

Manganese in Drinking Water: Montana Fact Sheet

Introduction

Manganese is a common, naturally occurring mineral found in rocks, soil, groundwater and surface water. It is a natural component of most foods and is necessary for proper nutrition. However, too much manganese in your drinking water can be harmful. This fact sheet provides health-based guidance values for drinking water along with information on how Montanans can take steps to protect their health.

Manganese and Your Health

Your body needs some manganese to stay healthy. The recommended daily intake for manganese depends on a person's age and sex. The level at which manganese benefits one person could overlap with the level at which it is harmful to another person. Adults and children get enough manganese through their diet. Infants get enough manganese from breast milk, food, or formula. Food often has a higher manganese level than water; however, your body can more easily absorb manganese in water. Children and adults who drink water with high levels of manganese for a long time may have problems with memory, attention, and motor skills. Infants and children up to 6 years old are most susceptible to excess manganese exposure because of their developing neurological systems. There is no correlation between manganese levels in water and manganese levels in breast milk, and hence breastfeeding is not considered a concern for manganese exposure in infants.

Because manganese is poorly absorbed through the skin, it is not a health concern to bathe or wash your hands with water that has high levels of manganese. Other uses such as washing dishes or brushing your teeth are also not a concern due to low levels of water that end up being ingested from these activities.

Health-Based Guidance Values

Working together, the Montana Department of Environmental Quality (DEQ) and the Montana Department of Public Health and Human Services (DPHHS) have developed manganese health-based guidance values. These values, provided below, can be used to evaluate the safety of your household drinking water. Because they are guidance, public water systems are not required to meet these values.

- If you have an infant or child up to the age of 6 years that drinks tap water or formula made with tap water, a safe level of manganese in your water is 100 micrograms of manganese per liter of water (100 µg/L)* or less.
- If everyone in your household is more than 6 years old, a safe level in your water is 300 µg/L based on daily use over an average human lifespan.

*One microgram per liter (µg/L) is the same as 1 part per billion. It is also the equivalent of 0.001 mg/L; thus 100 µg/L is the same level or concentration as 0.100 mg/L.

Drinking water at levels above the health-based guidance values can be harmful to your health. Individual requirements for, as well as adverse effects from manganese, can be highly variable.

As a precaution, the general population should consider limiting their consumption of drinking water with high levels of manganese to decrease their exposures and to decrease the possibility of adverse neurological effects.

The Information Resources section of this fact sheet provides a link to a document that describes how Montana derived these health-based guidance values. This derivation is consistent with approaches used by the Environmental Protection Agency (EPA) Region 8 and several other states.

Testing Your Drinking Water for Manganese

Your source of drinking water, whether from a private well, spring, or public water supply, may have manganese levels higher than the Montana health-based guidance values. Therefore, DEQ and DPHHS recommend that you determine the level of manganese in your drinking water. If you are on a public water system, you can contact your public water system representative to see if they test for manganese and obtain the results from them (see public water supply contacts link in the Information Resources section). Note that most public water systems do not test for manganese since it is not a regulatory requirement. If your public water system does not test for manganese, or if you obtain drinking water from a private well or spring, you can pursue manganese testing on your own. Water testing should be done using a lab certified by the state of Montana (see certified labs links under Information Resources). You should be able to obtain sample containers and sampling instructions from the certified lab.

Actions You Can Take If Test Results Show Elevated Manganese Levels

If your water test result shows high levels of manganese, you may want to invest in a home water treatment system that removes manganese if you do not already have one. Home treatment system information links are provided under the Information Resources section of this fact sheet. Because manganese treatment can involve more than simple filtration, you may want to perform multiple tests (two or three) to obtain an average manganese value in your water supply if your initial results are at levels of concern. Boiling your drinking water will not remove manganese; it can instead result in higher manganese levels. Changing to a different drinking water source with low levels of manganese is an alternative to treatment. This can include most brands of bottled water since the United States Food and Drug Administration requires that manganese levels in bottled water cannot be greater than 50 µg/L unless it is defined as mineral water (see link provided under Information Sources).

If you would like to discuss your water test results, agency contact links are provided in the Information Resources section. If you are concerned about your health effects from drinking water with elevated manganese levels, you should contact a health care provider. The 300 µg/L guidance value is based on daily use over an average human lifespan, so limited exposure to adults or children over the age of 6 may not result in health impacts. However, the United States EPA recommends that adults or children should not drink water having manganese concentrations greater than 1,000 µg/L for more than 10 days in a year. The 100 µg/L guidance

value for children from birth to age 6 is based on a shorter exposure period to avoid the risk of developmental-related effects and should be avoided to the extent practicable for that age group. If your water is above 100 µg/L and you have an infant or child up to age 6, you may want to immediately switch to an alternative source with acceptable manganese levels for their drinking water and, if applicable, for mixing infant formula.

Other Effects Associated with Manganese in Your Water

Manganese at levels below the health-based guidance values can cause aesthetic problems such as staining your laundry and household fixtures, creating scaling in your plumbing, and making your water look, smell, or taste bad. If you are experiencing these problems, you may want to pursue treatment to remove manganese from your water even if your manganese levels are less than the health-based guidance values.

Information is limited on the potential effects of elevated manganese in water consumed by your pets.

Background Information on Manganese in Montana's Water

Manganese occurs naturally in Montana's ground water and surface water, sometimes at levels above the health guidance values. Manganese levels in water can also be influenced by historical mining and some industrial land uses. The Montana Bureau of Mines and Geology (MBMG) maintains a ground water sampling network that includes manganese results from several thousand wells throughout Montana. This information suggests that up to 16% of all private and small public water system wells may have manganese values above 100 µg/L, up to 8% may have values above 300 µg/L, and up to 2% may have values above 1,000 µg/L.

Several of the larger public water systems serving a significant percentage of Montana's population use surface water as a drinking water source. This water is treated to address potential contaminants using technologies that have the potential to remove some manganese, though there is a lack of data to determine the extent of manganese removal at this time. DEQ plans to work with public water systems in Montana to characterize manganese levels and provide outreach and education to customers whose water contains manganese over the health-based guidance.

Montana DEQ and DPHHS Assistance

In addition to developing the manganese health guidance levels and presenting them in this fact sheet, both the Montana DEQ and Montana DPHHS maintain web resources on water quality and your health, private well ownership and approaches you can take to protect your private water supply. Links to some of these resource are provided under the Information Resources portion of this fact sheet.

Montana water quality and human health agencies will continue to work with drinking water system personnel, health and water quality professionals, and the public on future approaches to help address manganese in ground water.

Information Resources

- Derivation of Montana Health-Based Guidance for Manganese, Public Water Supply System Names and Contacts, MT DEQ Agency Contacts and additional information on private wells and drinking water can all be found on the MT DEQ Drinking Water Webpage
- Certified Labs for Manganese Analysis:
<https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#232403398-chemistry-laboratories---inorganic-and-organic>
Or:
<https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#232403399-chemistry-laboratories---inorganic-only>
NOTE: Manganese is considered an “inorganic”, the above links are for labs certified for inorganics or a combination of inorganics and organics. Costs may range from about \$14 to \$30 depending on whether you have the lab analyze for additional metals/inorganics of concern within your sample and if sample shipping is involved.
- Home Water Treatment References:
<https://www.purewaterproducts.com/articles/treating-manganese-in-well-water>
Or: <https://agwt.org/content/manganese-problems>
- U.S. Food and Drug Administration Manganese Limits for Bottled Water
<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=165.110&SearchTerm=bottled%20water>