

Costs of Artificial Water Fluoridation

Overview of Fluoridation Infrastructure costs

- Chemical Costs, Infrastructure Costs (installation & maintenance of equipment)
- Manpower – operation & maintenance of infrastructure, worker training
- Worker illness from exposures to HFSA and contaminants
- Premature aging of water delivery systems due to corrosive nature of hydrofluorosilicic acid (pumps, pipes)
- Increased turbidity, increased need for flushing of lines (400 lbs/tanker truck of insolubles contained in HFSA)
- Costs of Plebiscites to municipalities, government agencies

Overview of Environmental Costs

- Damage to fisheries, agriculture, livestock from this hazardous waste (Environment Canada), toxic substance (CEPA 2006)
- Accidental spills – costs to municipalities, individuals harmed, environment
- Liability costs for damages
- Transportation for delivering hazardous waste – carbon footprint

Overview of Health Costs to susceptible populations as reviewed by the National Research Council Review 2006 <http://www.nap.edu/catalog/11571.html>

- Dental fluorosis, edentulism, gingivitis & periodontitis
- Skeletal fluorosis – arthritic-like pain, increased risk of fracture
- Soft tissue fluorosis - neurotoxicity, endocrine disruption, kidney disease
- Hypersensitivity, chemical sensitivity
- Cancers of bone, thyroid, bladder, kidney and liver
- Increased exposure to contaminants such as arsenic, lead, mercury, radionuclides

Associated Health-Related Costs of Chronic Exposure to Toxic Substances *Source: Ambachsteer J, Kron J, Liroff RA, Little T, Massey R. 2007 Fiduciary Guide to Toxic Chemicals. www.iehn.org*

- **Direct costs of medical treatment.** e.g. medications, doctor visits, physical therapy, special equipment such as braces or crutches, and costs of hospitalization.
- **Lost work.** e.g. Workplace Safety and Insurance Board (WSIB) for employees of municipal water treatment facilities handling fluorosilicates - workplace hazard, public health-related loss of earnings
- **Lost School Time** (children and adults)
- **Special education.**
- **Home and institutional care.** Alzheimer's, Broken Bones
- **Foregone future earnings.**

What are we putting into our drinking water – source water?

“Fluoride is one of the [natural contaminants](#) found in public drinking water supplies”
Source: National Research Council Review 2006, page 13.

Fluoride is an [unapproved, unregulated drug](#) according to Canadian legislation. Under the **Federal Pharmacy Act** drugs are listed and published by **NAPRA (National Association of Pharmacy Regulatory Authorities)**. Drugs are regulated by Health Canada and sodium fluoride is listed as Schedule I drug requiring a prescription for more than 1 mg of fluoride/day and schedule III drug which must be sold in a pharmacy, for less than 1 mg of fluoride/day. (See www.napra.org and search for sodium fluoride.)

The [Basel Convention](#), [Environment Canada](#) and [United States Environmental Protection Agency \(US EPA\)](#) all state that the chemicals used in artificial water fluoridation are hazardous waste which may not be put directly into lakes, rivers & oceans;

Artificial water fluoridation chemicals contain between 20 to 30% hydrofluorosilicic acid (inorganic fluoride), trace amounts of arsenic, lead, mercury, radionuclides and other heavy metals (American Water Works Association ([AWWA Standard B703-06](#)), all considered to be toxic substances under the [Comprehensive Environmental Response, Compensation, and Liability Act \(CERCLA\) Priority List of Hazardous Substances in USA, 1989 First Priority Substances lists in Canada](#) and proposed for “virtual elimination” under the Canadian Environmental Protection Act ([CEPA 1999](#), 2006 update), the [1997 Binational Toxic Strategy](#) and the [1978 Great Lakes Water Quality Agreement](#);

Background levels of fluoride in the Great Lakes exceed the [Canadian Water Quality Guideline \(CWQG\)](#) and fluoride concentrations in sewage effluent are 5-10 times in excess of the CWQG (Camargo 2003, [Board of Health Hamilton, July 9, 2008](#)). At these concentrations fluoride is known to be toxic to a variety of water species such as salmon ([Daemker and Dey 1989](#)), caddisfly, daphnia magna ([2003 Camargo review](#)) & others ([1977 Canadian National Research Council Review](#));¹

“The Priority Substances List (PSL) assessment on inorganic fluorides, which was published in 1993 by Environment Canada and Health Canada concluded that these chemicals posed a risk to both aquatic and terrestrial organisms by way of water and air exposure respectively. The assessment indicated that about 23% of total inorganic fluorides releases were emitted to air and 58% were discharged to water.” Source: *Environment Canada response to Petition #245, Question 2* http://www.oag-bvg.gc.ca/internet/English/pet_245_e_30941.html

American Water Works Association:

“We drink very little of our drinking water. Generally speaking, less than 1% of the treated water produced by water utilities is actually consumed. The rest goes on lawns, in washing machines, and down toilets and drains.” <http://www.awwa.org/>

Hazardous Waste/Toxic Substance Disposal – 2 techniques

- **\$7,000/ton** polluting companies must pay for safe disposal of this Hazardous Waste (Bill Hirzy, Senior US EPA Chemist)
- **\$1,500-/ton** polluting companies receive from cities (Hamilton BOH Report, July 9, 2008)

Maintenance Costs: \$1-\$4/person/year, depending on community size. *Source: April 1, 2008 Presentation Dryden, Ontario, November 13, 2008 Presentation to Halton Region by Chief Dental Officer for Health Canada.*

Sample Maintenance Costs:

population 10,000 = \$40,000/year @ \$4/person/year
population 1 million = \$1 million /year @ \$1/person/year
population 2.5 million = \$2.5 million/year @ \$1/person/year
population 5 million = \$5 million/year @ \$1/person/year

Capital Costs/Upgrades of Water Fluoridation Systems: “The cost of installing fluoridation addition equipment for a community water system varies from approximately \$5 to \$20 per person, depending on a number of factors” *Source: US Centres for Disease Control*
<http://www.cdc.gov/fluoridation/engineering/faqs.htm>

Sample Capital Costs:

population 100,000 = \$500,000 - \$2 million
population 500,000 = \$2,500,000 - \$10 million
population 1 million = \$5 million - \$20 million
population 2.5 million = \$12.5million - \$50 million
population 5 million = \$25million - \$100 million

Case Study: New York City Department of Environmental Protection estimates, based on 2008 totals, provides the following information of fluoridation costs:

- a). Annual cost of fluoride chemicals all boroughs:
- Total cost for all boroughs- \$5,145,473.54 (include upstate outside water communities).
 - Cost breakdown for each borough- Can be apportioned by the estimated percent consumption of each borough- Bronx 23%, Manhattan 15%, Brooklyn 37%, Queens 21% and Richmond 4%.

- b). Annual cost of sodium hydroxide (pH adjustment) chemicals all boroughs:
- Total cost for all boroughs- \$5,992,351.86.
 - Coast breakdown for each borough- Can be apportioned by the estimated percent consumption of each borough- Bronx 23%, Manhattan 15%, Brooklyn 37%, Queens 21% and Richmond 4%.
- c). Analysis- Chemicals are \$1,040.00 and supplies are \$3,250.00.
- d). Personnel salaries- (full-time)
- (11) Watershed Maintainers- $\$46,784.00 \times 11 = \$514,624.00$
 - (2) Supervisor of Watershed Maintenance- $\$56,613.00 \times 2 = \$113,226.00$.
- d). Cost of protective gear- \$500.00 annually
- d). Fluoride facility and treatment equipment was upgraded in 2007 and the equipment is under warranty. Future cost (2010) would be expected to be 50,000.00 per year for maintenance/repair parts.

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Premature Erosion of Water Distribution Infrastructure from Fluorosilicates

Fluorosilicates shortens lifetime of water distribution infrastructure. Fluoride is the most corrosive of all known elements. (Merck Index). Fluorosilicates cause the following problems:

1. **leach lead from brass/copper fittings** (Coplan 2007, Maas 2007, Masters 1999, 2000, NRC 2006 Report on Fluorides in Drinking Water)
2. **leach lead from lead pipes and lead solder - cast iron (CI), ductile iron (DI) piping**
3. **antagonists to the Asbestos Cement pipe matrix** used in transmission watermains, hastening decay of this important infrastructure. (IAOMT p24)
4. **corrode stainless steel, nickel.** (Class 8 corrosive substance – Transport Canada)
5. **makes water more acidic, creating need for neutralizing agents** such as lime to increase pH.

Case Study: "Fluoridation impacts on Water Chemistry" Thunder Bay, Ontario (BOH report, July 20, 2009, P3-4)

"The drinking water produced from the Bare Point Water Treatment Plant is taken from Lake Superior and then treated. Water quality testing results of this source water have continually shown that the Lake Superior water is of high quality, is soft, and of low

alkalinity. Testing has also demonstrated that the water is very low in dissolved major ions and metals. These characteristics mean that the water is of excellent quality and as a result has little buffering capacity – the ability to resist changes in the water chemistry.

The effects on the water chemistry of three fluoridating agents, hydrofluorosilicic acid, sodium silicofluoride and sodium fluoride, were all tested on Bare Point drinking water in a laboratory controlled setting. The impact on the water chemistry with fluoride addition was tested to determine whether the addition of fluoride would have the potential to increase the number occurrences of elevated lead levels in the community.

The results of this preliminary study show that all fluoridating agents, when added to the drinking water at a concentration of 0.7ppm (the optimal fluoride concentration rate as recommended by an expert panel convened by Health Canada in 2007), increased lead leaching from the lead pipe.”

Case Study: New San Diego stainless steel vat for Fluoridation Chemicals destroyed within weeks of installation

“After waiting four years to complete billions of dollars of improvements at five water treatment plants, the Metropolitan Water District had expected to start fluoridating in October.” “Metropolitan spokesman Bob Muir said Wednesday the latest delay came after the agency's staff discovered the galvanized steel it planned to use could corrode if it came in contact with the fluorosilicic acid that will fluoridate supplies.” *Conaughton Gig. 2007 County's fluoridation date bumped again. NC Times. Accessed Oct 12, 2007:*

http://www.nctimes.com/articles/2007/10/18/news/top_stories/1_03_5810_17_07.txt

Case Study: International Academy of Oral and Medical Toxicology (IAOMT) Position Paper p24-25: <http://www.iaomt.org/articledetails.cfm?artid=97>

32ppb lead in municipal water at the time of the fluoridation equipment breakdown
17 ppb lead in municipal water after hydrofluorosilicic acid was turned off temporarily
32ppb lead in municipal water when hydrofluorosilicic acid was turned back on
5ppb lead in municipal water after hydrofluorosilicic acid was turned off permanently

Case Study: Hamilton Board of Health July 9 2008

“Most of the water provided to the community returns back in the form of sewage. The wastewater has high concentration of fluoride compared with potable water because of the fluoride added due to toothpaste use and some industrial discharges. A sample of the wastewater was tested for fluoride and the concentration was approximately 1.2 mg/L. Very little fluoride is removed in the wastewater treatment process and effluent had fluoride concentration of 1.05 mg/L.”

“There are many studies about the impacts of fluoride in aquatic environment and generally there is a consensus that fluoride concentration of about 0.6-0.7 mg/L has detrimental impact on aquatic life. If water fluoridation is stopped, it may be possible that the wastewater fluoride concentration would drop by 0.5-0.6 mg/L, which will be beneficial to aquatic environment.”

“The Canadian Council for Ministers of the Environment (CCME) is currently in the process of finalizing a Canada-wide Strategy for the Management of Municipal Wastewater. The draft strategy was posted for public consultation and comments. The draft strategy proposed a compliance requirement of end of the pipe toxicity testing for the wastewater treatment plants. It is anticipated that this requirement will be included in the Certificate of Approval for the Woodward WWTP upgrades. The fluorides in wastewater can't be removed in the treatment processes and as such the toxicity associated with it will be a significant challenge, if source controls are not implemented. Failure to achieve toxicity targets will require substantial future investments in the wastewater treatment systems.”

“Hydrofluosilic Acid (HFS) is an extremely hazardous chemical and poses significant health and safety risk to City's staff. Though significant safeguards have been in place at the water treatment plant, the risk of any chemical spill can't be completely overruled. There are significant risks during delivery and filling operations and any chemical spill would require extensive resources to manage and control the damage.”

“The existing fluoride dosage system is past its useful life and requires upgrading. The upgrade of the fluoride dosage system was estimated at \$2.1 million in 2007. Given the increase in construction costs, it is anticipated that the cost of the upgrade will increase by 15-20% over the original anticipated budget. The cost of the chemical went up from \$380 per tonne to \$800 per tonne, starting in June 2008, and will increase to \$1,020 per tonne in June 2009.”

“Based on the current market conditions and supply, it is anticipated that the price of chemical will continue to increase in future years due to fertiliser manufacturing moving offshore.”

“Kip Duchon (CDC) reported in 2007 that when U.S. Agrichemicals withdrew from the market in 2005, about half of U.S. sodium silicofluoride supplies began to be imported from a producer in **China**.” Source: *Boulder Colorado 2008*