

To: Chair and Members of the Civic Works Committee
From: Christopher Mackie, MD, MHSc, CCFP, FRCPC
Medical Officer of Health and Chief Executive Officer
Subject: Water Fluoridation
Date: February 5, 2019

Recommendation

As the Medical Officer of Health for London and Middlesex, I have a mandate to protect and promote public health and safety. Upon review of evidence-based research, data and information regarding water fluoridation, I strongly support and recommend that the City of London continue to practice water fluoridation at the optimal level of 0.6 mg/L – 0.8 mg/Lⁱ, as a safe, beneficial, equitable and cost-effective measure to provide all residents of London with protection against tooth decay.

Key Points:

- Water fluoridation is safe and improves and promotes the oral health of all residents, regardless of their socioeconomic status or whether they have dental insurance.
- Tooth decay is the single most common chronic childhood disease. The Middlesex-London Health Unit estimates that if water fluoridation were discontinued, London children would experience at least 40,000 additional cavities over the next ten years.
- There is no evidence to support a link between exposure to fluoride in drinking water at the levels used in London and any adverse health effects, such as any types of cancer, developmental defects, neurobehavioral effects, or genotoxicityⁱⁱ.
- In Calgary, a recent study found that there was a worsening in tooth decay for primary teeth since that city discontinued fluoridation in 2011, as compared to Edmonton, where water is still fluoridated. The number of tooth surfaces with decay per child increased by 3.8 surfaces in Calgary during the time frame of the study, as compared to only 2.1 in Edmontonⁱⁱⁱ.
- Windsor, Ontario recently voted to resume water fluoridation due to the strong science that it is safe and effective.
- In Juneau, Alaska, 12 years after that community stopped water fluoridation, children under 6 are experiencing one additional cavity per year, which translates to an expense of about \$300 per child^{iv}.
- An economic review of multiple studies found that savings for communities ranged from up to \$135 for every \$1 investing in water fluoridation^v.
- More than 90 national and international professional health organizations including Health Canada, the Canadian Public Health Association, the Canadian Dental Association, the Canadian Medical Association, the Centers for Disease Control, the National Institutes of Health and the World Health Organization endorse the fluoridation of drinking water to prevent tooth decay, especially among children.

Fluoride

The Canadian Dental Association asserts that water fluoridation is a safe and effective mechanism for preventing cavities in all age groups. Public health authorities across North America endorse fluoridation of community water supplies as a significant component of enhanced dental health. The U.S. Centers for Disease Control identifies it as one of 10 great public health achievements of the 20th century.

Fluoride is a naturally occurring mineral present in nearly all water sources. It supports oral health by making the outer layer of teeth stronger and less likely to get cavities. It can also help prevent and reduce tooth decay. When ingested, fluoride becomes part of the tooth structure during tooth formation and provides topical protection as it is retained in saliva and continually surrounding the tooth. When added to drinking water systems, fluoride is classified as a direct additive or a drinking water treatment chemical.

Wide-scale supplementation of food and beverages is a well-established public health approach that has been used for over 100 years. Similar interventions are iodine supplementation of table salt to prevent thyroid tumours, vitamin D supplementation of milk to prevent rickets, and folic acid supplementation of flour to prevent birth defects.

Over the last five years in Ontario, fluoridated water systems coverage increased from 67% of the population in 2012 to 71% in 2017. The City of London has practiced water fluoridation since 1967. Fluoridated drinking water has been proven effective at reducing the number of cavities in children's teeth, as well as adults, which contributes to their healthy development.

Tooth decay is the single most common chronic childhood disease - 5 times more common than asthma, 4 times more common than early- childhood obesity, and 20 times more common than diabetes^{vi}. In Canada, tooth decay accounts for one-third of all day surgeries performed on children between the ages of 1 and 5^{vii}.

While the majority of studies have described the positive impacts of fluoridation on the dental health of children, there are also studies that establish a benefit for adults, and particularly older adults. Caries reductions of approximately 15-35% have been observed in adults and seniors who reside in communities with fluoridated water. Older adults are especially vulnerable to tooth decay. This is linked to a variety of factors, including gum recession and decreased saliva production associated with certain medications prescribed to treat chronic illness.

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Oral Health Inequities

It has been well established that the benefits of fluoridation are greatest for people who live in conditions of material deprivation. Community level factors such as housing, education, income and access to oral health care greatly influence health and contribute to inequity in oral health status. Water fluoridation promotes equality amongst all segments of the population, particularly the underprivileged and the hardest to reach poor for whom other preventive measures, such as regular dental visits, may be inaccessible.

London elementary school screening data in 2017-2018 showed that 1,776 students (11.1%) of those screened were found to have urgent dental needs which deemed them clinically eligible to receive Healthy Smiles Ontario. Tooth decay can cause pain, school and work absences, difficulty concentrating and cosmetic issues. Even with government programs like Healthy Smiles Ontario, dental services are extremely underutilized, with a majority of services being paid out-of-pocket.

Quality of Research and Systematic Appraisal

Even in the peer-reviewed literature, there are many studies that either paint an incomplete picture, or are based on methods of varying quality. As such, MLHU is committed to identifying and reviewing research to identify the best available evidence, and to seek a balanced understanding of the issue at hand. MLHU critically and objectively appraises the relevant evidence for quality, interprets the findings, and applies the findings to the local context.

Where available, systematic reviews, rather than single studies, are a more appropriate guide for decisions. Systematic reviews compile the results from many high quality single studies to come to a well-grounded conclusion about a topic. To assess quality, research evidence is critically appraised to determine if methods controlled for different types of bias. “Bias” in the context of health research is defined as systematic errors in the way the study is designed, conducted or interpreted that could affect the study results.

The Hierarchy of Quantitative Evidence

What is the best available evidence?

The hierarchy of evidence attempts to address this question. It uses a top-down approach to locate the best evidence by searching for systematic reviews or meta-analyses.

If these are not available, the researchers move down to the next level that is appropriate to answer the research question.

The hierarchy ranks study types based on the rigour (strength and accuracy) of their research methods.

The higher up the study design is positioned, the more rigorous the methodology and more likely that the study design is able to minimize bias on the study results.



FIGURE 1: The hierarchy of quantitative evidence

Health Canada and Public Health Ontario Peer-Reviewed Evidence

Health Canada plays a major role in providing the scientific and technical basis for the drinking water standards that are implemented by the province. In 2010, Health Canada reviewed over 430 studies, including chronic toxicological studies, to determine that the consumption of fluoridated water at the optimal level did not pose a risk to human health^{ix}.

In October 2018, Public Health Ontario (PHO), an organization that provides scientific evidence and expert guidance that shapes policies and practices to prevent illness and improve health, released its Evidence Review for Adverse Health Effects of Drinking Optimally Fluoridated Water^x. This review provides a summary of the evidence published since the 2010 Health Canada fluoride document regarding the adverse health effects of optimally controlled fluoridated water with a scope specific to optimally controlled fluoridated community drinking water.

PHO reported that studies conducted and the organizational reports published after the 2010 Health Canada fluoride document corroborate the Health Canada findings there is no evidence to support a link between exposure to fluoride in drinking water at or below 1.5 mg/L (Health Canada’s maximum acceptable concentration^{xi}) and any adverse health effects such as any types of cancer, developmental defects, neurobehavioral effects, or genotoxicity^{xii}. The existing literature indicates that mild dental fluorosis (generally unnoticeable white specks on teeth) is the only adverse effect experienced from the consumption of optimally fluoridated water.

Like any substance, exposures to very high doses can cause health issues, including bone problems. These health issues are not a concern with the low levels of fluoride added to London's water.

Given that the studies included in PHO report assessed the impact of optimally fluoridated water and most of them were from countries that have similar demographic and socio-political environments, their findings can be generalized to the Canadian context.

Studies on water fluoridation continue to emerge, and several additional studies were published in 2018. MLHU has reviewed these, and they do not change the conclusion that water fluoridation is safe and effective.

Ending Fluoridation Would Present Risks to the Health of Londoners

Using data from the recent studies in Calgary and Alaska, we can estimate the impact that discontinuing water fluoridation might have in London. These studies and others demonstrate that discontinuing water fluoridation would result in an increase of approximately 1 to 1.7 cavities per child. If we use the lower figure to generate a conservative estimate and consider that there are over 4,000 births in London each year, we can see that:

Minimum of one excess cavity per child X 4,000 children born each year X 10 years = 40,000 additional cavities

This figure is almost certainly a low estimate due to the conservative figures used for both the number of children, and the number of additional cavities per child.

Conclusion

Fluoridation of drinking water is still the most economical means of getting the proven protection that fluoride gives to the oral health of all residents, regardless of socio-economic status. Where fluoride has been added to municipal water supplies, there has been a marked decline in tooth decay rates; recent studies have also shown that its removal resulted in increased dental caries. In addition, evidence-based research, data and information regarding water fluoridation have found no evidence to support a link between exposure to optimally fluoride levels in drinking water and any adverse health effects such as any types of cancer, developmental defects, neurobehavioral effects, or genotoxicity.

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- ⁱ Safe Drinking Water and Fluoride Monitoring Protocol, 2018. Ontario Public Health Standards, (2018).
- ⁱⁱ [Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride 2010](#)
- ⁱⁱⁱ McLaren, Lindsay & Patterson, Steven & Thawer, Salima & Faris, Pd & Mcneil, Deborah & Potestio, Melissa & Shwart, Luke. (2016). Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices. Community dentistry and oral epidemiology.
- ^{iv} [Consequences of community water fluoridation cessation for Medicaid-eligible children and adolescents in Juneau, Alaska, \(2018\).](#)
- ^v Ran, T., S.K. Chattopadhyay, and Community Preventive Services Task Force, Economic Evaluation of Community Water Fluoridation: A Community Guide Systematic Review. Am J Prev Med, 2016. 50(6): p. 790-6.
- ^{vi} American Academy of Pediatric Dentistry
- ^{vii} The State of Oral Health in Canada. (2017).
- ^{viii} Ran, T., S.K. Chattopadhyay, and Community Preventive Services Task Force, Economic Evaluation of Community Water Fluoridation: A Community Guide Systematic Review. Am J Prev Med, 2016. 50(6): p. 790-6.
- ^{ix} [Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride 2010](#)
- ^x [Ontario Agency for Health Protection and Promotion \(Public Health Ontario\). Evidence review for adverse health effects of drinking optimally fluoridated water: evidence since the 2010 Health Canada fluoride document. Toronto, ON: Queen’s Printer for Ontario; 2018.](#)
- ^{xi} [Health Canada](#)
- ^{xii} [Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Fluoride 2010](#)