



Fluoride Toxicity: Overview and Examples

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Overview Fluoride Exposure, Toxicity, and Health Effects

The sources of human exposure to fluoride have drastically increased since community water fluoridation began in the U.S. in the 1940's. In addition to water, these sources now include food, air, soil, pesticides, fertilizers, dental products used at home and in the dental office (some of which are implanted in the human body), pharmaceutical drugs, cookware, clothing, carpeting, and an array of other consumer items used on a regular basis.

Fluoride is not a nutrient and has no biological function in the body. Furthermore, hundreds of research articles published over the past several decades have demonstrated potential harm to humans from fluoride at various levels of exposure, including levels currently deemed as safe.

Scientific research has examined fluoride's effect on the skeletal system in detail and has indicated a definitive link between fluoride exposure and skeletal fluorosis, as well as dental fluorosis (which is permanent damage to the developing tooth, is the first visible sign of fluoride toxicity, and is currently on the rise in the United States). Fluoride is also known to impact the cardiovascular, central nervous, digestive, endocrine, immune, integumentary, renal, and respiratory systems, and exposure to fluoride has been linked to Alzheimer's disease, cancer, diabetes, heart disease, infertility, and many other adverse health outcomes.

In fact, a 2006 report by the National Research Council (NRC) of the National Academy of Sciences evaluated the health risks of fluoride and raised concerns about potential associations between fluoride and osteosarcoma (a bone cancer), bone fractures, musculoskeletal effects, reproductive and developmental effects, neurotoxicity and neurobehavioral effects, genotoxicity and carcinogenicity, and effects on other organ systems.¹ Since the NRC report was released in 2006, a number of other relevant research studies have been published.²

The First Sign of Fluoride Toxicity: Dental Fluorosis

Exposure to excess fluoride in children is known to result in dental fluorosis, a condition in which the teeth enamel becomes irreversibly damaged and the teeth become permanently discolored, displaying a white or brown mottling pattern and forming brittle teeth that break and stain easily.³ It has been scientifically recognized since the 1940's that overexposure to fluoride causes this condition, which can range from very mild to severe. In work published in 2015, researchers reviewed the facts that the first sign of fluoride toxicity is dental fluorosis and that fluoride is a known enzyme disruptor.⁴

According to data from the Centers for Disease Control and Prevention (CDC) released in 2010, **23% of Americans aged 6-49** and **41% of children aged 12-15** exhibit fluorosis to some degree.⁵ These drastic increases in rates of dental fluorosis were a crucial factor in the Public Health Service's decision to lower its water fluoridation level recommendations in 2015.⁶

*Figure 1: Dental Fluorosis Ranging from Very Mild to Severe
(Photos from Dr. David Kennedy and used with permission from victims of dental fluorosis.)*



Cases of Fluoride Toxicity

The first large scale case of alleged industrial poisoning from fluorine involved a disaster at Meuse Valley in Belgium in the 1930s. Fog and other conditions in this industrialized area were associated with 60 deaths and several thousand people becoming ill. Evidence has since related these casualties to fluorine releases from the nearby factories.⁷

Another case of industrial poisoning occurred in 1948 in Donora, Pennsylvania, due to fog and temperature inversion. In this instance, gaseous releases from zinc, steel, wire, and nail galvanizing industries have been suspected of causing 20 deaths and six thousand people to become ill as a result of fluoride poisoning.⁸

Fluoride toxicity from a dental product in the United States occurred in 1974 when a three-year old Brooklyn boy died due to a fluoride overdose from dental gel. A reporter for the *New York Times* wrote of the incident: “According to a Nassau County toxicologist, Dr. Jesse Bidanset, William ingested 45 cubic centimeters of 2 percent stannous fluoride solution, triple an amount sufficient to have been fatal.”⁹

Several major cases of fluoride poisoning in the United States have achieved attention in recent decades, such as the 1992 outbreak in Hooper Bay, Alaska, as a result of high levels of fluoride in the water supply¹⁰ and the 2015 poisoning of a family in Florida as a result of sulfuric fluoride used in a termite treatment on their home.¹¹

While the examples provided above are cases of acute (high dose, short-term) poisoning, chronic (low dose, long-term) poisoning must also be considered. The urgency for fluoride toxicity to be more widely recognized was explored in a 2005 publication entitled “Fluoride poisoning: a puzzle with hidden pieces.” Author Phyllis J. Mullenix, PhD, began the article, which was presented in part at the American College of Toxicology Symposium, by warning: “A history of enigmatic descriptions of fluoride poisoning in the medical literature has allowed it to become one of the most misunderstood, misdiagnosed, and misrepresented health problems in the United States today.”¹²

FOR MORE DETAILS ON THIS TOPIC, [CLICK HERE TO READ IAOMT’S FLUORIDE POSITION PAPER.](#)

¹ National Research Council. Fluoride in Drinking Water: A Scientific Review of EPA’s Standards. The National Academies Press: Washington, D.C. 2006.

² See references and discussion of these studies in Connett M. Citizen petition under Toxic Substances Control Act regarding the neurotoxic risks posed by fluoride compounds in drinking water. November 22, 2016. To the United States Department of Environmental Protection (EPA) by the Fluoride Action Network (FAN), the International Academy of Oral Medicine and Toxicology (IAOMT), the American Academy of Environmental Medicine (AAEM), Food & Water Watch (FWW), Moms Against Fluoridation, the Organic Consumers Association, Audrey Adams, Jacqueline Denton, Valerie Green, Kristin Lavelle, and Brenda Staudenmaier. Online at <http://fluoridealert.org/wp-content/uploads/epa-petition.pdf>. Accessed March 31, 2017.

³ National Research Council. Fluoride in Drinking Water: A Scientific Review of EPA’s Standards. The National Academies Press: Washington, D.C. 2006.

⁴ Peckham S, Awofeso N. Water fluoridation: a critical review of the physiological effects of ingested fluoride as a public health intervention. The Scientific World Journal. 2014 Feb 26;2014. Online at <http://downloads.hindawi.com/journals/tswj/2014/293019.pdf>. Accessed November 2, 2016.

⁵ Centers for Disease Control and Prevention. Prevalence and severity of dental fluorosis in the United States, 1999-2004. NCHS Data Brief No. 53. November 2010. Online at <http://www.cdc.gov/nchs/data/databriefs/db53.htm>. Accessed November 3, 2016.

⁶ United States Department of Health and Human Services. HHS issues final recommendation for community water fluoridation [Press release]. April 27, 2015. Online at <http://www.hhs.gov/about/news/2015/04/27/hhs-issues-final-recommendation-for-community-water-fluoridation.html>. Accessed November 2, 2016.

⁷ MacDonald HE, Berkeley PD. Fluoride as air pollutant. Fluoride Q Rep. 1969 Jan;2:4-12.

⁸ MacDonald HE, Berkeley PD. Fluoride as air pollutant. Fluoride Q Rep. 1969 Jan;2:4-12.

⁹ McFadden R. \$750,000 given in child's death in fluoride case. New York Times. January 20, 1979. Online at http://www.nytimes.com/1979/01/20/archives/750000-given-in-childs-death-in-fluoride-case-boy-3-was-in-city.html?_r=0. Accessed February 17, 2017.

¹⁰ Gessner BD, Beller M, Middaugh JP, Whitford GM. Acute fluoride poisoning from a public water system. *New England Journal of Medicine*. 1994 Jan 13;330(2):95-9. Online at <http://www.nejm.org/doi/pdf/10.1056/NEJM199401133300203>. Accessed November 4, 2016.

¹¹ Mulay PR. Acute Sulfuryl Fluoride Poisoning in a Family—Florida, August 2015. *MMWR. Morbidity and Mortality Weekly Report*. 2016;65. Online at <http://www.cdc.gov/mmwr/volumes/65/wr/mm6527a4.htm>. Accessed November 4, 2016.

¹² Mullenix PJ. Fluoride poisoning: a puzzle with hidden pieces. *International Journal of Occupational and Environmental Health*. 2005 Oct 1;11(4):404-14. Page 404.