

## **A Small Dose of Fluoride**

**Or**

## **An Introduction to the Health Effects of Fluoride**



Fluorite Crystal – Wikipedia  
<https://en.wikipedia.org/wiki/Fluoride>

## Dossier

**Name:** Fluoride

**Uses:** dental carries prevention, add to drinking water, additive in toothpaste and other dental products

**Source:** additive in drinking water, toothpaste, medication

**Recommended daily intake:** drinking water concentrations 0.7 mg/Kg

**Absorption** intestine

**Sensitive individuals:** children

**Toxicity/symptoms:** considerable controversy surrounding benefits' vs health effects, benefits reduced dental carries, hazards causes dental fluorosis increases hypothyroidism neurotoxic – can decrease IQ's and increase ADHD in children, acts mostly topically, not systemically

No use and not produced until WW II – used to separate isotopes of uranium

**Regulatory facts:**

EPA – The maximum contaminant level (MCL) for fluoride in drinking water is 4.0 ppm (4 mg/L)

CDC – The recommended level for fluoridating drinking water is 0.7 ppm (0.7 mg/L)

NSF – Maximum concentration allowed for fluoride is 1.2 ppm.

**Ethical issues:** no informed consent on fluoride ingestions, standard risk/benefit studies not done

**Environmental:** widely used in the US but in not Europe or rest of world

**Recommendations:** avoid, particular for young children

## Case Studies

“Fluoride seems to fit in with lead, mercury and other poisons that cause chemical brain drain. The effect of each toxicant may seem small, but the combined damage on a population scale may be serious, especially because the brain power of the next generation is crucial to all of us.”

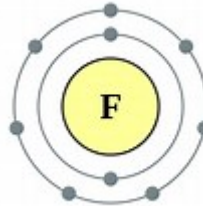
— **Philippe Grandjean, PhD**

"I am appalled at the prospect of using water as a vehicle for drugs. Fluoride is a corrosive poison that will produce serious effect on a long-range basis. Any attempt to use the water this way is deplorable."

--- **Charles Gordon Heyd, MD, Past President, American Medical Association.**

## Introduction

To add or not to add fluoride to community drinking water – that is the question. Currently, about 74% of the U.S. population, often without their knowledge or consent, drinks fluoridated water. There has been a 70-year controversy over the efficacy, safety and ethics of the consumption of fluoridated water. The American Dental Association (ADA, 2019) (ADA) and the Center for Disease Control and Prevention (CDC, 2019) (CDC) as well as others maintain that consumption of fluoridated water is safe, reduces dental caries in children and adults, and therefore has significant public health benefits. Others claim that adding fluoride to drinking water causes significant benefits that are greatly overstated, and is, moreover, unethical. Risks from fluoride ingestion include lowered IQs and increased rates of ADHD and hypothyroidism. Since the 1960s, fluoride toothpaste has become widespread, a topical use generally acknowledged to be more effective in preventing cavities than ingestion through water. This societal trend is thought to be a major reason why tooth decay rates have decreased, rather than because of water fluoridation (see graph – Tooth Decay Trends: Fluoridated vs. Unfluoridated Countries). Given the growing evidence of risks and uncertain evidence of benefits, many public health professionals are recommending that fluoridation of drinking water be discontinued.



The fluoridation vs the anti- fluoridation discussion has been going on since the 1940's. While “A Small Dose of Toxicology” strives a balanced view of Fluoride science there is a tilt toward the anti-fluoridation view. Information in favor of fluoridation is easily found at the CDC's web site and ADA (American Dental Association) web site.

## Science & Facts: Fluoride

- Neurotoxic – can decrease IQ and increase ADHD in children
- May increase hypothyroidism
- Causes dental fluorosis
- Dental benefits from contact with teeth, not ingestion

## Health Effects

### Science & Facts

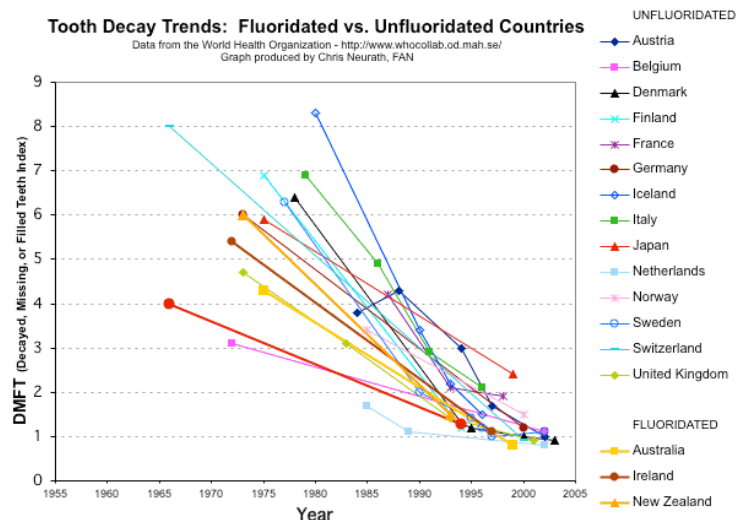
There are several important aspects to the science surrounding fluoridation: 1) are there significant hazards at expected human exposure levels? 2) do the potential societal benefits outweigh the hazards?; and 3) are some people more vulnerable than others to the harmful effects of fluoride?

There is no question that ingested fluoride can be detrimental to human health. The challenge is determining if there is a level of exposure to fluoride that is safe and improves dental health.

Dental fluorosis, which damages tooth enamel, is caused by an excess of ingested fluoride by young children. At a very mild or mild level, it causes white splotches or stripes on teeth. At moderate or severe levels, the mottling is more pronounced and can cause yellow or brown stains and pitting of the enamel, which can increase cavities. A 2019 study (Neurath et al., 2019) found that both prevalence and severity of fluorosis have jumped. Nearly 65% of 12-15 year-olds in the U.S. are afflicted, with 27.9% moderate and 2.6% severe levels, reinforcing a 2018 study (Wiener, Shen, Findley, Tan, & Sambamoorthi, 2018) that found similar increases in 16-17 year-olds. Fluoridated water is a major contributor to all levels.

Fluoride has been identified as an endocrine disruptor. In fact, fluoride has been known to lower thyroid function since the 1950's, when it was used to treat hyperthyroid patients. In 2006, the National Academy of Science (NAS) (Council., 2011) stated unequivocally that it **“decreased thyroid function.”** Studies in Canada (Malin & Till, 2015) and England (Peckham, Lowery, & Spencer, 2015) have added further evidence that increases fluoride exposure contributes to hypothyroidism.

The 2006 NAS review also determined **“fluoride has the ability to interfere with the functions of the brain.”** Since then, hundreds of studies in animals and humans have further validated that conclusion. In



2012, a meta-analysis (Choi, Sun, Zhang, & Grandjean, 2012) found that children ingesting higher levels of fluoride tested an average 7 IQ points lower, with supporting evidence from 26 of 27 studies. Most of the children in these studies were exposed to fluoride at higher concentrations than in typical U.S. water, but in many the total exposure to fluoride was similar to what millions of Americans receive.

In 2017, an NIH-funded prospective study (Bashash et al., 2017) found that every one part per million increase in fluoride in pregnant women's urine was associated with a reduction of their children's IQ by 5-6 points. By 2018, out of 60 studies, 53 had linked higher fluoride levels with lower IQ levels in children (Network, 2019).

Of additional concern is that the chemical typically used to fluoridate water, fluorosilicic acid, can be contaminated with lead and/or arsenic. (International, 2019) Both are known to be neurotoxic, and there are no safe levels for either.

Since the 1950s, the Public Health Service (PHS) recommendation for the concentration of fluoridated water has been 1.0 mg/L (milligrams per liter or ppm) for most of the U.S., with a range of 0.7 to 1.2 mg/L. In 2015, this recommendation was lowered to 0.7 mg/L to reduce the toxic side effects of fluoride ingestion while attempting to maintain its beneficial effects. For toxicological assessments, ingested doses are typically adjusted by body weight. Children eat more, breathe more, and drink more than adults on a body weight basis, so they will have higher fluoride doses than adults. Moreover, child organ systems such as the brain and bones are still developing, making them more vulnerable to the toxic effects of fluoride. Typically, when managing risk and benefits of a compound, standard toxicological protocols are applied, including safety factors, to ensure safety for the most vulnerable individuals.

## History

### History

- 1950: U.S. Public Health Service endorses fluoridation, despite few safety studies
- 2006: NAS *Fluoride in Drinking Water* identifies fluoride as endocrine disruptor and links to multiple health risks
- 2012: Meta-analysis shows higher fluoride levels linked to lower IQ's in 26 of 27 studies
- 2017–2019: High quality studies confirm lowering IQ at common exposure levels

The history of community water fluoridation is a reflection of the post WWII era of the 1950's, when many thought chemicals could solve almost any problem. Our gaze was focused on the beneficial properties of the chemicals, not on the potential hazards. A classic example is DDT, which, in addition to being a potent pesticide, almost killed off predatory birds and more recently was found to be harmful to humans.

Since the 1930's, fluoride has been known to have two opposing qualities for oral health: decreasing cavities but increasing dental fluorosis. There was also early evidence it could weaken bones and lower thyroid function.

In the 1940's, discussions began on the question of fluoridating water at levels that would maximize the benefit but minimize the harm. In 1945, two studies began, comparing one fluoridated city (Grand Rapids/Muskegon, MI, at 1 ppm) with a similar unfluoridated one

(Newburgh/Kingston, NY). They were designed to run for at least ten years, but early promising from Grand Rapids on cavity reduction and pressure from Wisconsin dentists, who had already persuaded at least 50 cities in that state to start fluoridating, led the PHS to approve fluoridation in 1950, after only five years. This was quickly followed by endorsements from the American Dental Association, American Public Health Association and American Medical Association.

All asserted fluoridation was safe, even though no long-term safety studies had ever been done on any diseases, and there were no studies on endocrine disruption, neurotoxicity, cancer, diabetes or chemical sensitivities. Their statements on the certainty of no health risks have continued to the present day, even after the 2006 NAS review cited numerous health risks and the need for more research on several harmful medical conditions, including cancer, diabetes, kidney disease, neurotoxicity and others.

Today, the endorsement of fluoridation by the U.S. government and much of the medical establishment is in stark contrast to most of the rest of the world. Approximately 95% of the world's population drinks unfluoridated water. Out of 196 nations, only 24 have any artificial fluoridation and of those, only 10 for more than half their population. Over 98% of Europe's population drinks unfluoridated water, where only five out of 48 nations have any at all. Some nations have fluoridated salt, but it is always sold as a consumer choice.

In 1999, the CDC included fluoridation as one of its top ten public health achievements of the 20th century. It is revealing that of all ten, this is the only one that has been rejected or not even considered by most nations, cities and health organizations in the world. It's also important that much of the most authoritative scientific evidence against fluoridation has come out since 1999, and the CDC has not changed its position.

### **Ethics**

- Fluoride in water is used as a drug
- No informed consent for ingestion
- Most families cannot avoid intake through water supply
- Kids should be able to reach and maintain their full potential

### **Ethics**

A drug is defined by the FDA as any substance used in the diagnosis, treatment or prevention of disease. For example, the FDA requires a label on fluoridated toothpaste that says, for children under 6, "If more than used for brushing is accidentally swallowed, get medical help or contact a Poison Control Center right away." But when fluoride is added to drinking water, the FDA has looked the other way and refuses to regulate it. Unlike other drugs, fluoridated water has never undergone clinical trials to establish its safety and effectiveness. Fluoridated water is in a "black hole" without any regulation. The EPA regulates it as a contaminant when it occurs naturally, but has stated they will not even consider health risks when fluoride is intentionally added to drinking water (Cross & Carton, 2003).

Physicians prescribe drugs on an individual's needs, ensuring that they are pharmaceutical grade (not contaminated) and recommending a specific dose for a specific length

of time. They also must inform their patients of potential harmful side effects. However, the final decision on whether to take the drugs rests with the patient. With fluoridation, all these safety and ethical protocols are violated, taking away the individual's right of informed consent.

European nations, including France, Germany, Belgium, the Netherlands and Czech Republic, cite the ethical problem of putting a drug in drinking water as a reason they disallow fluoridation (Network, 2019).

Fluoridation is also an environmental and social justice issue. Health conditions that render people more vulnerable to fluoride exposure, such as kidney disease and diabetes, are more prevalent among low-income populations, as are nutrient deficiencies. Moreover, low-income families cannot afford expensive filters or bottled water to avoid fluoridated water. They have no choice.

Finally, the "Precautionary Principle" says that whenever there is evidence that a substance is causing health or environmental harm, preventive measures should be taken, even if the evidence isn't 100% conclusive. The burden of proof should be to show beyond a reasonable doubt that the substance is safe, not absolute proof that it is harmful. Numerous scientific studies, from the 1950's to present day, suggest harm from fluoridation. Discontinuing this practice is the prudent and ethical preventive measure to take.

## **Regulatory Standards**

### **Current Regulations (USA)**

EPA – The maximum contaminant level (MCL) for fluoride in drinking water is 4.0 ppm (4 mg/L)

CDC – The recommended level for fluoridating drinking water is 0.7 ppm (0.7 mg/L)

NSF – Maximum concentration allowed for fluoride is 1.2 ppm; maximum allowable concentration of arsenic is 1.0 ppb; maximum allowable concentration of lead is 1.5 ppb

OSHA – Workplace air - 0.5 mg/m<sup>3</sup>

ATSDR – MRL – 0.3 µg/kg/day (chronic exposure)

## **Recommendation and Conclusions**

## **More Information and References**

### **Slide Presentation**

- A Small Dose of Fluoride presentation material and references online:
  - [www.asmalldoseoftoxicology.org](http://www.asmalldoseoftoxicology.org)Web site contains presentation material related to the health effects of arsenic.

### **European, Asian, and International Agencies**

European Commission - The Scientific Committee on Health and Environmental Risks (SCHER) Fluoride – Online:

[https://ec.europa.eu/health/scientific\\_committees/opinions\\_layman/fluoridation/en/about.htm#content](https://ec.europa.eu/health/scientific_committees/opinions_layman/fluoridation/en/about.htm#content) (accessed: 01 October 2020). Extensive information on fluoride from European view

### **North American Agencies**

Centers for Disease Control and Prevention (VDV) Community Water Fluoridation, Water Fluoridation Basics – Online: <https://www.cdc.gov/fluoridation/basics/> (accessed: 28 September 2020).

Environmental Protection Agency (EPA) Fluoride Health Effects in Drinking Water. Online: <https://www.epa.gov/sdwa/fluoride-health-effects-drinking-water> (accessed: 28 September 2020).

Information related to Fluoride health effects in drinking water. This document is a compilation of the study evaluations arranged alphabetically by the name of the lead author

Environmental Protection Agency (EPA) Review of the Fluoride Drinking Water Regulation. Online: <https://www.epa.gov/sdwa/fluoride-health-effects-drinking-water> (accessed: 28 September 2020).

On January 7, 2011, EPA announced its intent to review the national primary and secondary drinking water regulations for fluoride.

Environmental Protection Agency (EPA) Fluoride in Drinking Water: A review of Regulatory and Treatment Issues. Online:

[https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?Lab=NRMRL&count=10000&dirEntryId=213128&searchall=&showcriteria=2&simplesearch=0&timstype=](https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&count=10000&dirEntryId=213128&searchall=&showcriteria=2&simplesearch=0&timstype=) (accessed: 28 September 2020).

This presentation discusses the advantages and disadvantages for fluoride in drinking water and a review of regulatory and treatment issues. To inform the public.

Washington State Department of Health. Fluoridation of Drinking Water. Online:

<https://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/FluorideinDrinkingWater>. (accessed: 28 September 2020).

WHO World Health Organization (WHO) Fluoride in drinking-water (2006) Online:

[https://www.who.int/water\\_sanitation\\_health/publications/fluoride-in-drinking-water/en/](https://www.who.int/water_sanitation_health/publications/fluoride-in-drinking-water/en/) (accessed: 28 September 2020).

### **Non-Government Organizations**



Fluoride Action Network. 2019. Online: <http://fluoridealert.org/> (accessed: 28 September 2020).

A patrician group that is against fluoridation of drinking water.

The International Academy of Oral Medicine and Toxicology. Sources of Fluoride Toxicity and Exposure. Online: <https://iaomt.org/resources/fluoride-facts/fluoride-toxicity-exposure-effects/> (accessed: 28 September 2020).

## **Wikipedia**

Fluoride - <https://en.wikipedia.org/wiki/Fluoride>

Fluoride toxicity - [https://en.wikipedia.org/wiki/Fluoride\\_toxicity](https://en.wikipedia.org/wiki/Fluoride_toxicity)

Water fluoridation - [https://en.wikipedia.org/wiki/Water\\_fluoridation](https://en.wikipedia.org/wiki/Water_fluoridation)

Water fluoridation controversy - [https://en.wikipedia.org/wiki/Water\\_fluoridation\\_controversy](https://en.wikipedia.org/wiki/Water_fluoridation_controversy)

Fluoridation by country - [https://en.wikipedia.org/wiki/Fluoridation\\_by\\_country](https://en.wikipedia.org/wiki/Fluoridation_by_country)

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