

## **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 are most susceptible to excess manganese exposure because their bodies are not fully developed to regulate manganese. The Food and Drug Administration (FDA) requires a minimum amount of manganese in infant formula because it is an essential nutrient at very low levels. However, adding manganese in drinking water to the formula that already contains manganese increases an infant's exposure to this metal and risk for developing harmful health effects. Manganese is not expected to accumulate at high 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 the small amounts of water 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 reviewed existing manganese health-based guidance values (HBGVs) and recommended the HBGVs published by the Environmental Protection Agency (EPA, 2004) and Minnesota Department of Health (Scher 2021, Minnesota Department of Health 2023). These values, provided below, can be used to evaluate the safety of your household drinking water. The federal government and the State of Montana have not established regulations setting maximum contaminant limits for manganese in drinking water. Therefore, these levels are recommendations based on the best available knowledge.

- The manganese in water guideline for infants is 0.1 mg/L<sup>1</sup> based on the risk of potential cognitive and behavioral problems (Minnesota Department of Health 2023). An alternative drinking water source should be used for infants when the manganese level in the water is above 0.1 mg/L.
- EPA's lifetime health advisory for the general population is 0.3 mg/L based on daily consumption over an average human lifespan (EPA 2004). However, parents, guardians, and caregivers of young children may want to take precautions and ensure the water their children drink over long periods of time do not contain manganese above 0.1 mg/L.
- For short-term consumption, EPA advises that infants younger than 6 months should not be given water above 0.3 mg/L for more than 10 days.

Drinking water at levels above the health-based guidance values can be harmful to your health. 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.

### **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. Testing is the only way to know the manganese level in water.

If you are on a public water system, it is recommended to contact your public water system representative and ask for manganese results from them (see public water supply contacts link in the Information Resources section). Note that most public water systems do not regularly test for manganese since it is not a regulatory requirement. Concerns about the water quality should be directed to the public water system.

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). The certified lab will be able to provide the sample containers, sampling instructions, and cost.

### **Private Well Owners – Actions You Can Take**

If your private well water test result shows high levels of manganese, you have several options including using a different water source for drinking and cooking or treating the water to lower the amount of manganese. Using an alternative drinking water source is the simplest option and includes most brands of bottled water since the United States FDA requires that manganese levels in bottled water cannot be greater than 0.050 mg/L unless it is defined as mineral water (see link provided under Information Sources). Switching to an

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<sup>1</sup> mg/L stands for milligram per liter. You may see testing results presented as microgram per liter, abbreviated µg/L. 1 mg/L is equivalent to 1,000 µg/L. Therefore, the HBGVs of 0.1 mg/L and 0.3 mg/L are equivalent to 100 µg/L and 300 µg/L.

alternative source of drinking water is important for sensitive populations such as infants, elderly, and people with liver disease.

A home treatment system has installation and maintenance costs but provides a steady supply of water. It is recommended to contact a water treatment specialist, so the water treatment system functions as intended based on the unique water quality of the source water. Boiling your drinking water will not remove manganese; it can instead result in higher manganese levels.

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.

### **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.

### **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 0.1 mg/L, up to 8% may have values above 0.3 mg/L, and up to 2% may have values above 1.0 mg/L.

Some public water systems lower the manganese levels through treatment. DEQ is working with public water systems in Montana to characterize manganese levels and provide outreach and education to systems whose water contains manganese over the health-based guidance.

### **Information Resources**

- Montana DEQ Drinking Water webpage provides information about public water systems and agency contacts.  
<https://deq.mt.gov/water/Programs/dw>



- Montana Certified Laboratories:  
[https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#2324\\_03398-chemistry-laboratories--inorganic-and-organic](https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#2324_03398-chemistry-laboratories--inorganic-and-organic)

NOTE: Manganese is an inorganic chemical. Click on the tabs labeled "Chemistry Laboratories – Inorganic and Organic" or "Chemical Laboratories – Inorganic only" for laboratory contact information.



- U.S. Food and Drug Administration Manganese Limits for Bottled Water



<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcr/CFRSearch.cfm?fr=165.110&SearchTerm=bottled%20water>

## References

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