

Manganese in Drinking Water

Information for consumers and water providers

Manganese is one of the most abundant metals on Earth. It is naturally occurring in many surface waters and groundwaters. Due to Colorado's geology, some drinking water systems have manganese in their water. It is important to understand the risks of too much manganese in drinking water.

General facts

- Manganese is an essential nutrient for people. Small amounts of manganese are needed to form healthy bones, produce glucose, and heal wounds.
- Manganese can be found in grains, beans, nuts, and green tea, as well as in drinking water. It is more easily absorbed from water.
- Most people get the right amount of manganese in their diet, and most adult bodies can regulate the amount of manganese absorbed to maintain healthy levels. But, too much manganese can increase the risk of certain health problems.
- The U.S. Food and Drug Administration (FDA) requires baby formula to include manganese as a nutrient. However, baby formula prepared with water that has more than 0.3 milligrams of manganese per liter (mg/L) could expose an infant to more manganese than recommended. Infants exposed to high levels of manganese for 10 days or more may have increased risks of negative impacts on learning and behavior.

Standards and requirements for public water systems

- Manganese in drinking water is not regulated. There currently is no maximum contaminant level (MCL) for manganese. The United States Environmental Protection Agency (EPA) has health advisories for manganese in drinking water. The EPA's health advisories identify levels to protect people from adverse health effects resulting from exposure throughout their lives to the chemicals in drinking water. However, they are not enforceable regulations. The health advisories for manganese state:
 - Infants up to 6 months of age should not be given water with manganese concentrations greater than 0.3 mg/L for more than a total of 10 days per year, nor should water be used to make formula for more than 10 days a year.
 - Healthy adults and children older than 6 months of age should not drink water with manganese concentrations greater than 1.0 mg/L for more than 10 days per year.
- Much lower manganese levels in water can also result in staining and taste issues. For this reason, the US EPA has a "secondary" drinking water guideline of 0.05 mg/L for manganese. Similar to the health advisory levels, this secondary guideline is not enforceable.

Health effects of manganese in drinking water

- Formula-fed infants under the age of 6 months and pregnant individuals are at the greatest risk of becoming sick from consuming water with elevated levels of manganese.
- Many years of exposure to high levels of manganese can cause harm to the nervous system, and after prolonged exposure, a disorder similar to Parkinson's disease called Manganism can result. Tremors, shaking, and an unsteady gait are characteristics of a very high exposure to manganese. This type of effect is most likely to occur in the elderly after a lifetime of exposure to high levels of manganese or with individuals exposed to welding vapors that contain high levels of manganese
- In general, healthy adults and children over 6 months of age are at a lower risk of becoming ill from consuming elevated levels of manganese.
- Manganese does not easily enter the body through the skin. Bathing and showering with water that has elevated levels of manganese is considered safe as long as you avoid swallowing the water.

Recommendations to protect public health

- **If your water's manganese levels are above 0.3 mg/L, do not give infants under the age of 6 months tap water to drink. Do not use that water for making formula, juice, other drinks, or food.** Use an alternative source of water for preparing infants' food and brushing infants' teeth until you learn that manganese levels in your drinking water are below 0.3 mg/L.
- **Talk to your doctor.** Whether a contaminant will harm your health depends on many factors. These factors include the amount of exposure, age, genetics, and health history. If you or your family are concerned about your health or have symptoms you think are caused by manganese, discuss these concerns with your healthcare provider.
- **Consider taking extra precautions with your drinking water.** If you have health concerns, are pregnant, or have an infant under the age of 6 months, consider using bottled water or purchasing a whole home or point-of-use (at an individual tap) water treatment system, such as ion exchange or reverse osmosis treatment. You should verify that the product has been independently certified to reduce manganese and maintain the treatment according to the manufacturer's specifications.
 - Homeowners are encouraged to have a sample of their water analyzed by a state-certified laboratory if they have concerns. Visit <https://cdphe.colorado.gov/dwlab> for more information. These labs can measure manganese and other compounds in your water.
 - If the results show elevated levels of manganese, you can install (or hire a contractor to install) a whole-house or point-of-use water treatment system.
- **Boiling or freezing water will not reduce the manganese concentration.** Boiling the water will increase the manganese concentration. Letting the water sit stagnant for several hours will not reduce the manganese levels.

Recommendations for public water systems

- The department recommends that any system with elevated levels of manganese consult with a Professional Engineer licensed in the state of Colorado. For community water

systems, any treatment modifications must be designed by a Professional Engineer. Modifications to waterworks will generally need prior design approval from the department.

- The following processes are considered effective for the removal of manganese: green sand, ion exchange, and reverse osmosis. The blending of different water sources is commonly used by public water systems as a way to lower manganese levels.

Questions and answers for water systems and consumers

- **Why are young infants more susceptible to manganese?**

Certain baby formulas contain manganese as a nutrient, and if prepared with water that also contains manganese, the infant could get a higher dose than recommended. There is also concern that because infants' digestive systems have not fully developed, young infants may absorb more and get rid of less manganese. Exposure to high levels of manganese for more than 10 days may increase the risk of impacts on the infant's learning and behavior.

- **Is the water safe for infants and adults to brush their teeth with?**

Yes, but avoid swallowing the water.

- **Is the water safe to wash clothes or toys with?**

Yes. Very little water remains on washed surfaces and in laundered fabrics. Water having more than 0.3 mg/L of manganese may be safely used for general cleaning and washing of clothing, bedding, and linens. Dry surfaces thoroughly.

- **Is the water safe to wash dishes with?**

Yes. Only a very small amount of water clings to smooth surfaces, like dishes. Water having more than 0.3 mg/L of manganese may be safely used to wash and sanitize dishes, tables, and utensils. Dry dishes thoroughly before using.

- **Can I apply the water to my garden?**

Yes. Manganese is needed for all plants to grow and survive. However, different plants have very different manganese requirements. If too much manganese is applied to certain types of plants it can cause slower growth, discoloration of foliage, or poor quality crops.

- **Are animals OK to drink the water?**

We currently do not have enough information to fully understand the impacts of manganese on the health of pets or farm animals. As a precaution, you may consult a veterinarian or provide an alternative source of water.

- **I still have health-related questions.**

Contact ToxCall at 303-692-2606 or cdphe_toxcall@state.co.us.

- **I still have drinking water-related questions.**

Contact your compliance specialist at CDPHE. See the following link for specific contact information: <https://cdphe.colorado.gov/wqcdcompliance>