enclosed dust conditions. In addition, time-weighted average exposures to radon progeny greater than twice the OSHA standards were observed inside poorly ventilated loading tunnels in the Drying/Shipping area, in other plants in the industry (4); and in both this and other plants, time-weighted average exposures to long-lived α radiation exceeding the OSHA standard were observed in a few measurements in certain very dusty jobs in this Drying/Shipping category.[5, 6] The Chemical and Fertilizer area had chemical fumes and a few elevated γ radiation measurements. Workers classified as Maintenance tended not to be exposed to a single plant area but worked in a variety of locations, and thus had a variety of intermittent exposures, including those in dusty or chemical areas. Thus, the industrial hygiene assessment suggested *a priori* that highest risk might exist

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[1] This research was supported by funds from the American Cyanamid Corporation. The authors gratefully acknowledge that support.

[2] To whom requests for reprints should be addressed, at Division of Cancer Prevention and Control, National Cancer Institute, Executive Plaza North, Room 313, 9000 Rockville Pike, Bethesda, MD 20892.

[3] Current address: Centers for Disease Control, Rockville, MD 20815.

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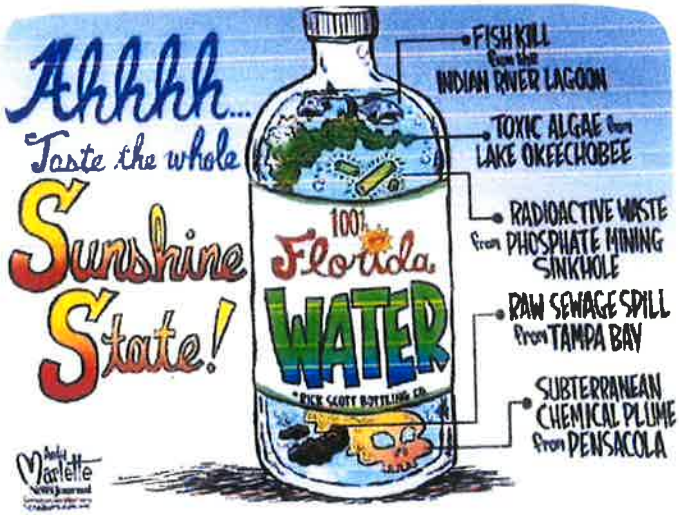

Do not Drink it.
Do not Swim in it.
Bacteria is Alive. 💔 🌴

Florida Phosphate Mining Waste By-Products Are Hazardous Waste

By David Hammock | Submitted On January 03, 2016

During the production of fertilizer from phosphates, many unwanted toxins or waste by-products are made as well. Florida's phosphate production's by-products are in the form of active airborne toxic chemical agents and heavy metals or central nervous system chemical agents. The agents include radium and poisons such as arsenic (1). There is "no safe level" of radioactive emissions from radium, says the U.S. Department of Environmental Protection (DEP).The DEP classifies radiological agents as hazardous waste and states that any measurable trace of these agents is highly toxic to all known life forms.

Fluorides Can Be Toxic Waste

During the 1940's, the phosphate industry in Polk County, Florida, released toxic airborne gasses and fumes to the local environment. The chemical release killed all life coming into contact with the toxic chemical agent. Over 25 thousand acres of farmland poisoned and over 30 thousand head of cattle perished in the wake as well, (5), according to the president of the Polk County Cattlemen's Association.

One of the toxins released is fluorine. Fluorine based gasses or fumes are responsible for causing severe environmental impacts to Florida residents and Central Florida's landscape. Fluoride poisoning in Polk County, Florida displays serious adverse effects on heath related issues and the economy as well.(3)

Florida's food producing industry is adversely affected due to Florida's phosphate industry's fluoride poisoning events. Estimates of the loss to those affected are about $500 million dollars, (6). Unfortunately, fluorine is released during the production of phosphate-based fertilizer by a process called "acidulation." Today, some but not all fluoride toxins are recovered from the process instead of released into the local environment (4). Historically, phosphate industry officials are not sympathetic to local economies (1) and do little in the way of economic revitalization, if any.

Fluorides Severe Environmental Impact

As time passes, it becomes evident, the toxins mentioned above continue to cause crop and cattle poisonings for years after the toxins initial release into the environment. The toxins killing animals and burning crops was found to be fluorides, based on veterinarian reports (2).

Fluoride poisoning is called skeletal fluorosis. Skeletal fluorosis causes swelling of the joints and is very painful. Today, fluoride poisoning is linked with arthritis. Florida's food producing industries found fluoride poisoning detrimental to their livelihood. Incidentally, food production is Florida's second largest industry behind tourism. Cattle companies and large crop producers had to relocate due to poisoned pastures and growing fields. Tens of thousands of acres were poisoned along with thousands of cattle in central Florida. (1)

Phosphate industry officials need engineers that will find a solution to make their waste by-products more environmentally friendly and economical for related industries to use. For example, industries requiring fluorine as a feedstock can use phosphate industry by-products. Currently, the phosphate industry stores all the recovered toxic waste. The waste by-product is stored locally to the phosphate plant in highly toxic mountainous structures called phosphogypsum stacks.

However, industries requiring fluoride based feedstock would use the fluorine waste produced from making fertilizer, but the process of making fertilizer also bonds the fluorine atom with silica. The bond between the fluorine atom and silica (silicofluorides) is expensive to break with current technology, so industry shies away from fluoride based phosphate waste by-products.

Untortunately, Florida's phosphate industry officials do not show interest in finding an environmentally sound solution. Poor environmental stewardship is one reason for the still growing phosphogypsum stacks on the central Florida landscape. Florida's residents should contact their elected officials concerning the environmental issues related to the phosphate industry.

Phosphogypsum and Commercial Applications

Phosphogypsum may have uses in the construction of roads. Road construction offers more demand for phosphogypsum to replace lime for road beds used now. According to Phosphate Management head for Florida's DEP believes the phosphogypsum is too dangerous for commercial purposes. The DEP decision is based on heavy metal radiation emissions from phosphogypsum due to uranium and radium. The Florida's Department of Environmental Protection still considers the phosphogypsum stacks as "the most serious pollution threat to the state" (Florida). One can see the industry's reluctance to remove toxins from the phosphogypsum stacks.

More waste by-products are made in the form of processed "waste clay" and contains toxic levels of uranium and radium. The Florida DEP does not allow toxic clays for reclamation projects of mined lands because the clay contains toxic levels of uranium and radium. The toxic clay is stored locally at the phosphate plant that made it, in the phosphogypsum stack. Again one can see the reluctance of phosphate industry officials to protect the Florida environment.

If the severe environmental impacts mentioned above were not enough, phosphate industry officials allow for over-pumping from the local aquifers, causing still greater stresses on the environment based on water shortages. (3) Central Florida's counties have been on water restrictions since the early 1990's due to over-pumping of Florida's aquifer systems.

However, Florida's phosphate industry pumps millions of gallons daily from the aquifers without fear of punishment from water management authorities. Interestingly, water from Florida's aquifers used by the phosphate industry is unmetered. At a minimum, unmetered water usage by Florida's phosphate industry needs to stop because of existing water restrictions placed on property owners. Florida's phosphate industry is asking for trouble it does not need based on recent environmental issues

Historically, Florida's phosphate industry produces tons of by-product toxins and then accidentally lets the toxins find their way out of the phosphate plants and into the local environment (3) for many years. Thus, illustrating over time, the phosphate industry's resolve to keep the status-quo in their favor. Florida's taxpayers will continue to pay for environmental impacts caused by the phosphate industry for many years to come.

The phosphate industry, historically, will not be held responsible for most of their environmental violations because Florida's elected officials do not hold industry officials accountable. Florida's residents should contact their elected officials concerning the phosphate industry's poor environmental record concerning Florida's landscape.

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Florida Mines is your website for learning the unethical practices of Florida's phosphate strip mining industry. See how they destroy and pollute unique aquifer systems, watershed, springs, creeks, and rivers. You will see the carnage left behind because their reclamation phase are too few and too far between.

Florida's residence should be up in arms over their environmental catastrophe.

https://www.flmines.com

TIME BOMBS

The Clock is Ticking on Florida's Mountains of Hazardous Phosphate Waste

Phosphate has also seeded Florida with the environmental equivalent of ticking time bombs.

By Craig Pittman • 4/26/2017 at 2:28am • Published in the May 2017 issue of *Sarasota Magazine*

One of the largest fertilizer manufacturing plants in the world sits about six miles southwest of the Polk County hamlet of Mulberry, with its entrance in walking distance of the Hillsborough County line. About 800 employees work there, turning phosphate rock into nearly 4 million tons of fertilizer and animal food ingredients every year.

They also produce a lot of waste. That's not unusual for the phosphate industry.

Drive through much of the Florida peninsula and the land you see is flat—flat as a pancake, flat as a billiard table, flat as a contestant on *The Voice* who's about to get the boot. But at the Mulberry plant, and everywhere else the phosphate industry operates, you'll see mountains. 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.

Many of those mountains belong to the same company that owns the Mulberry fertilizer plant, Mosaic. It's the biggest phosphate company in the world and a major presence in Florida. Mosaic is currently mining phosphate rock on more than 70,000 of the 380,000 acres it owns in Manatee, Hillsborough, Polk and Hardee counties. Meanwhile, despite vocal public opposition, it recently won local government approval to expand its mining in Manatee County by more than 3,000 additional acres just a short drive from Sarasota County's northern boundary—and from the source of its water supply.

Mosaic's phosphate mines and fertilizer factories must store their waste this way because there is no other way to get rid of it safely. The phosphogypsum is mildly radioactive, enough so that it exceeds a level that the U.S. Environmental Protection Agency has deemed safe for humans. The industry has proposed using its waste for everything from wallboard to road-building material. But the EPA, since 1992, has repeatedly said no. So the only solution is to stack it.

Mosaic contends the stacks are safe because the company "complies with the standards for waste handling and disposal" set by the EPA and state Department of Environmental Protection. In fact, the company says, "Mosaic is one of the most highly regulated companies in the state of Florida."

But from time to time, a problem crops up at one of the gyp stacks. Then the pond pooled on top spills out and threatens to poison a creek, a bay, or drinking water for miles around. The phosphate industry's benign image cracks apart.

For instance, in 2004, Hurricane Frances became the second of four hurricanes to slam into Florida in a six-week period. When its winds whipped across Hillsborough County, big waves churned up on the pond atop a 180-foot-tall gypsum stack at a phosphate plant in Riverview. The waves bashed a big hole in the dike around the pond, sending 65 million gallons of polluted water cascading down the stack's side into a stormwater ditch around its 400-acre base and, ultimately, into Archie Creek, which flows into Hillsborough Bay. It killed fish and drove away other marine life.

So while phosphate provides plenty of paying jobs, boosts America's crop yields and fill the campaign coffers of numerous Florida politicians, it's also seeded Florida with the environmental equivalent of ticking time bombs.

In August, at the Mulberry plant, one of those bombs went off.

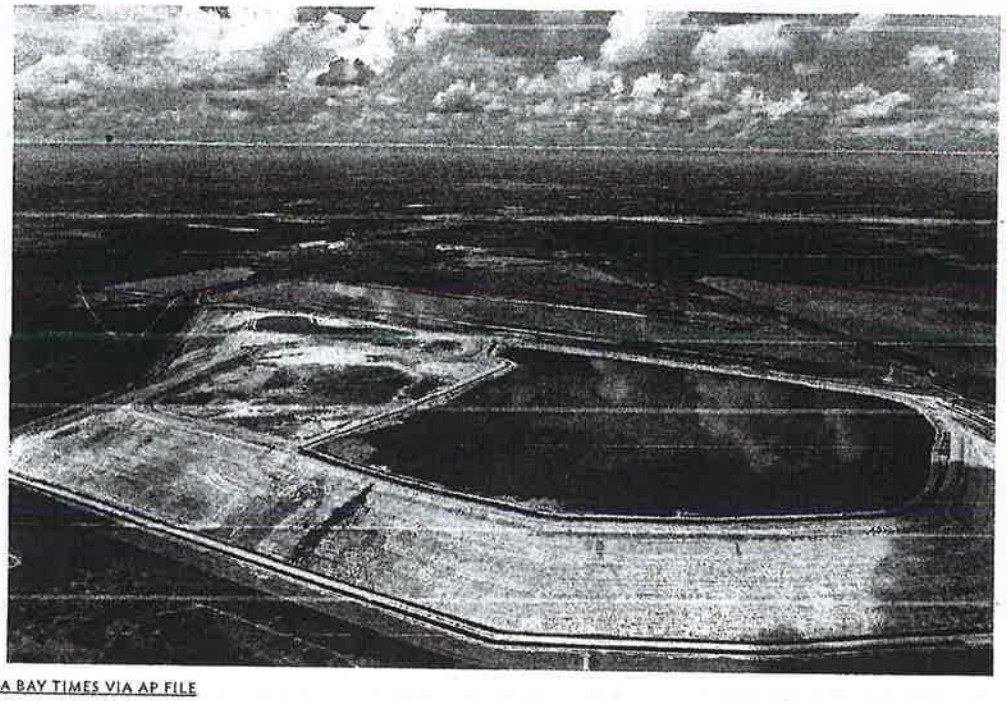


IMAGE: JIM DAMASKI/TAMPA BAY TIMES VIA AP FILE

The first sign something had gone wrong happened on the morning of Saturday, Aug. 27. Workers checked the water level in a 78-acre pond of polluted water sitting atop its 190-foot gyp stack and discovered it had dropped by more than a foot.

They decided it was just the wind blowing the water around. But around 11 a.m. Sunday, they checked again and realized the level had now dropped three feet.

What was sucking down all that contaminated water? A sinkhole 45 feet wide and 220 feet deep had opened up beneath the stack. Down went 215 million gallons of contaminated water, gurgling into the aquifer that supplies the region's drinking water.

Yet as the water drained down the hole, Mosaic employees, their consultants from Ardaman & Associates and state DEP inspectors all avoided saying the s-word. For 10 days they called it an "anomaly," or "a water loss incident."

Geologists say it should have been obvious right from the start what was happening. But not until the pond had drained out completely and everyone could see the fissure did they finally call it what it was.

A big reason geologists say it should have been obvious is history. One of the biggest Florida sinkholes ever recorded opened in 1994 at the very same facility where the Aug. 28 sinkhole opened. At 160 feet wide and 200 feet deep, it was so big wags dubbed it the new Disney ride, "Journey to the Center of the Earth." Like the 2016 sinkhole, it also sucked the pond from a gyp stack like water draining out of a bathtub. It happened just 1¼ miles from the new sinkhole.

Even after Mosaic and the DEP acknowledged that this new pond-draining event was a sinkhole, no one told the public what had happened. Florida law says neither the state nor the company involved has to notify anyone else about pollution spills until there's some sign the pollution has migrated outside the property where it went into the aquifer. (As of the end of December, more than 1,000 tests of water from wells around Mosaic's plant by a Mosaic contractor and by the DEP have not found any evidence it migrated into anyone's drinking supply.)

Neither Mosaic nor the government said a word about what was happening until Sept. 15, when a reporter for WFLA-Ch. 8 called Mosaic and the DEP to ask about rumors regarding the sinkhole. Only then did Mosaic make it public. On Sept. 20, the company apologized for keeping quiet.

"We deeply regret we didn't come forward sooner," Walt Precourt, senior vice president of phosphate for the company, told the Polk County Commission. "Any explanation about why we didn't would ring hollow."

Initially, Gov. Rick Scott—whom the DEP did not notify about the sinkhole until after it hit the news—defended the agency's silence. A week later, he reversed himself and called for a new approach. From now on, he said, he wanted any company or local government that spills a pollutant to notify the public about it, no matter where it ends up. Scott has vowed to push the 2017 Legislature to change the law to make that a requirement.

"It's based on my experience in business," Scott explained to reporters. "When something like this happens you say to yourself afterward, what can we do better?"

Yet the history of phosphate in Florida has largely been a story of doing the same destructive thing over and over.

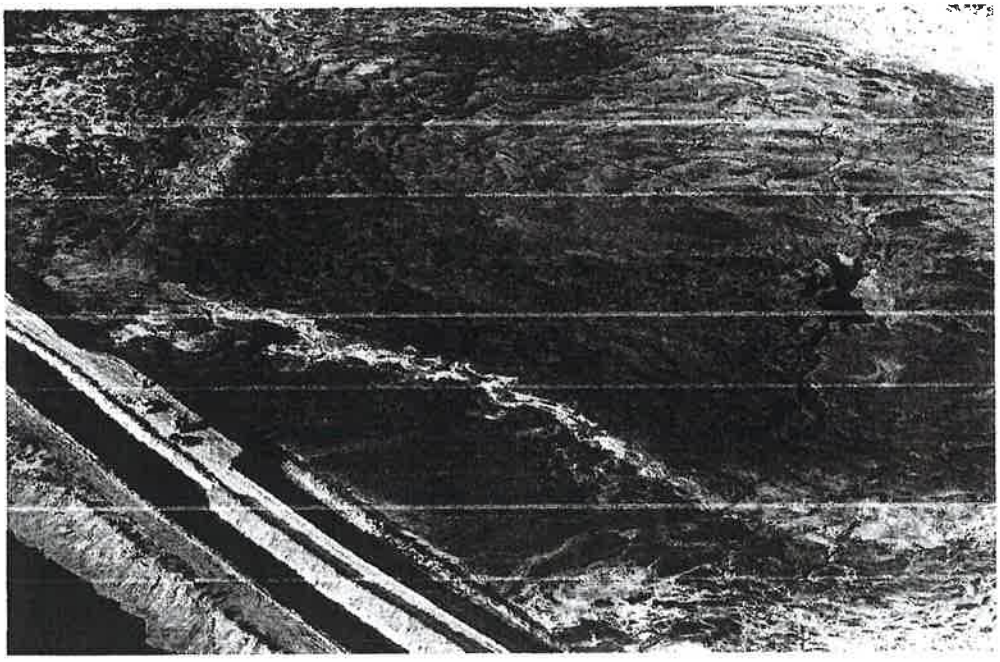


IMAGE: JIM DAMASKI/TAMPA BAY TIMES VIA AP FILE

Phosphate has been a part of Florida's economy for more than a century. First discovered in the Peace River by a Corps of Engineers captain in 1881, Florida's phosphate deposits today form the basis of an $85-billion industry that supplies three-fourths of the phosphate used in the United States.

To get at the underground deposits, the miners use a dragline with a bucket the size of a truck. It scoops up the top 30 feet of earth and dumps it to the side of the mine pit. Then the dragline scoops out the underlying section of earth, which contains phosphate rocks mixed with clay and sand. The bucket dumps this into a pit where high-pressure water guns create a slurry that can then be pumped to a plant up to 10 miles away.

At the plant, the phosphate is separated from the sand and clay. The clay slurry is pumped to a settling pond, and the phosphate is sent to a chemical processing plant where it is processed for use in fertilizer and other products. The sand is sent back to the mine site to fill in the hole after all the phosphate is dug out—years after the mining began.

When phosphate miners destroy a wetland, they promise to replace it a few decades later when they're finished—a seemingly impossible task.

"You're really talking about creating wetlands after 60 to 80 feet of earth have been soufflèed," Florida wetlands expert Kevin Erwin said in 2005.

The odds against success are higher than any gyp stack. Forty percent of the land that's left behind after mining is covered by the clay-slurry settling ponds. Within five years a crust forms on top of the ponds, but the stuff under the crust remains about as soft as a bowl of chocolate pudding. That means the old clay settling areas are too unstable for building. Meanwhile the sand-filled pits drain too fast to hold water—a serious problem for any would-be wetland.

The industry's track record for making up for wetlands damage isn't pretty. In 2002, in preparation for a lawsuit in which he was listed as an expert witness, Erwin toured several new wetlands built by IMC-Agrico. Erwin found that virtually all the wetlands the company built were deep marshes, with standing water two to four feet deep, instead of the thousands of acres of pine flatwoods that had once existed there.

Erwin said he asked his IMC tour guides to show him how the company had recreated a wet prairie. That particular type of environment is extremely difficult to rebuild, he said, but the site the mining officials showed him surprised him. The vegetation looked perfect, as if it had been growing there for decades. But then Erwin looked a little closer and discovered that this wet prairie had no roots.

"What they'd done is gone out in a wet prairie before it was mined and used a sod cutter," Erwin said. They sliced a swath of vegetation, rolled it up, and then when they were ready unrolled it like a section of carpet, he said.

But the miners forgot something important. "I took some borings and the water table was several feet below the surface," Erwin said. Since wetlands need water flowing through them to survive, this manmade wet prairie was unlikely to last long.

Destruction of wetlands is a major reason why, in December, four environmental groups—the Center for Biological Diversity, ManaSota-88, People for Protecting Peace River and Suncoast Waterkeeper—filed a notice of intent to sue the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service over their review of the impact of phosphate mining on 50,000 acres.

The mining approvals had been based on a 2013study published by the Army Corps that said creating those mines will destroy nearly 10,000 acres of wetlands and 50 miles of streams, causing a "significant" impact.

But the study—prepared for the Army Corps by a consultant paid by the phosphate industry—contended miners would do such a good job of making up for the damage that eventually the damage wouldn't be noticeable at all.

"Without mitigation, a lot of the effects would be significant—on wetlands, on groundwater, on surface water," Corps senior project manager John Fellows said when the study was released. "No question about it, mining is an impactive industry."

The phosphate industry produces a lot more waste than just the stuff in the gyp stacks. In 2012, the Southwest Florida Water Management District granted Mosaic a permit to pump up to 70 million gallons of water a day from more than 250 wells in Hillsborough, Manatee, Polk, Hardee and DeSoto counties, an area that since 1992 has been under tight restrictions for any new residential and commercial water use. Some of those millions of gallons—no one can say how much—is used to dilute Mosaic's polluted waste so it can be dumped into creeks without violating state regulations.

Without that freshwater to dilute it, what Mosaic is discharging would violate the state limits on a type of pollution called "conductivity," a term that refers to the solids that are left in the waste after it's processed.

In other words, dilution is the solution to their pollution.

The issue of how much water Mosaic pumps out of the ground was explored by a 2013 environmental impact study on phosphate mining commissioned by the U.S. Army Corps of Engineers. The Corps' report found that the miners' water use in some areas could lower the aquifer by up to 10 feet. However, it contended the aquifer would eventually recover—once the mining ended and the pumping stopped.

That approach to pollution control is completely legal under Florida law. But something else Mosaic was doing with its waste was not.

In 2003, the Piney Point phosphate plant, near the southern end of the Sunshine Skyway bridge, leaked some waste from atop its gyp stack into the edge of Tampa Bay after its owners walked away. That prompted the U.S. Environmental Protection Agency to launch a national review of phosphate mining facilities.

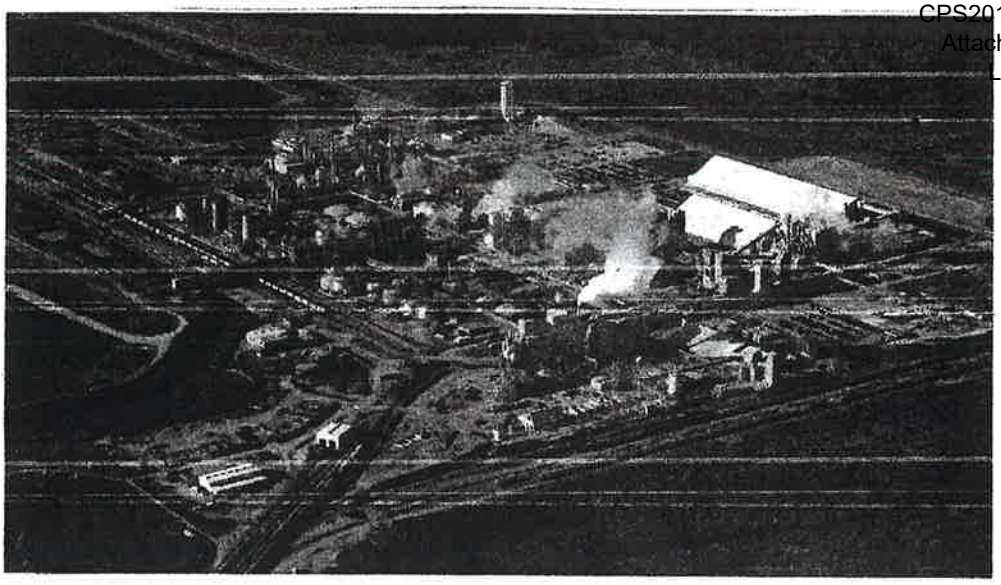
As a result, in 2007, the EPA took Mosaic to court, accusing the company of improper storage and disposal of waste from the production of phosphoric and sulfuric acids at its Florida facilities in Bartow, New Wales, Mulberry, Riverview, South Pierce and Green Bay, as well as two sites in Louisiana. The EPA said it had discovered the company's employees were mixing highly corrosive substances from its fertilizer operations with the solid waste and wastewater from mineral processing, in violation of federal and state hazardous waste laws.

In 2015, Mosaic agreed to settle the case. The EPA, in a news release, said the 60 billion pounds of hazardous waste addressed in this case "is the largest amount ever covered by a federal or state . . . settlement and will ensure that wastewater at Mosaic's facilities is properly managed and does not pose a threat to groundwater resources."

Mixing the waste was something everyone in the industry did, according to Richard Ghent of Mosaic's Florida operations. The EPA said that violated both state and federal law and put groundwater at risk. It had previously won settlements from two other companies, one of which, CF Industries, has since been taken over by Mosaic.

To settle the case, Mosaic agreed to invest at least $170 million at its fertilizer manufacturing facilities to keep those substances separate going forward. Mosaic also agreed put money aside for the safe future closure of the gypsum stacks and created a $630 million trust for that purpose. That money will be invested until it reaches $1.8 billion, which will pay for the closures.

What remains unknown is how many more gyp stack bombs will explode between now and then—and what the industry will do with its waste once the gyp stacks are shut down.



An aerial view of the Mulberry plant.

IMAGE: AP PHOTO/CHRIS O'MEARA

Dennis Mader grew up in Bone Valley, the area of Polk County where nearly all of the state's phosphate industry was located until a few years ago. It got that name because the phosphate miners sometimes dug up prehistoric fossils along with the ore.

Mader remembers how dusty the air was all the time, and how the water often tasted "like kerosene and mud." He and his buddies would camp out at the mines sometimes, back before security gates kept the public out.

"It was like No Man's Land," he recalled.

These days Mader, now a Hardee County resident, is president of 3PR, an environmental group promoting the protection of the Peace River, and a diehard opponent of allowing phosphate mining to expand its footprint. As the Polk mines played out, Mosaic's predecessors began laying the groundwork for a move south into Manatee, DeSoto and Hardee counties, opening new mines and expanding old ones. Meanwhile Mosaic is trying to figure out how to make money off the old mining sites—for instance, it has turned one near Bartow into the Streamsong Resort.

Mader's biggest argument against the expanded mining is the most obvious. "They have proven they can't handle their waste stream," he says.

In 1997, amid heavy rains, a dam broke atop one of two gypsum stacks at the Mulberry Phosphates plant on State Road 60, unleashing a 56-million gallon spill of the acidic wastewater into the Alafia River. The pollution killed everything in its path for 42 miles, eventually rolling into Hillsborough Bay. The death toll included more than 1 million baitfish and shellfish and 72,900 gamefish near the river's mouth, 377 acres of damaged trees and other vegetation along the riverbank, and an unknown number of alligators. When state officials hit the company with a multimillion-dollar fine for the damage done, it declared bankruptcy and shut down. (Its insurance company wound up footing the bill.) Ten years later, local and state officials were still working on restoration projects. Meanwhile the old gyp stack was taken over by a larger company—Mosaic—with plans to close it permanently.

Florida's leading industry is tourism. Nearly 100 million tourists visit the state every year. They show up because Florida's air and beaches are clean and free of pollution. One catastrophic gyp stack leak like the one that happened in 1997 can lay waste to an entire estuary, creating fishkills and other impacts that can drive the tourists away for years. To Mader, the two industries—tourism and phosphate—are like trains running straight toward each other on the same track.

"It's this head-on collision," he says, "between this industry and the environment of Florida."

Craig Pittman is an award-winning journalist for the Tampa Bay Times; he's also won a number of awards for pieces for Sarasota Magazine. He's the author of four books, most recently, Oh, Florida: How America's Weirdest State Influences the Rest of the Country.

Feature image by Virginia Hoffman.

Herald-Tribune

Speakers debate merits, dangers of phosphate mining

By Dale White
Staff Writer
Posted Feb 11, 2019 at 5:09 PM
Updated Feb 20, 2019 at 4:54 PM

'We do not have an anti-mining ordinance'

MANATEE COUNTY – A back-and-forth discussion on Monday about the merits and dangers associated with phosphate mining may not have changed any minds.

Yet it generated a dialogue between a spokesman for Mosaic Fertilizer, which operates mines in Manatee County, and several citizens who worry about the environmental and human health consequences associated with extracting and processing the mineral.

About 100 people attended the League of Women Voters of Manatee County's forum.

Russell Schweiss, vice president of mine permitting, land management and public affairs for Mosaic, stressed that phosphorus is a naturally occurring element. "It's in our bones. It's in our DNA."

He contended that fertilizer made from the ore is essential for feeding a global population of 7 billion.

Schweiss acknowledged that "mining is not a pretty process." Yet he said those who argue that the mining of phosphate must cease "should really contemplate what they're saying." He said the result would be "a ripple effect" that escalates the cost of food.

He showed a photo of himself holding a bass he caught last week in a reclaimed lake at a former Mosaic mine in Hardee County and emphasized the company's efforts to restore mined land into forested wetlands to which wildlife returns.

Andre Mele, an environmentalist with Suncoast Waterkeeper and the Sierra Club, presented a more dire picture.

He showed a photo that he said depicted a future mine property being set on fire and "scourged right down to the bare earth" to clear it.

"They burn it down to the ground," Mele said. "Talk about a scorched earth policy."

He showed aerial photos of what is often called the "moonscape" caused by phosphate mining.

Mele criticized phosphate companies' efforts to restore land that has been mined so it becomes natural habitat again. "It's not full restoration. It's not even close."

He noted that phosphogypsum, the radioactive waste from phosphate processing, has to be indefinitely stored in earthen mounds or "stacks" that can breach and contaminate nearby waterways.

Charlie Hunsicker, Manatee County's director of Parks and Natural Resources, said the county regulates the phosphate industry and imposes standards "more stringent than the state."

"Manatee County has a mining ordinance," Hunsicker said. "We do not have an anti-mining ordinance."

The county's approach is to avoid adverse environmental impacts if possible and, if not, minimize or mitigate those impacts, Hunsicker said.

Becky Canesse, an east county resident, expressed concerns about a sinkhole that occurred in 2016 at a Mosaic gypsum stack in Polk County that released 215 million gallons of polluted water into the aquifer.

She said the well water at her home showed radium at three times what is regarded as a safe limit, which she believes caused her to contract multiple cancers and her horse to get bone cancer.

Schweiss said that anyone relying on well water should periodically have their well tested and that, in Florida, radium can be detected in wells "nowhere near our mines."

Candace Luther, a former County Commission candidate, said a gypsum stack at a closed phosphate processing plant at Piney Point in Manatee County is "a huge disaster waiting to happen."

Hunsicker emphasized that the closed Piney Point stack, which belonged to a bankrupt company, is not associated with any Mosaic mine.

"You're not a good steward of the land," Glen Gibellina, a community activist, told Mosaic's representative.

Gibellina said his research shows that Mosaic – which also has mines in Louisiana and overseas- has been fined more than $851.3 million since 2000 for environmental, workplace safety and other violations by the U.S. Environmental Protection Agency and others.

Gibellina said he is an organic farmer. "We do very well without your fertilizer," he told Schweiss.

Schweiss emphasized that the mining industry has a record of improving its operations.

"No industry is perfect but every industry is better than it was 40 years ago," Schweiss said.

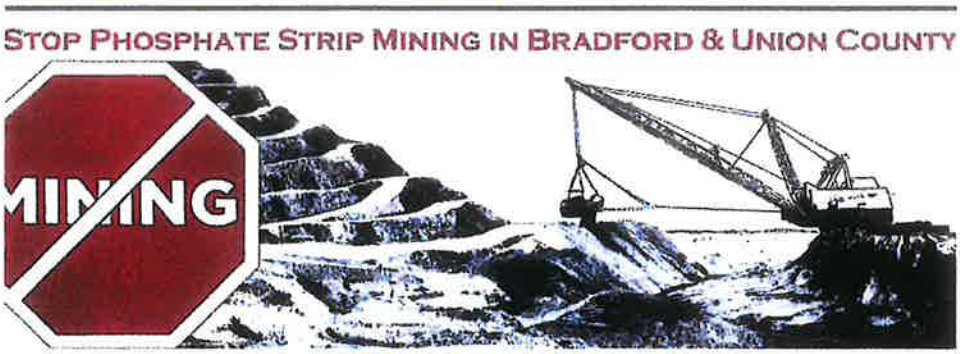
3

Phosphate Mine Threat in Florida

Dr. Steve R. Pieczenick, M.D. PhD

Phosphate Mine Threat in Florida

May 11, 2018 Dr. Steve R. Pieczenik, MD, PhD



PHOSPHATE MINES CONTINUE TO DESTROY THE FLORIDA ENVIRONMENT

Dr. George Meanwell

For nearly three generations, the Florida phosphate industry has claimed that any adverse environmental impacts on Florida citizens in surrounding areas are minimal. However, current phosphate industry mining practices conveniently "overlook" what are proven to be sound environmental practices, causing unwanted hazardous collateral damage to the Florida landscape as though it is their "right" to do so.

In the past two decades, the Unites States Department of Environmental Protection (DEP) has studied the effects of the radioactive elements that occur naturally in the Florida landscape compared to the highly compacted toxic waste by-product of the Florida phosphate industry. In the areas that are considered economical to mine, the "matrix" layer (which consists of phosphate rock, clay, and sand) is buried well below the surface or "overburden" as it is referred to by the phosphate industry. This toxic by-product (phosphor-gypsum) is left in massive mounds that can be seen throughout central Florida.

These toxic elements are in the decay chain of uranium (called radium) as a solid and radon gas as an air born toxin. These elements are normally confined deep below the surface, but the mighty phosphate dragline strips them from the fabric of the earth until it removes the phosphate matrix it seeks. In doing so, radioactive elements are brought to the surface, highly compacted, and stored in giant highly toxic mounds called phosphor-gypsum stacks (or "gyp stacks").

The radioactive material is combined with other toxic waste by-products and piled in gyp stacks, some of which are over two hundred feet in height and may cover over four hundred acres. That is the equivalent to a twenty story building covering four hundred acres of radioactive materials. Florida is home to at least twenty seven radioactive gyp stacks and each toxic stack is still growing. The gyp stacks are SO toxic that the DEP will not allow the phosphate industry to move the phosphor-gypsum off site.

The areas around phosphate facilities in central Florida usually consist of agricultural area, with some residential. The surrounding flora absorb the toxic elements caused by phosphate mining, and store cumulative amounts of toxins so that toxic materials move from the ground into the food chain, primarily through agriculture and cattle ranching. Both domesticated and wild animals are exposed to the same tainted food sources, introducing the toxins into the entire local food chain.

In one decade, at least six gyp stacks have failed in west central Florida due to their massive weight. When a gyp stack "fails" it causes a surface collapse sinkhole to form in the bottom of the gyp stack, and can then allow billions of gallons of toxic waste to drain through the sinkhole and into Floridian aquifer system. In one stack failure, the amount of environmental damage was so extensive that the DEP was unable to determine the total loss associated with the spill.

In another stack failure, a 150 foot hole opened under a gyp stack and 80 million tons of radioactive toxic waste disappeared into the Floridian aquifer, which contains about 90 percent of central Florida's drinking water. The toxic waste amount overwhelmed officials so much that the amount of environmental damage was again, undetermined. It cost almost $7 million to fill the sinkhole with concrete. In another phosphate industry induced accident, a gyp stack failed and almost 2 million gallons of radioactive toxic waste flowed over the landscape and two cars driving by the plant were carried away with the flow of toxic waste.

In another gyp stack breach in Riverview, Florida, it cost nearly $30 million in repair costs for the phosphate plant. The cost to recover from the severe local environmental impacts that were caused by the failed gyp-stack were covered by Florida taxpayers. Each time a phosphate industry "accident" occurs, both water and air quality degrade, causing health issues for many Floridians as well.

Sadly, central Florida's phosphate industry locates their facilities in watersheds where the production of fertilizer causes the greatest environmental damage to the landscape, drinking water, wild animals, and human inhabitants. Phosphate facilities severely pollute and disrupt the landscape locally and miles away from mining operations due to phosphate facilities built in central Florida's watershed. This is because watersheds and lowlands are nature's way of cleaning toxic materials from drinking water resources as the water percolates through karst rock formations into Florida's aquifers below.

Florida's phosphate facilities are considered by the DEP to be the greatest threat to Florida's

environment including land and aquatic life forms. Indisputably, the greatest offender is The Mosaic Company, which in 2016 allowed over 200 million gallons of radioactive water to be dumped into the aquifer in Polk County. This happened despite the fact that there were indications that a sinkhole was forming, and the threat of contamination was kept hidden from neighbors.

The examples mentioned above illustrate the poor environmental stewardship from the phosphate industry, which is now focused on north-central Florida. However, the Hazen, Howard, Pritchett, and Shadd families (organized as HPS II Enterprises) have proposed a massive phosphate mining operation together with Mosaic on over 10,000 acres that span portions of both Bradford and Union counties.

HPS II Enterprises is a new company with no experience in what it is trying to do. They claim to have a new mining procedure, but have provided no evidence of this. Rather, they have shown blatant disregard for proper legal procedures, with three recent violations. Specifically, they were cited on March 15, 2016 by the Suwannee River Water Management District (SRWMD) for engaging in dredge and fill activities in wetlands with no permits, and making illegal drainage ditches. They also admitted to the construction of 38 water wells without permits, receiving only a miniscule fine of $400 from SRWMD.

The fact that HPS II Enterprises partner, Mosaic Company has had numerous spills and contaminations in the past, and yet continue to pollute should give us pause. However, Jack Hazen brazenly boasts that, "God has made me his instrument to make this project a reality." Like the legendary tycoons (e.g., J. Pierpont Morgan, Alfred Vanderbilt, etc.) of the previous century, this is a man who cares only about increasing his massive fortune, with no real regard for the sanctity of human life or the health of others.

There are many reasons to reject this and ALL phosphate mining in Florida, as it is one of the most polluting industries that we have in this state. Contrary to what Mosaic Company and other "experts" say, we do not need the phosphate industry here. Phosphorus is a renewable resource and reliable estimates indicate that we have enough phosphate rock resources to last between 300 and 400 more years.

Most importantly, Florida is far more vulnerable to damage from phosphate mining than any other state for the simple reason that its sub-surface geology is dramatically different. Underneath a thin layer of dirt, the entire Florida peninsula has a sub-surface that is essentially a porous plateau of carbonate rock that is not solid, but rather, contains numerous

watersheds that store and transmit groundwater, in what is referred to as the "Floridian aquifer system." These permeable aquifers contain almost all of the fresh water resources for the population of north-central Florida.

Additionally, the phosphate mine proposed by HPS II Enterprises in Bradford and Union counties poses substantial water impacts on the Santa Fe River system, including harmful draw-down and pollution. The river is a major economic resource for its adjacent area. HPS II Enterprises has proven to be irresponsible in respecting rules and regulations, and the probability of an environmental catastrophe is high. The threat of a phosphate mine to the Santa Fe River system alone is catastrophic.

Phosphate mines have been shown to threaten and cause serious and long-lasting harm to Florida's natural resources, and most importantly its aquifer system and the drinking water for millions of Florida citizens. The phosphate industry in Florida has a long history of accidents, environmental destruction and bankruptcy, leaving behind millions in liabilities that taxpayers have had to clean up. The proposal of a phosphate mine in north-central Florida by HPS II Enterprises is wrong for many reasons. People like those running HPS, who sell their souls in such small quantities – believing that they are within their rights, but allowing a seemingly trivial compromise here or rationalization of a minor evil there – really don't realize what they're doing until it is too late.

Sources:

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NO PHOSPHATE MINING- NO WATER FLUORIDATION

PHOSPHATE INDUSTRY PRACTICES

The Phosphate Industry is destroying Florida's watersheds, lakes, aquafers and rivers.

They are also responsible for contaminating public drinking water in cities/towns around North America through the sale of their industry waste bi-product Hydrofluorosilicic Acid for the use in Water Fluoridation.

Florida's Phosphate Mines

March 28, 2019

There are 27 phosphate mines in Florida, covering more than 450,000 acres. Nine phosphate mines are currently active. Nine mines are 100 percent reclaimed and released from reclamation obligations. The remaining mines are either not started or are shut down. Phosphate mines typically range in size from approximately 5,000 to 100,000 acres. Phosphate mining disturbs between 3,000 to 6,000 acres annually in Florida. Approximately 25 to 30 percent of these lands are wetlands or other surface waters.

The Mining and Mitigation Program administers reclamation and stormwater management programs for mining operations in Florida, including phosphate. Reclamation standards for phosphate mining are detailed in Part II of Chapter 211, Part II of Chapter 378, Florida Statutes (F.S.), and Chapter 62C-16, Florida Administrative Code (F.A.C.). Phosphate mines require an ERP unless they are specifically grandfathered under Chapter 373.414(15), F.S.

Projects associated with mining operations for phosphate on land that was included in a conceptua reclamation plan or modification submitted prior to July 1, 1996, are grandfathered from the ERP rules. Even if grandfathered from ERP, unless the activity is specifically exempted by statutes or rules, a Wetland Resource Permit (WRP) is required if the project involves dredging or filling conducted in, on or over wetlands or other surface waters of the state. For phosphate mines still qualified for a WRP, the applicable rule is Chapter 62-312, F.A.C., effective August 7, 1995. Environmental resource permitting standards are detailed in Part IV of Chapter 373, F.S., and Chapter 62-330, F.A.C. Permits or authorizations from other local, state or federal agencies may also be required prior to mining

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FLORIDA

The Bradenton Times

Citizen Alert: More Phosphate Mining Coming to Manatee

Dennis Maley • Thursday, Jan 19, 2017

On January 26, the Mosaic Fertilizer company will go before the Manatee County Commission to request a rezone of 3,500 acres in order to expand its phosphate strip mine in the northeast corner of Manatee County. At the same meeting, the BOCC will consider a master mine plan. An approval would significantly increase the intensity of mining in a section of the county that has already been ravaged for decades by the industry.

The Wingate East Mine is in a rural area of Manatee County known as Duette. It's a place that most residents don't even know exists, because there's little reason to drive through the rural hamlet that lies well off the beaten path of major roadways and connecting arteries. Out of sight and out of mind, the $20 billion industry giant has managed to successfully expand operations there despite constant opposition from a determined cadre of local environmentalists and groups like ManaSota 88 and the Sierra Club.

Aside from the apocalyptic damage to wildlife habitats for a diverse range of species that includes the American bald eagle, gopher tortoises, egrets, the Florida burrowing owl, our sandhill crane and many, many more, there are numerous reasons for Manatee County residents to oppose the expansion of this dirty industry, the ramifications of which are far broader than most of us realize.

Phosphate mining is an incredibly water-intensive industry and Mosaic pumps and spoils billions of gallons of groundwater—at the nominal cost of a ridiculously inadequate permit fee—in order to get the phosphate rock out of the ground (read more about that here). Groundwater modeling already paints a very grim picture of water supplies for our state in the near-term future with more sinkholes and more need for expensive, fossil fuel-intensive desalination plants on the horizon, as well as higher residential rates like the ones that phosphate mining have brought to Hillsborough County.

The mining also leaves behind a toxic substance called phosphogypsum, a radioactive byproduct of processing the phosphate, for which no safe use has been found. Quite simply, more phosphate mining means more phosphogypsum. A billion tons of this toxic sludge already lines the Florida landscape in what are called "gypsum stacks," while millions of gallons of acidic wastewater sits in lined ponds waiting for tears to happen like the one which ultimately sent millions of gallons of hazardous discharge into Bishop Harbor—part of the Terra Ceia Aquatic Buffer Preserve—from a spill at Piney Point in 2011. Florida's tendency to suffer hurricanes obviously exacerbates the risk of this nonsensical practice.

Last September, a 45-foot-wide, 300-foot-deep sinkhole opened underneath one of Mosaic's phosphogypsum stacks at the

company's phosphate fertilizer plant in Mulberry, putting hundreds of millions of gallons of contaminated water into the Floridan Aquifer. The company and DEP waited weeks before acknowledging the catastrophe, failing to even notify neighbors who share the water source.

Phosphate mining operations also produce plenty of fluoride gases that once upon a time escaped into the air and poisoned surrounding agriculture and livestock. Pollution control technology like wet scrubbers have helped to contain the fluoride, but it still needs to be disposed of. That's where you come in. While the FDA has never approved fluoride ingestion for medical use, your body acts as a free filtration system when municipalities buy the toxin from such companies (with your tax money) and dump it into your drinking water, ostensibly to prevent cavities—a practice that's been compared to drinking sunscreen lotion to prevent sunburn (and shouldn't be confused with topical fluoride treatments given by dentists). There is a wide body of evidence demonstrating that municipalities that do not employ this practice have no higher rate of tooth decay, and most bottled water manufacturers have actually removed fluoride from water marketed as being for "babies" because it can cause dental fluorosis when ingested during enamel formation.

Mosaic spends millions of dollars advertising itself as a green company that recycles water and reclaims mined lands (making itself an important client of many media outlets in the process, which may then have an incentive to handle the subject of mining's environmental costs with kid gloves), but a report from the Florida Industrial and Phosphate Research Institute claims that approximately 40 percent of the mined-out lands have been left in toxic-waste clay settling areas, creating over 125,000 acres of these toxic slime ponds throughout the state.

Mosaic's plan for the Wingate East expansion includes the addition of a third clay settling area, this one in the headwaters of the Myakka River, where it will threaten the tributaries that flow into that body of water (other clay settling areas are already in the Manatee River shed). Some 350 acres of the expansion would also impact the Peace River watershed, yet it does not seem that Sarasota County has been brought into the planning process.

The "overriding public benefit" that the company will attempt to use to justify the expansion is a paltry $2.5 million into a land conservation fund for future acquisition of conservation lands, along with some vague "conservation buffers" on the property. It would seem that Manatee County residents could do without either, if it means not increasing the already significant threat phosphate mining poses to our water supply.

Yesterday, I attended ManaSota 88's monthly meeting. Chairman Glenn Compton explained that the county commission can only consider the rezone in terms of whether it complies with the county's current comprehensive land use plan. His group has detailed numerous reasons why it does *not* and will be recommending that it is denied on that basis. Compton was most troubled by the addition of another clay settling pond and says the application fails to prove that there will be no impact on the Myakka River. He said the $2.5 million figure seems to be a completely arbitrary number decided by the company, which seems to be getting off very cheap considering the impact.

Anyone who's followed this issue knows how such proceedings usually play out. Mosaic gets there early and fills the seats of the commission chambers with bodies in an effort to limit the amount of citizens opposing their actions from getting a seat, while creating the illusion that the community is somewhat split on the issue. Those who can't get in are shoved off to a 4th floor "overflow" room to watch it on video. The opposition does their best to beg, badger or shame board members into standing up for the community and its public resources and not the company that so generously contributes to many of their campaigns. There is lots of hemming and hawing, followed by Mosaic getting what it wants.

Compton and other activists are hoping that the recent sinkhole incident along with heightened public scrutiny of issues related to drinking water in the wake of the Flint, Michigan disaster will finally tip the scales and our residents will rally to send a powerful enough message to board members that enough is enough when it comes to phosphate mining. Turnout at a protest in front of the county administration building Saturday, where around 50 citizens marched in opposition of the expansion, suggests he may be correct.

In fact, Manasota 88 is expecting so many citizens at the land use meeting that they've asked for a change of venue to ensure that all members of the public who want to attend and give public comment can do so. They've been told by county officials that it's unlikely to be granted. The meeting is scheduled for Thursday, January 26 at 9 a.m. at the county administration building, located at 1112 Manatee Avenue West. You probably want to arrive at least 45 minutes early in order to ensure a seat, and then fill out a public comment card if you'd like up to three minutes to tell commissioners how you feel from the dais. The meeting will also be televised online and on local television by ME-TV. If you can't make the meeting, be sure to call or email your commissioner along with the two countywide commissioners to let them know your position.

I'd also encourage you to check out ManaSota 88, which meets on the third Wednesday of every month and is the front-line defense against the ravages of phosphate mining in our area. Mr. Compton graciously makes himself available to speak before any group that is interested in learning more about the environmental dangers associated with the industry. If you belong to a social or civic group, consider having him at a future meeting as a guest speaker so that more people can learn about this important issue. In order to push back hard enough to make a difference, it will take an all hands on deck approach. The future viability of clean water in Manatee County depends on it.

Dennis Maley is a featured columnist for The Bradenton Times. His column appears each Thursday and Sunday. He is the author of the novel, A Long Road Home, and the brand new short story collection, Casting Shadows, which can be ordered in paperback here, or in the Amazon Kindle store here.

THE BRADENTON TIMES READER COMMENTS

Candy Luther

JAN 19 • Since Betsy Benac is a member of the Peace River Manasota Regional Water Supply Authority, I would hope that she has enough knowledge of this to know that she can only rightfully vote "NO" on this. Since the mission statement of the Authority reads, "The mission of the Authority is to provide the region with a sufficient, high-quality, safe drinking water supply that is reliable, sustainable and protective of our natural resources now and into the future," an approval of this expansion and future addition of acreage to be used for mining would go against the purpose of this Authority. There is no way to keep the chemicals from leaking into the neighboring rivers and streams, and we all know this regardless of what the Mosaic people claim. We also know that the land reclaimed after 30-40 years of destruction will never be restored to what it once was, and will never sustain the flora and fauna that once occupied the land. The commissioners need to do the right thing for the citizens of Manatee County and say "NO" to Mosaic.

Nancy R Dean

JAN 19 • Thank you for explaining to new comers what MOSAIC had done to the land and water in FL. I only emphasize the point that drinking water, recreational water and water for wildlife is already insufficient for current populations. Growth will not stop; so massive water use and pollution is totally wrong for our area.

Column: It's time to rein in Florida's phosphate strip mining

TAMPA BAY TIMES

By Jaclyn Lopez, special to the Tampa Bay Times

Published September 19 2016
Updated September 19 2016

Florida is starting to wake up to its massive phosphate mining problem.

Phosphate mining has not only scarred the face of Florida but created the perpetual threat of contaminated water being released into the Floridan Aquifer, which provides drinking water to millions of people.

Late last week broke the news that a massive sinkhole had opened up in a stack of waste at a Mosaic phosphate mine just 30 miles east of Tampa in New Wales. The sinkhole has already caused at least 215 million gallons of contaminated water to spill into the Floridan Aquifer. The spill had been going on for three weeks before the story broke.

The New Wales sinkhole was not the first phosphogypsum sinkhole, and will likely not be the last, a reality that sheds new light on efforts to expand two of the state's existing phosphate mines and approve a new mine.

Unknown to many Floridians, the state leads the nation in the environmentally destructive practice of phosphate mining, a process that creates phosphogypsum waste — fertilizer byproduct with low levels of radiation — that is stored in stacks hundreds of feet tall. It was in one of those radioactive storage stacks where Mosaic discovered the sinkhole.

Phosphate mines — which require scraping away the earth's surface and removing 60 feet of sand, clay and phosphoric rock — cover 837 square miles of central Florida, an area more than two-thirds the size of Rhode Island.

The bulk of the state's 27 phosphate mines are concentrated in the 1.3 million acre fossil-rich area known as Bone Valley just east of the Tampa area, with the majority of the mining in Polk, Hillsborough, Manatee and Hardee counties.

Phosphogypsum waste is produced when sulfuric acid is applied to phosphoric ore to turn it into phosphoric acid. The process releases and concentrates the naturally occurring low levels of uranium and radium; the EPA considers phosphogypsum radioactive waste and requires it to be stored in above-ground stacks in the hopes of keeping cancer-causing radon gas and the uranium and radium from escaping into the environment.

Five tons of waste are generated for every one ton of usable phosphate. And there's no long-term solution in place for what will be done with the more than 1 billion tons of waste in the stacks that have already been generated.

Open-pit mining also permanently replaces native landscape with so-called "reclaimed land" that can sometimes support non-native species like cogon grass, eucalyptus trees and cows. And studies of waters downstream of phosphate mines have found an increase in heavy metals like lead, and studies of aquifers have found chemicals used to process the phosphate, like fuel oil.

Yet, despite the mines' close proximity to one of the state's largest urban centers, most Floridians know little of their existence, let alone their troubling long-term environmental impacts.

But Florida's dirty little secret is about to get a lot bigger.

A proposal called the South Pasture Extension to expand a surface mine in Hardee County by more than 7,500 acres — including through hundreds of acres of wetlands — is now moving through an Army Corps of Engineers approval process, despite the clear risk the project poses to wildlife, people and the Peace River.

Meanwhile, the Manatee County Planning Commission just voted to expand a different mine called the Wingate East Mine by rezoning more than 3,500 acres of agricultural land for phosphate mining. The Manatee County Board of Commissioners will have the final say on Sept. 29.

And the Bradford County Board of Commissioners is considering a 5,000-acre mine — it would have been a 10,000-acre mine if the Union County Board of Commissioners didn't just approve a one-year moratorium on approving mines — that would bisect the New River and run right through critical habitat for the oval pigtoe, and endangered freshwater mussel.

SK

Given the many unanswered questions about the long-term environmental and health risk associated with an expansion of the mine, the Corps should extend the proposal comment period and hold public hearings on the South Pasture Extension; the Manatee County Board of Commissioners should deny the rezone request at the public hearing on Sept. 29; and Bradford County should likewise deny the request before it, or institute a moratorium until more research can be done on the effects of mining in that area.

More important, the Florida Legislature should revisit its cozy relationship with the industry and fly over the areas already devastated by phosphate mining. They should go back to the books and require restoration, not just reclamation.

Jaclyn Lopez is a Florida native and the Florida director for the Center for Biological Diversity.

Enviro Groups Lose Bid to Stop Florida Phosphate Mine

ALEX PICKETT December 15, 2017

(CN) – The world's largest producer of potash and phosphate fertilizer can proceed with plans to greatly expand mining operations in Florida, a federal judge ruled.

In his ruling, which was issued Wednesday, U.S. District Judge Steven Merryday dismissed claims brought by four environmental groups who alleged the expansion of an existing mine and creation of three others would significantly damage 57,000 acres wetlands and woodlands in Southwest and Central Florida.

Together the Center for Biological Diversity, Manasota-88 Inc., People for Protecting Peace River and Suncoast Waterkeeper challenged federal permits given to Mosaic Fertilizer, claiming the approvals did not adhere to the Clean Air Act, Endangered Species Act and National Environmental Policy Act.

"We're obviously disappointed by the ruling and considering our options for appeal," said Hannah Connor, senior attorney with the Center for Biological Diversity. "A lot of organizations are really concerned about their community's health and their environment moving forward."

Mosaic was not originally named in the suit, since a predecessor company requested and was awarded the permits, but later became a party to the litigation.

"We are pleased that the court's ruling demonstrated the strength and validity of our South Pasture Extension permit and the environmental review that accompanied it," said Mosaic spokesman Russell Schweiss by e-mail. "While we are confident that the Center for Biological Diversity will not be deterred in its efforts to end the thousands of jobs our industry supports, we're encouraged that the court dismissed their arguments and affirmed our permit."

Minnesota-based Mosaic's largest phosphate mines and processing plants operate in Florida. Its open pit mines dot the landscape in five Florida counties.

The Fortune 500 company wants to expand one mine near the Peace River watershed near Sarasota, Florida, and build three new mines in Central Florida.

But environmental groups contend the mining process drastically alters the ecology of the area.

According to court documents, the company typically uses a dragline to remove 30 feet of vegetation and top soil, extracts the phosphate and transports the ore to a nearby plant. The

ore is treated with chemicals to create the synthetic fertilizer sold throughout the world.

But the plaintiffs claim the process also creates radioactive phosphogypsum that requires storage in large pools of acidic wastewater called a gypsum stack.

This water — a cocktail of chemicals and minerals with low levels of radiation – poses a risk for animals and humans, the environmentalists claim.

In 2015, Mosaic reached two settlements with the Environmental Protection Agency to resolve claims about hazardous waste management practices at eight sites in Florida and Louisiana. The company agreed to pay an $8 million fine. It also committed $630 million which will grow to $1.8 billion to support the long-term care of phosphogypsum stacks on those sites. Mosaic also agreed to fund environmental projects and capital improvements.

Last year, a 45-foot-wide sinkhole opened up under one of the gypsum stacks, swallowing an estimated 215 million gallons of the wastewater. The company confirmed the wastewater reached the Florida aquifer, the state's main source of drinking water.

Residents of the area immediately sued the company, but dropped the lawsuit in June.

The environmental groups said they filed their lawsuit because they did not want a repeat of the past.

The original complaint claimed federal regulators did not properly review Mosaic's proposal in its 2013 area-wide Environmental Impact Statement. Among other points of contention, the report does not consider mine site alternatives to areas bordering streams and rivers.

The environmental groups also worried the mines would harm some of the state's most endangered species, including the Florida panther.

Although reports prepared by the regulators said they expect wild animals will move to more isolated areas, critics argue the mines border each other and may leave the creatures no place to go.

The lawsuit also questioned the U.S. Fish and Wildlife Service's failure to conduct a "cumulative impact" on species from all the proposed mines. In some cases, the complaint stated, the FWS used the exact language found in Mosaic's application for their final report.

The judge, however, agreed with the agencies' attorneys who argued the environmental groups could not show the federal government acted arbitrarily or capriciously in approving the mine permits.

The defend Department of the Interior and the U.S. Corps of Engineers directed questions to the Department of Justice, which declined to comment. U.S. Fish and Wildlife Service spokesman Phil Kloer said the agency was pleased with the ruling.

"We continue to try to base all of our decisions on the best available science," he said via e-mail.

Phosphate Mining Threatens Our Homes, Families & Environment | Stop the Mosaic Mines & Save Southwest Florida

July 20, 2018

TIDE+TALE

UPDATED DECEMBER 2018

When I wrote my first draft of this, I was riddled with emotion and ranting through my keyboard. I had a pit in my stomach and tears in my eyes thinking of how my family would be personally affected by mining operations so close to our homes. I possibly used some profanities, but that may be related to the three cups of Cafe Bustelo espresso I'd consumed prior.

It's been a few days. I'm calmer. I've done research (a lot). I've read the outrage on Facebook. And I've revisited this post to inform you of what I've learned about the potential consequences of phosphate mining. For people and the environment.

Supporters of mining consider this a "scare tactic." I've also heard accusations of being against agriculture or farmers. This couldn't be further from the truth. Wanting to prevent mining from potentially harming our families, our homes and

our communities, is because **we love our families, our homes and our communities**. And we will do everything in our power to protect them.

If you are a visual person, here's a 10-minute video that gives you a quick rundown on phosphate mining. Otherwise, read on.

Posted by Mike Knepper
757,215 Views

Phosphate Mining is Florida's dirty little secret. Not many people even know of the environmental devastation that is going on in our state involving this mining. Our leaders are looking the other way while these companies destroy our natural wonders. Please share this video because all Floridians need to know the facts so we can demand that our leaders stop them from poisoning our environment and our water supply!

1.6K 1K 26K

Death in the Air: Air Pollution from Phosphate Fertilizer Production

by George Glasser

In the early predawn hours when the air is still and moist, phosphate fertilizer factories are often shrouded in an acidic haze. Temperature inversions form airy bubbles of noxious, acidic fumes. Lights from the factories seem to blaze through the hellish mist, and the lemony taste of sulfuric and hydrofluoric acid leaves the lips tingling with a slight burning sensation. Then the delicate tissues in the nostrils begin to tingle with a stinging sensation. Floating and sparkling in the still morning air, microscopic acid droplets splash against the thin film of fluid protecting the eyes, and subsequent burning and watering blur one's vision. And finally, the full impact of inhaling the noxious smog causes choking and coughing.

Sometimes, the misting hydrofluoric, fluorosilicic, phosphoric and sulfuric acids are so concentrated, they etch the windshields and eat the paint off cars passing through the fog.

For those employed at the phosphoric acid factories, this is the work world they enter every day. Day in and day out, they eat, breathe, and drink toxic pollution until they become too sick to work, or die.

Gary Owen Pittman was one of those people. While Gary and his coworkers worked amidst the toxic, corrosive fumes, the corporate elite at Occidental Chemical Corporation sat safely in well-ventilated, air-conditioned offices some seven miles from the factory.

The emissions were so acidic at the plant, visiting secretaries complained of their panty hose being dissolved on their legs. Reassuringly, management said they had come into contact with some chemicals, but there was nothing to worry about.

Gary's first and last job was working for the Occidental Chemical Corporation's phosphoric acid factories in Hamilton County, Florida. Gary Pittman was 18 years old and in excellent health when he started to work in the analytical laboratory of the Suwannee River Plant. He rose from a $4,000 sample man in the laboratory to supervising one third of Occidental's Swift Creek plant, earning about $50,000 a year.

Today, Gary is unable to work and suffers from auto-immune disorders, toxic myopathy, chronic obstructive lung diseases with emphysema, chronic bronchitis, blood disorders, chronic fatigue syndrome, liver dysfunctions, polyarthritis, swelling

of feet and lower legs, muscle weakness, cardiac arrhythmia, reactive depression, and memory loss. He walks with a waddling gate and suffers dizziness: the diagnosis is toxic brain syndrome.

Gary Pittman does little these days except surf the internet to learn more about the toxic effects of chemicals to which he and his coworkers were exposed. The list reads like the top 40 toxic chemicals on the Superfund Priority List of hazardous substances that pose the most significant threat to human health. The chemical exposures left him unable to work at the age of 39, and five years later, Gary Pittman finds difficulty enjoying the simple pleasures of life.

The adverse environmental and health effects from phosphoric acid production are well documented in newspaper articles from the 1970's, 80's and into the 1990's. But to the author's knowledge, the EPA and Centers for Disease Control (USCDC) have never commissioned any substantive studies.

Geology of Florida, 1997 reports: For more than 100 years, Florida has been a major producer of superphosphate fertilizer and phosphoric acid.

There are few regulations governing wastes from phosphoric acid and superphosphate fertilizer production.

In the phosphate producing regions, telltale environmental damage is the legacy of the industry. It is not uncommon to see ragged holes filled with low level radioactive water left from strip-mining operations. Reclaimed land emits high levels of radon; people who have built homes on reclaimed land stand a greater chance of developing lung cancer and leukemia. Phosphogypsum stacks are piled up to 200 feet high and leach toxic chemicals into the aquifer and toxic dust into the atmosphere.

Spills from toxic waste-water ponds dump hundreds of millions of gallons of highly acidic water laced with toxic fluorides, radionuclides, heavy metals, sulfites and phosphoric acid into rivers and streams. Massive fish kills are not unusual when these spills occur. There are few regulations governing wastes from phosphoric acid and superphosphate fertilizer production.

People living near phosphate fertilizer plants are twice as likely to develop lung cancer and osteoblastic leukemia.

Milky, lime green wash water is held in man-made ponds. Toxic waste water evaporates in the searing Florida sun. Hydrogen fluoride is released with other contaminants. According to an article in the *Florida Scientist*, 1987, by Dr. Howard Moore (deceased), a series of reactions takes place between suspended solids and hydrogen fluoride in the presence of moisture. The reactions create pollutants that can be carried far from the ponds on air currents (possibly hundreds of miles from the site).

The insidious problem with airborne fluorides is that they can be very reactive when they come in contact with moisture. When inhaled, many fluoride salts react with water (moist lung tissue) and break down into hydrofluoric acid and a toxic component. The reaction of hydrofluoric acid with lung surface burns a tiny hole in the tissue, and the toxic component is left at the site of damage. It is like rubbing dirt into a wound or injecting a poison. The airborne fluoride salt can act to enhance the effect of the toxic component.

People living near phosphate fertilizer plants are twice as likely to develop lung cancer and osteoblastic leukemia. While high cancer rates for people living near phosphoric acid plants are noted in magazine and newspaper articles, little is ever said about workers and their families.

Workers have to go into acid reaction chambers filled with toxic fumes and scour scale from filters and walls. The scale is so radioactive, up to 100,000 picocuries of radium per gram, that the only landfill in the country that accepts naturally occurring radioactive wastes will not accept the scale from phosphate fertilizer production. The radioactive wastes are either buried in the gypsum stacks or dumped into holding ponds.

Crystallized, radioactive silica tetrafluoride has to be chipped from pollution scrubbers. The residue is so hard that jack hammers must be used to remove the buildup. Workers are required to go into these hell holes and perform these dirty tasks, many times without adequate safety equipment. Workers are not only exposed to the naturally occurring toxic substances, but also manmade chemicals used as reagents, defoamers (possibly containing dioxins) and flocculants to more efficiently produce phosphoric acid.

The fluorosilicic acid produced in pollution scrubbers is sold as a water fluoridation agent. More than 50% of US cities which fluoridate drinking water use some form of the highly toxic pollution. Neither the EPA nor US Public Health Service can produce one safety or clinical study on this use.

A 1983 query to EPA regarding the use of toxic waste for water fluoridation resulted in the following response:

> In regard to the use of fluosilicic (fluorosilicic) acid as a source of fluoride for fluoridation, this agency regards such use 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 the communities. (Rebecca Hanmer, Deputy Administrator, Office of Water, EPA in 1983 correspondence to Dr. Leslie Russell stating EPA position on water fluoridation).

Sulfuric acid is also essential to phosphoric acid production. The plants produce their own sulfuric acid. The acid is mixed with finely ground phosphate rock producing noxious vapors containing heavy metals, sulfates, fluorosilicates, hydrogen fluoride and other contaminants. Uncontrolled releases of highly toxic hydrogen sulfide gas are commonplace, especially during unloading in the molten state.

Only recently has the Florida Department of Environmental Protection (FDEP) required companies to place liners under phospho-gypsum stacks. Because of airborne fluorine pollution, manufacturers were forced by EPA to install pollution

scrubbers in the late 1960's and early 1970's. But in Florida it is common knowledge that the phosphate companies set the environmental ground rules, and the EPA and FDEP tend to turn a blind eye regarding the violation of environmental regulations.

...the phosphate companies set the environmental ground rules...

There is speculation that preferred treatment for phosphate fertilizer manufacturers started when the first atomic bombs were being developed. It was discovered that uranium-238 could be extracted from phosphate rock.

During the Cold War era, 75% of the uranium oxide used to produce nuclear weapons and fuel for the nuclear power industry came from several Florida phosphate fertilizer plants. Today, the laxity on the part of EPA in enforcing federal regulations is probably a leftover attitude from the days when phosphate fertilizer plants were a national security asset.

Gary Pittman's deposition for a lawsuit reads like a 20-year sentence to hell. "When I first started working for Occidental, safety considerations were basically nonexistent. The only thing we were required to wear were safety glasses. Gloves, respirators and dust masks were not furnished."

In the 20 years working for Occidental, Gary had never taken a urine test, even when he became ill.

In 1987, according to Gary, Occidental management decided to shut down a pollution scrubber stating that it was not needed. For almost three years, in spite of violating state regulations and in felony violation of the Clean Air Act, Occidental operated the facility with the pollution scrubber shut down to save money. The entire population of Hamilton County, Florida was exposed to toxic emissions from the plant, possibly many times what are considered safe levels.

Aside from orange juice, phosphoric acid and superphospmhate fertilizer are Florida's primary exports...

The complaint written by Gary Pittman's attorneys alleges that Occidental failed to provide and/or destroyed product data safety sheets and warning labels on toxic chemicals to avoid the expense of purchasing adequate safety equipment.

In documents and tapes provided by Pittman, he states that ventilation in the work areas was also poor and the equipment often failed. At one time the air-conditioning in laboratories recirculated the toxic air. During analytical procedures, toxic gases were recirculated in the rooms. "We poured all sorts of chemicals down an open drain in the floor. Sometimes they would start boiling and fuming. All those noxious fumes were recirculated by the air conditioning system. We were continuously breathing that stuff, back then. We didn't know any better."

Of the 8 original plaintiffs who were directly exposed to the chemicals, only 6 remain, but others are coming forward. Two have died: one, plaintiff a non-smoker died from lung and liver cancer, and the other from bone cancer. Gary said the wife and daughter of one man suffering with similar health problems and neurotoxic damage have developed similar symptoms.

Gary Owen Pittman is concerned about the lawsuit because he knows that he is going up against a mammoth organization with much to lose. The parent company of Occidental Chemical Corporation, Hooker Chemical Corporation, is no stranger to litigation. Hooker Chemical was responsible for Love Canal. Both companies are owned by Occidental Petroleum Corp. Not only is he going up against Occidental, Pittman and the surviving plaintiffs in the lawsuit are taking on the entire phosphate fertilizer industry.

Expecting a 20% increase in the global demand for superphosphate fertilizer, chemical corporations have dumped over 10 billion dollars into phosphoric acid and phosphate mining in the state of Florida. Today, Florida's phosphate fertilizer producers supply 30% of the world demand and 75% of the domestic supply, account for some 50,000 jobs nationwide and $800 million in wages. Aside from orange juice, phosphoric acid and superphosphate fertilizer are Florida's primary exports: a major contributor to reducing the national trade deficit. And it also appears the industry is a major contributor of illness and death to people who live and work in the toxic, radioactive fallout.

Fluoride and the Phosphate Connection

by George C. Glasser

Cities all over the US purchase hundreds of thousands of gallons of fresh pollution concentrate from Florida - fluorosilicic acid (H_2SiF_6) - to fluoridate water.

Fluorosilicic acid is composed of tetrafluorosiliciate gas and other species of fluorine gases captured in pollution scrubbers and concentrated into a 23% solution during wet process phosphate fertilizer manufacture. Generally, the acid is stored in outdoor cooling ponds before being shipped to US cities to artificially fluoridate drinking water.

Fluoridating drinking water with recovered pollution is a cost-effective means of disposing of toxic waste. The fluorosilicic acid would otherwise be classified as a hazardous toxic waste on the Superfund Priorities List of toxic substances that pose the most significant risk to human health and the greatest potential liability for manufacturers.

Phosphate fertilizer suppliers have more than $10 billion invested in production and mining facilities in Florida. Phosphate fertilizer production accounts for $800 million in wages per year. Florida's mines produce 30% of the world supply and 75% of the US supply of phosphate fertilizers. Much of the country's supply of fluoro-silicic acid for water fluoridation is also produced in Florida.

Phosphate fertilizer manufacturing and mining are not environment friendly operations. Fluorides and radionuclides are the primary toxic pollutants from the manufacture of phosphate fertilizer in Central Florida. People living near the fertilizer plants and mines, experience lung cancer and leukemia rates that are double the state average. Much of West Central Florida has become a toxic waste dump for phosphate fertilizer manufacturers. Federal and state pollution regulations have been modified to accommodate phosphate fertilizer production and use: These regulations have included using recovered pollution for water fluoridation.

Radium wastes from filtration systems at phosphate fertilizer facilities are among the most radioactive types of naturally occurring radioactive material (NORM) wastes. The radium wastes are so concentrated, they cannot be disposed of at the one US landfill licensed to accept NORM wastes, so manufacturers dump the radioactive wastes in acidic ponds atop 200-foot-high gypsum stacks. The federal government has no rules for its disposal.

During the late 1960s, fluorine emissions were damaging crops, killing fish and causing crippling skeletal fluorosis in livestock. The EPA became concerned and enforced regulations requiring manufacturers to install pollution scrubbers. At that time, the facilities were dumping the concentrated pollution directly into waterways leading into Tampa Bay.

A Phosphate Worse than Death

In the late 1960s, EPA chemist Ervin Bellack worked out the ideal solution to a monumental pollution problem. Because recovered phosphate fertilizer manufacturing waste contain about 19% fluorine, Bellack concluded that the concentrated "scrubber liquor" could be a perfect water fluoridation agent. It was a liquid and easily soluble in water, unlike sodium fluoride - a waste product from aluminum manufacturing. It was also inexpensive.

Fate also intervened. The aluminum industry, which previously supplied sodium fluoride for water fluoridation, was facing a shortage of fluorspar used in smelting aluminum. Consequently, there was a shortage of sodium fluoride to fluoridate drinking water.

For the phosphate fertilizer industry, the shortage of sodium fluoride was the key to turning red ink into black and an environmental liability into a perceived asset. With the help of the EPA, fluorosilicic acid was transformed from a concentrated toxic waste and a liability into a "proven cavity fighter."

The EPA and the US Public Health Service waived all testing procedures and - with the help of the American Dental Association (ADA) - encouraged cities to add the radioactive concentrate into America's drinking water as an "improved" form of fluoride.

The product is not "fluorine" or "fluoride" as proponents state: It is a pollution concentrate. Fluorine is only one captured pollutant comprising about 19% of the total product.

By 1983, the official EPA policy was expressed by EPA Office of Water Deputy Administrator Rebecca Hanmer as follows: "In regard to the use of fluosilicic (fluorosilicic) acid as a source of fluoride for fluoridation, this agency regards such use 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."

A Hot New Property

In promoting the use of the pollution concentrate as a fluoridation agent, the ADA, Federal agencies and manufacturers failed to mention that it was radioactive. Whenever uranium is found in nature as a component of a mineral, a host of other radionuclides are always found in the mineral in various stages of decay. Uranium and all of its decay-rate products are found in phosphate rock, fluorosilicic acid and phosphate fertilizer.

During wet-process manufacturing, trace amounts of radium and uranium are captured in the pollution scrubber. This process was the subject of an article by H.F. Denzinger, H. J. König and G.E. Krüger in the fertilizer industry journal, Phosphorus & Potassium (No. 103, Sept./Oct. 1979) discussed how radionuclides are carried into the fluorosilicic acid.

While the uranium and radium in fluorosilicic acid are known carcinogens, two decay products of uranium are even more carcinogenic: radon-222 and polonium-210.

During the acidulation process that creates phosphoric acid, radon gas contained in the phosphate pebble can be released in greater proportions than other decay-rate products

(radionuclides) and carried over into the fluorosilicic acid. Polonium may also be captured in greater quantities during scrubbing operations because, like radon, it can readily combine with fluoride.

In written communications to the author, EPA Office of Drinking Water official Joseph A. Cotruvo and Public Health Service fluoridation engineer Thomas Reeves have acknowledged the presence of radionuclides in fluorosilicic acid.

Radon-222 is not an immediate threat because it stops emitting alpha radiation and decays into lead-214 in 3.86 days. Lead-214 appears to be harmless but it eventually decays into bismuth-214 and then into polonium-214. Unless someone knew to look for specific isotopes, no one would know that a transmutation into the polonium isotope had occurred.

Polonium-210, a decay product of bismuth-210, has a half-life of 138 days and gives off intense alpha radiation as it decays into regular lead and becomes stable. Any polonium-210 that might be present in the phosphate concentrate could pose a significant health threat. A very small amount of polonium-210 can be very dangerous, giving off 5,000 times more alpha radiation than the same amount of radium. As little as 0.03 microcuries (6.8 trillionths of a gram) of polonium-210 can be carcinogenic to humans.

The lead isotope behaves like calcium in the body. It may be stored in the bones for years before turning into polonium-210 and triggering a carcinogenic release of alpha radiation.

Drinking water fluoridated with fluorosilicic acid contains radon at every sequence of its decay to polonium. The fresher the pollution concentrate, the more polonium it will contain.

As long as the amount of contaminants added to the drinking water (including radionuclides in fluorosilicic acid) do not exceed the limits set forth in the Safe Drinking Water Act, the EPA has no regulatory problem with the use of any contaminated products for drinking water treatment.

Big Risks: No Tests

Despite the increased cancer risk from using phosphate waste to fluoridate drinking water, the EPA nor the Centers for Disease Control have never commissioned or required any clinical studies with the pollution concentrate - specifically, the hexafluorsilicate radical whose toxicokinetic properties are different than the lone, fluoride ion.

Section 104 (I) (5) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) directs the Toxic Substances and Disease Registry, the EPA, the Public Health Service and the National Toxicology Program to initiate a program of research on fluoride safety. However, after almost 30 years of using fluorosilicic acid and sodium fluorosilicate to fluoridate the drinking water, not one study has been commissioned.

The fluoride ion only hypothetically exists as an entity in an ideal solution of purified water - and tap water is far from pure H2O. All clinical research with animal models is done using 99.97% pure sodium fluoride and double distilled or deionized water. Among the thousands of clinical studies about fluoride, not one has been done with the pollution concentrate or typical tap water containing fluorides.

Synergy Soup
The fluorosilicic acid is also contaminated with small traces of arsenic, cadmium, mercury, lead, sulfates, iron and phosphorous, not to mention radionuclides. Some contaminants have the potential to react with the hexafluorosilicate radical and may act as complex ionic compounds. The biological fates and toxicokinetic properties of these complex ions are unknown.

The reality of artificial water fluoridation is so complex that determining the safety of the practice may be impossible. Tap water is chemically treated with chlorine, soluble silicates, phosphate polymers and many other chemicals. In addition, the source water itself may contain a variety of contaminants.

The addition of a fluoridation agent can create synergized toxicants in a water supply that have unique toxico-kinetic properties found only in that particular water supply. Consequently, any maladies resulting from chronic ingestion of the product likely would be dismissed as a local or regional anomaly unrelated to water fluoridation.

Technically, artificially fluoridating drinking water is a violation of the Safe Drinking Water Act (SDWA). Under statutes of the SDWA, federal agencies are forbidden from endorsing, supporting, requiring or funding the practice of adding any chemicals to the water supply other than for purposes of water purification. However, the Public Health Service (PHS) applies semantics to circumvent Federal law in order to promote and fund the practice.

PHS states that they only recommend levels of fluorides in the drinking water, and it is the sole decision of a state or community to fluoridate drinking water.

Federal agencies are forbidden from directly funding or implementing water fluoridation but Federal Block Grants are given to States to use as they see fit. Through second and third parties (such as the American Dental Association, state health departments and state fluoridation coordinators), PHS encourages communities to apply for Federal Block Grant funds to implement fluoridation.

The legality of using of Federal Block Grant funds to fund water fluoridation, a practice prohibited by Federal law, has never been addressed in the courts.

Vendors selling the pollution concentrate as a fluoridation agent use a broad disclaimer found on the Material Data Safety Sheet that states: "no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent to the product." [Emphasis added.]

The next time you turn on the tap and water gushes out into a glass, reflect on the following disclaimer from the EPA's 1997 Fluoride: Regulatory Fact Sheet: "In the United States, there are no Federal safety standards which are applicable to additives, including those for use in fluoridating drinking water."

George Glasser is a Florida-based writer whose work has appeared in Newlife, Whole Life Times, the Sarasota ECO Report and the Tampa Tribune.

AGROPAGES

Mosaic gets panel's recommendation for another phosphate mine in Florida

Date:2016/8/19

After a contentious public hearing, a land-use panel on Thursday recommended that Mosaic Fertilizer should be allowed to establish another phosphate mine in Manatee County. The Manatee County Planning Commission voted 5-1 to recommend approval. Commissioner Matt Bower cast the dissenting vote.

"I know Mosaic does a great job," Bower said. "I don't have any doubt that that's not true." Yet Bower expressed concerns about potential impacts on the watersheds of the Manatee and Peace rivers. "They haven't met the burden of overriding public benefit," he added. Commission Chairman Bill Conerly said he viewed the application through the lens of the county's development codes and voted in favor because the county staff said the project met the criteria.

The Manatee County Commission will make the final decision on Sept. 15.Environmentalists and area residents expressed concerns about potential ecological damage and public health threats. Yet Mosaic argued that it effectively restores the environment after mining and that long-term scientific studies show no difference in health risks and mortality rates among phosphate mine workers than those for the nation overall.

The County Commission will hear the matter on Sept. 15. Mosaic Fertilizer — which also owns the Four Corners Mine spanning Manatee, Hillsborough, Hardee and Polk counties, and the Wingate Creek Mine in Manatee — wants to rezone 3,599 acres known as its Wingate East property from agriculture to extraction, which will allow the mining of phosphate ore. Phosphate is a key ingredient in fertilizer products.

The site flanking Duette Road is east of Mosaic's Wingate Creek mine, north of the 202-lot Winding Creek subdivision, south of Duette Preserve and west of Hardee County land owned by Mosaic. Mosaic will conduct dredge mining west of Duette Road, which is what already occurs at the Wingate Creek Mine, and drag line mining, which is what is used at the Four Corners Mine, east of Duette Road. Mosaic will have to relocate wildlife on the site, such as gopher tortoises. After the property is mined, Mosaic will be required to replace the habitat that was destroyed with uplands and wetlands.

'A logical extension'

Hugh McGuire, attorney for Mosaic, called the proposed mine "a logical extension of existing uses in the area." He emphasized that it meets all state and county standards for mining.

Property within 1,000 feet of the closest homes and property within the watershed of Lake Manatee, the county's reservoir, is not proposed to be mined. Nearly 280 of 367 acres within the Peace River watershed will be impacted, but the county's environmental staff determined that Mosaic will use "best possible technology" and "best operating practices" and "will not cause a degradation of water quality or adverse impacts on water quantity" within that watershed.

Bart Arrington, mine permitting manager for Mosaic, said the company already has acquired Florida Department of Environmental Protection permits and has applied for a required permit from the U.S. Army Corps of Engineers. Mosaic officials said that, after mining, the company is required to restore natural habitats on the property. They said reclamation at Wingate East will create 14 percent more wetlands than exists there now and groups those wetlands together to be more beneficial. The company also promised to make a $2.5 million donation to Manatee Community Foundation. The contribution is to go toward the Conservation Foundation of the Gulf Coast for land acquisition or enhancement of ongoing projects it has in the Myakka River watershed.

'Toxic waste pools'

Andy Mele of the Sierra Club, which has endorsed Bower's candidacy for the County Commission, argued that phosphate mines are not "a temporary land use" — as mining advocates contend. He claimed the mines create lasting environmental harm, including the creation of clay settling ponds that are "toxic waste pools" because of the radium that is dug up with the clay and phosphate ore. "Reclaimed CSAs will not grow crops or sustain livestock without radioactive contamination and without economically unsustainable investments," Mele said. "... Here's a simple test: Just ask yourself, 'Would I eat fruit grown on a toxic waste pit?'"

Mosaic later countered that water used in its mining process passes annual tests for toxicity and has proven safe for aquatic life.

Debbie Mafera, whose home is near the headwaters of the Myakka River south of the potential mine, said the project would release radon gas, draw down the aquifer, destroy "old growth trees," strip top soil of nutrients and hire less employees per acre than virtually any other industry. "It's going to destroy our way of life," her husband, Ricky Mafera, said. "... It will plummet the property values out there ... You can never replace that natural habitat." Jaclyn Lopez, president of the nonprofit Center for Biological Diversity, expressed concerns about the effects on endangered species. "The leading cause of species extinction is habitat loss," she said.

Dan Cacchiotti of Myakka City spoke in favor of Mosaic's application, saying he has visited their mines and said they are "heavily regulated" and operate in "an extremely safe manner. ... I have a lot of faith in what Mosaic has been doing." Cacchiotti said he has also seen their reclaimed lands. "They've got wildlife there. The habitat is surviving and doing quite well."

Mosaic is actively mining more than 70,000 of the 380,000 acres it owns in Manatee, Hillsborough, Polk and Hardee counties. Roughly half of its property in the region has been mined or is permitted for mining.

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The Ledger

DeSoto County rejects Mosaic mine

By Craig Pittman / Tampa Bay Times
Posted Jul 26, 2018 at 3:15 PM

The world's largest phosphate company, Mosaic Co., lost its bid Wednesday night to open a new mine on 18,000 acres near one of the state's most pristine creeks.

After hearing impassioned testimony from hundreds of people over the course of two days, the DeSoto County Commission voted 4-1 Wednesday to reject Mosaic's request to change the zoning on its property from agricultural to mining.

The vote slams the door on the company's plans — in the works for nearly 20 years — to start moving its mining operations further south as its Central Florida mines begin petering out. It also protects Horse Creek, a major tributary of the Peace River, which supplies water for two counties.

The commissioners' vote, which also rejected a recommendation by their own planning director, came as a surprise to many, including longtime mining foe Dennis Mader.

"After 16 years of activism, I have never seen a victory that decisive," said Mader, president of People Protecting the Peace River. "Hopefully this will turn the tide on them."

A Mosaic spokeswoman said the company was "disappointed" with the DeSoto County decision, and hinted at possible legal action.

"It is clear that our rezoning application met every requirement of law and we will now begin reviewing our options to ensure our rights are protected," said company spokeswoman Jackie Barron.

Although phosphate was first discovered in what is now DeSoto County, no one has mined there in a century because the richest deposits were in Polk. But now that those mines are playing out, the company has been working

toward opening or expanding mines in Manatee, Hardee and DeSoto counties.

Meanwhile Mosaic recently announced it's moving its corporate headquarters from Minnesota to Florida.

As Mosaic has tried to move into the future, though, it has had to deal repeatedly with questions about the industry's past damage to the environment. That includes a 1994 accident involving its predecessor, IMC-Agrico, that sent 500 million gallons of slimy, gray water rolling toward the Alafia River, flooding homes, killing livestock, mucking up ponds and contaminating private wells.

More recently, a sinkhole opened up in 2016 under a phosphogypsum stack at Mosaic's Mulberry plant near the Hillsborough-Polk county line, dumping 215 million gallons of contaminated water into the aquifer. The company failed to disclose that news to the surrounding community for three weeks, a move that backfired once the news got out. Sealing the sinkhole took two years, $84 million and 20,000 cubic yards of grout, a thick mixture of water, cement and sand that hardens over time.

Opponents of Mosaic's DeSoto mine plans were particularly concerned about what impact it might have on Horse Creek, which provides 15 percent of the freshwater flow to the Peace River. The Peace River Manasota Regional Water Supply Authority supplies more than 28 million gallons of water a day to customers in Sarasota, Charlotte and DeSoto counties.

The creek is so pure that one water official once observed that the Peace River's purity is "barely acceptable for water supply purposes ... until the waters of Horse Creek enter it."

At the two days of public hearing testimony on the rezoning application, DeSoto commissioners heard from hundreds of people concerned about the proposed mine's impact on their water supply, their air, their highways and their homes. Opponents ranged from real estate agents to contractors and charter boat captains who feared the mine would ruin their livelihoods.

When commissioners asked questions of Mosaic, they didn't like the answers, Mader said. One question they asked: How much of the mine's process water would be dumped into the creek? The answer: anywhere from 1 million to 30 million gallons a day. And the discharge would only be checked once a year.

Last year, Manatee County commissioners approved a 3,600-acre expansion to a Mosaic mine that sits right next to the Lake Manatee watershed. Today Mosaic goes back to the Manatee commissioners to get approval for its operating permit.

CITIZENS AGAINST PHOSPHATE MINING

Our Story

Go to YouTube to see a beautiful 8-minute video about the proposed phosphate mine in Bradford and Union Counties. It is called The Fight Against Phosphate
youtu.be/GOnWTZRf2as

If Not Us, Then Who . . .

CITIZENS AGAINST PHOSPHATE MINING

IF NOT US, THEN WHO WILL PREVENT PHOSPHATE MINING IN NORTH FLORIDA?

A small group of rural residents-turned-activists are determined to halt the mining of phosphate on 7,000 acres straddling the New River in north central Florida. It's clear to these folks that Margaret Meade was right when she famously noted, "Never doubt the ability of a small group of dedicated individuals to initiate change; indeed, it is the only thing that ever really has."

The New River is the dividing line between the two counties of Union and Bradford, and feeds into the Santa Fe River of Alachua County, home to the University of Florida. The mining operation will cut trenches to dry the land in order to mine it. Their own permit application states the New River is fed by the same surficial aquifer they plan to disrupt in this process. The water will be diverted to make a man-made lake instead of feeding the New River as would naturally occur. New River flows will suffer.

The North Central Florida area is punctuated with lakes and rivers that make it a haven for tubing, canoeing and camping. The lack of development in the area provides refuge for wildlife including a number of endangered flora and fauna. It's a sportsman paradise.

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CITIZENS AGAINST PHOSPHATE MINING

But now, four families holding vast tracts of land have formed a limited liability corporation, HPSII, to mine phosphate via an experimental process. The plan is to operate a minimum of 20 hours per day, six days per week. The vague permit they seek would allow mining **up to within 25 feet of a wetland**.

The main concern, despite the intrusion on quality of life in general, is contamination or diminished flow of water wells, the drinking water source for most people in the area. Another grave concern is the potential for release of lung cancer-causing radon gas, already at high levels in the area, is released when the ground is disturbed. The underlying karst geology is prone to sinkholes, even before pulling millions more gallons of water per day from the aquifer.

The Union County Commission wisely enacted a one year moratorium on mining to give themselves time to review their Land Development Regulations (LDR) and perform due diligence on the mining details. They renewed it for a second year, which ends in February 2018. However, the Bradford County Commission (BCC), at an "emergency meeting," without the public's awareness, and under the sole influence of HPSII, who promised to wait on permit applications and to work with the Board, voted against any moratorium at all. When the citizens heard what happened, they flooded the next commission meeting with opposition and HPSII hurriedly submitted an application for a zoning change from agriculture to mining, tying the hands of the commissioners and gagging them from any further verbal interactions with the public.

Even though the Bradford Commission won't engage in the conversation, the (3) Citizens Against Phosphate Mining are determined, meeting after meeting, to give the commissioners factual information and their opinions as constituents and

Concerned citizens. They submit frequent letters to the editor of the local paper to keep the issue before the public eye. They have collected more than 3500 petition signatures and gotten nearly all of the local cities and townships to pass Resolutions in Opposition. They set up tables at local events with their handouts: petitions, brochures, Q & A sheets, and individual letters to be signed, sealed and stamped

CITIZENS AGAINST PHOSPHATE MINING

on site then mailed to the Commissioners.

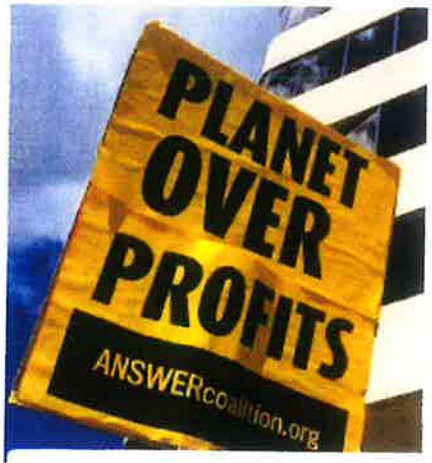
The most impressive aspect of this leaderless group is that they toss ideas around like bean bags until enough people with the necessary talents step in to implement the most valuable ones. It's a fascinating, though unconventional, self-organizing dynamic that seems to work well for this group and impresses any who witness the results. Most of these folks didn't even know each other before collaborating around this issue. But now, these bears have been poked, and they're determined to keep their ears to the ground for early rumblings from the extraction industries so they can lodge preemptive strikes against such future destruction.

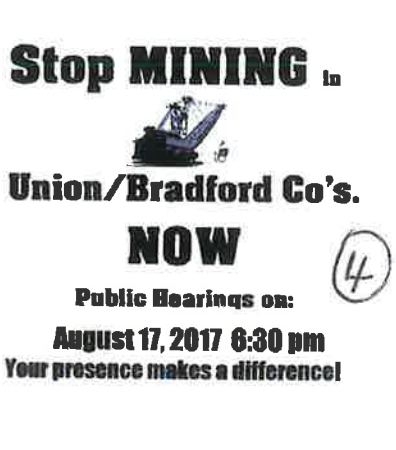
As far as they're concerned, if not them, then who? How about you?

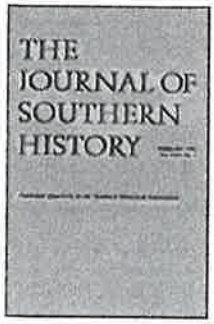
Follow the group on **Facebook**.

THE ISSUES

Our Counties Need Healthy Growth, Not Phosphate Mining







JOURNAL ARTICLE

The Fickle Finger of Phosphate: Central Florida Air Pollution and the Failure of Environmental Policy, 1957-1970

Scott H. Dewey

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Topics: Air pollution, Phosphates, Air pollutants, Fluorides, Pollution control, Pollutant emissions, Environmental policy, Environmental legislation, Industrial plants, Government intervention

EFFECTS OF THREE PHOSPHATE INDUSTRIAL SITES ON GROUND-WATER QUALITY IN CENTRAL FLORIDA, 1979 TO 1980

By Ronald L. Miller and Horace Sutcliffe, Jr.

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 83-4256

Prepared in cooperation with the

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

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https://www.theadvocate.com/baton_rouge/news/article_04f0ab62-3c58-11e9-9219-dbaa2fee2d13.html

Mosaic halts pumping aimed at stabilizing troubled acid lake while new storage reservoir readied

BY DAVID J. MITCHELL | DMITCHELL@THEADVOCATE.COM MAR 2, 2019 - 2:46 PM

David Mitchell

Faced with rainy skies and shrinking room in a key reservoir, Mosaic Fertilizer has halted pumping out a lake filled with acid water, at least for now.

The pumping has been put on hold, company and state officials said, until a new pond can be opened to hold as much as 500 million more gallons of the hazardous fluid. The company is

trying to reduce pressure on the lake's north wall to prevent it from breaking through and spilling out into nearby freshwater swamps.

The company has been trying to pump down the 140-acre lake that sits atop a 200-foot-high section of its slipping mountain of waste gypsum in St. James Parish to avoid the potential for a catastrophic failure of the water body.

But rain in recent days and the forecast of more to come have complicated those efforts, officials said, and contributed to the halt in pumping Tuesday as Mosaic awaits the opening of the new storage pond at the "Uncle Sam" site near Convent.

Mosaic spokeswoman Callie Neslund said just over three inches of rain fell on the plant site next to the Mississippi River between Feb. 18 and Monday. Another 0.61 inches was projected through Sunday, according to the National Weather Service.

So for the past few days, Mosaic hasn't been pumping water, and the 140-acre lake has taken in another 6 million gallons of water through Thursday after the volume had been dropping for weeks. As of Thursday, the lake had 493 million gallons, about a third of what it contained when the emergency started in early January, according to daily reports Mosaic has been supplying to DEQ.

Company officials and federal regulators have said early fears that a major collapse could happen and release the lake's hazardous contents are very unlikely. The concern had been that the highly acidic process water laced with heavy metals and radioactive elements might find its way into freshwater swamps and harm aquatic life.

RELATED

Risk falling for potential environmental disaster from slipping waste pile, Mosaic officials say

In addition to pumping out water from the lake to lower pressure on the wall containing it, the company also has been dumping loads of dirt, known as a "stability berm," at the toe of the moving gypsum wall to act as a brake.

"The volume of water we've removed, coupled with the stability berm that's been constructed, has reduced the risk of failure," Neslund said.

Despite those assurances, Mosaic has not been able to estimate the probability of a failure because it does not have enough data and can't say when the north face of the pile of gypsum will stop slipping. U.S. Environmental Protection Agency officials won't completely rule out a major failure, though they say the risk is "negligible."

RELATED

Activists want to close St. James plant where huge pile holding hazardous water could collapse

Mosaic produces gypsum as a waste byproduct from its creation of phosphoric acid used to make fertilizer for crops. The acid is made from phosphate rock mined in Florida and elsewhere.

The company and its predecessors have been stacking the waste gypsum for decades. The trace levels of heavy metals and radioactive elements from the source rock make the byproduct hard to reuse.

Mosaic officials said they submitted paperwork Friday to have the state Department of Environmental Quality inspect the new pond, known as the East Cell, for permits so it can open. The company finished construction earlier in the week.

Greg Langley, a DEQ spokesman, said the agency is hopeful it can issue the permit in a few days after Mosaic submits that request.

"We're hoping to get them ready on the East Cell. That will give them a lot more" space, Langley said.

The reservoir previously being used to hold water pumped from the 140-acre lake recently ran out of available capacity. Its remaining space is being reserved as a cushion for rainfall runoff, Langley said.

RELATED
With gypsum wall slipping under weight of rain-filled lake, Mosaic taps emergency reservoir

The halt in pumping highlights Mosaic's complicated juggling act since problems with the gypsum pile's wall came to light at the turn of the year. The company has tried to get pressure off the moving north wall by draining the 140-acre lake but must also contain those hazardous contents in other ponds.

Further complicating the response, the 960-acre pile isn't only a waste dump for gypsum but is a cog in a complicated system at Mosaic to collect, store and recycle water to and from its production plant that has been hampered by above average rain over the past few years and the recent emergency with the slipping wall.

Mosaic's phosphoric acid production consumes water as part of its chemical process. The slipping 140-acre lake is part of that collecting and recycling system for the plant, serving both as a kind of giant rain-gathering cistern and a cooling pond to recycle water.

The waste pile also creates a lot of rainfall runoff that must be handled. One inch of rain over the entire pile generates 20 million gallons of hazardous process water by falling on or running off into a series of "active" ponds and trenches, DEQ reports say. That water must eventually be used by Mosaic's plant, injected deep underground or evaporate naturally to be disposed of properly, company officials said.

One inch of rain creates 4.6 million gallons of additional water inside the 140-acre lake alone. Once the rain touches the process water in the lake, it is considered equally hazardous, company officials have said.

About 5.5 pounds of gypsum are produced for every pound of phosphoric acid made in Mosaic's plant, company permit documents show.

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What is gypsum? What you should know about this giant wall, its possible collapse in St. James

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Potential disaster at huge St. James waste pile has crews racing to prevent massive wall collapse

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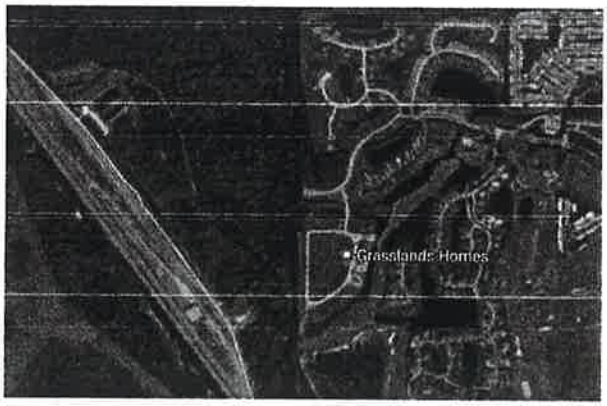
Suit alleges phosphate company knowingly developed homes on contaminated land in Polk County

BY KATE BRADSHAW — MAR 14, 2017 5 PM

Residents of two south Lakeland developments have filed a class action lawsuit against Alabama-based mining conglomerate Drummond Company, Inc., which developed former phosphate strip mining land into homes starting in the early 1980s.

The suit claims that the company knowingly sold "reclaimed" phosphate mine land that had dangerously high levels of radiation that drastically raise the risk of many cancers, including lung and thyroid. Prior to the



A few of the thousands of homes in southern Lakeland that are built on former phosphate land.
SCREEN GRAB, GOOGLE MAPS

development of 1,400 acres of land that now comprise the Oakbridge and Grassland areas, the law firm representing the plaintiffs claims, the U.S. Environmental Protection Agency found 11 to 21 times the acceptable amount of ambient radioactive materials.

The national firm Lanier Law joined the case after attorneys for the plaintiffs approached them with the suit.

"We reviewed it and thought that the case had a lot of merit and the people were wronged, the people who bought the homes," said Richard Meadow, national mass tort director for Lanier Law Firm.

Also litigating on behalf of the plaintiff is Tom Girardi, who is perhaps best known for his work on the case against Pacific Gas & Electric over water contamination, which inspired the film *Erin Brockovich*.

What makes the case particularly compelling, Meadow said, is the type of poisoning residents may potentially be dealing with.

"This one is unique in that we're talking about gamma radiation here, and not necessarily like the chromium or some of the other ones we've dealt with," he said. "It's like getting x-rays every day or something like that."

Attorneys working on the case unearthed a EPA "Florida Phosphate Initiative" from May, 2003, a document previously unavailable to the public that highlighted the potential dangers of building homes on land above radioactive phosphate industry waste.

Among talking points outlined in the once-Freedom of Information Act-exempt document:

> The main concern is that people may be exposed to unsafe levels of radiation in cases where residential dwellings have been constructed over former phosphate mines. Phosphate mining results in the redistribution of radium-226 (Ra-226), a radioactive contaminant of the phosphate ore, from buried deposits to the landsurface. The radioactive contaminant emits gamma radiation which has been determined to be a cancer-causing agent. The Ra-226 eventually degrades into Radon gas which is another known carcinogen. Preliminary estimates indicate that approximately 40,000 residential dwellings have been built over former phosphate mines in Polk County, Florida. Many of these homes are believed to have elevated levels of Ra-226 or gamma radiation that exceeds the EPA's safe standards.

In 1975, the lawsuit claims, the EPA warned then-governor Reuben Askew of the radiation levels in buildings constructed on reclaimed phosphate land, and that Drummond may have known that as far back as 1975, but did nothing to protect the health and safety of incoming residents. As a result, the suit continues, residents not only face potentially toxic air and water, but also declining property values.

The plaintiffs are seeking recompense that includes medical monitoring and aid as well as financial compensation for lost property values and relocation should they choose to leave.

And given how much land is mined for phosphate in that part of the state, Meadow said he also hopes the case will help set a precedent to guide the way the industry deals with spent land — assuming EPA regulators will actually enforce regulations under a Donald Trump administration.

"We may be dealing with a fangless or toothless EPA going forward, which would be really bad for everybody," he said. "But hopefully this will shine some light on this, bring it into daylight."

Yet part of the reason Drummond may not have been held accountable in the first place was that the phosphate industry has wielded influence on lawmakers — and still does, if campaign finance records for politicians like Agriculture Commissioner (and likely GOP gubernatorial contender) Adam Putnam are any indication.

Instead of heeding warnings from the EPA as well as the U.S. Department of Energy, the plaintiffs say, the phosphate industry, including Drummond, "pressured the EPA (both directly through state and/or federal legislators) to cease its investigation into the risks of reclaimed phosphate mining lands." As a result, the suit continues "in 2014 the EPA officially abandoned its plans for further assessment and potential remediation of the contaminated mining areas under the federal Superfund program, including those comprising the Oakbridge and Grasslands developments."

Drummond appears to be out of the phosphate business, but in addition to real estate, Drummond now carries out extensive coal and oil mining and extraction in the U.S. and Central America. A spokesperson for the company was not available for comment Tuesday.

Central Florida is home to some of the biggest phosphate mining operations in the world, and the industry says that without it, food production as we know it would cease. After all, phosphate mined in Florida becomes fertilizer for mass-scale agricultural operations.

Concerns over the industry's impact on the environment are ever-present. Fertilizers cause harmful algae blooms when rain washes some of the product into waterways. Mining the raw material strips the natural landscape and the wildlife habitats therein completely bare. Plus,

its radioactive byproduct is on its face concerning for many people.

The March 10 lawsuit comes months after Mosaic Company, which has mined for phosphate extensively in central Florida, was found to have not told the public about a large sinkhole that opened up underneath a radioactive gypsum stack, putting the fresh water naturally stored underneath at risk for contamination.

Even though the industry is under scrutiny from the environmental community, many elected officials in Florida look the other way as the industry seeks permission for new mines.

Given the advantage big business has in battles over public safety and policy, it's unclear how a lawsuit like the one filed Friday will fare in the long run. It's likely that a powerhouse like Drummond could afford to fight the suit indefinitely, while residents of the developed phosphate lands might not be able to keep fighting.

But attorneys for the plaintiffs say they're equipped to fight back.

"One of the reasons [the plaintiffs'] lawyers approached us is, we have a lot of resources ourselves," Meadow said. "We can battle them. We're not intimidated by that."

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Lanier Law Firm says homebuyers kept in dark about cancer-causing contamination

NEWS PROVIDED BY
Lanier Law Firm →
Mar 10, 2017, 12:03 ET

TAMPA, Fla., March 10, 2017 /PRNewswire/ -- The Lanier Law Firm has filed a class-action lawsuit on behalf of homeowners in Central Florida, charging that operators of phosphate mines failed to warn them about dangerously high levels of radiation.

Newly obtained information from the U.S. Environmental Protection Agency confirms that the Lakeland-area subdivisions of Oakbridge and Grasslands have been exposed to toxic contamination from phosphate strip mines operated by Drummond Company.

The Lanier Law Firm is working with law firms Girardi Keese, Nidel & Nace, PLLC, German Rubenstein LLP, and Lilly O'Toole & Brown LLP. The lawsuit is *Jerue v Drummond Company, Inc., Case 8:17-cv-00587-EAK-AEP*, filed in U.S. District Court for the Middle District of Florida.

Phosphate mining contamination includes cancer-causing gamma rays, which can penetrate the body and increase the risk of certain cancers including leukemia, lymphoma and bone cancer. Decaying uranium from phosphate mines also releases radon, an odorless, radioactive gas that is linked to lung cancer. Testing has revealed radon levels significantly higher than surrounding land. For information, visit http://lanierlawfirm.com/legal_practice_areas/florida-phosphate-contamination.

After ceasing operations at its Poseidon Mine in 1982, the Drummond Company developed

surrounding these toxic sites," said Lanier Law Firm founder Mark Lanier. "We are stepping in to do what the government has failed to do - fully disclose the extent of contamination and make sure these companies clean up the mess they've created."

EPA tests before development of the Oakbridge subdivision showed radiation levels 11 to 21 times higher than the acceptable risk limit. In 2003, the EPA's Florida Phosphate Initiative noted that some homes had median radiation concentration 4 to 22 times higher than pre-mined land and gamma exposure 2 to 3 times higher than normal.

The lawsuit seeks compensation to clean up contamination and initiate medical monitoring for residents, as well as full disclosure of all state, federal and private testing results.

In 2016, the Lanier Law Firm recorded two high-profile verdicts in medical device litigation, with the awards totaling more than $1.5 billion. The firm was named by the National Trial Lawyers Association as one of the nation's 25 Most Influential Law Firms for 2017, and also as a National Tier 1 practice in Mass Torts and Class Actions by U.S. News/Best Law Firms, and by Legal 500 in its national ranking of top firms in Medical Device and Pharmaceutical litigation. Mr. Lanier was named Houston's Trial Lawyer of the Year by Best Lawyers in America in 2017 for Personal Injury Litigation and in 2016 for Mass Torts/Class Actions. Mr. Lanier has been recognized as one of the Most Influential Attorneys of the Decade by the National Law Journal and as one of the 25 Greatest Lawyers of the Past Quarter Century by Texas Lawyer.

With offices in Houston, Los Angeles, and New York, the Lanier Law Firm is committed to addressing client concerns with effective and innovative solutions in courtrooms across the country. The firm is composed of outstanding trial attorneys with decades of experience handling cases involving pharmaceutical liability, asbestos exposure, commercial litigation, product liability, maritime law, and serious personal injuries. To learn more about the firm, visit http://www.lanierlawfirm.com.

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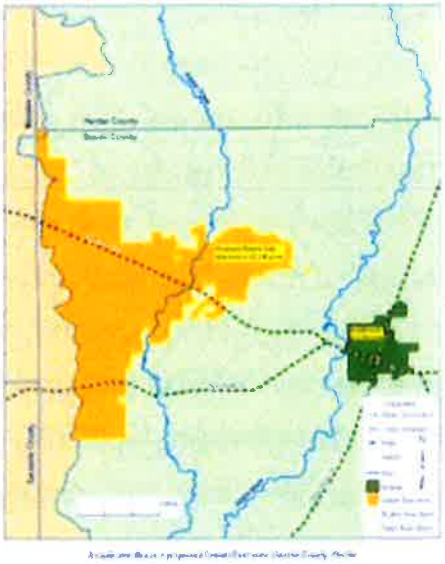
No Means No: The Battle of Mosiac vs DeSoto County Update

Dragline mining for phosphate at Four Corners Lonesome Mine. Florida's Phosphate Mines

In a classic David vs Goliath battle, mining giant Mosaic has made it clear that it won't take "no" for an answer regarding its quest to establish large-scale phosphate mining operations in DeSoto County.

(https://charlottedems.com/wp-content/myimages/2019/04/DesotoMine_Arcadia-1.jpg)It is currently pursuing a quasi-judicial dispute resolution mediation process with the DeSoto Board of County Commissioners (BOCC), and BOCC legal counsel, to reach a compromise in the board-denied request by Mosaic to rezone 14,000 acres of county land from agriculture to mining. The land rezoning is a prerequisite for the pending application of Mosaic's mining plan and operating permits. The BOCC denied Mosaic's rezoning request in July 2018 citing Mosaic's failure to meet 7/15 criteria for granting the request. There was strong public sentiment against granting the rezoning



(mailto:website@CharlotteDems

Request at the hearing in July and at the subsequent hearings in Aug. 2018 and on April 3, 2019

2019 conducted as part of the Mosaic-initiated dispute resolution process. There will be another hearing later this month where the BOCC will approve or deny a compromise proposal between Mosaic and DeSoto County legal representatives. At this time, the details of the compromise proposal are not known.

So far, at each of these hearings, public attendance has been high, and the over-riding sentiment is not just "No" but a resounding "Hell No"! to Mosaic's rezoning request. At the last hearing, more than 50 people from DeSoto, and other counties, stood up to voice their dissent for a compromise. "No means no" was a popular refrain. Only one speaker was supportive of Mosaic on the grounds that a property owner should have the right to do what they wanted to on their land. So, as summed up by that one public commenter, you have the argument at hand: Rights of the Community vs. Rights of the Property Owner. In this case, David vs. Goliath.

Phosphogypsum stack located near Fort Meade, Florida. These contain the waste byproducts of the phosphate fertilizer industry.

To put things into perspective, Mosaic is the world leader in making phosphate and potash crop nutrients in its quest to "help the world grow the food it needs". It also generates more than $7-Billion in annual revenue. On the other hand, DeSoto County is home to 35,000 people with a median annual household income of just over $30,000. The county is 639 square miles of mostly farmland, rangeland, and wetlands. It is home to cattle ranchers, horse farmers and citrus growers many of whom are multi-generational owners of lands passed down over more than 100 years. Mosaic wants to turn approximately 23,000 acres of that land into active mining operations. This is about 18% of the county's land mass or 9 times the size of the county seat, Arcadia.

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Given the way the scales are tipped, and the outcome of similar scenarios in other Florida counties, including Manatee, Hillsborough, Polk and Hardee counties, Mosaic will likely win the battle. Based on Mosaic's track record in these counties, DeSoto County is at risk of becoming a mining town. Its native citizens will leave (if they can), DeSoto and surrounding communities will live under the stress of nearby mining operations, another toxic legacy will be created, and the once fertile county lands and wetlands will be compromised. An excellent article about the history and impact of phosphate mining in Florida was published in the May 2017 issue of Sarasota Magazine. The article is entitled The Clock is Ticking on Florida's Mountains of Hazardous Phosphate Waste (https://www.sarasotamagazine.com/articles/2017/4/26/florida-phosphate).

(https://charlottedems.com/wp-content/myimages/2019/04/Charlotte-Harbor.jpg)

Charlotte Harbor Estuary at Ponce de Leon Park, Punta Gorda

If you think this is just a sad story for some poor souls in DeSoto County, think again. DeSoto County is also home to the Peace River and which flows into Charlotte Harbor and the Gulf of Mexico. The Charlotte Harbor estuary is one of the most productive wetlands in Florida and supports fishing, commerce, recreation, and tourism. It is also a threatened ecosystem because of the rapid increase of growth and development, poor land-use policies, and the overuse of natural resources. The Peace River is the region's drinking water supply and needs to be protected. The risks posed by large-scale phosphate mine near the Peace River watershed and Charlotte Harbor estuary are real. Phosphate mining accidents and force majeure incidents of the past are scary reminders of what could be in our future. Less obvious, and more complex, are the long-term impacts on our ecosystems and water quality over time.

As the battle between DeSoto County and Mosaic plays out, the dilemmas to consider extend beyond "rights of the community" AND "rights of the property owner". Decision-makers are also tasked with finding the optimum balance between "progress AND "preservation", "industry" AND "environment", and "feeding the world" AND "protecting Florida water quality". These are not "either/or" considerations. Both sides of each equation are important. If it were a "No Brainer" the answers would be obvious. So how do we strike the right balance to maintain a healthy, growing and vibrant Florida?

The first step is to look for warning signs that our systems are out of balance whether they be economic or environmental. By most accounts, economic indicators for the state are

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very good. On the other hand, one only needs to read or watch the news to know that we

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have serious water quality issues in Florida. Media accounts of red tide, green algae, red algae, massive fish kills and people on the beach sporting face masks have plagued us for months and months. Water use restrictions are in place in many communities and at times we are under a "boil your water" alert. Water quality is the lifeblood of Florida with human health and well-being, the environment and the economy all reliant on clean water. We have reached a tipping point where it's time to shift the needed degree of focus to improving, maintaining, protecting and preserving our natural resources. In the case of DeSoto County vs Mosaic Corporation, this means not allowing Mosaic to expand its mining footprint in Florida until they can demonstrate their ability, not just to meet current mining and reclamation regulations, but safely manage it's waste, have a controlled impact on the environment and natural ecosystems, and restore the lands to their natural state.

Farmland in DeSoto County

The property owner, Mosaic, invested in 14,000 acres of agriculture land speculating that it would be rezoned for mining. If they lose their rezoning battle, they will still have 14,000 acres of fertile and valuable agriculture land. They won't have lost a thing.

Stay strong DeSoto County, the state of Florida needs you! And step up and step in state and federal legislators. We need your help to make this an even match. No more David and Goliath scenarios. Because David really isn't really small after all.

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Image Credits: Florida EPA (https://floridadep.gov/water/mining-mitigation/content/phosphate)
Harvey Henkelmann (https://commons.wikimedia.org/wiki/File:GypStack.JPG)
Jim Blue
Mosaicco.com

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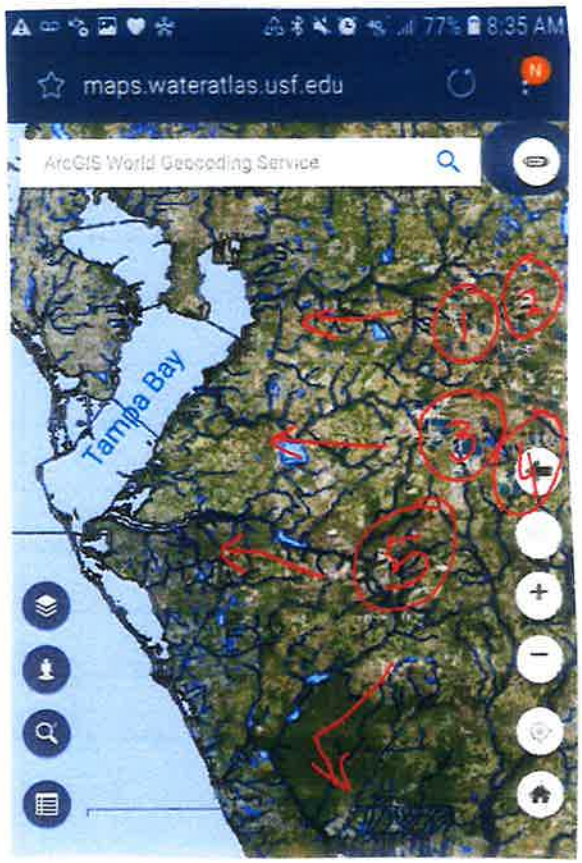
Mosaic has mines and plants at the beginning of every river that flows into Tampa Bay. 1-Mosaid New Wales 2-Mosaic Bartow 3- Mosaic Four Corners 4-Mosaic South Pasture 5-Mosaic Wingate



Paul DeGaeta **PREACH-Peace River-Charlotte Harbor Environmental Awareness Group**
March 20 ·

With yesterday's (Mar 19, 2019) MOSAIC phosphate spill into the LITTLE MANATEE RIVER, its a good time to introduce this map I've been working on the last few weeks.

No argument that Red Tide is natural.

But an industry with this many conduits to the Gulf of Mexico that uses blending every day in runoff, and gets to self-monitor, isn't.

The New York Times https://nyti.ms/1QKCUpZ

Florida Battling Phosphate Industry Over Mining

JUNE 11, 1978

iALLAHASSEE, Fla.—The State of Florida, disturbed by phosphate mining on disputed land and the prospect of strip mines in a national forest, is fighting with the industry over the use of thousands of acres in the world"s richest phosphate reserves.

For nearly a century, the industry mined phosphate rock from central Florida with little Government interference. Recently, however, the state has doubled the mineral severance tax, restricted claims to sovereign land and entered a complex lawsuit contending that seven concerns have been removing phosphate and uranium ore from state-owned river- beds without state approval and without paying royalties.

Florida's $1.5 billion phosphate industry provides 80 percent of the world's supply, according to industry statistics, and employ3 50,000 workers. The industry is centered :n Polk County, between Tampa and Orlando, but reserves have also been found in the Osceola National Forest, near the Georgia border.

In a move to discourage expansion by the industry, the Florida Legislature

maintains that the land in question was never state-owned, plans to challenge the Leg:slature's action in court.

The Legislature's special session was called by Gcv. Reubin Askew, who said that unless sovereign lands held since statehcod were exempted from the law, the phosphate interests might successfully assert ownership to thousands of acres of riverbeds and lake bottoms now specifically retained by the state when it sold surrounding uplands.

Already, the state has joined Coastal Petroleum Company in a suit against Mob1 Oil Company and six other concerns over operations in Polk County.

Coastal holds a lease on mineral rights to 55,000 acres of sovereign lands there and, in an agreement with the state, has the right to a 5 percent royalty on minerals extracted from its leased lands. Coastal sued the phosphate companies that subleased much of the land, contending that they were mining without paying royalties, and the state joined the suit in February.

Most of the legal activity centers on the Peace River. which Coastal contends was diverted by strip miners in order to expose the riverbed for mining.

It is estimated that as much as $3 billion in damages could be claimed from the defendants, which include Mobil, International Minerals Corporation, Agrioo, United States Steel's Agrichem

W.R. Grace and Company, Swift and Company, and American Cynamid.

"The fight is a question of money, not a question of land," said Chesterfield Smith, the phosphate industry's chief attorney in the case. Mr. Smith, a former president of the American Bar Association, lost another battle last spring when the Legislature raised the mineral severance tax on phosphate rock from 54 cents to S1.04 a ton.

Land is the issue, however, in the Osceola National Forest, where where four mining concerns have requested Federal strip-mining leases. State environmental agencies are lobbying to block the leases. and the Legislature sent a resolution to Congress last week requesting action to prohibit strip mining in the forest.

The Interior Department is expected to make a decision this summer on the leases, which would go to Kerr McGee Chemical Company, Midway Coal Mining

The Florida Audubon Society, in a hearing with Interior officials last month, said that one-third of the 157,000-acre forest would be destroyed by strip mining, just as much of central Florida has been scarred and scraped.

Interior officials, who cited two recent Federal reports suggesting that strip mining would cause little damage, were accused by state environmentalists of having "an almost flippant attitude toward the state's water quality standards."

Victoria Tschinkel, assistant secretary of the state Department of Environmental Regulation, said the Federal Government "is proposing to let something take place on public lands that the State of Florida will not let take pla(.e on private lands."

A version of this archives appears in print on June 11, 1978, on Page 47 of the New York edition with the headline: Florida Battling Phosphate Industry Over Mining.

NOAA Helps Reverse Pollution Woes for Two Florida Wetland Areas

What do fertilizer wastewater, an illegal dump tucked into sinkholes, and Florida wetlands have in common? Until recently, a little too much. The first two resulted in serious pollution in wetlands and other habitat in the area of Tampa Bay, Florida.

Fortunately, however, NOAA and our co-trustees have helped pave the way for restoration at two important hazardous waste sites in the Tampa area. The Mosaic Fertilizer Riverview facility is located southeast of Tampa, bordering on Tampa Bay and the Alafia River. Restoration sites are located both north and south of the Alafia River. The Raleigh Street Dump Site is located in an industrial area of Tampa, east of McKay Bay. The Tampa Bay estuary is home to diverse habitats including seagrasses, mangroves, salt marshes, mud flats, and oyster reefs. These habitats stabilize the shore and provide a buffer against damaging coastal storms. They also provide shelter for marine life and nesting areas for birds. The growing Tampa Bay area is also home to more than 2.3 million people. Because the open-water estuary is so important to the development of fish, shellfish, and crustaceans, and the coastal communities that depend on vibrant fisheries, maintaining its health is a high priority in the region.

Big Worries from Fertilizer Slurries

On September 5, 2004, Hurricane Frances made landfall on the east coast of Florida and swept across the state, passing near Tampa Bay as a tropical storm. High winds and heavy rainfall associated with the storm damaged an outdoor storage system at the Mosaic Fertilizer plant in Riverview, releasing 65 million gallons of acidic, nutrient-rich process water into Archie Creek Canal, Hillsborough Bay, and surrounding wetlands. Mosaic Fertilizer, LLC is the world's largest producer of concentrated phosphate and potash, which are used to manufacture plant fertilizer. Phosphorus is an essential nutrient for plants. Yet its original form, calcium phosphate derived from phosphate rock, is not water-soluble and therefore cannot be absorbed by plants. Getting it into a water-soluble form is accomplished by treating it with sulfuric acid to create phosphoric acid. The by-product from that conversion is mostly calcium sulfate but goes by the name "phosphogypsum." Phosphogypsum starts out as slurry when it is first stored in outdoor containment units. Over time, as the slurry is piled higher and higher, immense stacks are created with sloped sides of phosphogypsum and open-air ponds at the top. Acidic process

water is stored and recycled from the top of the stack through the phosphate production facility. If the berms that contain the acidic, nutrient rich ponds at the top of the stack fail, as they did in the wake of Hurricane Frances, they pose a threat to human health and the environment. The pollution released from the Mosaic Fertilizer plant in 2004 harmed nearly 10 acres of seagrass beds and more than 135 acres of wetland habitats, including nearly 80 acres of mangroves. The acidic water dramatically lowered pH, directly killing thousands of fish, crabs and bottom-dwelling organisms. The influx of nitrogen and phosphorous also disrupted the local ecosystem, potentially injuring fish and other aquatic wildlife. NOAA and State trustees worked with Mosaic Fertilizer, LLC to assess these environmental injuries and restore the site. In 2013 and 2014, Mosaic implemented restoration projects to compensate for the environmental injuries that the process water spill caused. Restoration included the removal of invasive exotic plants, widening and improving tidal creeks and increasing through 85 acres of mangrove forest, constructing a 3500' oyster reef, and creating an oligohaline or brackish tidal wetland. Mosaic is now monitoring the health of the restored natural areas, with NOAA and our partners providing oversight.

Oligohaline or brackish tidal wetland, created at the Mosaic fertilizer site in Riverview, FL. (NOAA)

From Illegal Dump to Wetland Bonus

Not far from the Mosaic Fertilizer plant, a five acre parcel of low-lying land pocked with sinkholes had produced its own pollution woes for wetlands. Located on Raleigh Street, battery casings, furnace slag, trash, and construction debris were dumped at this site from 1977 to 1991. By 2009, the level of pollution was deemed dire enough to land it on the U.S. Environmental Protection Agency's National Priorities List, slating it for cleanup under the Superfund law. Years of illegal dumping had left the area filled with contaminated soil, sediment, and groundwater. EPA investigations at the site found a number of chemical contaminants posing an unacceptable risk to human health and the environment, including oil-

related compounds and heavy metals such as antimony, arsenic, and lead. Cleanup and restoration activities at the Raleigh Street Dump Site were comprehensive and involved replacing contaminated soils with clean soils, removing contaminated sediments, planting grass, restoring wetland areas, and reducing the concentration of contaminants in the groundwater. NOAA has worked closely with EPA over the years to ensure the cleanup at Raleigh Street Dump Site was protective of the environment. By the end, restoration actually resulted in an increase of wetland area at the site, more than doubling it to 2.6 acres. The restoration work done at the Mosaic Fertilizer and Raleigh Street sites is just part of a larger overall conservation effort in a region that for decades had been experiencing environmental decline. According to the Tampa Bay Estuary Program, a regional alliance of local, state, and federal government partners dedicated to the area's health, the Tampa Bay area has made "a remarkable comeback in recent years, with impressive gains in water quality, seagrass recovery, and fish and wildlife populations." NOAA is happy to have a part in making this a reality.

Restored Raleigh Street Dump site. (NOAA)

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Business

Fluorosilicic Acid Market Size For to Expand Significantly 2016 – 2024

ajinkya@tmrresearch.com • February 11, 2019 0 20 2 minutes read

Fluorosilicic acid is an organic liquid produced as by product of hydrogen fluoride and phosphoric acid production. It is generally used for fluoridation of water to maintain fluoride level in water by municipal corporations and in toothpastes. Maintaining fluoride levels helps in preventing tooth decay. Being a liquid, fluorosilicic acid is easy to handle and plant operators does not have to handle the fine powder which may create occupational hazards. Fluorosilicic acid is used in various applications that include sterilization, electroplating, commercial laundry, oil well acidizing, wood preservative, stain and rust removing, neutralizing agent and for tanning of glass, ceramic and animal hides.

Rising demand of fluorosilicic acid in fluoridation of drinking water is expected to drive the market. Governmental regulations in the U.S. and *Europe are compelling the municipal corporations to use fluorosilicic acid* as fluoridating agent for public drinking water. Fluorosilicic acid is used in manufacturing of commercial detergents such as cryolite, silicon tetrafluoride and other fluorosilicicates. Rising demand from textile industry is further expected to boost the market growth as it is being used for removal of stain and rust from the fabrics. Concentrated fluorosilicic acid found applications in tanning of animal hides & skin, glass and ceramics. Rising demand for tanned glass and ceramic from various end user applications such as house interiors, electrical and electronics is expected to fuel the flurosilicic acid market.

Read Report Overview @ https://www.transparencymarketresearch.com/fluorosilicic-acid-market.html

However, corrosive nature and fuming property of concentrated fluorosilicic acid especially above 20% concentration may hamper the market growth. The acidic nature of this compound leaches the lead and arsenic from water delivery plumbing. Additionally, it is a byproduct of phosphate fertilizer industry and claimed to be contaminated with heavy metals and radioactive elements which may inhibit the fluorosilicic acid market growth. Increasing application in sterilization and fumigation technologies is expected to provide immense opportunities for the players in fluorosilicic acid market. Further, rising demand from dental applications such as mouth rinse solutions, chewing gums and toothpastes is expected to contribute to the opportunities in developed countries.

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North America is the largest consumer of fluorosilicic acid in terms of consumption followed by Europe. Environmental Protection Agency (EPA) from the U.S. has certified the chemical to be used as fluoridating agent in drinking water and have compelled municipal corporations to use for fluoridation to prevent tooth decay of population. Commercial laundry and textile industries are expected to boost the fluorosilicic acid market in this region. European countries such as Ireland, the United Kingdom uses fluorosilicic acid for fluoridation of drinking water and for tanning animal hides and skin. Rising demand from these end user industries is expected to fuel the market growth in this region. Growing application in mouth wash, gel and other dental products is expected to drive the market in North America and Europe. China was the largest producer of fluorosilicic acid due to presence of large number of players and abundant raw materials. Changing lifestyle and disposable income in Asia Pacific is driving dental care and commercial laundry market which in turn expected to boost the fluorosilicic acid market.

Some of the key players in this market include Eti, Russian Bor, SRL, Da Shi Qiao Huaxin, Liaoning Jiayuan, Fencheng Chemical, Searles, Dalian Junma Group, Mosaic, Sanmei, Solvay, Zibo Aosi Chemical Co. Ltd, PhoAgro, Mosaic, Dongyue, Sinochem Yunlong, Halopolymer, Dow Chemical Company, IMC fertilizer, Texagulf, Weaver Fertilizer, Occidental and Chemtech among others.

Spring 1996

Florida's Troubled Phosphate Companies: Can Bankruptcy Law Be Used to Relieve Their Obligation to Reclaim the Land?

Mary Jane Angelo
University of Florida Levin College of Law, angelo@law.ufl.edu

SUGAR INDUSTRY IN FLORIDA

bullsugar.org

AN INDUSTRY THAT CAUSES MAJOR POLLUTION IN FLORIDA, AND CAUSES MAJOR CAVITIES IN CHILDREN.

TIME FOR SUGAR TO CLEAN UP ITS OWN POLLUTION?

POSTED ON MARCH 01, 2018

Mark Perry of Florida Oceanographic Society says this all better than we could. *Scientists estimate that the Everglades reservoir plan* ***needs another 6,500 acres*** *to work properly, and the sugar industry warns any expansion better come from public land. This is after Florida turned 60,000 acres into filtration for the industry's pollution and invested billions to help it meet legal requirements. Despite some Florida lawmakers' push to extend corporate welfare to billionaire sugar families, more people are asking whether it's finally time to wean the industry off public assistance.*

Make Agriculture Clean Water on its Own Land South of Lake Okeechobee

By Mark Perry (reprinted with permission, first appeared in ***TCPalm***)

Discharges of water from Lake Okeechobee totaled 832 billion gallons in 2017. The majority of those discharges, 650 billion gallons, went east and west causing massive environmental destruction to the northern coastal estuaries: the St. Lucie River/Indian River Lagoon and the Caloosahatchee River.

Billions of gallons of precious freshwater resources were dumped to the Atlantic Ocean and Gulf of Mexico. Of the 182 billion gallons of lake water that went south, the Everglades Agricultural Area used 142 billion gallons for irrigation and only 39 billion gallons went south to the Everglades.

Historically, all of the water from Lake Okeechobee used to flow south to the Everglades as a "River of Grass," 112 miles long, 35 miles wide and 1.5 feet deep. The river flowed slowly south from the lake, taking about 16 months to reach Florida Bay.

The sawgrass of the river took up the nutrients (phosphorus and nitrogen), and the clean, freshwater finally mixed with the ocean saltwater of Florida Bay. This was one of the most productive estuarine environments on our planet, a thriving nursery for abundant aquatic life. It must have been absolutely beautiful.

Due to major hurricane flooding in 1928, the government built a dam around Lake Okeechobee to stop the flooding (which stopped the River of Grass) and built channels to direct the water east to the St. Lucie estuary and west to the Caloosahatchee estuary instead of south to the Everglades.

The 700,000 acres just south of the lake became the Everglades Agricultural Area where the private agricultural industry, primarily sugar cane, controls the water for their irrigation — keeping the crops dry and land drained for perfect conditions resulting in a profitable harvest.

The runoff water from the EAA basin is huge and has high amounts of phosphorus. Several decades ago, the state of Florida bought 57,000 acres in the EAA and built stormwater treatment areas, which are manmade marshes, operated to take out the phosphorus before it could go south to the Everglades.

The state has spent over $1.8 billion on the STAs and millions each year to operate them to clean up the EAA basin runoff. In fact, we as state taxpayers are spending an additional $880 million on "restoration strategies" to expand the STAs just to meet the water quality standards for discharging the EAA basin runoff water to the Everglades.

From May through October 2017, about 418 billion gallons of EAA basin runoff went through the STAs, while only 7 billion gallons of water from Lake Okeechobee were treated on the way south to the Everglades.

Since 1995, the state's STAs have treated 5.7 trillion gallons, with only an average of 10 percent coming from Lake Okeechobee and 90 percent from EAA basin runoff.

Now we are trying to build the EAA Reservoir project, as called for in Senate Bill 10, to store and treat more water from Lake Okeechobee.

Well, perhaps we should use the state-owned and operated lands, including the stormwater treatment areas, to treat our state water from Lake Okeechobee — and tell the agricultural industry in the EAA to use their own land to store and treat their runoff to the Everglades.

For too many years, state taxpayers have covered the costs of treating billions of gallons of agricultural runoff and removed thousands of tons of the industry's phosphorus.

Isn't it time we tell them to store and treat their water on their own lands, just like we require other land development to do now? Shouldn't we use our state-owned STAs for the goal of restoring the River of Grass and stopping the damaging discharges to the coastal estuaries?

Shouldn't we require the EAA agricultural industry to store and clean up their own water, as the Florida Constitution requires?

-Mark Perry, executive director of Florida Oceanographic Society

Florida's Asbestos Belt: What's Behind High Mortality Rates in Three Counties?

Florida's Hernando, Citrus and Sumter counties share a great quality of life, pleasant climate and central location between Tampa and Orlando. They also have a less pleasant feature in common: asbestos death rates more than twice as high as the state or national average.

Washington, D.C. – Florida's Hernando, Citrus and Sumter counties share a great quality of life, pleasant climate and central location between Tampa and Orlando. They also have a less pleasant feature in common: asbestos death rates more than twice as high as the state or national average.

The annual mortality rate from asbestos-triggered diseases is 4.9 per 100,000 deaths in the U.S. and 5.3 per 100,000 deaths in Florida. But an analysis by EWG Action Fund finds that the rate is 13.2 per 100,000 in Hernando County, 12.3 in Sumter County and 11.7 in Citrus County. Those rates are much higher than in major urban counties such as Pinellas, Orange or Miami-Dade.

mortality rates for leukemia and for cancer of the pancreas, cervix, brain or stomach. Between 1999 and 2013, nearly 700 residents of Hernando, Citrus and Sumter counties, with a combined population of about 420,000, died of diseases caused by asbestos. In the same period, 14,000 Floridians died from asbestos exposure, more than in any other state except California.

Sonya Lunder, a research analyst with EWG Action Fund, said the elevated death rates could be a legacy of mining and cement production. The three-county area once had or still has a number of limestone, phosphate or crushed-rock mines, which can all contain asbestos deposits. Until the 1970s, when its deadly risks became well known, asbestos was often added to strengthen cement.

To come up with her estimates, Lunder combined federal records of deaths from mesothelioma and asbestos, two diseases caused only by asbestos exposure, with a formula developed by international cancer researchers of the World Health Organization for estimating asbestos-related lung cancer deaths.

Asbestos was once widely used in the construction, auto manufacturing and repair, shipbuilding and electrical industries, as well as in many consumer products. It is no longer mined in the U.S., and its use has declined significantly. Although many Americans believe it has been banned, it remains legal for import and for many uses. Asbestos is almost certainly in homes, schools and other buildings constructed before 1980.

The federal Occupational Safety and Health Administration (OSHA) warns that there is no "safe" level of asbestos exposure, adding that, "[a]sbestos exposures as short in duration as a few days have caused mesothelioma in humans."

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EWG Action Fund is a 501(c)(4) organization that is a separate sister organization of the Environmental Working Group. The mission of EWG Action Fund is to protect health and the environment by educating the public and lobbying on a wide range of environmental issues. Donations to EWG Action Fund are not tax-deductible.

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From: **Judy Hughes** jlynn2@shaw.ca
Subject: **Submission for the Standing Policy Committee on Community and Protective Services Hearing on Water Fluoridation Agenda. July 24,2019**
Date: **July 15, 2019 at 9:50 AM**
To: PublicSubmissions@calgary.ca
Cc: cityclerk@calgary.ca

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.

Dear Letter to city co...or.docx

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 Representative Jeff Davison,

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 the 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.