

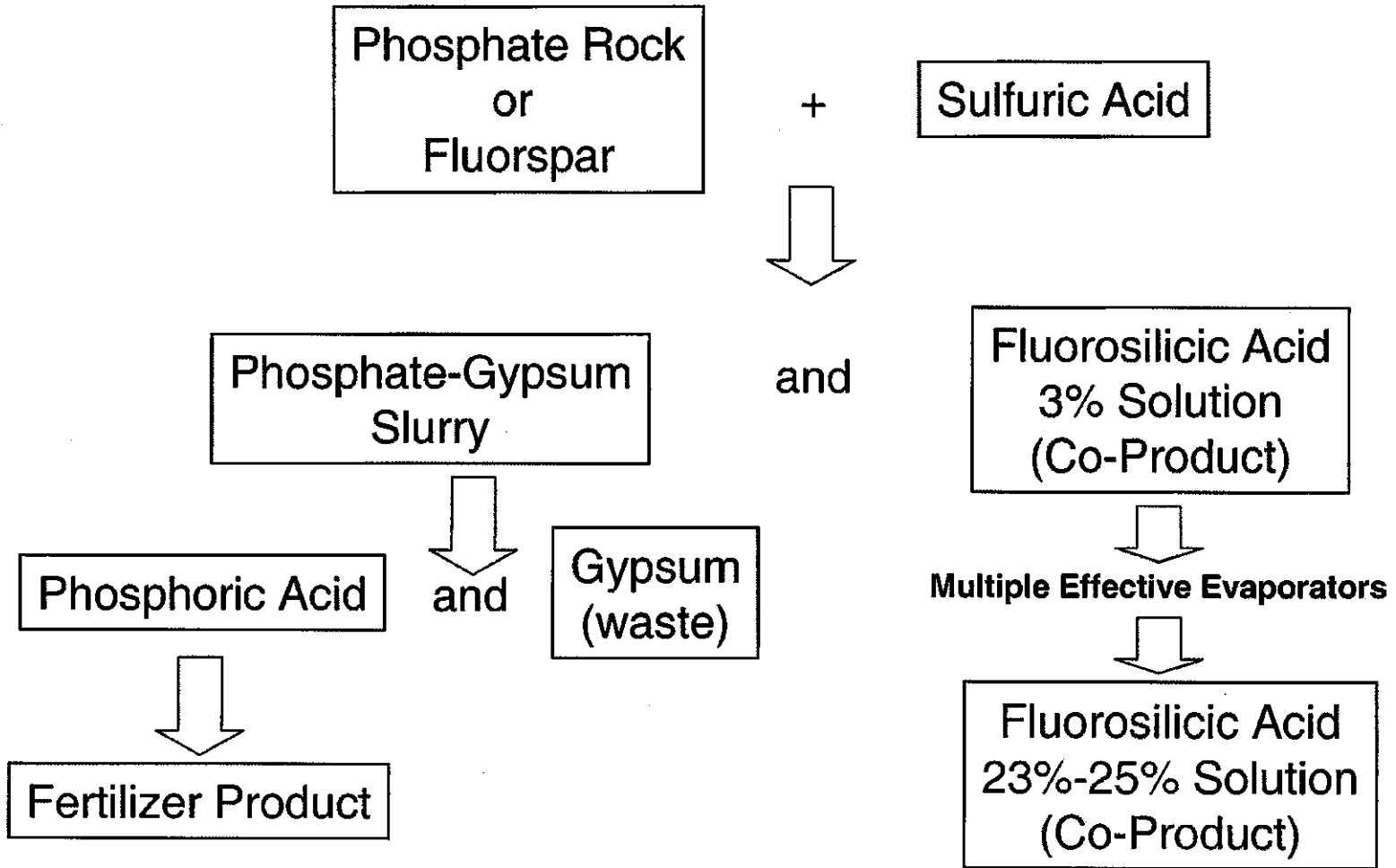
FSA Manufacture

- ◆ **Most FSA is a Co-Product of the manufacture of phosphate fertilizer or hydrofluoric acid**
- ◆ **Manufacturing processes are similar**
- ◆ **FSA solution from both processes is similar**
 - 23%-25% FSA (Hydrofluorosilicic Acid, H_2SiF_6)
 - <1% HF (Hydrofluoric Acid)
 - Balance is water

Solvay Fluorides' FSA

- ◆ **Most of Solvay Fluorides' FSA is purchased from other sources such as phosphate fertilizer manufacturers.**
- ◆ **Some of Solvay Fluorides' FSA is a co-product of our manufacturing operations in Juarez, Mexico.**
- ◆ **All Solvay Fluorides' FSA is NSF certified.**

FSA Production



18 Reviews on Community Water Fluoridation

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April 2008

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

Context:

As part of its review of the health effects of exposure to fluoride in drinking water, Health Canada convened a panel of experts in January 2007 to discuss this topic and to provide recommendations to ensure that exposure to fluoride remains below levels that could cause adverse effects (i.e., moderate and severe dental fluorosis) while achieving the public health benefit of preventing dental caries. Discussions were based on topic-specific literature reviews developed and presented by some of the invited experts.

The Expert Panel was asked to provide expert advice and to make recommendations to Health Canada and the Federal-Provincial-Territorial Committee on Drinking Water (CDW) regarding fluoride in drinking water. Advice was sought from the Expert Panel on five specific issues of concern:

- Total Daily Intake of Fluoride;
- Dental Fluorosis;
- Other Health Effects;
- Risk Assessment; and
- Drinking Water Fluoridation: Risks and Benefits

The Expert Panel reached a consensus on all key issues identified, and its main conclusions and recommendations to Health Canada and the Federal-Provincial-Territorial Committee on Drinking Water on each issue are provided below.

Expert Panel Members

- Steven M. Levy, Iowa College of Dentistry
- Christopher Clark, University of British Columbia
- Robert Tardif, Université de Montréal
- Michael Levy, Institut National de Santé Publique du Québec
- Jayanth Kumar, New York State Department of Health
- Albert Nantel, Institut National de Santé Publique du Québec

The opinions expressed in this report are those of the Expert Panel and do not necessarily reflect the views of Health Canada.

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

Total Daily Intake of Fluoride

Conclusions/Concerns:

- There appears to be a general decrease in the overall intake of fluoride in recent years. The use of supplements has decreased, as have the concentrations of fluoride in infant formulas.
- Experts were concerned about the assumptions used in the total daily intake calculation provided for the discussion. They all found that the ranges of age groups were too wide, especially for the 12 months to 4 years old category regarding differences in daily habits, body weight, food intake, and ingestion rates. *(Note from Health Canada: these are standard assumptions used by other groups within Health Canada. A working group at Statistic Canada is currently preparing the updated version of some of these exposure factors for the Canadian population.)*
- A concern was raised about the presence of Sulfuryl Fluoride residues as a pesticide that might be present in some food items. *(Note from Health Canada: This is not expected to be a concern in Canada, where there is a Maximum Residue Limit (MRL) of 0.1 ppm in unspecified food products, with actual levels observed usually much lower.)*

Recommendations:

- In the table summarizing the data for the total daily intake, ranges of intakes should be presented, rather than point estimates.
- In the table summarizing the data for the total daily intake, the range of the fluoride intake from toothpaste should be based on mean values of fluoride, and not on the 90th percentile.
- For infant formula, it is recommended that the “**All Formulae**” estimation, taking into account the average consumption of infant formula by Canadian infants, should be used. A footnote should be added at the bottom of the summary table of the Total Daily Intake from all sources to indicate that it does not represent the worst case scenario (powdered infant formula reconstituted with fluoridated water).

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

Dental Fluorosis

Conclusions/Concerns:

- There is no compelling evidence to challenge the statement that “22-26 months of age represents the period of greatest risk.” However, the first three years of age should be considered as the period with the most significant concern, with 22-26 months old possibly being the period at highest risk.
- The end-point of concern for fluoride is still considered to be “moderate dental fluorosis,” according to Dean’s Index. It was agreed that this should not be considered a toxicological end-point, but that this endpoint is significant because it correlates with cosmetic problems.

Recommendations:

- A clear definition is needed for the end-point of concern “moderate dental fluorosis” as there are no generally accepted criteria, and existing rating systems are not generally compatible and/or comparable. Monitoring of the prevalence of dental fluorosis in the Canadian population should be done on an on-going basis, based on the resulting definition and using common criteria.
- The calculation of the tolerable daily intake (TDI) of fluoride to prevent the occurrence of moderate dental fluorosis (according to Dean’s Index) should be mainly based on estimated total fluoride intake from fluid and food in Dean’s time. These estimates, as described below, should still be relevant today and should be used in the calculation of the tolerable daily intake to prevent the occurrence of moderate dental fluorosis:

1) 1600 µg/L of fluoride intake from drinking water, the level at which there was no moderate dental fluorosis in the 1940's, according to Dean’s data (*Note from Health Canada: With an ingestion rate of 0.8 L/day and a body weight of 13 kg for a 1 to 4 year-old child, the fluoride intake from drinking water would be:*

$$\frac{1600 \mu\text{g/L} \times 0.8 \text{ L/day}}{13 \text{ kg}} = 98.5 \mu\text{g/kg/day);}$$

2) Use the best food intake value to represent the situation in the 1940's. (*Note from Health Canada: New calculations, assuming a 1940's diet, indicate that the dietary intake of fluoride by a 1-4 year-old child living in a community with 1.5 ppm fluoride in the drinking water would have been about 27 µg/kg bw/day. Knowing that about 80% of the intake of fluoride from food comes from beverages (included in the 0.8 L/day), the breakdown amount comes to 5.4 µg/kg/day for food intake only);*

3) The intake of fluoride from soil and air is assumed to be about the same as it was in the 1940's (*the values are 1.19 µg/kg/day from soil and 0.01 µg/kg/day from air).*

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

Fluoride – Other potential health effects

Conclusions/Concerns:

- *Skeletal fluorosis*: The primary functional adverse effect associated with excess fluoride intake (after dental fluorosis) is still skeletal fluorosis (milder forms), likely to occur at about 10 mg/day after 10 or more years of exposure. Definitions of the different stages of skeletal fluorosis should be developed.
- *Cancer*: Weight of evidence does not support a link between exposure to fluoride and increased risks of cancer. It is important to avoid any generalization and over-interpretation of the results of the Bassin *et al.* (2006) paper and to await the publication of the full study before drawing conclusions and particularly before influencing any related policy. In addition, there is supplemental negative evidence from the 2005 NTP study, even with higher levels of fluoride than the original 1992 NTP study.
- *Intelligence Quotient*: - Weight of evidence does not support a link between fluoride and intelligence quotient deficit. There are significant concerns regarding the available studies, including quality, credibility, and methodological weaknesses such as the lack of control for confounding factors, the small number of subjects, and the dose of exposure.
- *Bone fracture*: Studies that do not control for confounding factors, such as intake of calcium, fluoride, or vitamin D supplements, intake of other medication, or consideration of traumatic fractures, should be interpreted cautiously.
- *Immunotoxicity, reproductive and developmental toxicity, genotoxicity and neurotoxicity*: 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 regarding immunotoxicity, reproductive/developmental toxicity, genotoxicity and/or neurotoxicity.

Recommendations:

- Weight of evidence does not support modifying the current Health Canada position/opinion on the carcinogenicity of fluoride. Policy decisions should not be based on the Bassin *et al.* (2006) paper.
- The current Maximum Acceptable Concentration (MAC) of 1.5 mg/L of fluoride in drinking water is unlikely to cause adverse health effects, including cancer, bone fracture, immunotoxicity, reproductive/developmental toxicity, genotoxicity, and/or neurotoxicity.

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

Risk Assessment

Conclusions/Concerns:

- The consumption of powdered infant formula reconstituted with fluoridated water could lead to excessive intake of fluoride in infants, although the following points should be considered:
 1. A few studies have found a positive association between greater use of infant formula reconstituted with fluoridated water and a greater prevalence of dental fluorosis; however, there are no studies that have been conducted to assess possible associations between fluoridated water and risk of moderate/severe dental fluorosis;
 2. The bioavailability of fluoride in reconstituted infant formula is likely to be less than in drinking water;
 3. Extended periods (e.g., multiple years) of exposure to fluoride are associated with increased fluorosis risk, and a higher exposure in the first year of life may not be as much of a concern if it is followed by low exposure;
 4. The risk of excessive intake of fluoride is higher for infants consuming larger quantities of infant formulas.

- Probabilistic exposures and outcomes are important to consider, rather than just point estimates.

Recommendations:

- Based on earlier and updated data, the current drinking water guideline of 1.5 mg/L for fluoride is still unlikely to be a cause of moderate dental fluorosis in the Canadian population.

- The MAC of 1.5 mg/L for fluoride in drinking water should be reaffirmed.

- Monitoring of fluoride levels in food items for the Canadian population known to contain high levels of fluoride should be done on an on-going basis.

- Further study is required to identify any possible links between dietary factors, fluoride intake and health impacts.

Findings and Recommendations of the Fluoride Expert Panel (January 2007)

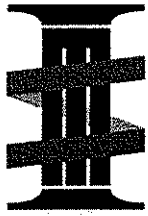
Water fluoridation - risks and benefits

Conclusions/Concerns:

- Under modern conditions of exposure, Heller *et al.* (1997) concluded that 0.7 mg/L of fluoride in drinking water provides a suitable trade off between the risk of dental fluorosis and the protective effect against dental caries. A previous analysis by Eklund and Striffler (1980) indicated that the effectiveness of water fluoridation seems to plateau at a concentration higher than 0.6 ppm of fluoride in drinking water.
- From a health perspective, there is no reason to be concerned about the actual prevalence of very mild and mild dental fluorosis in Canada. In addition, the actual prevalence of moderate dental fluorosis in Canada is low, and all evidence suggests that since 1996 there has been an overall decreasing trend of dental fluorosis in Canada.
- Community drinking water fluoridation is still an effective public health method to reduce the prevalence of dental caries in the Canadian population.
- It is now unlikely necessary to determine a range for the optimal target concentration of fluoride, partly because seasonal variability in drinking water consumption appears to be less significant now than before, with more indoor temperature control and fewer people working outdoors.

Recommendations:

- To adopt a level of 0.7 mg/L as the optimal target concentration for fluoride in drinking water, which would prevent excessive intake of fluoride through multiple sources of exposure.
- To promote and encourage the availability of lower-concentration fluoride dentifrices for children, which are already available in other countries.
- Because the greatest variability in fluoride ingestion from food comes from infant formula, the affected industry should be requested to continue to lower and standardize the fluoride concentration in infant formula.



Institute for Science in Medicine

COMMUNITY WATER FLUORIDATION

THE PROBLEM

Tooth decay continues to be the most common disease of mankind, having long caused misery and can even lead to life-threatening infections. One of the top public health achievements has been community water fluoridation (CWF), which now provides a safe, effective and economical way to help prevent tooth decay. Despite CWF's phenomenal success, a small but vocal movement of anti-fluoridation activists have, since the 1950s, spread unfounded fears among the public about it, with the result that some communities have opted to stop fluoridating their drinking water. Their destructive activities have manufactured a fake "scientific controversy" which ultimately results in a decline in dental health, lost productivity, and increased financial burdens on individuals and the health care systems.

BACKGROUND

Fluoride is necessary for developing and maintaining strong bones and teeth. In 1998, the Institute of Medicine classified fluoride a "nutrient" because of its important role in sustaining health.¹

Community water fluoridation (CWF) is the adjustment of the naturally-occurring fluoride content in drinking water for optimal health benefit. Worldwide, communities that fluoridate drinking water do so within the range of 0.6 to 1.2 ppm (parts per million).^{2,3,4,5,6} At this concentration, there is a wide margin of safety.⁷ Today in the United States, with many consumer products from toothpastes to fruit juices containing fluoride, a lower concentration of 0.7 ppm was proposed in 2011. It isn't until concentrations reach 4.0 ppm or greater that communities are required by the US Environmental Protection Agency to remove excessive naturally-occurring fluoride from drinking water.⁸ It should be noted that no communities in the United States add fluoride to drinking water to levels that exceed 1.2 ppm.

CWF is a safe, economical and effective way to deliver fluoride. Scientific studies have established that CWF lowers the rate of tooth decay by 20-40% in children, over and above the effect of topical fluoride products.⁹ Moreover, it benefits all residents of a community, regardless of socio-economic status.¹⁰ Fluoridation is one of the most cost-effective health strategies; for most communities, every \$1 invested in CWF saves \$38 to \$80 in dental treatment.^{11,12,13} CWF has been documented to eliminate millions of dollars in welfare medical costs, days lost at school and work, and in dental and emergency room visits.¹⁴ In 1995, fluoridation was estimated to be saving Americans an estimated \$3.8 billion per year.¹⁵ For example, according to a Texas study

published in 2000, CWF saved Medicaid \$24 per child per year.¹⁶ Research done in New Zealand determined that CWF is cost effective for communities of 1,000 or more inhabitants.¹⁷

The fluoride obtained from systemic sources actually becomes part of the tooth structure as baby teeth and permanent teeth develop under the gums of infants and children.¹⁸ These teeth are then considerably stronger and resist dental decay much better once they have erupted into the mouth. This protection, gained from getting fluoride from systemic sources, generally stays with the teeth throughout life.

Systemic sources of fluoride also benefit older children and adults. Fluoride from food and drink eventually ends up in a person's saliva. The fluoride in saliva constantly bathes the teeth so that the teeth are protected continuously through exposure to small amounts of fluoride. For those older children and adults fortunate enough to live in fluoridated communities, this constant protection of the teeth by saliva containing small amounts of fluoride is substantial. Through a process called remineralization, some very small cavities are not only prevented from getting larger, they actually can "heal" or repair themselves because of the action of these low levels of fluoride present in the saliva. Fluoride in saliva also inhibits attachment, metabolism, and reproduction of the bacteria implicated in the decay process, such that it inhibits the ability of these bacteria to produce enamel-destroying acids.^{11,19,20,21} CWF helps the elderly protect teeth that are at additional risk because of decreased saliva production and increased root exposure.²²

A recent increase in the incidence of tooth decay has been linked to the reliance on bottled water that does not contain sufficient fluoride content to promote dental health.^{23,24}

Antifluoridationists activists are small in number but tend to be very vocal. Since CWF's inception in 1945, they have made hundreds of invalid criticisms.²⁵ CWF has been a favorite target of conspiracy theorists; it has been charged with being a secret plot of Nazis, Communists, the Illuminati, the Centers for Disease Control and Prevention (CDC), the fertilizer industry, and many other groups.^{26,27}

The anti-fluoridation movement's allegations of harm from CWF are not scientifically substantiated. In particular, toxicity and carcinogenicity of fluoridation at the levels used in CWF have been ruled out by reliable scientific studies. The National Cancer Institute (NCI) states that CWF poses no increased risks for cancer.²⁸ The CDC has also concluded that there is "no credible evidence" for such a link.²⁹ Fluoride's only identified side-effect has been mild dental fluorosis — an almost unnoticeable *cosmetic* concern — and one where CWF makes only a small contribution.^{30,31,32,33}

Worldwide, some 400 million people have optimally fluoridated drinking water, with approximately 70% of the US, 90% of Australians, and 10% of the UK population having access.^{34,35,36} While studies indicate that most people favor CWF,^{37,38} this public health measure is not always implemented or retained. In January 2012, a prominent anti-fluoridation organization claimed 38 communities in the United States, Canada and New Zealand, together representing a population of 2,892,500, had been "freed from forced fluoridation" in just over a year.³⁹

The safety of CWF has been comprehensively reviewed by numerous public-health authorities and scientific institutions.⁴⁰ These include the US Public Health Service,⁴¹ World Health Or-

ganization,⁴² NCI,²⁸ CDC,⁴³ National Research Council,⁴⁴ and National Health and Medical Research Council (Australia).⁴⁵ None has ever identified any health risk with the levels of fluoride provided by CWF. As Consumers Union, another supporter of CWF, has aptly concluded:

*The simple truth is that there's no "scientific controversy" over the safety of fluoridation. The practice is safe, economical, and beneficial. The survival of this fake controversy represents one of the major triumphs of quackery over science in our generation.*⁴⁶

US courts have also recognized that there is no scientific controversy over the safety and efficacy of CWF. No appellate court – state or federal – has ever ruled that fluoridation of local water systems is an unconstitutional exercise of government power. Moreover, because fluoride is scientifically classified as a naturally-occurring mineral nutrient, like calcium or iron, courts have also consistently found that adjusting fluoride levels in water cannot be legally characterized as “mass medication.”^{47,48,49}

DISCUSSION

For a democratic society to make sound decisions about CWF, the debate that occurs should be reliably informed; scientific evidence and reasoning should be indispensable in making public health policy. Yet every year, some communities needlessly forego CWF, with resulting declines in dental health. Policy makers may see CWF as a place to trim public expenditures, especially when faced with local anti-fluoridation activists clamoring for an end to CWF, but it is a penny-wise, pound-foolish decision for the community. Decades of sound research and experience with CWF have made certain conclusions clear and inescapable.

Individuals can receive lifetime benefits from CWF, in improved quality of life, employment opportunities, and in the dental care savings (not only for the initial treatment for caries, but in the subsequent need for caps, root canals, tooth loss, dentures, etc.). Poor communities are especially impacted negatively by the lack of CWF.

No health risks have been identified with the levels of fluoride provided by CWF. Moreover, researchers continue to monitor changes in diet, climate, and life styles in order to insure the ideal levels of fluoride are present in drinking water.

Courts have repeatedly ruled that CWF neither interferes with constitutional freedoms nor is “mass medication” of a population. Since it already occurs in water naturally, CWF is an adjustment of that level. Water treatment should be determined by what is best for the community as a whole. The primary source of fluoride (hydrofluorosilicic acid) is irrelevant; when added to water, this chemical breaks down into fluoride ions, sand and water. Water-treatment engineers have an excellent record of ensuring safe drinking water.

CWF is practical and economical for most communities. Where it is not, there are alternative sources of fluoride, but these are considerably more expensive than CWF and require more individual effort than CWF. Reliance on alternative sources of fluoride puts many children at risk.

The astounding success of CWF may make citizens and policymakers complacent about the seriousness of tooth decay and its costs to the community. It is short-sighted to bow to the demands made by anti-fluoridation activists solely on fiscal grounds. It is a sound investment for states and municipalities to establish, maintain, or modernize fluoridation equipment.

Anti-fluoridation activists use many conventional propaganda techniques, such as the “Big Lie.” The Internet allows false claims about fluoridation to reach a wide audience. Emotionally-charged claims undermine the public’s confidence in the proven safety and effectiveness of CWF and have led some communities to reject scientific arguments supporting CWF.

The public can be misled about CWF when the media, in attempting to provide “balanced” reporting on the “controversy,” frequently give weight to the views of anti-fluoridationists that are not warranted by the scientific facts of the matter.

NEEDED POLICY

To help protect the public’s dental health, policymakers need to maintain community water fluoridation (CWF) and expand it to underserved communities.

- In order to optimize the dental health of citizens, all communal water systems need to implement CWF as recommended by recognized public health authorities.
- States, NGOs, and insurance companies should financially assist local communities to create and maintain facilities for optimal fluoridation of drinking water.
- The National Institutes of Health and the US Public Health Service need to begin a widespread program of public education, emphasizing the benefits, cost-effectiveness and safety of CWF.
- State health departments, local health officials, and dental and medical societies need to determine the level of fluoride in local water supplies, while educating their states and communities about appropriate fluoride supplementation and the need for CWF. Educators should encourage parents to supervise their children’s use of toothpaste.
- State and local dental and medical societies and other health authorities should be prepared to counter unfounded health claims about fluoridation as they arise. While the false claims made by the anti-fluoridation movement need to be addressed, the public especially needs to become familiar with the significant benefits of CWF and its excellent safety record.
- State and local dental/medical societies need to make a priority of reintroducing CWF where the anti-fluoridation movement has stopped this vital public health measure. Citizens in these communities need to be made aware that they are not benefitting from the protections of CWF.
- All bottled water sold for drinking purposes should be required to contain optimal levels of fluoride. Bottled water labels should be required to state the fluoride concentration.
- Media should be mindful that their content is used by voters and policy makers to decide public health issues. Whenever a story touches on CWF, reporters and editors should fact-

check with reliable and authoritative sources, and balance the story in accordance with the weight of the facts.

- Policy makers should seek out scientifically reliable information and opinion, and base decisions about CWF accordingly.

**Approved by ISM Board of Directors
22 January 2012**

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Hamilton

INFORMATION REPORT

TO: Mayor and Members Board of Health	WARD(S) AFFECTED: CITY WIDE
COMMITTEE DATE: April 16, 2012	
SUBJECT/REPORT NO: Water Fluoridation: New Data and Recent Developments BOH08024(c)(City Wide)	
SUBMITTED BY: Elizabeth Richardson, MD, MHSc, FRCPC Medical Officer of Health Public Health Services Department	PREPARED BY: Dr. Chris Mackie (905) 546-2424 Ext. 5581
SIGNATURE:	

Council Direction:

The Board of Health, at its meeting on April 26, 2011 directed "That staff be directed to provide annual reports to the Board of Health on Water Fluoridation."

Information:

Previous reviews by Public Health Services of the research on water fluoridation determined that water fluoridation is safe and effective in preventing dental cavities (caries)^{1,2}. For this report, a systematic review was conducted of the peer-reviewed medical literature published since the last Public Health Services report on water fluoridation in 2011. A basic environmental scan was also conducted to identify recent decisions by municipal bodies to fluoridate or not to fluoridate drinking water supplies as well as any potential policy changes at the provincial or national level. Details of findings are below; background information is in the final section of this report.

Summary:

- Some municipalities in Ontario and elsewhere made decisions to begin or continue water fluoridation and others made decisions to discontinue.

- A search of the scientific literature published since 2011 supports that fluoride is an effective and cost-efficient method to prevent dental caries. No study identified new harms.
- Health Canada raised its recommended optimal concentration of fluoride in drinking water for health benefits to 0.7 mg/L³. Hamilton water is fluoridated to 0.6 mg/L³.
- Recent analysis indicates that if water fluoridation was discontinued in Hamilton, this would translate into 180,000 additional cavities in Hamilton over 10 years.

Part 1: Municipal Water Fluoridation Decisions

These are communities that have made decisions about water fluoridation during the past 12 months. There is no registry for such events, so this list may be incomplete. For a list of communities that have made decisions prior to this, please see our 2011 report, BOH 08024(b)¹.

a) Some communities have introduced or continued adding fluoride to their drinking water:

- Halton Regional Councillors (Ontario) voted in favour of continuing fluoridation after 10 hours of presentations from delegates (January 2012)⁴.
- Peel Region Council voted to continue to carry on with the 40-year practice of fluoridated drinking water after hearing arguments from more than 20 delegates representing both sides of the fluoride debate (April 2011)⁵.
- The Toronto Core Services Review KPMG Report suggested that within Toronto Water, the city should consider eliminating fluoridation of city water⁶. But it said the potential savings are low at five per cent of the cost of fluoridation, and that "It is very likely that dental health of Toronto residents would decline." Toronto Public Health board members voted unanimously for the continued fluoridation of the water (April 2011)⁷.
- Maquoketa, Iowa City Council members agreed to keep fluoride in the city's water (January 2012)⁸.
- The Pinellas Park (Florida) City Council voted unanimously in favour of adding fluoride to community water supplies (January 2012)⁹.
- Arkansas passed the Arkansas Act 197 which mandates that water systems serving 5,000 or more people must fluoridate their water (February 2011)¹⁰.
- Port Macquarie-Hastings joined 95% of New South Wales (Australia) in delivering fluoridated water through its water supply system (February 2012)¹¹.

b) Some communities have removed fluoride from their drinking water systems:

- Amherstburg, Ontario voted to remove fluoride from the drinking water system. The town suspended water fluoridation awaiting information on upgrades and repairs to the system and methodology in providing fluoridation (April 2011). In January 2012, the decision was sustained, when town council passed a moratorium against adding fluoride¹².
- Lakeshore (which neighbours Amherstburg) town council decided to stop adding fluoride at the Stoney Point water treatment plant (November 2011)¹³.
- Williams Lake, BC and Lake Cowichan, BC voted separately to end fluoride (November 2011)¹⁴.

Part 2: Review of Scientific Literature

Research Question and Search Strategy

We conducted a review of the medical literature to identify if there was any new data about the safety or effectiveness of water fluoridation published since our last review in 2011. Our main research questions were:

- Is water fluoridation still beneficial for dental health in the current context?
- Is there any new evidence suggesting that water fluoridation is harmful?

A summary of our search strategy is found in Table 2: Search Strategy.

Our search for primary research studies and reviews of research studies about “water fluoridation” generated 14 articles in Medline and 70 articles in EMBASE. Three of these studies are discussed below. Also discussed below is a Canadian review. Studies not discussed did not relate to community water fluoridation, were not applicable to the Canadian setting, were general reviews of the topic with no new primary research information, or were policy statements rather than scientific research.

An Australian study¹⁵ evaluated the effectiveness of public water fluoridation in reducing children’s dental disease by comparing caries experience in areas with negligible fluoride concentrations in water and optimally fluoridated areas. Caries in baby teeth and adult teeth (deciduous and permanent teeth) were respectively 28.7% and 31.6% higher in low-fluoride communities.

Another Australian study¹⁶ modelled the cost-effectiveness of fluoridation of drinking water for children less than 15 years of age in Brisbane. If fluoridation was implemented there would be a savings of \$10,437 disability-adjusted life-years (DALYS, i.e., years of life lived with dental disability) and a substantial cost savings of \$666 million Australian dollars for state and private expenses.

An American study¹⁷ sought to estimate the association between community water fluoridation (CWF) and tooth loss at various stages of life. It found that CWF at birth was associated with having 0.26 more teeth 20 years later. The impact was larger for individuals of lower socio-economic status.

At the request of the Public Health Agency of Canada, Dr. McLaren, of the University of Calgary, published (April 2011) a synthesis of the literature pertaining to drinking water fluoridation in Canada¹⁸. The review focused on literature in academic and professional journals. The main findings include as follows:

- There is evidence beginning as early as 1945 for the effectiveness of drinking water fluoridation in the prevention of dental caries.
- Research consistently shows an association between exposure to drinking water fluoridation and increased risk of fluorosis. This illustrates the importance of monitoring fluoride concentrations, particularly in rural areas.
- Water fluoridation is an effective method to provide fluoride to all, including those who cannot afford or access dental care and other sources of fluoride. As such it is a practical way to address oral health inequities.
- Two empirical studies of public opinions about fluoridation suggested that the majority of various Canadian populations are supportive of, or at least not opposed to, fluoridation. This was echoed by a survey (2009) in the Region of Halton which showed the 64 percent of adults supported adding fluoride to the water¹⁹.

Part 3: New Guidelines and Impact of Fluoridation in Hamilton

a) New Health Canada Guidelines for Fluoride in Drinking Water:

Health Canada (June 2011) released its publication "Guidelines for Canadian Drinking Water Quality: Guidelines Technical Document Fluoride". This placed the optimal concentration of fluoride in drinking water for health benefits at 0.7 mg/L³. The U.S. Department of Health and Human Services did likewise²⁰. Currently, the City of Hamilton sets the concentration at 0.6 mg/L¹.

The Guideline also establishes the maximum acceptable concentration (MAC) for fluoride in drinking water as 1.5 mg/L to protect from mild fluorosis. This was based on the segment of the population most at risk for developing dental fluorosis, children under 4. Fluorosis is a condition caused by a child receiving too much fluoride during tooth development. In its mildest form, fluorosis may affect the look of a tooth but will not affect its function. Mild fluorosis can lead to white stains or mottling on the teeth²¹ and is not noticeable to most people.

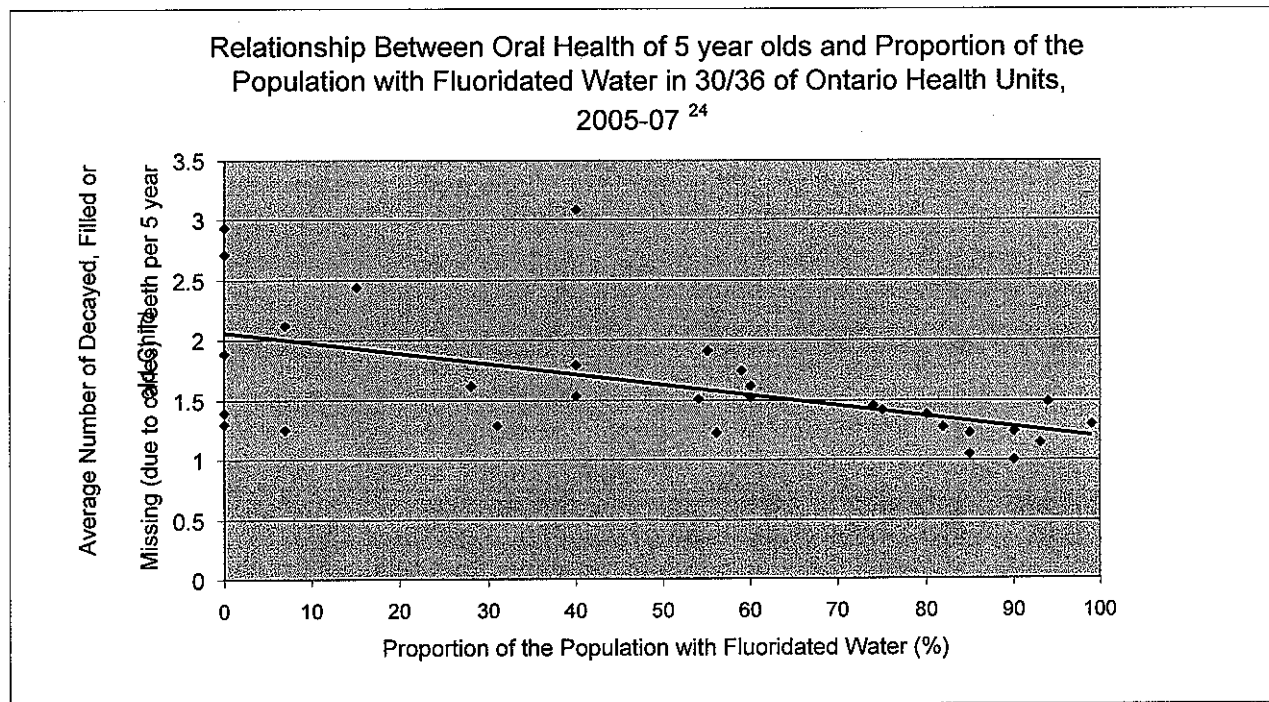
This guideline reaffirms that evidence does not support a link between exposure to fluoride in drinking water at or below 1.5 mg/L and any adverse health effects. The guideline specifically states that this level has not been associated with cancer, toxic effects to the immune, reproductive, genetic or neurological system nor been linked to intelligence quotient deficits³.

b) Impact of Removing Fluoride from Community Water Systems:

Removing fluoride from community water systems has been shown to increase the prevalence of caries within the community. In Dryden²², dental caries increased 26% overtime after fluoride was removed from the water in 2001. Grade 5 students were screened for dental caries in the year prior to discontinuing fluoride and counts were compared to current rates²³.

As shown in Figure 1 below, communities in Ontario with higher rates of water fluoridation have better teeth. This data, from the 2008 Ontario Association of Public Health Dentistry Survey²⁴ of Ontario Health Units, looked at the relationship between oral health of 5-year-olds and the percentage of the population with fluoridated water by Ontario public health units.

Figure 1



In 2002 the US Task Force on Community Preventive Services, supported by the Centers for Disease Control, systematically reviewed the literature to review interventions to promote and improve oral health²⁵. Starting community water

fluoridation decreased dental caries among children by a median of 50.7% during 3 to 12 year follow-up. Stopping community water fluoridation was associated with a median 17.9% increase in caries over 6 to 10 year follow-up.

The 2010 Canadian Health Measures Survey¹⁷ reports that the average Decayed, Filled, or Missing Teeth (DFMT) for adolescents in Canada is 2.49. DFMT is an indicator of the severity of disease. For example, a DFMT of 4 denotes that four teeth are decayed, filled or missing.

Applying this information to Hamilton, estimating conservatively 2 cavities per person and Hamilton's population of 500,000, there would be 1 million cavities currently. If we consider this 18% increase over 10 years to apply, again conservatively, only to the 385,000 people in Hamilton who live on homes serviced by the Woodward Avenue Water Treatment plant, we can estimate the number of cavities that would be caused over the next 10 years if fluoridation were discontinued in Hamilton.

Based on this information, an additional 138,600 additional cavities would occur in Hamilton residents over the next 10 years if fluoride was removed from Woodward water supply. This estimate is consistent with those derived from the Ontario data shown in Figure 1.

Background:

Fluoride is a mineral that is found in soil, water and various foods. It has a positive effect on oral health by making the tooth more resistant to decay. Fluoride can also prevent or even reverse tooth decay that has already started¹⁷.

Water fluoridation is the practice of adding small amounts of fluoride to municipal water supplies in order to prevent dental caries (cavities). Hamilton has fluoridated its municipal water supply since two referendums in the 1960's indicated public support. The cost of water fluoridation is less than \$3 per person per year, and is paid by users through the capital component of the water rate.

In Ontario, the Fluoridation Act and the Municipal Act define various processes by which a municipality may initiate or discontinue water fluoridation. The decision to fluoridate the community water system is left to the municipality, unless 10% of the electorate petitions for a referendum²⁶.

As of 2009, over 70% of the population of Ontario had access to fluoridated water²⁷. Water fluoridation has been described as one of the ten great public health achievements of the 20th century²⁸, in part because it helps improve the oral health of the entire population, including those who cannot afford dental care. Water fluoridation is supported by over 90 Canadian and international medical and dental organizations.

Table 1: Sample of organizations supporting water fluoridation to reduce occurrence of tooth decay

Canada	International
Health Canada Canadian Medical Association Ontario Medical Association Canadian Public Health Association Canadian Paediatric Society Association of Local Public Health Agencies, Ontario Ontario Dental Association Canadian Dental Hygienists Association	World Health Organization (WHO) Centers for Disease Control and Prevention, USA Pan American Health Organization European Organization for Caries Research American Dental Association British Medical Association British Dental Association Australian Dental Association

Like many substances, acute or chronic exposure to large doses of fluoride can have health risks. However, water fluoridation at the low levels used in Canada is considered safe, and is associated primarily with very mild and mild fluorosis. Fluorosis is a condition caused by a child receiving too much fluoride during tooth development, i.e., under the age of 6. In the mild form that may occur at low levels of fluoride exposure such as through fluoridated drinking water, fluorosis may affect the look of a tooth but will not affect its function. For example, mild fluorosis can lead to white stains or mottling on the teeth¹⁷. This occurs in less than 20% of the Canadian population²⁹ and is not noticeable to most people.

To produce serious health effects, extremely large amounts of water would need to be consumed. See Figure 2 for a summary of estimates. Many claims have been made that water fluoridation causes serious health risks, but existing scientific evidence refutes these claims.

Figure 2: Exposure required for various health impacts

Exposure	Required quantity of water fluoridated at 0.6 mg/L (Hamilton water)	Health Impact
Drinking water at 2.0 mg/L	Child (under the age of 8 years) consumes 17 glasses of water daily for a prolonged period,* and swallows no toothpaste†	Mild dental fluorosis
Drinking water at 8.0 mg/L	Child or adult consumes 67 glasses daily for a prolonged period*	Skeletal fluorosis
16 mg oral/kg body weight	A 20 kg child drinks 2666 glasses of water, or 333 jugs of orange juice (2 litre) in one sitting*	Acute lethal dose (child)
2,500-10,000 mg oral	An adult male would need to consume at least 4,167 litres of water (28 bath tubs) in one sitting*	Acute lethal dose (adult)

* Water consumption of this magnitude would result in severe illness directly from the effects of the water before approaching levels required for severe fluoride effects.

† Toothpaste contains concentrated fluoride. Swallowing toothpaste poses the greatest risk of fluorosis.³⁰ Table adapted from UK MRC³¹ and TPH Reports.³²

In summary, water fluoridation is a safe way to improve dental health. Fluoridation is inexpensive and is a way to provide health protection for the entire population, regardless of income, age or access to dental care.

Search Strategy

Table 2: Search Strategy

Date of Search:	March 1, 2011
Databases:	PubMed, Embase (peer-reviewed scientific health literature)
Search Term:	"water fluoridation"
Date Span Searched:	2011 – March 1, 2012
Search Limits:	<p>(Pubmed) Include the following study types:</p> <ul style="list-style-type: none"> • Clinical Trial • Meta Analysis • Review • Comparative Study • Evaluation Study <p>(Embase) Include the following study types:</p> <ul style="list-style-type: none"> • Evidence Based Medicine • Clinical Trials • Clinical Queries
Relevance Criteria:	Focused on primary research studies or reviews of primary research devoting attention to safety or effectiveness of water fluoridation.

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A Review of the Effectiveness and Safety of Community Water Fluoridation
Prepared by Dr. G. Allen Heimann, MD, MHSc, Medical Officer of Health,
Windsor-Essex County Health Unit
08 January 2013

Water fluoridation has been established in many communities for over fifty years. Numerous scientific studies have validated both the effectiveness and safety of fluoridation. Fluoridation has always had its opponents. The opponents have focused on the issue of community water fluoridation. The arguments against fluoride have not been extended to removing fluoride from tooth paste or dental rinses. It is important to note that as fluoridation has been provided to millions of people for over fifty years, any significant adverse effects would have been identified by the scientific community by now. No such adverse effects have been published in the peer-reviewed scientific literature.

This review brings together a collection of some of the more recent articles dealing with the effectiveness and safety of community water fluoridation.

Effectiveness

Of the 11 studies making conclusions about effectiveness, all eleven concluded that water fluoridation is effective at preventing dental caries.

These included:

1. A general review conducted by researchers in England concluding that water fluoridation is safe and effective, though it does cause dental fluorosis.¹
2. A primary study showing that children in communities with water fluoridation in Australia have less dental caries.²
3. A primary study showing that for children in communities with water fluoridation in New York State, costs paid by insurance companies for dental procedures were lower.³
4. A general review conducted by researchers in Ireland concluding that water fluoridation is safe and effective, though it does cause dental fluorosis.⁴
5. A primary study in Australia showing that water fluoridation saves between \$69.86 and \$249.45 per person, with minimal up-front costs.⁵
6. A general review of studies that were conducted in Brazil concluding that water fluoridation in Brazil is safe and effective, though it does cause dental fluorosis.⁶
7. A primary study in Denmark showing that water fluoridation may be effective even at lower concentrations than currently recommended.⁷

8. A general review conducted by researchers in India concluding that water fluoridation is safe and effective, though it does cause dental fluorosis.⁸
9. A general review conducted by researchers in Ireland concluding that water fluoridation is safe and effective, though it does cause dental fluorosis.⁹
10. Another primary study showing that children in communities with water fluoridation in Australia have less dental caries.¹⁰
11. A primary study in Lithuania showing that increased fluoride content in drinking reduces dental caries in children.¹¹

Safety in Persons

Of the studies focussing more on safety, none identified any new risks or provided any data supporting speculation about any substantial health risks. Some studies confirmed or clarified the known risk of dental fluorosis. A number of studies provided evidence against some of the previous claims that water fluoridation may have more severe risks. Some highlights:

1. Does water fluoridation harm bones? No. A study co-authored by Harvey Limeback, one of the main anti-fluoridation advocates in Canada, was designed to look for substantive impacts of water fluoridation on bones, but found none.¹² The study¹² concluded that:

“Many decades of epidemiological studies have shown minimal evidence of any effects of fluoride administration on bone, and it is therefore very unlikely that municipally fluoridated water affects adults with healthy bone. In this study, no effects of fluoride on mineralization... and no substantive negative effects of fluoride administration on bone mechanical properties were observed.”

2. Does fluoride cause bone cancer? No. A recent case-control study found no significant association between bone fluoride levels and osteosarcoma⁵⁵.

3. Is artificial fluoride used in water fluoridation more dangerous? No. Some individuals have claimed that the type of fluoride used in water fluoridation (H₂SiF₆) is more poisonous than the type that is found in most surface water, such as Lake Ontario (NaF). Two studies found that this was not the case, and the human body reacts to both types of fluoride the same way.^{13,14}

4. Is drinking formula part of the cause of the known risk of dental fluorosis compared to drinking breast milk? Possibly. A review conducted by US researchers found that each increase of 0.1 ppm in drinking water used to make formula may be associated with a 5% relative increase of fluorosis. However, the study found substantial evidence of publication bias that meant that it could not

make definitive conclusions.¹⁵ Regardless, this potential risk is consistent with Public Health Services messaging about the importance of breast feeding.

5. Does the method of supplementation affect the overall dose of fluoride ingested? Yes, and water fluoridation may be the safest route. Researchers in Brazil assessed total intake of fluoride associated with four sources of fluoride: naturally fluoridated water; artificially fluoridated water (what we call “water fluoridation”); fluoridated salt and fluoridated milk. Their data indicates that the total dose of fluoride consumed is relatively low and/or less variable with water fluoridation than other fluoridation approaches. They concluded that further work is needed in this area.¹⁶

6. All of the general reviews¹⁻¹¹ mentioned under the heading of Effectiveness above identified the primary risk of mild or very mild fluorosis, and that rare cases of moderate or severe fluorosis do occur. Some mention the risk of bone fluorosis in association with large doses of fluoride, beyond the levels found in fluoridated water. All concluded that claims about more severe risks are not substantiated by the existing evidence.

7. A review⁵⁶ of studies examining fluoride and neurotoxicity found possible adverse effects of high levels of fluoride, but the comparison or control group were noted to have fluoride levels from 0.34 to 1.33 mg/l which is in the same range as community water fluoridation levels.

There were no studies in any of the 48 studies identified, including those studies¹⁷⁻⁵⁰ that are not discussed in detail here because they were not relevant to the safety or effectiveness questions that provided evidence of any health risks attributable to community water fluoridation beyond dental fluorosis.

Safety in the Environment

Anti-fluoridation advocates have stated that hydrofluorosilicic acid is a toxic waste product. Hydrofluorosilicic acid is a compound which is produced by manufacturers who also produce fertilizer. Hydrofluorosilicic acid is specifically produced for a number of uses including water fluoridation.

Masten and Haneke⁵¹ in their 2001 toxicological summary for fluorosilicic acid state;

‘Although current data indicate that silicofluoricates’ are used in over 9,000 U.S. water treatment systems serving over 120 million individuals, exposure via drinking water is expected to be minimal since both compounds hydrolyze almost completely under these conditions’⁵¹

In the concentrated form, as it would be in manufacture and use before dilution, hydrofluorosilicic acid does deserve care and respect for safe handling, however when dissolved in very low concentrations in water we are no longer dealing with the original concentrated substance.

Assertions have been made in the presentation that hydrofluorosilicic acid is a hazardous waste and a toxic substance.

To quote from a federal document entitled "Joint Government of Canada Response to Environmental Petition Number 221 Filed Under Section 22 of the Auditor General Act Received November 19, 2007—Petition to Discontinue Water Fluoridation (March 18, 2008):

The US EPA classifies hydrofluorosilicic acid as a class 1 hazardous waste. Is hydrofluorosilicic acid is a Class 1 hazardous waste or equivalent in Canada?

'Health Canada Response:

The U.S. Resource Conservation and Recovery Act (RCRA) establishes a federal program to manage hazardous wastes from cradle to grave in the United States, to ensure that hazardous waste is handled in a manner that protects human health and the environment. It classifies waste in categories through a listing process. Hydrofluorosilicic acid is included in lists of commercial chemical products in a concentrated (unused) form. The RCRA focuses on ensuring the safe disposal of these waste products.

In Canada, the responsibility for managing hazardous waste rests primarily with the provinces and territories, who control the waste producers, the recycling, processing and elimination facilities, and the transportation of waste within their territory. The federal government regulates international and interprovincial movements. The main definitions for hazardous wastes in Canada are under CEPA regulations for exports and imports of hazardous wastes and hazardous recyclable materials. **Fluoridation additives certified for use in drinking water are not classified as hazardous waste in Canada** [Underlined and Bolded by Dr. Heimann].

Are Health Canada, Environment Canada and other government departments aware that inorganic arsenic, lead, mercury and inorganic fluorides (e.g., hydrofluorosilicic acid) are on the CEPA 2006 toxic substances list and that hydrofluorosilicic acid is not naturally present in the environment?

Health Canada Response:

Health Canada works with Environment Canada to assess substances under the *Canadian Environmental Protection Act, 1999* (CEPA), which includes prioritizing substances for assessment. Under the Act, a substance is considered "CEPA-toxic" if it enters or may

enter the environment in amounts that may pose a risk to human health, to the environment (such as fish or wildlife) and/or to the environment upon which life depends (such as water, soil, and air). Substances determined to be "CEPA-toxic" may be added to the List of Toxic Substances (Schedule 1 of CEPA 1999). The process focuses on whether the substance is entering the environment at levels of concern.

Inorganic fluorides are "toxic" to the environment as defined under CEPA and this assessment focussed principally on four inorganic fluorides: hydrogen fluoride (HF), calcium fluoride (CaF₂), sodium fluoride (NaF), and sulphur hexafluoride (SF₆). These compounds were considered the most relevant of the inorganic fluorides on the basis of quantities released to the Canadian environment, environmental concentrations, and toxicological effects on biota. **Hydrofluorosilicic acid was not assessed for this classification [underlined and bolded by Dr. Heimann].**'

Municipal drinking water licences require chemicals used to meet all applicable standards as set by both the American Water Works Association and the American National Standards Institute Safety Criteria Standards NSF/60 and NSF/61. The National Sanitation Foundation is the internationally recognized expert agency on certifying products and writing standards for food, water, and consumer goods. To date they have certified that the three available fluoride-containing water treatment additives hydrofluorosilicic acid, sodium fluorosilicate, and sodium fluoride meet the NSF ANSI Standard 60 which deals with the health effects of drinking water treatment chemicals.

Also under Ontario Regulations under the Safe Drinking Water Act, operating authorities must test regularly for levels of fluoride as well as heavy metals, including arsenic and lead.

With respect to water fluoridation and the environment, a study by Pollick⁵³ in 2004 states that:

'Scientific evidence supports the fluoridation of public water supplies as safe for the environment and beneficial to people. Reports at the local, national, and international levels have continued to support this most important public health measure. There appears to be no concern about the environmental aspects of water fluoridation among those experts who have investigated the matter.'

A study by Osterman [1990]⁵⁴ in evaluating water fluoridation in Montreal states that:

'Overall, river fluoride concentrations theoretically would be raised by 0.001-0.002 mg/l, a value not measured by current analytical techniques'.

Osterman [1990]⁵⁴ also states:

'a literature review did not reveal any examples of municipal water fluoridation causing recommended environmental concentrations to be exceeded, although excesses have occurred in several cases of severe industrial pollution.'

Osterman [1990]⁵⁴ concludes:

'In conclusion, by using a mass balance approach, fluoridation-related changes in environmental concentrations of fluoride may be estimated from knowledge of municipal water management systems and data which are usually readily available from appropriate water authorities. Generally speaking, these changes will be minimal and, except when accompanied by serious industrial pollution, will remain below toxic levels recorded in the literature and recommendations by scientific authorities for the protection of the environment and human health.'

Finally, in a presentation to the City of Orillia Public Forum on Fluoridation on February 29, 2012, Mr. Tim Fletcher, Supervisor – Water quality Standards Unit, Standards Development branch, Ontario Ministry of the Environment concluded the following points:

- Fluoride concentrations are not decreased significantly through the sewage treatment process, thus levels in municipal wastewater effluent would be similar to the levels added (i.e. 0.5 to 0.8 mg/L).
- Impacts to aquatic life (i.e. changes in growth, reproduction or survival) are unlikely to occur until concentrations exceed 1 mg/L for extended periods of time.
- Fluoridated drinking water is well below this concentration and would not be expected to impact aquatic life.
- A review of the fluoride data from 1986 to 2007 has shown no increasing trend in raw (source) water for the 192 drinking water systems that have been monitored by DWSP [Drinking Water Surveillance Program].
- Data also shows that, on average, concentrations in Great Lakes drinking water intakes are at or below the CWQG [Canadian Water Quality Guidelines] for inorganic fluoride.

Parts of this report were adapted with permission from a 2011 report by Dr. Chris Mackie of Hamilton Public Health Services

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FLUORIDATION FACT SHEET

- Fluoride, a naturally occurring mineral, has been found to stop, prevent, and even reverse the process of tooth decay. This finding is strongly supported by an extensive body of Canadian and international research.
- Water fluoridation is the process whereby the level of fluoride in a water supply is adjusted to a level that will optimize dental benefits.
- The current target level of fluoride in Windsor, LaSalle, and Tecumseh, drinking water is 0.6 parts per million (ppm) –less than the naturally occurring fluoride levels from a number of water sources in North America, including parts of Ontario.
- Health Canada endorses water fluoridation as a public health measure to prevent dental decay. Dental disease is the most common cause of permanent tooth loss in children. Besides the obvious pain and suffering it causes, poor oral health is also associated with poor overall health.
- When the fluoridation of drinking water was introduced across North America in the mid-1900s, the result was a significant decrease in dental decay. Currently, over 70% of the residents of Ontario receive fluoridated water.
- According to the Centres for Disease Control and Prevention (CDC), community water fluoridation is one of the greatest public health achievements of the 20th Century.
- The practice is supported by numerous national and international organizations including Health Canada, Ontario's Ministry of Health and Long-Term Care, the Public Health Agency of Canada, the Canadian Public Health Association, Ontario's Chief Medical Officer of Health, the Ontario Dental Association, the Canadian Dental Association, and the World Health Organization.
- The safety of community water fluoridation has been extensively researched. In the past 15 years, there have been at least 18 reviews on water fluoridation which found the fluoridation of community drinking water to be safe and effective at preventing tooth decay. The reviews found no compelling evidence that community water fluoridation causes cancer, bone-disease, or any other adverse health effects.
- Health Canada reviewed the latest available evidence on the benefits and potential risks from the fluoridation of community water in 2007 and concluded that the weight of evidence from all currently available studies shows no harmful health risk at current fluoride levels. The review concluded that fluoridation continues to be an effective public health strategy to prevent dental disease.

- Community water fluoridation is recognized as the most cost-effective way to prevent tooth decay. It's estimated that for every \$1 invested in community water fluoridation, \$38 is saved in future dental treatment costs.
- The fluoridation of community drinking water is also the most equitable way to preserve oral health since the health benefits extend to all residents of the community regardless of their socio-economic status. Water fluoridation is especially beneficial to lower income residents who may not have access to other means of fluoridation.
- Children who are exposed to higher than optimal levels of fluoride can sometimes develop a condition known as dental fluorosis which, while not harmful, can cause white and brown spots to appear on the teeth. Water that's optimally fluoridated doesn't pose a fluorosis problem. However, other sources of exposure such as the ingestion of fluoridated toothpaste could increase the risk of fluorosis. That's why Health Canada recommends that children under six years of age be supervised while brushing and be taught not to swallow while brushing.
- Adults who consume too much fluoride over a long period of time can suffer from skeletal fluorosis, which causes bones to be brittle. This condition is very rare in Canada since we're not exposed to the high levels of fluoride considered to be a risk.

For more information:

Health Canada

http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/health-sante/faq_fluoride-fluorure-eng.php

<http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/fnihb-dgspni/ocdo-bdc/project-eng.php#a6>.

<http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2008-fluoride-fluorure/index-eng.php>

Chief Medical Officer of Health (Ontario)

http://www.health.gov.on.ca/en/news/bulletin/2011/hb_20110404_2.aspx

<http://www.mhp.gov.on.ca/en/healthy-communities/dental/CMOH-on-Fluoridation.pdf>

Canadian Dental Association

http://www.cda-adc.ca/_files/position_statements/fluorides-en.pdf

Centers for Disease Control and Prevention

<http://www.cdc.gov/fluoridation/>



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FLUORIDATION Q & As

Q. What is fluoride?

Fluoride is a naturally occurring mineral found in soil, air, and water supplies.

Q. What are the benefits of fluoride?

Fluoride has been found to stop, prevent, and even reverse the process of tooth decay. This finding is strongly supported by an extensive body of Canadian and international research.

Q. What is water fluoridation?

Water fluoridation is the process whereby the level of fluoride in a water supply is adjusted to a level that will optimize dental benefits.

Q. Why add fluoride to the water (since we have fluoridated toothpaste and fluoride in other consumer products)?

Adding fluoride to water is the best way to provide fluoride protection to a large number of people at a low cost. The big advantage of water fluoridation is that it benefits all residents in a community, regardless of age, socioeconomic status, education, or employment, or dental insurance status.

Q. Does Health Canada support drinking water fluoridation?

Health Canada endorses water fluoridation as a public health measure to prevent dental decay. Dental disease is the most common cause of permanent tooth loss in children. Besides the obvious pain and suffering it causes, poor oral health is also associated with poor overall health.

Q. I've heard Hydrofluorosilicic acid is toxic and comes from fertilizer and factory smoke stacks. How can it be safe?

Fluoridated drinking water doesn't expose people to hydrofluorosilicic acid. There is no such thing as artificial fluoride; all fluoride ions are chemically identical, whether found in natural water sources, or in the rocks and minerals which are mined or oared for fluoride. These rocks are rich in both fluoride and phosphorus. The rocks are processed by dissolving them in acid, which allows the fluoride and the phosphorus to be separated, creating hydrofluorosilicic acid (HFSA) and phosphoric acid. HFSA is used for water fluoridation, and phosphoric acid is an important ingredient in chemical fertilizer.

When added to water, fluorosilicate compounds dissolve completely to release fluoride ions and break down into harmless compounds, leaving none of the original chemical. It has been stated that HFSA is a by-product of fertilizer production; it would be equally valid to state that fertilizer is a by-product of HFSA production.

Q. What are the acceptable levels of fluoride in drinking water supplies?

The guideline for fluoride is a maximum acceptable concentration (MAC) of 1.5 mg/L. The current target level of fluoride in Windsor, LaSalle, and Tecumseh, drinking water is 0.6 parts per million (ppm) –less than the naturally occurring fluoride levels from a number of water sources in North America, including parts of Ontario.

Q. Doesn't fluoride cause low IQ, bone problems (cancer and brittle bones), endocrinologic problems, other cancers, and fluorosis (skeletal and cosmetic)?

There are many studies that have looked at IQ and fluoride levels. These studies are all from developing countries, most commonly China. The study results are hard to compare to our region, because we can't know if the differences in IQ are correct. We also don't know if the results are from fluoride, related to problems with how the studies were done, or if they come from unrecognized, unmeasured exposures, like other chemicals in the area. The average fluoride levels in drinking water in these studies were three to five times higher than what is in Windsor water. No studies have been done in developed countries (such as Canada) that look at IQ levels and fluoride exposure.

At much higher levels, than in Windsor, fluoride can affect your bones and lead to skeletal fluorosis. Skeletal fluorosis is a bone disease that's caused by consuming too much fluoride. However, Health Canada says there's no risk when water is being monitored and fluoridated levels are adjusted accordingly (such as here in Windsor).

Children who are exposed to higher than optimal levels of fluoride can sometimes develop a condition known as dental fluorosis which, while not harmful, can cause white and brown spots to appear on the teeth. Water that's optimally fluoridated doesn't pose a fluorosis problem. However, other sources of exposure such as the ingestion of fluoridated toothpaste could increase the risk of fluorosis. That's why Health Canada recommends that children under six years of age be supervised while brushing and be taught not to swallow while brushing.

Many studies have looked at the relationship between fluoride in drinking water and cancer. Experts have reviewed these studies and decided that there is no clear relationship between the two.

Q. Can baby formula be made with fluoridated water?

Major health organizations in North America including, Health Canada, Canadian Pediatric Society, Centers for Disease Control, and American Dental Association say it is safe to use fluoridated water in baby formula. For example, Health Canada says, "infant formula prepared with water fluoridated at the optimal level of 0.7 milligrams per liter (mg/L) maximizes the protective role of fluoride during the development of the permanent teeth while minimizing the risk of dental fluorosis." Windsor water is fluoridated at an even lower level than this – 0.6 mg/L.

Q. Is it true that Community Water Fluoridation (CWF) is ineffective and the incidence of tooth decay is decreasing in areas without CWF?

There have been some studies that showed there was no decrease in tooth decay once water fluoridation stopped. However, these studies noted that preventative services like dental fluoride treatments increased, or there were already public programs in place in these communities. It was also stressed that these results should not be generalized to countries or provinces with less preventative dental care (such as Ontario). Several studies have found tooth decay has increased once fluoridation was stopped.

Cavity rates in some communities that don't fluoridate their water have also decreased for many other reasons such as:

- Better hygiene habits and the use of fluoridated tooth pastes.
- The Diffusion Effect due to increased fluoride exposure among people from communities that don't fluoridate their water. For example: foods and beverages can be processed in a community using water with fluoride and then shipped to non-fluoridated communities.
- The use of other methods of getting fluoride, like salt and milk fluoridation, and fluoride supplements (pills and drops).

Q. Is water fluoridation causing higher fluoride levels in the Great Lakes basins?

No. Not all of the fluoride added to our drinking water returns to the water source. Windsor water is fluoridated at a level of about 0.6 mg/L. This doesn't mean that fluoride levels in our waterways increase by the same amount. A Montreal study showed that water fluoridation raises overall river fluoride concentrations by just 0.001 to .002 mg/L, which is 1000 times less than naturally occurring levels of fluoride found in some bodies of water.

Q. More municipalities are taking fluoride out of their water so why shouldn't Windsor-Essex County?

It's true that some Canadian municipalities have decided to stop fluoridating their water, including Waterloo ON, Calgary AB, and Moncton NB. Other Canadian municipalities have decided to keep fluoridating their water, including Region of Halton ON, Region of Peel ON, Toronto, Sarnia, and Cape Breton NS. In all cases the local, provincial, and federal public health agencies continue to support water fluoridation.

Q. Wouldn't ending water fluoridation save tax payers money?

It costs the City of Windsor between \$125,000 and \$150,000 yearly to fluoridate our water (about 50 cents per person). If your City Council decides to remove fluoride it will cost taxpayers between \$2.8 and \$11.6 million yearly for public health services such as fluoride treatments and dental hygienists, for the 33 per cent of the population without dental insurance. While other ways of providing fluoride may be as effective, CWF provides fluoride in a safe and effective way to those who can't afford to get fluoride in other ways.

Adapted from: Health Canada's *commonly asked patient questions on fluoridation*, Canadian Dental Association- http://www.cda-adc.ca/en/oral_health/faqs_resources/faqs/fluoride_faqs.asp#water
City of London Water Fluoridation April 2012 Report -
<http://www.healthunit.com/articlesPDF/18024.pdf>