

Natural Fluoride in Drinking Water

This fact sheet was prepared for State and Territorial Dental Directors to assist in providing answers to common questions about fluoride occurring naturally in private wells and groundwater.

How much fluoride is found naturally in drinking water sources?

Fluoride is present in all water sources at concentrations ranging from minimally detectible to greater than 10 parts per million (ppm). The fluoride level in rivers and lakes (surface water) varies widely reflecting rainwater contact with windblown soils and other elements in the environment. Well water (groundwater) fluoride levels vary depending on the minerals in the rock and ores that the water passes through. Fluoride in ocean water (96.5 percent of Earth's water) is typically in the range of 1.2 to 1.4 ppm.

**Fluoride is the
13th most abundant
element in the earth's crust.**

Parts per million (ppm) is equivalent to milligrams per liter (mg/L). One part per million is comparable to one inch in 16 miles.

Water sources with high fluoride concentrations affect up to 60 percent of populations of Pakistan, the African continent, Thailand, China, and Sri Lanka.^{1, 2} In the United States, less than one-half of one percent of U.S. residents on community water systems have drinking water that exceeds 2 ppm and less than one-tenth of one percent have water that exceeds 4 ppm.³ Water samples from Colorado, analyzed when studying the association between Colorado children with yellow/brown stains and reduced tooth decay in the early 1900s, found higher levels of fluoride ranging from 2 to 13.7 ppm fluoride.⁴

Who is responsible for monitoring fluoride found naturally in public/community water systems?

The Safe Drinking Water Act (SDWA) designated the Environmental Protection Agency (EPA) as the lead agency responsible for safe levels of substances in drinking water. The EPA is responsible for setting regulatory standards for the quality of public (community) drinking water systems defined as water systems with 15 or more service connections serving an average of 25 persons daily for at least 60 days in a year (for example, parks and recreational areas). The SDWA defines *any* physical, chemical, biological or radiological substances or matter in drinking water as "contaminants" regardless of the effect or level of the substance on human health. Drinking water contains small amounts of many different substances below the identified regulatory safe level. EPA considers scientific literature on health effects of all regulated substances, establishes a maximum level in drinking water to protect against adverse health effects, and works with designated regulatory agencies in states to monitor and enforce these levels.⁵

Who is responsible for monitoring fluoride found naturally in private drinking water sources?

Fourteen percent of U.S. residents rely on private wells that are not regulated by the EPA.⁶ Private groundwater wells serving fewer than 15 connections or fewer than 25 persons for no more than 60 days in a year are not regulated. It is the responsibility of the well owner to know the quality of the water and if it is suitable for human consumption. The EPA recommends wells used for drinking water be tested once every three years since water quality can change over time. The U.S. Geological Survey (USGS), the science agency for the U.S. Department of the Interior, found that 23 percent of private wells exceeded the identified regulatory safe level for one or more contaminants at a level indicating a potential health concern.⁷ These substances were primarily radon, arsenic, uranium, manganese and

¹ World Health Organization. *Fluoride in Drinking-water*. pp: 5-8.2006.

² Petersen PE, Lennon MA. [Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach](#). Community Dent Oral Epidemiol. 2004;32:319-21.

³ National Academies Press. [Fluoride in Drinking Water: A Scientific Review of EPA's Standards](#). 2006;2:25.

⁴ Churchill, HV. [Occurrence of Fluorides in Some Waters of the United States](#). Industrial and Engineering Chemistry. Sept 1931. 23(9)996-8.

⁵ EPA. [Drinking Water Regulatory Information](#). <https://www.epa.gov/dwreginfo/drinking-water-regulatory-information>

⁶ U.S. Census Bureau. [Current Housing Reports, Series H150/07, American Housing Survey for the United States: 2007 \[PDF - 642 pages\]](#). U.S. Government Printing Office, Washington, D.C.: 20401, Printed in 2008.

⁷ United States Geological Survey. USGS Water Science School. [Contamination in US Private Wells](#). 2009.

nitrate. This compares to 1 percent with excessive fluoride levels. Few private well owners test for fluoride and are likely unaware of the possibility of high fluoride content. The Association of State and Territorial Dental Directors (ASTDD) recommends that private well owners test their wells at regular intervals for drinking water contaminants of significant health concern.

What are the recommended levels for fluoride in drinking water sources?

The EPA has set maximum allowable concentrations of fluoride in drinking water at 2 ppm to prevent enamel fluorosis and 4 ppm to prevent skeletal fluorosis.⁸ Four ppm, the maximum contaminant level (MCL), is enforceable by the EPA, meaning that the EPA considers it unusable as a routine drinking water source. The SDWA requires public notification when the level is greater than 2 ppm, the secondary MCL. In addition, states may set their own standard for the lower MCL.

The U.S. Public Health Service (USPHS) recommends 0.7 ppm as the optimum level of fluoride in drinking water for reducing the risk of tooth decay, while at the same time remaining low enough to reduce the risk of enamel fluorosis, a staining of the teeth. At the USPHS recommended level of 0.7 ppm, there are no adverse health effects. More than 117 organizations including the USPHS, Centers for Disease Control and Prevention (CDC), the American Dental Association (ADA) and ASTDD encourage the adjustment of the naturally occurring fluoride level to meet the optimal concentration for preventing dental decay.

If the naturally occurring level of fluoride in a source of drinking water is not adequate, and the water supply cannot be fluoridated, fluoride supplements are recommended for children at risk for tooth decay.⁹ Health professionals need to know when the fluoride level in drinking water is less than the recommended level to safely and effectively prescribe fluoride supplements for children, thus making testing of individual private wells necessary.

What water filtration systems reduce or remove excessive fluoride from drinking water?

Removal of fluoride from water is difficult and expensive for community water systems or for private wells. Reverse osmosis devices and water distillation can effectively remove fluoride. [NSF Standard 58](#) recommends that defluoridation devices achieve at least an 80 percent fluoride removal rate to be considered adequate.¹⁰ Activated carbon filtration units sold for home use do not remove fluoride.

RESOURCES

As with many subjects, there are scientifically accepted, evidence-based facts as well as sources of erroneous information concerning fluoride in drinking water. Recognized and reliable sources for scientifically accepted information include:

[Centers for Disease Control and Prevention](http://www.cdc.gov/oralhealth/) <http://www.cdc.gov/oralhealth/>

Private Well Water and Fluoride <http://www.cdc.gov/fluoridation/faqs/wellwater.htm#q6>

Community Water Fluoridation <http://www.cdc.gov/fluoridation/>

[National Academy of Sciences and its National Research Council](http://www.cdc.gov/fluoridation/safety/nas.htm/) at <http://www.cdc.gov/fluoridation/safety/nas.htm/>
[American Dental Association](http://www.ada.org) www.ada.org

Fluoridation Facts

<http://www.ada.org/en/public-programs/advocating-for-the-public/fluoride-and-fluoridation/fluoridation-facts>

Fluoride Supplements

<http://www.ada.org/en/member-center/oral-health-topics/fluoride-supplements>

[Water Systems Council](http://www.watersystemscouncil.org/) - WSC is a national nonprofit organization dedicated to promoting the wider use of wells as modern and affordable safe drinking water systems and to protecting ground water resources nationwide. There are more than 60 available fact sheets available to be downloaded free. (See: [Fluoride and Well Water](#) and [Well Water and Fluoride](#))
<https://www.watersystemscouncil.org/well-owners/wellcare-info-sheets/>

[Wellcare](http://www.wellcarehotline.org) hotline at 1-888-395-1033 or visit www.wellcarehotline.org

[National Groundwater Association](http://www.ngwa.org/Pages/default.aspx) at <http://www.ngwa.org/Pages/default.aspx>

Consumer Fact Sheet Sample: [Addressing Safety Concerns, New York Community Water Fluoridation](#) at <https://www.health.ny.gov/prevention/dental/fluoridation/docs/safety.pdf>

⁸ Environmental Protection Agency. Questions and Answers on Fluoride. (2011) https://www.epa.gov/sites/production/files/2015-10/documents/2011_fluoride_questionsanswers.pdf

⁹ ASTDD. Fluoride Supplement Policy Statement. <http://www.astdd.org/docs/fluoride-supplement-policy-statement-january-28-2013.pdf>

¹⁰ A copy of the NSF/ANSI Standard 58 can be ordered from the website, <http://www.nsf.org/regulatory/regulator-nsf-standards> Founded in 1944 as the National Sanitation Foundation and now known as NSF International, NSF follows the American National Standards Institute (ANSI) standards development process to develop standards and to test and certify products and systems that help protect the world's food, water, consumer products and environment.