

Chairman Gian-Carra Carlo and members of the Standing Policy Committee of
Community and Protective Services

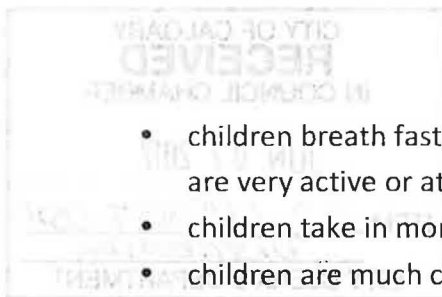


RE: Pesticide Toxicity Report – CPS 2017-0510, June 7, 2017

First of all, it is so encouraging to hear that the City of Calgary Council is evaluating pesticide toxicity with the goal of eliminating the use of the more toxic pesticides on City-owned land. Calgary has been criticized in the past for not protecting its citizens from toxic pesticides despite the awareness that these chemicals have long been linked to many developmental and health issues with children including cancer. Of greatest concern for me is the impact these chemicals have on children's health and am pleased to submit my position as a concerned citizen, a long-standing health care worker, a university educator, an author, a mother, grandmother and an Advisory Board member for the Coalition for a Healthy Calgary. I will speak from the position of having studied the impact of toxic chemicals on our health with a special interest in children's health. I have authored a book called "Indoor Air Pollution... The Silent Killer" and developed two courses for Mount Royal University. The first course was entitled "Children's Environmental Health" which was developed for Continuing education and the second is called Integrative Healing Practices and speaks to environmental impacts on health. This second course is delivered in the fourth year of the Nursing Program and the Integrative Health Coach Program for Continuing Education. I spent many years presenting seminars throughout North America on environmental wellness, served on the Advisory Board for the Integrative Health Institute at Mount Royal University for seven years, and am listed on the Experts Directory at Mount Royal University to address issues identified by the community for environmental concerns. I have been employed by Mount Royal University for seventeen years as an Associate Professor, Department of Nursing and Midwifery.

Let me begin by stressing how much scientific evidence is now available to support the long standing belief of many researchers that pesticide use has both immediate and long-term impact on human health, and especially the health of children. Please consider the following facts when making any decision related to pesticide use for the City of Calgary:

- children are at a very immature stage of neurological development. We have known for some time that the blood brain barrier does not fully close until about the age of two and scientific evidence further suggests that the brain is not fully developed until about the age of 12. Exposure to toxic pesticides during this time may greatly impact the development of the nervous system resulting in numerous health and behavioural problems
- children have a greater skin surface for their size compared to adults so absorb proportionally greater amount of all toxic substances they are exposed to through their lungs and intestinal tracts

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- children breath faster than adults so take in more air. This is further enhanced when they are very active or at play
 - children take in more food and water per kilo than adults
 - children are much closer to the ground than adults and often engage in activities that have direct contact with the ground and grass.
 - very young children tend to put their hands or other things in their mouths which further increases their exposure to toxic pesticides
children do not fully develop their immune systems or detoxifying mechanisms until early teenage years greatly reducing their ability to fight the introduction of toxic pesticides into their systems
 - cancer continues to be the leading cause of death by disease past infancy among children -- leading the way are leukemia and brain cancer, both areas of the body that are extremely vulnerable to exposures in the environment.

It is this combination of increased exposure to pesticides and the lack of defenses related to bodily development to combat the toxic effects of pesticides that puts children at such a high risk.

In making your decision regarding pesticide use, allow me to bring your attention to the ***"Precautionary Principle"*** or sometimes referred to as the "precautionary approach" to risk management which clearly states that if ***"an action or policy has a suspected risk of causing harm to the public, or to the environment, in the absence of scientific consensus the "burden of proof" that it is NOT harmful falls on those taking that action.***

This is the principle that is used by policy makers to justify discretionary decisions in situations where there is the ***"possibility of harm"*** from making a certain decision such as taking or choosing a particular course of action, when extensive scientific knowledge on the matter is lacking. The principle implies that there is a ***"social responsibility"*** to protect the public from exposure to harm, when scientific investigation has found a plausible risk. These protections can be relaxed ONLY if further scientific findings emerge that provide sound evidence that no harm will result. To date, that evidence has not been made available to us.

I would like to leave you with 46 recent and relevant scientific studies related to pesticide exposure that should definitely make you question the safety, and ask that you please consider them carefully. The main theme of each study has been identified.

Thank you,

Respectfully submitted by:

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Recent and relevant scientific studies related to pesticide exposure

- In 2015, WHO found that there was sufficient evidence of carcinogenicity in experimental organisms to classify glyphosate, the active ingredient in the most popular lawn care brand (Roundup) as “probably carcinogenic to humans” (Group 2A). WHO also found that 2,4-D found in many ‘weed and feed’ products is possibly carcinogenic (10).
- A 2010 meta-analysis of 15 studies on residential pesticide use and childhood leukemia finds an association with exposure during pregnancy, as well as to insecticides and herbicides. An association is also found for exposure to insecticides during children (11).
- A 2013 study suggests that preconception pesticide exposure, and possibly exposure during pregnancy, is associated with an increased risk of childhood brain tumors (12).
- According to a 2015 study, living in agricultural regions is linked to increased leukemia and central nervous system cancers in children (13).
- The National Academy of Sciences reports that children are more susceptible to chemicals than adults and estimates that 50% of lifetime pesticide exposure occurs during the first five years of life (1).
- EPA concurs that children take in more pesticides relative to body weight than adults and have developing organ systems that are more vulnerable and less able to detoxify toxic chemicals (2).
- Infants crawling behavior and proximity to the floor account for a greater potential than adults for dermal and inhalation exposure to contaminants on carpets, floors, lawns, and soil (3).
- Children with developmental delays and those younger than six years are at increased risk of ingesting pesticides through non-food items, such as soil (4).
- Pre-natal exposure to the herbicide atrazine are associated with fetal growth restriction and small head circumference and fetal growth restriction (5).
- A 2010 analysis observed that women who use pesticide in their homes or yards were two times more likely to have children with neural tube defects than women without these reported exposures (6).
- Studies find that pesticides such as the weedkiller 2,4-D pass from mother to child through umbilical cord blood and breast milk (7).
- Consistent observations have led investigators to conclude that chronic low-dose exposure to certain pesticides might pose a hazard to the health and development of children (8).
- The World Health Organization (WHO) cites that over 30% of the global burden of disease in children can be attributed to environmental factors, including pesticides (9).
- A meta-analysis study by scientists at the Harvard University’s School of Public Health finds that children’s exposure to pesticides in and around the home results in an increased risk of developing certain childhood cancers. Authors found that cancer risks were connected most closely to the type of pesticide used and the location where it was applied (14).

- The probability of an effect such as cancer, which requires a period of time to develop after exposure, is enhanced if exposure occurs early in life (15).
- A study published in the Journal of National Cancer Institute finds that household and garden pesticide use don't mix.
- Use of toxic pesticides increase the risk of childhood leukemia as much as seven-fold (16).
- Studies show that children living in households where pesticides are used suffer elevated rates of leukemia, brain cancer and soft tissue sarcoma (17).
- Pesticides can increase susceptibility to certain cancers by breaking down the immune system's surveillance against cancer cells. Infants and children, the aged and the chronically ill are at greatest risk from chemically-induced immune suppression (18).
- A study published by the American Cancer Society finds an increased risk for non-Hodgkin's lymphoma (NHL) in people exposed to common herbicide and fungicides, particularly the weedkiller mecoprop (MCPP). People exposed to glyphosate (Roundup®) are 2.7 times more likely to develop NHL (19).
- 75 out of all 99 human studies done on lymphoma and pesticides find a link between the two (20).
- Four peer-reviewed studies demonstrate the ability of glyphosate-containing herbicides to cause genetic damage to DNA (mutagenicity), even at very low concentration levels (21).
- A 2007 study published in Environmental Health Perspectives finds that children born to mothers living in households with pesticide use during pregnancy had over twice as much risk of getting cancer, specifically acute leukemia (AL) or non-Hodgkin lymphoma (NHL) (22).
- A 2007 Canadian report shows that a greater environmental risk exists for boys, specifically when it comes to cancer, asthma, learning and behavioral disorders, birth defects and testicular dysgenesis syndrome (23). This correlates with figures shown on the greater number of boys who experience learning and behavioural disorders such as ADD and ADHD.
- Researchers find that pesticides may increase the risk of developing asthma, exacerbate a previous asthmatic condition or even trigger asthma attacks by increasing bronchial hyper-responsiveness (24).
- One 2015 farmworker study found an association between early-life exposure to OPs and respiratory symptoms consistent with possible asthma in childhood (25).
- A 2012 study concluded that prenatal PBO exposure was associated with childhood cough in inner city children (26).

- A 2004 study finds that young infants and toddlers exposed to herbicide (weedkillers) within their first year of life are 4.5 times more likely to develop asthma by the age of five, and almost 2.5 times more likely when exposed to insecticides (27).
- EPA material safety data sheets for the common herbicides 2,4-D, mecoprop, dicamba, (often combined as Trimec® and glyphosate (Roundup®) list them as respiratory irritants that can cause irritation to skin and mucous membranes, chest burning, coughing, nausea and vomiting.
- Roughly one in six children in the U.S. has one or more developmental disabilities, ranging from a learning disability to a serious behavioural or emotional disorder (28).
- Scientists believe that the amount of toxic chemical in the environment that cause developmental and neurological damage are contributing to the rise of physical and mental effects being found in children (29).
- According to researchers at the University of California Berkeley School of Public Health, exposure to pesticides while in the womb may increase the odds that a child will have attention deficit hyperactivity disorder (ADHD) (30).
- Studies show children's developing organs create "early window of great vulnerability" during which exposure to pesticides can cause great damage (31).
- Lawn pesticide products containing herbicides and fertilizers (such as "weed and feed" products) tested on mice show increased risk of infertility, miscarriage and birth defects at very low dosages (32).
- Results from a CHARGE study finds that agricultural exposures to organophosphates at some point during gestation was associated with a 60% increased risk for autism higher for third-trimester exposures, and second-trimester chlorpyrifos applications. Similarly, children of mothers residing near pyrethroid insecticide applications just before conception or during third trimester were at greater risk for both autism and developmental delay (33).
- Researchers at the Cincinnati Children's Hospital Medical Center found an association between increasing pyrethroid pesticide exposure and ADHD which they conclude may be stronger for symptoms seen in boys compared to girls (34).
- Additional studies on lawn pesticide product formulations show effect on learning ability, aggressiveness, memory, motor skills and immune system function (35).
- A 2002 study finds children born to parents exposed to glyphosate (Roundup®) show a higher incidence of attention deficit disorder and hyperactivity (36).
- A study of 210,723 live births in Minnesota farming communities finds children of pesticide applicators have significantly higher rates of birth defects than the average population (37).

- In a 2004-2005 review of 2,4-D, EPA finds that, "there is a concern for endocrine disruption." (38)
- Children ages 6-11 nationwide have significantly higher levels of pesticide residues in their bodies than all other age categories (39).
- Biomonitoring testing in Canada finds residues of lawn pesticides, such as 2,4-D and mecoprop, in 15% of children tested, ages three to seven whose parents had recently applied the lawn chemicals. Breakdown products of organophosphate insecticides are present in 98.7% of children tested (40).
- Scientific studies show that 2,4-D applied to lawns drifts and is tracked indoors where it settles in dust, air and surfaces and may remain for up to a year in carpets (41).
- One 2014 analysis of 129 preschool children, ages 20 to 66 months, found that children were exposed to indoor concentrations of pyrethroids, organophosphates and organochlorine pesticides which were detected in soil, dust and indoor air (42).
- Samples from 120 Cape Cod homes, where elevated incidence of breast, colorectal, lung, and prostate cancers are reported, find high indoor air and dust concentrations of carbaryl, permethrin, and 2,4-D (43).
- A study published in Environmental Health Perspectives found that children who eat a conventional diet of food produced with chemical-intensive practices carry residues of organophosphate pesticides that are reduced or eliminated when they switch to an organic diet (44).
- Scientists at the California Department of Public Health found that 28% of the mothers studies who lived near fields in the Central Valley, which were sprayed with organochlorines, such as endosulfan and dicofol, have children with autism (45).
- A 2005 study published in the Journal of the American Medical Association found that students and school employees are being poisoned by pesticide use at schools and from drift off of neighborin farmlands (46).

Hopefully, these studies will help us recognize the importance of using alternatives to reduce exposure to toxic chemicals by adopting sound organic or integrates pest management (IPM) practices that use cultural, mechanical and biological methods of control and "least-toxic" chemicals only as a last resort.

References:

1. National Research Council, National Academy of Sciences. 1993. Pesticides in the Diets of Infants and Children, National Academy Press, Washington, DC. 184-185.

2. US EPA, Office of the Administrator, Environmental Health Threats to Children, EPA 175-F-96-001, September 1996. See also: <http://www.epa.gov/pesticides/food/pest.htm>.
3. Bearer, CF. 2000. "The special and unique vulnerability of children to environmental hazards." *Neurotoxicology* 21: 925-934; Fenske, R., et al. 1990. "Potential Exposure and Health Risks of Infants following Indoor Residential Pesticide Applications." *Am J. Public Health*. 80:689-693.
4. Faustman EM, Silbernagel SM, Fenske RA, Burbacher TM, Ponce RA. 2000. "Mechanisms underlying children's susceptibility to environmental toxicants." *Environmental Health Perspectives*. 108(suppl 1):13 -21.
5. Chevrier C, Limon G, Monfort C, Rouget F, Garlantézec R, Petit C, et al. 2011. Urinary Biomarkers of Prenatal Atrazine Exposure and Adverse Birth Outcomes in the PELAGIE Birth Cohort. *Environ Health Perspect*. 119:1034-1041
6. Brender, JD., et al. 2010. Maternal Pesticide Exposure and Neural Tube Defects in Mexican Americans. *Ann Epidemiol*. 20(1):16-22
7. Pohl, HR., et al. 2000. "Breast-feeding exposure of infants to selected pesticides," *Toxicol Ind Health* 16 :65 -77; Sturtz, N., et al. 2000. "Detection of 2,4-dichlorophenoxyacetic acid (2,4-D) residues in neonates breast-fed by 2,4-D exposed dams." *Neurotoxicology* 21(1-2): 147-54; Houlihan, J., et al. 2005. Body Burden, The Pollution in Newborns. Environmental Working Group, Washington, D.C. http://www.ewg.org/reports/body_burden2/ (accessed 8/5/05).
8. Weiss, B., et al. 2004 April. "Pesticides," *Pediatrics* 113(4): 1030-1036.
9. World Health Organization (WHO). 2006. Principles for Evaluating Health Risks in Children Associated with Exposure to Chemicals. Geneva, Switzerland.
10. [IARC. IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. 20 march 2015. <http://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf>; and IARC. Carcinogenicity of lindane, DDT, and 2,4-dichlorophenoxyacetic acid. *The Lancet Oncology*, 16(8).p891-892.
11. Turner, M.C., et al. 2010. Residential pesticides and childhood leukemia: a systematic review and meta-analysis. *Environ Health Perspect* 118(1):33-41

12. Green KR, Peters S, Bailey HD. 2013) Exposure to pesticides and the risk of childhood brain tumors. *Cancer Causes Control*. DOI 10.1007/s10552-013-0205-1

13. Booth BJ, Ward MH, Turyk ME, et al. 2015. Agricultural crop density and risk of childhood cancer in the midwestern United States: an ecologic study. *Environmental Health*:14(82)

14. Chen M, Chi-Hsuan C, Tao L, et al. 2015. Residential Exposure to Pesticide During Childhood and Childhood Cancers: A Meta-Analysis. *Pediatrics*. DOI: 10.1542/ peds.2015-0006

15. Vasselinovitch, S., et al. 1979. "Neoplastic Response of Mouse Tissues During Perinatal Age Periods and Its Significance in Chemical Carcinogenesis," *Perinatal Carcinogenesis*, National Cancer Institute Monograph 51.

16. Lowengart, R., et al. 1987. "Childhood Leukemia and Parent's Occupational and Home Exposures," *Journal of the National Cancer Institute* 79:39.

17. Leiss, J., et al. 1995. "Home Pesticide Use and Childhood Cancer: A Case-Control Study," *American Journal of Public Health* 85:249-252; Gold, E. et al. 1979. "Risk Factors for Brain Tumors in Children," *Am J of Epidemiology* 109(3): 309-319; Lowengart, P., et al. 1995. "Childhood Leukemia and Parents' Occupational and Home Exposures," *J National Cancer Institute* 79(1): 39-45; Reeves, J. 1982. "Household Insecticide-Associated Blood Dyscrasias in Children," (letter) *Am J of Pediatric Hematology/Oncology* 4:438-439; Davis, J., et al. 1993. "Family Pesticide Use and Childhood Brain Cancer," *Archives of Environmental Contamination and Toxicology* 24:87-92; Buckley, J., et al. 1994. "Epidemiological characteristics of Childhood Acute Lymphocytic Leukemia," *Leukemia* 8(5):856-864.

18. Repetto, R., et al. 1996 March. *Pesticides and Immune System: The Public Health Risk*, World Resources Institute, Washington, DC.

19. Hardell, L., et al. 1999 Mar. "A Case-Control Study of Non-Hodgkins Lymphoma and Exposure to Pesticides," *J of the Am Cancer Soc*, (85):6. p.1353.

20. Osburn, S. 2001. *Do Pesticides Cause Lymphoma?* Lymphoma Foundation of America, Chevy Chase, MD.

21. Cox C. 2004 Winter. "Glyphosate." *Journal Of Pesticide Reform* Vol. 24 (4).
22. Rudant, J. et al. 2007. Household Exposure to Pesticides and Risk of Childhood Hematopoietic Malignancies: The ESCALE Study (SFCE). *Environ Health Perspect.* 115:1787–1793.
23. Canadian Partnership For Children's Health and Environment. 2007. A Father's Day Report - Men, Boys And Environmental Health Threats. www.healthyenvironmentforkids.ca.
24. Hernández, AF., Parrón, T. and Alarcón, R. 2011. Pesticides and asthma. *Curr Opin Allergy Clin Immunol.* 11(2):90-6
25. Raanan R, Harley KG, Balmes JR, et al. 2015. Early-life exposure to organophosphate pesticides and pediatric respiratory symptoms in the CHAMACOS cohort. *Environ Health Perspect.* 123(2):179-85.
26. Liu B, Jung KH, Horton MK, et al. 2012. Prenatal exposure to pesticide ingredient piperonyl butoxide and childhood cough in an urban cohort, *Environ Int.* 48:156-61.
27. Salam, MT, et al. 2004. "Early Life Environmental Risk Factors for Asthma: Findings from the Children's Health Study." *Environmental Health Perspectives* 112(6): 760.
28. Boyle, C. A., et al. 1994. "Prevalence and health impact of developmental disabilities in US children." *Pediatrics* 93: 399-403.
29. National Research Council. 2000. *Scientific frontiers in developmental toxicology and risk assessment*. Washington, DC: National Academy Press; Physicians for Social Responsibility, The National Environmental Trust, and the Learning Disabilities Association of America. 2000. *Polluting our future: Chemical pollution in the U.S. that affects child development and learning*. http://www.net.org/health/tri_report.pdf (accessed 6/2/05).
30. Marks AR, Harley K, Bradman A, Kogut K, Barr DB, Johnson C, et al. 2010. Organophosphate Pesticide Exposure and Attention in Young Mexican-American Children: The CHAMACOS Study. *Environ Health Perspect* 118:1768-1774.
31. Landrigan, P.J., L Claudio, SB Markowitz, et al. 1999. "Pesticides and inner-city children: exposures, risks, and prevention." *Environmental Health Perspectives* 107 (Suppl 3): 431-437.

32. Greenlee, A. et al. 2004. "Low-Dose Agrochemicals and Lawn-Care Pesticides Induce Developmental Toxicity in Murine Preimplantation Embryos," *Environmental Health Perspectives* 112(6): 703-709; Cavieres, M., et al. 2002. "Developmental toxicity of a commercial herbicide mixture in mice: Effects on embryo implantation and litter size." *Environmental Health Perspectives* 110:1081-1085.
33. Shelton, Geraghty, Tancredi. 2014. Neurodevelopmental Disorders and Prenatal Residential Proximity to Agricultural Pesticides: The CHARGE Study. *Environmental Health Perspectives*:122(10).
34. Wagner-Schuman, M, Richardson, J, Auinger, P et al. 2015. Association of pyrethroid pesticide exposure with attention-deficit/hyperactivity disorder in a nationally representative sample of U.S. children. *Environmental Health*. 14:44
35. Porter, W. 2004 Spring. "Do Pesticides Affect Learning and Behavior? The neuro-endocrine-immune connection," *Pesticides and You, Beyond Pesticides* 21(4): 1115; Shettler, T., et al. 2000. "Known and suspected developmental neurotoxicants," In *Harms Way: Toxic Threats to Child Development*, Greater Boston Physicians for Social Responsibility: Cambridge, MA; Mitchell, J. et al. 1989. "The Behavioral Effects of Pesticides in Male Mice," *Neurotoxicology and Teratology* 11: 45-50.
36. Cox C. 2004. *Journal Of Pesticide Reform* Vol. 24 (4) citing: Garry, V.F. et al. 2002. "Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota." *Environmental Health Perspectives* 110 (Suppl. 3):441-449.
37. Garry, V., et al. 1996. "Pesticide applicers, biocides, and birth defects in rural Minnesota." *Environmental Health Perspectives* 104(4):394-399.
38. EPA. 2004 June. 2,4-D. HED's Human Health Risk Assessment for the Reregistration Eligibility Decision (RED). p7.
39. Centers for Disease Control and Prevention. 2003 Jan. Second National Report on Human Exposure to Environmental Chemicals.
40. Valcke, Mathieu, et al. 2004. "Characterization of exposure to pesticides used in average residential homes with children ages 3 to 7 in Quebec." *Nat Inst of Public Health, Québec*. www.inspq.qc.ca/pdf/publications/319-CharacterisationPesticidesEnfants.pdf (accessed 6/2/05).

41. Nishioka, M., et al. 1996. "Measuring lawn transport of lawn-applied herbicide acids from turf..." *Env Science Technology*, 30:3313-3320; Nishioka, M., et al. 2001. "Distribution of 2,4-D in Air and on Surfaces Inside Residences..." *Environmental Health Perspectives* 109(11)
- . 42. Morgan, M, Wilson, N, and Chuang C. 2014. Exposures of 129 Preschool Children to Organochlorines, Organophosphates, Pyrethroids, and Acid Herbicides at Their Homes and Daycares in North Carolina. *Int. J. Environ. Res. Public Health*, 11(4), 3743-3764
43. Rudel, Ruthann, et al. 2003. "Phthalates, Alkylphenols, Pesticides, Polybrominated Diphenyl Ethers, and Other Endocrine-Disrupting Compounds in Indoor Air and Dust." *Environmental Science and Technology* 37(20): 4543-4553.
44. Lu, C. et al. 2008. Dietary Intake and Its Contribution to Longitudinal Organophosphorus Pesticide Exposure in Urban/Suburban Children. *Environmental Health Perspectives* doi:10.1289/ehp.10912 available via <http://dx.doi.org/>.
45. Roberts, C. et al. 2007. Maternal Residence Near Agricultural Pesticide Applications and Autism Spectrum Disorders among Children in the California Central Valley. *Environmental Health Perspectives* 115(10)
46. Alarcon, WA. et al. 2005. Acute illnesses associated with pesticide exposure at school. *J Am Medical Association* 294(4); 455-465.