Fluoridation chemicals added to drinking water are defined as a hazardous waste

prepared by
Carole Clinch BA, BPHE
March 25, 2011

Hydrofluorosilicic acid is also known as hexafluorosilicic acid, fluorosilicic acid, dihydrogen hexaflorosilicate, fluosilicic acid, hydrogen hexafluorosilicate or silicofluoric acid.

The dripping of fluorosilicates into drinking water is clearly a method of "recycling" or "disposal" for this hazardous waste according to a 1983 letter written by Rebecca Hanmer, then Deputy Assistant Administrator for Water at the United States Environmental Protection Agency;

> "In regard to the use of fluosilicic (fluorosilicic) acid as a source of fluoride for fluoridation, this agency regards such use as an ideal environmental solution to a long-standing problem. By recovering by-product fluosilicic acid from fertilizer manufacturing, water and air pollution are minimized, and water utilities have a low-cost source of fluoride available to them."[1]

Hexafluorosilsicic acid (H_2SiF_6) and Sodium Silicofluoride (Na_2SiF_6) are the two fluoride products most commonly used in artificial water fluoridation. They are classified as hazardous waste, according to various international treaties signed by Canada (e.g., Basel Convention), and the following Canadian and Provincial/Territorial legislation:

(a) the *Hazardous Products Act* 2010 [R.S., 1985, c. H-3];[2]

(b) the *Canadian Environmental Protection Act* 1999, c. 33 [CEPA Section 7, Division 8: Control of Movement of Hazardous Waste];[3]

(c) the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (EIHWHRMR);[4]

(d) the *Interprovincial Movement of Hazardous Waste Regulations* (IMHWR);[5]

(e) the *Transportation of Dangerous Goods Regulations;*[6]

(f) the *US Code of Federal Regulations, Title 49 (49CFR), US Toxicity Characteristic Leaching Procedure, SW846, Test Method 1311;*[7]

(g) the *Consumer Chemicals and Containers Regulations* [SOR/2001-269];[8]

1 See: http://fluoridealert.org/re/hanmer1983.pdf
2 Available from: http://laws.justice.gc.ca/en/H-3/
3 Available from: http://laws.justice.gc.ca/eng/C-15.31/page-6.html#anchorbo-ga:l_7-gb:l_8
4 Available from: http://www.ec.gc.ca/ceparegistry/documents/regs/g2-13911_r1.pdf
5 Available from: http://www.canlii.org/en/ca/laws/regu/sor-2002-301/latest/sor-2002-301.html
6 Available from: http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=24374285-1&offset=8&toc=show#h
7 Available from: http://www.ehso.com/cssepa/TCLPfaqs.htm
8 Available from: http://laws.justice.gc.ca/en/showtdm/cr/SOR-2001-269

(h) the Controlled Products Regulations [SOR/88-66][9]

(i) Quebec: Règlement sur les matières dangereuses c. Q-2, r.32;[10]

(j) Ontario: Workplace Hazardous Material Information System (WHMIS) [R.R.O. 1990, Reg. 860, s.25][11] In Ontario, the Ministry of Labour is responsible for the administration and enforcement of both the federal and provincial WHMIS legislation.[12] Until 2005, Ontario was the only jurisdiction in North America that accepted untreated hazardous waste).[13]

No legislation specifically permits the addition of this Hazardous Waste to drinking water. Case Study: Ontario

- **The Ontario Fluoridation Act** permits the addition of "fluoride ions". It is silent on the addition of hazardous waste or unregulated fluoride products making specific health claims.

- **The Ontario Safe Drinking Water Act (SDWA)** legislation (section 20) states clearly that the addition of "drinking water health hazards" is not permitted, and that "dilution [is] no defense." It is assumed that these man-made toxic substances, as defined by the Canadian Environmental Protection Act, (CEPA)and hazardous waste products (see above list of legislation) are "drinking water health hazards" as defined by the Ontario SDWA.

Schedule 1: Transportation of Dangerous Goods Regulations:

UN #	Shipping name and description	Class	Packing Group Category	Special Provisions	Explosive Limit and Limited Quantity Index	ERAP Index	Passenger Carrying Ship Index	Passenger Carrying Road or Rail Index	Marine Pollutant
UN1778	Fluorosilicic acid	8	8					1	

Fluorosilicic acid is listed as a dangerous good (#UN1778)

Schedule 6: Hazardous Constituents Controlled Under Leachate Test and Regulated Limits

Item	Hazardous Constituent Code No.	Hazardous Constituents (synonyms and description)	Concentration (mg/L)
45	L15	Fluoride	150

9 Available from: http://laws.justice.gc.ca/eng/sor-88-66/index.html
10 Available from: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/Q_2/Q2R32.HTM
11 Available from: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_900860_e.htm
12 Available from: http://www.labour.gov.on.ca/english/hs/pubs/whmis/whmis_9.php
13 Available from: www.cielap.org/pdf/hwfactsheet.pdf

The Hazardous Products Act, SCHEDULE I, Part 1I, includes;

1. Chemical products as defined in the Consumer Chemicals and Containers Regulations [SOR/2001-269, section 42 (1)].[14] Consumer Chemicals and Containers Regulations, defines "chemical products"; means a product used by a consumer that has the properties of one or more of the following:

(a) a toxic product;

(b) a corrosive product.

Fluoridation products satisfy both criteria of the Hazardous Products Act.

1. Inorganic fluorides (e.g., sodium fluoride, sodium silicofluoride, hexafluorosilicic acid) are defined in Schedule 1, Canadian Environmental Protection Act (CEPA) as a "toxic product" which is persistent, bioaccumulative and man-made (see Section B.1).

2. Fluorosilicates are defined as a class 8 corrosive product (see TDGR above). The Hazardous Products Act, SCHEDULE II, (Section 2), includes fluorosilicic acid under Class E - Corrosive Material.

Table: Consumer Chemicals and Containers Regulations: Table to Subsection 42(1)
Sub-Categories – Substance of Special Concern

Item	Substance of special concern	Concentration	Sub-category
2	Fluoride	0.5% or more available fluoride ions	Very corrosive

A product containing 23 % fluorosilicic acid has a fluoride concentration of about 182,000 mg/L.[15] Hexafluorosilicic acid added to drinking water exceeds the above maximal limits of fluoride for classification as a hazardous waste (150 mg/L) by several orders of magnitude. These leachate requirements are also found in Schedule 6: Hazardous Constituents Controlled Under Leachate Test.

---

14 See Consumer Chemicals and Containers Regulations, 2001 [SOR/2001-269] available from: http://laws.justice.gc.ca/en/showtdm/cr/SOR-2001-269 PART 2, Corrosive Products Classification of Corrosive Products. Data sources. 41. (1) The person responsible for a corrosive product must determine the appropriate sub-category for the product from one or more of the following data sources in the following order of precedence.

(*d*) the table to subsection 42(4), in the case of a corrosive product that contains a substance, other than an acid or a base, that is capable of inducing necrosis or ulceration of epithelial tissue at the site of application determined using the data sources set out in subsection 43(1); or

(*e*) subsection 42(5), in the case of a corrosive product that contains a substance, other than an acid or a base, that is capable, when tested using the appropriate test methods set out in subsection 43(2), of causing any of the following at the site of application:

(i) an erythema or edema of the skin graded at 2 or more,
(ii) corneal damage graded at 2 or more,
(iii) iris damage graded at 1 or more, or
(iv) conjunctival swelling or redness graded at 2.5 or more.

15 Calculations by Thomas G. Reeves, P.E., National Fluoridation Engineer, Program Services Branch, Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention

In summary, fluorosilicates are classified as a hazardous waste because:

1. it exceeds the regulated fluoride leachate limit of 150.00 mg/L by several orders of magnitude;[16]
2. it is included in at least one of the 9 classes of "dangerous goods" in Schedule 1 of the Transportation of Dangerous Goods Regulations[17] (e.g., classified as a class 8 corrosive substance which, according to the OECD guidelines, is "known to cause full thickness destruction of human skin, that is, skin lesions that are permanent and destroy all layers of the outer skin through to the internal tissues);[18]
3. it has a pH below 3;
4. it is a "corrosive substance" according to the Consumer Chemicals and Containers Regulations**.**

Sewage treatment practices currently are unable to remove fluoride from either primary or secondary treatment, therefore fluoride levels in sewage from any city which fluoridates exceeds the Canadian Water Quality Guideline for Aquatic Species (fluoride) by one order of magnitude.[19] Artificial water fluoridation is therefore an indirect means of disposing these toxic substances and hazardous wastes into the environment.

Many assumptions have been made regarding the dilution of these hazardous waste products into drinking water:

a) it is a cheap way to dispose of harmful by-products resulting from air-pollution-reduction measures (i.e. the use of scrubbers to clean exhaust air from industrial plants[20];

b) the dilution of these products into drinking water and source water is the best solution to pollution;

c) it is legal to put these hazardous wastes into drinking water in Canada

d) it is legal, according to the Food and Drugs Act, to promote the use of these fluoride products with specific health claims;

16 Petition #221 to the Auditor General of Canada, see answer #1 from Environment Canada: http://www.oag-bvg.gc.ca/internet/English/pet_lp_e_938.html. Fluorosilicic acid is listed as UN1778 under the *Transportation of Dangerous Goods Regulations* (The fluoridation chemicals actually used in artificial water fluoridation are defined as a hazardous waste according to the Basel Convention, Environment Canada and United States Environmental Protection Agency (US EPA). Fluoride is one of the hazardous constituents listed and the waste or recyclable material would be considered hazardous when the concentration of the fluoride in the leachant exceeds the regulated limit of 150.00 mg/L. The leachate test referenced in the Canadian EIHWHRMR is the US Toxicity Characteristic Leaching Procedure, SW846, Test Method 1311, available from: http://www.ehso.com/cssepa/TCLPfaqs.htm

17 See: 2.1 Determining When Substances Are Dangerous Goods "(a) it is listed by name in Schedule 1 and is in any form, state or concentration that meets the criteria in this Part for inclusion in at least one of the 9 classes of dangerous goods; or (b) it is not listed by name in Schedule 1 but meets the criteria in this Part for inclusion in at least one of the 9 classes of dangerous goods. http://www.tc.gc.ca/eng/tdg/clear-part2-339.htm#sec21

18 2.40 General: "Substances are included in Class 8, Corrosives, if they (a) are known to cause full thickness destruction of human skin, that is, skin lesions that are permanent and destroy all layers of the outer skin through to the internal tissues; (b) cause full thickness skin destruction, as determined in accordance with the OECD Guidelines;" http://www.tc.gc.ca/eng/tdg/clear-part2-339.htm#sec240

19 http://www.newmediaexplorer.org/chris/Mayor_2009_Hamilton-Halton_AWF_Source_Water_Concerns.pdf

20 Rebecca Hamner letter from the US EPA, March 30, 1983 "an ideal environmental solution to a long-standing problem"

e) toxicological studies on animals or double blind, controlled clinical trials on humans have NOT been performed on these products to demonstrate safety or efficacy.[21]

While the first assumption is probably correct, the assumption that dilution is the best solution to pollution is no longer acceptable to those concerned with environmentally sustainable practices.

It has been argued by government agencies that the use of hazardous waste products is permissible because fluorosilicates dissociate completely, releasing only 'fluoride ions' into drinking water for specific health purposes.[22] Those who make this argument neglect to mention the other contaminants associated with fluoridation products, nor do they cite the legislation which specifically permits the addition of hazardous substances into drinking water. They also neglect to mention that the available research uses distilled water, not drinking water, which contains many chemical species. Using this same logic, it is clear that if we are only adding "fluoride ions" to drinking water, for a specific health purpose (preventing or treating cavities), these fluoridation products must be regulated under the Food and Drugs Act.

The National Research Council 2006 Review of Fluorides in Drinking Water discusses the following concerns regarding fluorosilicates added to municipal drinking water:[23]

1. the unknown bio-chemical reactions of fluorosilicates, fluoride ions and silicon in drinking water as opposed to distilled water used with *in vitro* research;[24]
2. contaminants found commonly in fluorosilicates which are unnecessarily added to drinking water;
3. fluoride ions and silicon re-associate in low pH environments (e.g., gut, acidic beverages and foods using fluoridated water) to form a variety of species;[25]
4. fluoride ions associate with other chemical species in drinking water such as lead, aluminum, calcium, magnesium.[26],[27]

---

21 See: http://fluoridealert.org/fan.statement.jan.8.2011.html

22 Petition #221B to the Auditor General of Canada Answer #3 by Health Canada: "As stated in a response to an earlier petition, fluorosilicate compounds readily hydrolyse in water to release fluoride ions, which means that drinking water is not a source of exposure to these compounds." http://www.oag-bvg.gc.ca/internet/English/pet_221B_e_31256.html

23 NRC 2006 Review Page 52,53,90,91,210.

24Machalinski B, Baskiewicz-Masiuk M, Sadowska B, Machalinska A, Marchlewicz M, Wiszniewska B, Stecewicza I. The Influence of Sodium Fluoride and Sodium Hexafluorosilicate on Human Leukemic Cell Lines. Fluoride 2003; 36(4):231-40. - reported that the four different human leukemic cell lines were more susceptible to the effects of fluorosilicates (SiF), the compounds most often used in fluoridation, than to (NaF). "silicofluoride complex (SiF) has biological effects that are even more potent than those of simple fluoride released by sodium fluoride."

25 Urbansky ET. 2002 Fate of fluorosilicate drinking water additives. Chemical Reviews. 102 (8), 2837-2853. "There is considerable debate over the composition and even the existence of some homo- and heteroleptic aquo-, fluoro-, and hydroxo complexes of silicon- (IV), which makes it impossible to predict what species might be found in real potable water supplies that are fluoridated or those that naturally contain fluoride and silicates as background ions."

26 See: http://www.newmediaexplorer.org/chris/Clinch_2009_Fluorosilicates_Increase_Blood_Lead_Levels1.pdf

27 NRC 2006 Review pages 219-220: "[aluminum-fluoride] not only provides false messages throughout the nervous system but, at the same time, diminishes the energy essential to brain function." & "Aluminum combined with fluoride in very small quantities influences the following [0.5mg/L] ;Thyroid Hormone; Growth Hormone; Melatonin; Neural Transmitters; Insulin/Glucagon; Prostaglandins; Vasopressin etc." & "Chronic administration of aluminum-fluoride and sodium-fluoride to rats in drinking water caused alterations in neuronal and cerebrovascular integrity."