

Omissions

Draft report, Fluoride in Drinking Water, by Health Canada; public comments due by Nov 27, 2009 <water_eau@hc-sc.gc.ca>

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Introduction

The Health Canada claims that there is no “credible evidence from the fluoride present in the water with fluoridation or naturally occurring fluoride, at concentrations equal to the recommended level and up the the MAC”, demonstrating health harm, is scientifically incorrect. The US National Research Council Review of [2006](#), the [Canadian NRC 1977 Environmental Fluoride Review](#), the The Quebec Ministry of the Environment 1979 Review, [Daemker and Dey 1989](#), and the [Camargo 2003 Review](#) all outline many environmental and human health concerns with artificial water fluoridation. [14 Nobel Prize winning scientists](#), including the 2000 Nobel Laureate in Medicine, Dr. Arvid Carlsson, have expressed serious concerns on, or outright opposition to, artificial water fluoridation. [Great Lakes United](#), the United States Environmental Protection Agency unions ([US EPA Unions](#)), Canadian Association of Physicians for the Environment ([CAPE](#)) and [professionals world-wide](#) have stated their opposition to artificial water fluoridation. [Table 2-4](#) in the US NRC 2006 Review illustrates how fluoride exposure, just from drinking water, is exposing numerous susceptible populations in Canada to fluoride doses known to cause health harm and which exceed Health Canada's TDI or “safe dose”.

This review selectively omits large numbers of primary research papers and recent reviews without justification. Such omissions of significance without explanation violates basic scientific research protocol and suggests a lack of objectivity on the part of this Health Canada panel.

Omission #1: Chemicals used in artificial water fluoridation

Any discussion of artificial water fluoridation should include a discussion of the actual chemicals used and whether there are any undesirable side effects from their use. Because Canadians use silicofluorides almost exclusively, omission of any discussion of these chemicals and their known impurities, is scientifically unacceptable. The AWWA writes in their latest standard:

“The transfer of contaminants from chemicals to processed water or the residual solids is becoming a problem of greater concern.” page ix, AWWA Standard for Fluoride B-703-06.

The chemicals most commonly used for artificial water fluoridation include:

- a. Sodium fluoride (NaF) - familiar for its widespread use in toothpaste and other dental treatments.
- b. Hydrofluorosilicic acid (H_2SiF_6) - a liquid compound that has been used for artificial water fluoridation in Canada for over 60 years. This chemical was chosen because of its low cost and widespread availability (as a waste product from chemical processing of phosphate rock, especially for separation of uranium from other ores).
- c. Sodium silicofluoride (Na_2SiF_6) - a solid compound related to hydrofluorosilicic acid.

Silicofluorides (H_2SiF_6 & Na_2SiF_6) are classified as Hazardous Waste according to the [Basel Convention](#), [Environment Canada](#) and [United States Environmental Protection Agency \(US EPA\)](#).

The artificial water fluoridation chemicals most commonly used contains between 20 to 30% hydrofluorosilicic acid (inorganic fluoride most commonly used in Canada), 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](#).

Statements by US EPA union members who oppose artificial water fluoridation:

<http://nteu280.org/Issues/Fluoride/flouridestatement.htm>

"Upon being sold (unrefined) to municipalities as fluoridating agents, these same substances are then considered a "product", allowing them to be dispensed through fluoridated municipal water systems to the very same ecosystems to which they could not be released directly."

"99.97% of fluoridated water is released directly into the environment. This water is NOT used for drinking or cooking."

"When asked by the U.S. House Committee on Science for chronic toxicity test data on sodium fluorosilicate and hydrofluorosilicic acid, Charles Fox of the EPA answered on June 23, 1999, "EPA was not able to identify chronic toxicity data on these chemicals".

⁵ Further, EPA's National Risk Management Research Laboratory stated, on April 25, 2002, that the chemistry of silicofluorides is "not well understood" and studies are needed."

“The EPA defines the Maximum Contaminant Level Goal (MCLG) for toxic elements in drinking water thus: "the level below which there are no known or anticipated effects to health." The MCLG for arsenic, lead, and radioactive particles, all contaminants of the scrubber liquors used for fluoridation, is 0.0 ppb (zero parts per billion). Therefore, any addition of fluorine-bearing substances to drinking water that include these contaminants is contrary to the intent of EPA's established health goals.”

Omission #2: Synergistic Effects

In addition, discussion of the synergistic effects of these compounds in use for "water fluoridation" is also completely omitted from the Health Canada Review. A discussion of some of the synergistic effects with lead and aluminum are discussed in the NRC 2006 review but are omitted in the Health Canada Review.

“Both Urbansky (2002) and Morris (2004) indicate that other substances in the water, especially metal cations, might form complexes with fluoride, which, depending on pH and other factors, could influence the amount of fluoride actually present as free fluoride ion.” p 53 NRC 2006

“ Although neither Urbansky (2002) nor Morris (2004) discusses such beverages, both indicate that at pH < 5, SiF_6^{2-} would be present, so it seems reasonable to expect that some SiF_6^{2-} would be present in acidic beverages but not in the tap water used to prepare the beverages. Consumption rates of these beverages [fruit juice from concentrate, tea, and soft drinks] are high for many people, and therefore the possibility of biological effects of SiF_6^{2-} , as opposed to free fluoride ion, should be examined.” p 53 NRC 2006

Fluoride species & Lead

Recent research by Maas et al 2007 in Neurotoxicology demonstrate that lead in solder and brass is also released by all 3 fluoride chemicals used in artificial water fluoridation. Their synergistic effects with chlorine and/or chloramine were demonstrated to increase the lead levels even further.

Maas RP, Patch SC, Christian AM, Coplan MJ 2007 Effects of fluoridation and disinfection agent combinations on lead leaching from leaded-brass parts. Neurotoxicology. Sep;28(5):1023-31, From Table 3, p 1029.

CHLORAMINE & FLUOROSILICIC ACID & LEAD LEACHING FROM BRASS

	Median Lead level
Chlorine	145.9µg/DL (1.5mg/L)
Chloramine *	23.3µg/DL (0.23mg/L) or 233ppb

Chlorine & sodium fluoride	185.3µg/DL (1.85mg/L)
Chloramine* & sodium fluoride	28.1µg/DL (0.28mg/L)
Chlorine and fluorosilicic acid	362.8µg/DL (3.63mg/L) doubled
Chloramine* & fluorosilicic acid	42.6µg/DL (0.43mg/L) doubled
Chloramine** & fluorosilicic acid	83.1µg/DL (0.83mg/L) quadrupled

* with 100% extra ammonia added, to neutralize effect; **note** difference of one sample of chloramine without this extra ammonia (at **)

** without extra ammonia.

Research by Masters and Coplan 1999 and Westendorf 1975 provide evidence that fluoride in drinking water increases blood lead levels and interferes with acetylcholine esterase.

Masters RD, Coplan M. 1999 Water treatment with silicofluorides and lead toxicity. International Journal of Environmental Science 56: 435-449.

Recent analysis in Thunder Bay, Ontario (see below) shows that all 3 chemicals used in artificial water fluoridation increase the lead content in drinking water when lead pipes are used.

Fluoridation Impacts on Water Chemistry P3-4, Report No. 2009.123, Thunder Bay, Ontario, Board of Health Report, July 20, 2009

“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.”

Fluoride species & Aluminum

]The research on aluminum and fluoride interactions is well documented. AlFx is a phosphate mimic, capable of interfering with many cellular processes and pathways (e.g., Gproteins, energy production and transfer). The gut has a pH of about 3.

“For example, P.J. Jackson et al. (2002) have calculated that at pH 7, in the presence of aluminum, 97.46% of a total fluoride concentration of 1 mg/L is present as fluoride ion, but at pH 6, only 21.35% of the total fluoride is present as fluoride ion, the rest being present in various aluminum fluoride species (primarily AlF₂⁺ and AlF₃⁰). Calculations were not reported for pH < 6.”

Fluoride species & Iodine

Fluoride interferes with the essential nutrient iodine via multiple pathways. ([Clinch 2009](#))

Omission #3: Fluoride is not a nutrient & should not be swallowed

This statement is available on the Auditor General of Canada's website:

“Health Canada does not consider fluoride as an essential nutrient.” AG Petition 221, Q/A #12; http://www.oag-bvg.gc.ca/internet/English/pet_221_e_30308.html

The statements regarding essentiality are not consistent with the following statement which is available on the Health Canada website which recommends that Canadians not swallow fluorides:

" Health Canada does not recommend the use of fluoride supplements (drops or tablets). This guideline is consistent with recommendations made by Health Canada's First Nations and Inuit Health Branch (FNIHB) and the Canadian Association of Public Health Dentistry (CAPHD). " http://www.hc-sc.gc.ca/iyh-vsv/environ/fluor_e.html

Omission #4: Source Water in excess of the MAC in Southwestern Ontario

A Health Canada presentation to the Hamilton Board of Health, on July 9, 2008, which presented the 2008 Review Panel's findings, suggested that the fluoride levels in Stratford, which exceed the Maximum Acceptable Concentration, are “optimal”. Parents with newborns are told in hospitals not to use the municipal drinking water. This would indicate that the fluoride levels are not only in excess of the Health Canada MAC, but not “optimal” for babies.

The following F levels in excess of the MAC have been known for decades to occur in Southwestern Ontario. No mention was made of these fluoride concentrations in drinking water that exceed the MAC in Ontario:

Ingersoll 2007 Fluoride Levels: 2.0ppm

Stratford 2007 Fluoride levels: 1.4 - 2.1ppm
 St. Pauls 2006 Fluoride levels: 1.59ppm
 Mitchell 2006 Fluoride levels: 1.93ppm
 Sebringville 2006 Fluoride levels: 2.76ppm
 Chepstow Fluoride levels: February 24, 2004 – 1.89ppm & January 11, 2006 – 1.73ppm

Omission #5: Fluoride levels in drinking water exceed Fluoride levels in Infant Formula yet Health Canada omits any concern regarding the higher F levels in water.

Hujoel PP, Zina LG, Moimaz SAS, Cunha-Cruz J. Infant Formula and Enamel Fluorosis: A Systematic Review. J Am Dent Assoc 2009;140:841-854. C O V E R S T O R Y (see Figure 2 below)

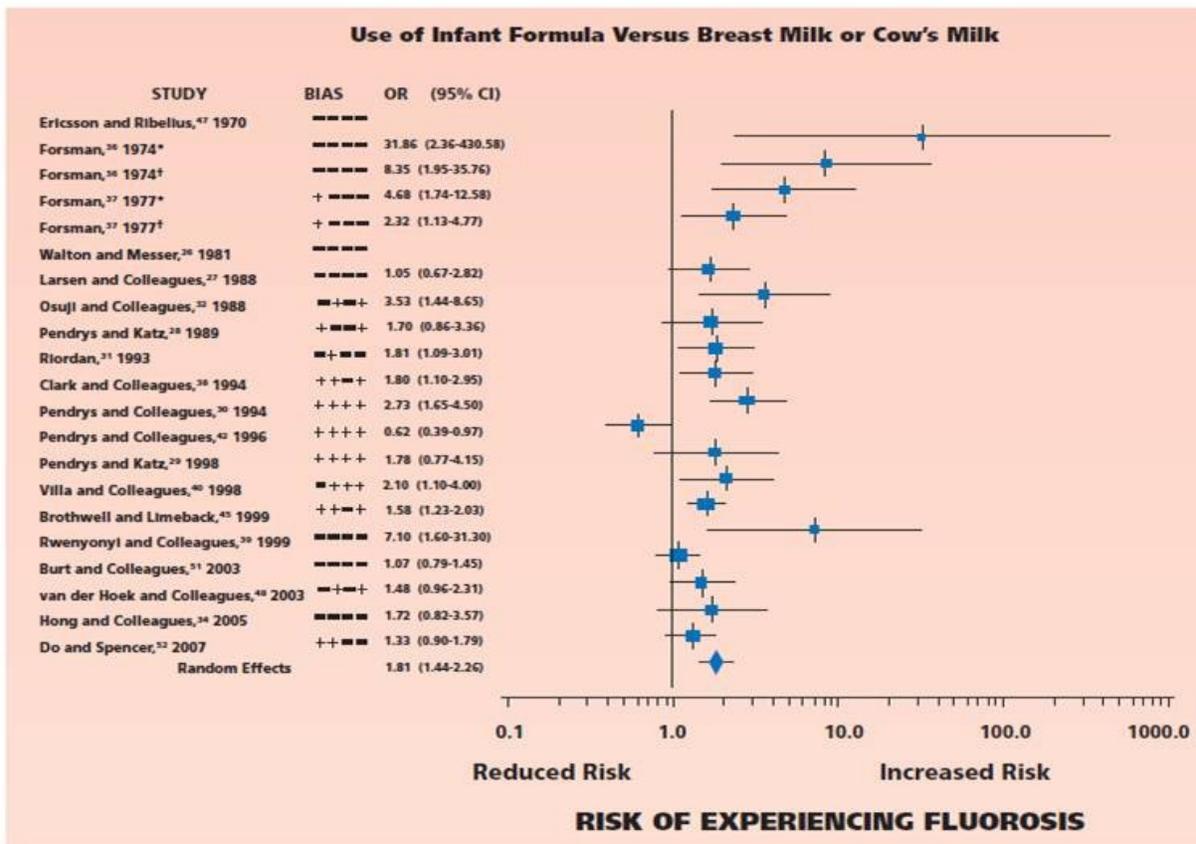


Figure 2. Forest plot of the odds ratios (ORs) relating infant formula to fluorosis. Adjustments for fluoride supplements, toothpaste, sex and socioeconomic status are summarized as present (+) or absent (-) under the column labeled "Bias." Readers should use caution in interpreting the summary estimates on the forest plot owing to the significant heterogeneity of the selected studies. CI: Confidence interval. *: Subjects exposed to fluoridated water. †: Subjects exposed to nonfluoridated water.

- “A metaregression analysis indicated that the ORs associating infant formula with enamel **fluorosis** increased by 5 percent for each 0.1–part-per-million increase in the reported levels of fluoride in the water supply (OR 1.05, 95 percent CI 1.02-1.09).”

- “The evidence that the fluoride in the infant formula caused enamel fluorosis was weak, as other mechanisms could explain the observed association.”
- “U.S. manufacturers have voluntarily reduced the fluoride levels of ready-to-feed and concentrated formulas since 1979.¹⁴ Since this change, formulas’ fluoride content reportedly has ranged between 0.03 and 0.34 ppm.¹⁵ Investigators have assessed the maintenance of this decrease intermittently.^{16,17}

Health Canada states: “the highest estimated dietary intake of fluoride in infants is from powdered infant formula reconstituted with fluoridated drinking water.” p7

Health Canada states its concern about the fluoride in infant formula but states no concern regarding fluoride in drinking water. Fluoride concentrations recommended for drinking water are 0.7mg/L and fluoride concentrations in infant formula in the USA are approximately 0.3 mg/L. It is clear that the greater exposure, therefore the greater concern, should be with fluoride in drinking water. Ironically, eliminating fluoride from drinking water is the easiest option, yet this option is omitted from all discussion in this review.

The NRC 2006 Review clearly shows a ten-fold range in drinking water intake (table 2-4 http://books.nap.edu/openbook.php?record_id=11571&page=35#p200111b79960035001) with nephrogenic diabetes patients, athletes, soldiers, lactating mothers forming subpopulations with high water consumption. A typical infant exceeds the recommended fluoride dose from drinking water alone:

“Heller et al. (1999, 2000) estimated that a typical infant less than 1 year old who drinks fluoridated water containing fluoride at 1 mg/L would ingest approximately 0.08 mg/kg/day from water alone. Shulman et al. (1995) also calculated fluoride intake from water, obtaining an estimate of 0.08 mg/kg/day for infants (7-9 months of age),” NRC 2006 p 54

The research demonstrates why fetuses and infants are at high risk for fluorosis disease; they consume more per body; they will be subjected to a lifetime of bioaccumulation; fluoride is easily transferred from mother to fetus; and their kidneys are unable to filter toxins, comparable to an adult. It is well understood that fetal development is extremely sensitive to toxic substances, at particular windows of time.

Ekstrand J, et al. (1981). No evidence of transfer of fluoride from plasma to breast milk. British Medical Journal 283: 761-2.

"These findings show that plasma fluoride is poorly transferred to breast milk and infants thus receive almost no fluoride during breast feeding... The existence of a physiological plasma-milk barrier against fluoride suggests that the newborn is actively protected from this halogen."

Whitford GM. (1994). Intake and metabolism of fluoride. *Advances in Dental Research* 8:5-14.

“Overall, an average of 86.8% of the dose was retained by the infants, which is about 50% higher than would be expected for adults (Whitford 1994)”

Health Canada states; “Fluoride is readily transferred from mother to fetus across the placenta (IPCS, 2002).”

Omission #6: The fact that it is the fluoride, not the toothpaste, that causes acute or chronic toxicity is omitted from discussion in this review

Health Canada states: “Health Canada recommends children under the age of 3 should have their teeth brushed by an adult without using any toothpaste.”

It is the fluoride in the toothpaste that is toxic. Clearly if it is the fluoride, it should be so stated. Obfuscation of this information does not serve the public well.

Omission #7: Claims for the acute dose omits relevant research evidence in this review

Health Canada states: “An acute dose of 5 mg fluoride/kg bw has been considered to be the minimum that might lead to adverse health effects (Whitford, 1996).”

This Health Canada review ignores the following research evidence provided by one of their external and internal reviewers, Dr. Tardif. No justification was given for this omission:

Akinawa K. (1997). Re-examination of acute toxicity of fluoride. *Fluoride* 30(2):89-104.

“The acute toxic dose of fluoride has been believed to be 2 to 5 mg or 8 mg/kg of body weight. However, acute fluoride poisonings have occurred at doses of 0.1 to 0.8 mgF/kg of body weight in the USA.”

Omission #8: Recent and relevant carcinogenicity research omitted

1. California Carcinogen Identification Committee (CIC) provided advice to the Office of the Environmental Health Hazard Assessment (OEHHA) at the California Environmental Protection Agency, that fluoride and its salts are now on the high priority list as a carcinogen
2. The available Canadian research satisfies EPA guidelines to classify fluoride as “likely to be carcinogenic to humans” is omitted
3. Health Canada based its conclusions on unpublished work by a researcher (Douglass) who is known to have various conflicts of interest regarding fluorides, choose to ignore

a published paper by Bassin et al 2006.

- NRC 2006 concerns are omitted

1. The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) is the lead agency for the implementation of the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

The Carcinogen Identification Committee (CIC) of OEHHA's Science Advisory Board serves as the State's qualified experts for rendering an opinion whether a chemical has been clearly shown through scientifically valid testing according to generally accepted principles to cause cancer.

On [May 29, 2009](#), the CIC considered the priority ranking of 38 chemicals of which they recommended that nine of the chemicals be placed in the High priority category. OEHHA has initially selected five of the nine chemicals for the CIC's review for possible listing under Proposition 65 and **is initiating the development of hazard identification materials for these chemicals**. [The remaining four chemicals will be the subject of a future public notice or notices.] The five chemicals are listed in Table 1 below.

Table 1. Chemicals Selected for Preparation of Cancer Hazard Identification Materials and Review for Possible Listing by the Carcinogen Identification Committee

Chemical	CAS No.
3-Monochloropropane-1,2-diol	96-24-2
1,3-Dichloro-2-propanol	96-23-1
Fluoride and its salts	---
Diisononyl phthalate (DINP)	---
Perfluorooctanoic acid (PFOA) and its salts and transformation and degradation precursors	---

These chemicals were selected using the procedure described in the document entitled: "Process for Prioritizing Chemicals for Consideration under Proposition 65 by the State's Qualified Experts," adopted in 2004, and available on the Internet at www.oehha.ca.gov.

US EPA Guidelines for Carcinogenicity 2005

The conclusions of this committee does not agree with the the US EPA guidelines for carcinogenicity. If the evidence discussed in the NRC 2006 Review is objectively reviewed (Bassin et al 2006, Cohn 1992, Hoover 1991, NTP 1991) and more recent evidence (Sandhu 2009) regarding fluoride it seems to fit the category called “Likely to be Carcinogenic to Humans” - Category 2 (see below):

- “rare animal tumor response in a single experiment that is assumed to be relevant to humans” (NTP 1991)
- “a single positive cancer result” There are several positive cancer results. (Bassin 2006, Cohn 1992, Hoover 1991, NTP 1991)
- “a positive tumor study that raises additional biological concerns beyond that of a statistically significant result, for example, a high degree of malignancy, OR AN EARLY AGE AT ONSET”- my emphasis (Bassin et al 2006, Cohn 1992, Hoover 1991 all demonstrated age-specific, sex-specific association that was STATISTICALLY SIGNIFICANT)
- “a positive tumor study that is strengthened by other lines of evidence, for example, either plausible (Bassin et al 2006) (but not definitively causal) association between human exposure and cancer or evidence that the agent or an important metabolite causes events generally known to be associated with tumor formation (such as DNA reactivity or effects on cell growth control) likely to be related to the tumor response in this case.” (mitogenesis of fluoride is “well-established” according to the NRC 2006 review and it would seem that fluoride is at least a promoter of cancer)
- “mode of action” is known (see below), therefore strengthening the evidence

If you read the EPA Guidelines and actually follow them, fluoride or the silicofluorides used (e.g. hydrofluorosilicic acid), seems LIKELY TO BE CARCINOGENIC IN HUMANS.

The new paper by Sandhu 2009 demonstrates an association between fluoride osteosarcoma and other bone-forming tumours, and musculo-skeletal pain syndromes using biochemical analysis. Sandhu R, Lal H, Kundu ZS, Kharb S. Serum Fluoride and Sialic Acid Levels in Osteosarcoma. Biol Trace Elem Res. 2009 Apr 24. [Epub ahead of print]

Of course there is also the introduction of other contaminants like arsenic and lead in fluorosilicates which are an additional “confounding variable” which may influence cancer and other health effects.

2005 EPA GUIDELINES FOR CARCINOGENICITY: “Likely to Be Carcinogenic to Humans” 2-55 available at: <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=116283>

“Carcinogenic to Humans.”

Adequate evidence consistent with this descriptor covers a broad spectrum. As stated previously, the use of the term “likely” as a weight of evidence descriptor does not correspond

to a quantifiable probability. The examples below are meant to represent the broad range of data combinations that are covered by this descriptor; they are illustrative and provide neither a checklist nor a limitation for the data that might support use of this descriptor. Moreover, additional information, e.g., on mode of action, might change the choice of descriptor for the illustrated examples. Supporting data for this descriptor may include:

- an agent demonstrating a plausible (but not definitively causal) association between human exposure and cancer, in most cases with some supporting biological, experimental evidence, though not necessarily carcinogenicity data from animal experiments;
- an agent that has tested positive in animal experiments in more than one species, sex, strain, site, or exposure route, with or without evidence of carcinogenicity in humans;
- a positive tumor study that raises additional biological concerns beyond that of a statistically significant result, for example, a high degree of malignancy, or an early age at onset;
- a rare animal tumor response in a single experiment that is assumed to be relevant to humans; or
- a positive tumor study that is strengthened by other lines of evidence, for example, either plausible (but not definitively causal) association between human exposure and cancer or evidence that the agent or an important metabolite causes events generally known to be associated with tumor formation (such as DNA reactivity or effects on cell growth control) likely to be related to the tumor response in this case.

2. Health Canada conclusions on unpublished work and ignores published work

Health Canada accepts the evidence of unpublished work by Douglass as irrefutable and ignores the published, peer-reviewed paper by Bassin et al 2006. Health Canada conclusions are not based on the best available published, scientific research. Douglass has a known conflict of interest with regards to fluoride due to his heavy financial support from Colgate.

Usually a researcher does not publish a paper for one of two reasons:

1. The author is unable to publish because the findings did not pass the peer review process
2. The author is unwilling to publish because the findings do not support the conclusions desired by the author.

3. NRC 2006 Review states:

“Fluoride appears to have the potential to initiate or promote cancers, particularly of the bone but the evidence is tentative and mixed.” p336

4. Tardif 2007 unpublished, internal review for Health Canada states:

“-the impact of endemic fluoride on intelligence (cognitive effects) that seems to occur at lower levels (less than 1 ppm).”

Omission #9: Fluoride does not inhibit bacteria which cause acid production and dissolution of teeth

Health Canada claims; “Fluoride was also shown to inhibit plaque bacterial acid production (Grembowski et al., 1992).”

Recent research by Brailsford et al 2005 disputes the epidemiological findings of Grembowski et al 1992 which does not control confounding variables.

[Brailsford SR](#), Kidd EA, Gilbert SC, Clark DT, Beighton D. Effect of withdrawal of fluoride-containing toothpaste on the interproximal plaque microflora. *Caries Res.* 2005 May-Jun;39(3):231-5.

“There was no difference between the groups in the numbers or proportions of aciduric bacteria (recovered at pH 4.8 or 5.2), or of yeasts, neisseriae, lactobacilli or streptococci (total or individual species, including *Streptococcus mutans*).”

“The data suggest that the anti-caries effect of fluoride toothpaste is not mediated primarily through effects on the plaque microflora, although effects on plaque physiology could be important.”

Omission #10: Author of the 2008 Health Canada review panel states that the use of the word “optimal” no longer recommended for artificial water fluoridation

Despite the published research by members of the Health Canada 2008 review panel stating clearly that the use of the word “optimal” is no longer valid, this review panel continues to use this outdated and invalid terminology.

Warren JJ, Levy SM, Broffitt B, Cavanaugh JE, Kanellis MJ, Weber-Gasparoni K. Considerations on Optimal Fluoride Intake Using Dental Fluorosis and Dental Caries Outcomes - A Longitudinal Study. *J Public Health Dent.* 2008 Nov 21. [Epub ahead of print]

“firmly recommending an ‘optimal’ fluoride intake is problematic” because “it is doubtful that parents or clinicians could adequately track children’s fluoride intake and compare it with the recommended level, rendering the concept of an “optimal” or target intake relatively moot.”

Omission #11: Dental Fluorosis incidence

Health Canada claims:

There is evidence in some instances—for example, in the Niagara region—of a dramatic decrease in prevalence between 1994 and 1998.

since 1996 there has been an overall decreasing trend of dental fluorosis in Canada.

Health Canada contradicts itself:

Over the last 55 years, in areas where fluoride is added to the drinking water to bring the total level of fluoride to approximately 1 mg/L (optimally fluoridated areas), there have been increases in the total prevalence of dental fluorosis. Also, in non-fluoridated areas, there is clear evidence that the total prevalence of dental fluorosis has increased over the last 40 years (Clark, 2006).

Ismail AI, Brodeur JM, Kavanagh M, Boisclair G, Tessier C, Picotte L. Prevalence of dental caries and dental fluorosis in students, 11-17 years of age, in fluoridated and non-fluoridated cities in Quebec. *Caries Res* 1990;24(4):290-7. Prevalence of dental fluorosis was:

45.6% et 58.0% - Trois-Rivières (fluoridated)
31.1% et 30.1% - Sherbrooke (not fluoridated)
in public and private schools respectively

Recent research from the USA, where artificial water fluoridation levels are virtually identical to Canada (0.7– 1.2 ppm F recommended by US PHS, Health Canada recommends 0.7ppm, with 0.8-1.0 ppm F used across Canada until 2009, except in Ontario where 0.5-0.8ppm is the recommended F concentration, since 2000).

Sohn W, Noh H, Burt BA. Fluoride Ingestion is Related to Fluid Consumption Patterns. *Journal of Public Health Dentistry* 2009 In Press.

“Several studies have indicated that the prevalence of dental fluorosis in the United States has increased during the past decades (1-4). It follows that the amount of fluoride ingested by young children is a matter of public health interest.”

Recent and relevant Canadian data demonstrates both high and increasing rates of dental fluorosis. Halton Region 2005-7 survey shows that 10-11% of 9 & 13 year-children in this region have moderate to severe dental fluorosis. (Table 4 below) By the age of 13 the permanent teeth are fully erupted.

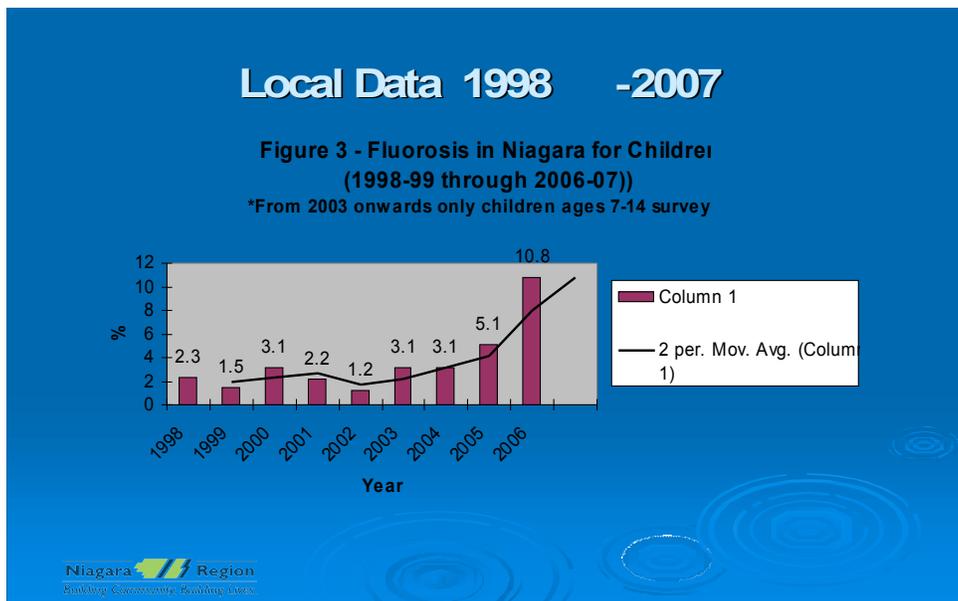
Contrary to what is stated by Health Canada there has been a dramatic increase in dental fluorosis documented in the Niagara Region according to recent data. (see Figure 3 above)

Data from these 2 communities reflects fluoride drinking water concentrations of between 0.5-0.8 mg/L.

This is in agreement with the York Review 2000, which showed an average rate of 54% of cases of dental fluorosis, or 40 to 57%, with 12.5% of moderate or moderately severe. Full report available: www.york.ac.uk / inst / crd / fluores.htm).

Halton Region Table 4. Dental Fluorosis rates for children aged 5, 7, 9 and 13

Age	Mild Fluorosis	Moderate Fluorosis	Severe Fluorosis
7 years			
2003-2005	8.0%	3.0%	
2005-2007	11.1%	4.7%	
9 years			
2003-2005	14.2%	7.8%	0.2%
2005-2007	25.8%	10.4%	
13 years			
2003-2005	13.6%	5.3%	0.3%
2005-2007	22.0%	10.80%	



The claim of a decrease in dental fluorosis contradicts other statements, and is based on an unpublished paper by Health Canada panel member (Clark 2006) for Health Canada. This is scientifically unacceptable. The actual evidence cited below showing that dental fluorosis is high and increasing in fluoridated Halton Region and Niagara Region, and the evidence of rampant dental cavities in low socio-economic brackets in fluoridated cities (e.g. Oshawa see <http://www.oshawaexpress.ca/story2203.html>) provides no evidence that the overall intake of F has declined in recent years, that dental fluorosis is declining, or that this intake of F is preventing tooth decay among the low socioeconomic brackets, as claimed.

Clark et al 2006 published paper not cited in this review, which demonstrates that DF drops dramatically when AWF discontinued. This author is a member of this Health Canada review panel. Instead, the Clark 2006 unpublished paper which the public and peers are unable to review, is cited and used as evidence.

Clark, D.C. (2006) Unpublished contract re: Fluoride expert committee. Faculty of Dentistry, University of British Columbia, Vancouver.

Clark DC, Shulman JD, Maupome G, Levy SM. 2006 Changes in Dental Fluorosis Following Cessation of Water Fluoridation. Community of Dental and Oral Epidemiology 2006 Com Dent Oral Epidemiol June;34(3):197-204.

Omission #12: Fluoridation Cessation Studies Omitted

Omitted are the following studies which demonstrate that cavity rates remained unchanged or continued to decrease, following the cessation of water fluoridation. This is scientifically unacceptable to omit research that does not support your conclusions. Such cherry-picking of the data demonstrates that your claim of the “best available evidence” is scientifically untenable.

Two of these papers (Maupome et al 2001, Azarpazhooh et al 2006) are recent & Canadian and are therefore highly relevant. To omit these Canadian research papers in your analysis is incomprehensible.

Bibliography – Recent Artificial Water Fluoridation Cessation Studies

1. Burt BA, et al. 2000. The effects of a break in water fluoridation on the development of dental caries and fluorosis. *Journal of Dental Research* 79(2):761-9.
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Recent Reviews of Cessation Studies

12. Pizzo G, Piscopo M, Pizzo I, Giulliana G. 2007 Community water fluoridation and caries prevention: a critical review. *Clinical and Oral Investigations* Sep;11(3):189-193.
13. Azarpazhooh A, Stewart H. 2006 Oral Health Consequences of the Cessation of Water Fluoridation in Toronto.

Omission #13: Reviews & studies which disagree with Health Canada conclusions

The Heller et al 1997 paper cited by this Health Canada review is not in agreement with recently published research by 3 of the 6 members of the Health Canada panel (Kumar, Clark, Levy), the Pizzo et al 2007 Review, and 2 recent Canadian studies. It is also not in agreement with statements made by York Review 2000 members and Ontario Ministry of Health & Long Term Care Review 1999 author.

Omitted from this review:

More recent research by [Burt BA, et al. 2006](#) examined 800 low-income African American adults living in Detroit (fluoridated since 1967). The quantity of fluoridated tap water consumed by each individual was actually assessed. Tooth decay was "severe" and "extensive", with tooth decay rates reaching as high as 99.8% for individuals aged 14 to 35 years who were consuming fluoridated tap water. NO RELATIONSHIP was found between the quantity of fluoridated water consumed & rate of tooth decay.

Omitted from this review (Kumar is a member of the Health Canada panel):

[Iida H, Kumar JV](#). The association between enamel fluorosis and dental caries in U.S.

schoolchildren. J Am Dent Assoc 2009 Jul;140(7):855-62.

Authors use 1986-1987 National Institute of Dental Research (NIDR) data which, upon analysis, shows that 7- to 17-year-olds have similar cavity rates in their permanent teeth whether their water supply is fluoridated or not (Table 1).

In 1990, using the same NIDR data, Dr. John Yiamouyiannis published equally surprising results in a peer-reviewed journal. He concluded, "No statistically significant differences were found in the decay rates of permanent teeth or the percentages of decay-free children in the F [fluoridated], NF [non-fluoridated], and PF [partially fluoridated] areas."

Omitted from this review: Levy is a member of the Health Canada Review Panel Warren JJ, Levy SM, Broffitt B, Cavanaugh JE, Kanellis MJ, Weber-Gasparoni K. Considerations on Optimal Fluoride Intake Using Dental Fluorosis and Dental Caries Outcomes - A Longitudinal Study. J Public Health Dent. 2008 Nov 21. [Epub ahead of print]

"firmly recommending an 'optimal' fluoride intake is problematic" because "it is doubtful that parents or clinicians could adequately track children's fluoride intake and compare it with the recommended level, rendering the concept of an "optimal" or target intake relatively moot."

Omitted from this review : recent Canadian study that controls many confounding variables: Ito D, President of Ontario Association of Public Health Dentistry. Determinants of caries in adjacent fluoridated and non-fluoridated cities. IADR/AADR/CADR 85th General Session and Exhibition March 21-24, 2007 # 2757.

- "We found virtually no difference in caries prevalence or severity between 7-year-old children from schools in non-fluoridated Caledon and schools matched on socio-economic factors, in fluoridated Brampton." This study controlled for a number of confounding variables.

Omitted from this review:

Kakei M, Sakaeb T, Yoshikawac M, Tamurad N. 2007 Effect of fluoride ions on apatite crystal formation in rat hard tissues. Annals of Anatomy 189: 175—181.

"regardless of its amount, fluoride intake has harmful effects on both tooth and bone formation."

Omitted from this review is a subsequent paper written by members of York Review panel: Cheng KK, Chalmer I, Sheldon TA 2007 British Medical Journal October 6, 335: 699-702.

- "Department of Health's objectivity is questionable—it funded the British Fluoridation Society and, along with many other supporters of fluoridation, it used the findings of the

York Review selectively to give an overoptimistic assessment of the evidence in favour of fluoridation.”

- “Water fluoridation has not been proved to reduce tooth decay”

Omitted from this review:

Letter written by the chair of the York Review 2000. Since this review felt it important to include a letter from Dr. Douglass regarding the research on osteosarcoma, I assume that they feel it is relevant to include important letters.

Source: www.fluoridealert.org/sheldon.htm or

- The review found water fluoridation to be significantly associated with high levels of dental fluorosis which was not characterised as "just a cosmetic issue".
- The review did not show water fluoridation to be safe. The quality of the research was too poor to establish with confidence whether or not there are potentially important adverse effects in addition to the high levels of fluorosis. The report recommended that more research was needed.
- There was little evidence to show that water fluoridation has reduced social inequalities in dental health.
- The review team was surprised that in spite of the large number of studies carried out over several decades there is a dearth of *reliable* evidence with which to inform policy.
- Until high quality studies are undertaken providing more definitive evidence, there will continue to be legitimate scientific controversy over the likely effects and costs of water fluoridation.

Omitted from this review:

The last comment by Dr. Sheldon reiterates comments made by the Chair of the NRC 2006 Review in the article “Second Thoughts About Fluoride” in the January, 2008 Scientific American:

“What the committee found is that we’ve gone with the status quo regarding fluoride for many years—for too long, really—and now we need to take a fresh look,” Doull says. “In the scientific community, people tend to think this is settled. I mean, when the U.S. surgeon general comes out and says this is one of the 10 greatest achievements of the 20th century, that’s a hard hurdle to get over. But when we looked at the studies that have been done, we found that many of these questions are unsettled and we have much less information than we should, considering how long this has been going on. I think that’s why fluoridation is still being challenged so many years after it began. In the face of ignorance, controversy is rampant.”

Omitted from this review:

Ontario Ministry of Health 1999 Review and subsequent commentary.

Locker D. 1999 Benefits and Risks of Water Fluoridation: An Update of the 1996 Federal-Provincial Sub-committee Report Prepared under contract for: Public Health Branch, Ontario Ministry of Health First Nations and Inuit Health Branch, Health Canada.

1. "In Canada, actual intakes are larger than recommended intakes for **formula-fed infants and those living in fluoridated communities**. Efforts are required to reduce intakes among the most vulnerable age group, children aged 7 months to 4 years."
2. "Current studies support the view that **dental fluorosis** has increased in both **fluoridated** and **non-fluoridated** communities. North American studies suggest rates of **20 to 75%** in the former and **12 to 45%** in the latter."
3. "The magnitude of [fluoridation's] effect is not large in absolute terms, is often not statistically significant, and may not be of clinical significance."
4. "Although it was **initially thought** that the main mode of action of fluoride was through its incorporation into enamel, thereby reducing the solubility of the enamel, this pre-eruptive effect is likely to be minor. **The evidence for a post-eruptive effect, particularly its role in inhibiting demineralization and promoting remineralization, is much stronger.**"

Omitted from this review:

Cohen H, Locker D. 2001 The Science and Ethics of Water Fluoridation Journal of the Canadian Dental Association. 67(10): 578-80.

1. "In the absence of comprehensive, high-quality evidence with respect to the benefits and risks of water fluoridation, the moral status of advocacy for this practice is, at best, indeterminate, and **could perhaps be considered immoral.**"
2. "Ethically, it cannot be argued that past benefits, by themselves, justify continuing the practice of fluoridation. This position presumes the constancy of the environment in which policy decisions are made. Questions of public health policy are relative, not absolute, and different stages of human progress not only will have, but ought to have, different needs and different means of meeting those needs. Standards regarding the optimal level of fluoride in the water supply were developed on the basis of epidemiological data collected more than 50 years ago. There is a need for new guidelines for water fluoridation that are based on sound, up-to-date science and sound ethics. In this context, we would argue that sound ethics presupposes sound science."

Omission #14: Artificial water fluoridation does not reduce social inequalities.

Health Canada claims: "Furthermore, there appears to be some evidence that water fluoridation reduces the inequalities in dental health across social classes in 5- and 12-year-olds, using the dmft/DMFT measure."

There are 2 concerns regarding this claim.

1. Omission of any scientific research to support this claim, making such a claim scientifically invalid.
2. The conclusions from the York Review 2000, the Ontario Ministry of Health Review 1999 and other more recent research by authors of this 2009 Health Review do not support this claim.
3. No justification or analysis is given for omitting evidence which does not agree with conclusions

The recent paper by Sohn et al 2009 demonstrates that AWF does not help children of lower socio-economic status & AWF does not help African-American children. Therefore, AWF is not an equitable way to get fluoride to everyone in the population regardless of social status, as claimed.

Sohn W, Noh H, Burt BA. Fluoride Ingestion is Related to Fluid Consumption Patterns. Journal of Public Health Dentistry 2009 In Press.

“-we found that fluid consumption among children varied significantly by age, sex, race/ethnicity, and socioeconomic status.”

“African-American children and children from low SES have a tendency toward higher consumption of plain drinking water and lower consumption of milk compared with their White or more affluent counterparts.” (18,41)

“Our results raise concerns that African-American children, and/or children of lower SES, are ingesting significantly more fluoride than children who are higher on the social scale. They may be therefore at higher risk for fluorosis.”

The Pizzo et al 2007 Review and the York 2000 Review state clearly that the evidence that AWF reduces social inequalities is unfounded. The American Dental Association has this paper on its website for [Evidence Based Dentistry](#) and yet this review panel has omitted this review from their review paper. Omitting reviews which do not support your conclusions is not scientifically acceptable:

"to date, there is limited evidence to support the view that fluoridation reduced the disparities in caries." Giuseppe Pizzo, Maria Piscopo, Ignazio Pizzo and Giovanna Giulliana. 2007 Community water fluoridation and caries prevention: a critical review. Clinical and Oral Investigations. Sep;11(3):189-193.

There is significant evidence that water fluoridation does not reduce social inequities, as evidenced by the high incidence of caries in lower socio-economic brackets in fluoridated communities and recent analysis done in Canada which controlled for these important confounding variables.

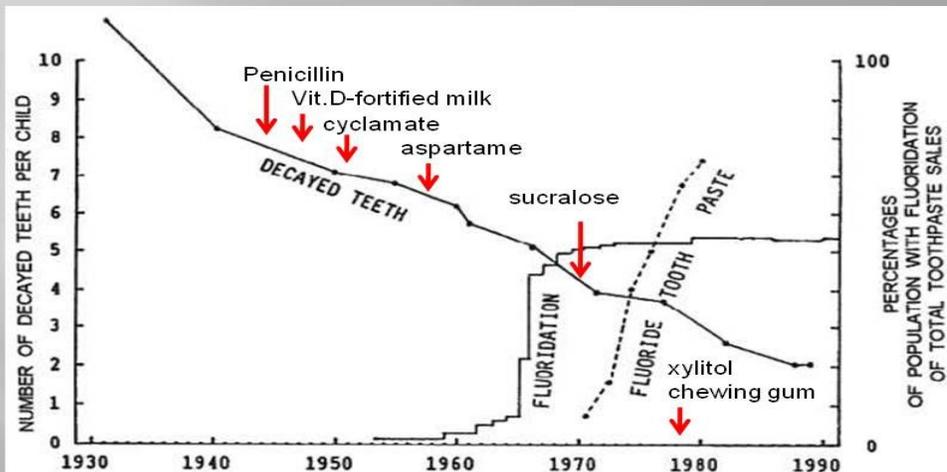
Recent reports in [Oshawa](#) demonstrate that water fluoridation has not reduced social inequalities after decades of use. “Oshawa has the highest rate of tooth decay and cavities,” “This can be an excellent indicator of poverty.”

Omission #15: Confounding Variables not controlled

The total lack of discussion of the poor quality epidemiology evidence now available, as discussed in the York Review 2000, is an extraordinary oversight in this review. The following variables are known to affect cavities and must be controlled in any epidemiological analysis:

1. Socio-economic status
2. Exposure to sugars which combine with bacteria to form acid leading to tooth decay
3. Exposure to nutrients known to protect against tooth decay (e.g. calcium, magnesium, Vitamin D, xylitol)
4. Dental hygiene
5. Access to dental education and dental care
6. Fluoride ingestion delays eruption of teeth, therefore delays development of cavities.
7. Fluoride ingestion delays detection of cavities, increasing severity of cavities when detected (Fluoride Bombs)
8. Fluoride ingestion potentially causes mis-diagnosis because dental fluorosis looks like cavities
9. Smoking ([Shenkin et al 2004](#))

Where have the caries gone???



COLQUHOUN J, *Perspectives in Biology and Medicine*, 41, 1, Autumn 1997

Dental exams are error prone

The recent paper by Fracaro et al. demonstrates how error prone dental exams truly are, with error rates exceeding 40%:

- Clinical exams by dentists missed 43% of all cavities
- X-rays missed 42% of all cavities

The ingestion of fluoride use leads to 3 additional sources of error:

1. **Delayed Eruption of Teeth/Caries**
2. **Delayed Diagnosis**
3. **Mis-diagnosis of caries**

**Delaying the development or diagnosis of cavities is not the goal.
Preventing cavities should be the goal.
Preventing fluorosis diseases should be the goal.**

Delayed Eruption of Teeth & Time at Risk for Cavities

An important confounding variable that requires attention is the issue of delayed eruption of teeth potentially caused by fluoride. According to the 2000 York Review: ‘no (fluoridation) study used an analysis that would control for...the number of erupted teeth’.

A recent analysis by Komarek et al. 2007 reports that, “since the emergence of permanent teeth might be delayed by fluoride-intake, evaluating the impact of fluoride-intake should take into account the time at risk for caries. Hence, in our analysis, the response will be the time between emergence and the onset of caries development.” “Our analysis shows no convincing effect of fluoride-intake on caries development.”

A significant [body of research evidence](#) (70+ studies) available since the 1940s (Short et al. 1944) suggests that fluoride delays the eruption of teeth, thereby merely delaying the development of cavities. This delay has been reported to be anywhere from several months (Tseng et al, 1989) to 2 years (Campagna et al, 1995).

The York review also discussed the methodologically poor quality of research and stated that important confounding variables were not controlled in these analyses such as delayed eruption of teeth, therefore delayed development of cavities, known to be caused by fluoride (70+ studies); “no (fluoridation) study used an analysis that would control for...the number of erupted teeth” (York Review 2000)

Proposed mechanisms for this delayed tooth eruption include:

- Delayed eruption may be due to thickening of the bone around the emerging teeth

(Kunzel 1976)

- Delayed eruption may be due to thyroid hormone suppression by fluoride. Fluoride is well-known to mimic TSH (Thyroid Stimulating Hormone) via activation of G-proteins (proteins located on cell membranes to relay/amplify signals from outside cells to inside cells). (Strunecka et al 2007)

Delayed Diagnosis of Cavities

Evidence also suggests that fluoride temporarily hides cavities by causing only surface remineralization which “covers up” underlying cavities. ([Osmunson 2007](#), [FAQ Australia](#)) Delays in the diagnosis of cavities may also lead to larger fillings, hence higher financial costs to the patient and increased fragility of the tooth. Increased fragility of the tooth generally leads to a shortened life span for a tooth.

Mis-diagnosis of Cavities with Dental Fluorosis

The potential for fluorosis, especially the mild, highly prevalent form*, to further confuse the diagnosis of caries, because of its cloudy, demineralized appearance, similar to caries, has been proposed. [Hirasuna et al. 2008](#) state; “the more common mild fluorosis can be easily mistaken for early enamel demineralization due to caries.”

These research papers suggest that the use of fluoride may simply delay the development and/or diagnosis of cavities, or lead to misdiagnoses of cavities due to the presence of fluorosis. This does not assist in the public health goal to prevent cavities.

*25-70% in artificially fluoridated communities according to Locker et al 1999; US CDC report 1/3 of children in the US with fluorosis; Halton Region, Ontario reports 48% incidence of dental fluorosis in Oakville from 2005-7 survey data.

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FAQ page of the Dental Sense (Perth, Australia) website the question 'What are fluoride bombs?' <http://www.dentistmidland.com.au/faqs-cosmetic-dentist-in-midland-wa.php#19>

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