

Manganese in Montana's Drinking Water: Frequently Asked Questions

What is Manganese?

Manganese is a common, naturally occurring mineral found in rocks, soil, ground water 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.

How Does Manganese Affect 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.

What Levels in Drinking Water Are of Concern?

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.

What Are Some Considerations of Being Exposed to High Levels of Manganese in Drinking Water?

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. However, individual requirements for, as well as adverse effects from manganese, can be highly variable. 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.

How Were the Health-Based Guidance Values Derived?

The Derivation of Montana's Health-Based Guidance for Manganese, located at <http://deq.mt.gov/Water/DrinkingWater/Manganese>, describes how Montana derived the health-based guidance values. This derivation is consistent with approaches used by the Environmental Protection Agency (EPA) Region 8 and several other states.

Should I Test My 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 obtain drinking water from a private well or spring, you can pursue manganese testing on your own. There are several statewide and local water quality entities that may provide technical or other assistance including the Montana State University Extension System which maintains their Well Educated Program Site (<https://waterquality.montana.edu/well-ed/index.html>)

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 Additional Information section). Note that most public water systems do not test for manganese since it is not a regulatory requirement and you may need to pursue manganese testing on your own. Those on smaller public supply systems may want to contact other residents using the same system to coordinate sampling either at the tap or at the public water supply outlet to eliminate redundancy and reduce overall costs and effort. Note that the Montana DEQ plans on working 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.

Where Should I Get My Water Tested?

Water testing should be done using a lab certified by the state of Montana (see certified labs links under Additional Information section). You should be able to obtain sample containers and sampling instructions from the certified lab.

What Actions Should I 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. 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. Home treatment system web links are provided in the Additional Information section.

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.

Should I boil my water to reduce manganese levels?

No. Boiling your drinking water will not remove manganese; it can instead result in higher manganese levels.

Should I be concerned if I am pregnant or have been drinking the water for some time?

If you are pregnant, have significant health issues and/or are otherwise concerned, you should talk to your health care provider.

Should I be concerned about breastfeeding my child?

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.

Should I use the water for cooking?

Exposures from water used to cook foods are likely small unless you are making soups or other food that result in consuming proportionally high amounts of added water.

Should I continue to use the water to shower or bathe?

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. Similarly, inhalation of aerosolized manganese while taking a shower is considered an insignificant pathway of exposure.

Is it safe for my pets to drink the water?

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

Should I continue to use the water for washing dishes or brushing my teeth?

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.

Are There Aesthetic Effects Associated with Elevated Levels of Manganese?

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.

What Causes High Levels of Manganese in Montana's Water?

Manganese occurs naturally in Montana's ground water and surface water, sometimes at levels above the health-based guidance values. Manganese levels in water can also be influenced by historical mining and some industrial land uses.

How Likely Is It That My Water Source Has Elevated Manganese?

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. This information will be updated as Montana expands manganese testing for private wells and public water systems. As part of this effort, DEQ plans on working 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.

Where Would I Find Elevated Levels of Manganese in Montana?

Mapping of the above referenced MBMG data reveals that elevated levels of manganese are found through much of Montana. A resulting map showing sample sites and associated manganese levels can be viewed at

http://deq.mt.gov/Portals/112/Water/PWSUB/Documents/Manganese/Mn_map.pdf.

This map does not provide information on the sample depths for each site. Therefore, an elevated manganese site near your drinking water source may not equate to elevated manganese in your source water since the sample site and your drinking water source could represent different ground water depths and different aquifer systems.

Where Can I Find Additional Information?

- Montana DEQ and Montana DPHHS web resources on water quality and your health, private well ownership and approaches you can take to protect your private water supply.
 - <http://deq.mt.gov/Water/DrinkingWater/safewells>;
 - <https://dphhs.mt.gov/publichealth/LaboratoryServices/EnvironmentalLaboratory>;
 - <http://deq.mt.gov/water/drinkingwater/yourdrinkingwater>
- The Montana State University Well Educated Program site also includes information on private well ownership and water quality testing.
 - <https://waterquality.montana.edu/well-ed/index.html>
- A list of Montana DEQ and Montana DPHHS agency contacts:

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- <http://deq.mt.gov/Water/DrinkingWater/Manganese>
 - Public water supply system names and contacts:
 - http://sdwisdww.mt.gov:8080/DWW/JSP/SearchDispatch?number=&name=&count=y=All&WaterSystemType=All&SourceWaterType=All&PointOfContactType=None&SampleType=null&begin_date=12%2F11%2F2018&end_date=12%2F11%2F2020&action=Search+For+Water+Systems
 - Information on certified labs for manganese analysis:
 - <https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#232403398-chemistry-laboratories---inorganic-and-organic>
 - <https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram#232403399-chemistry-laboratories---inorganic-only>
- Note that 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 information:
 - <https://www.purewaterproducts.com/articles/treating-manganese-in-well-water>
 - <https://agwt.org/content/manganese-problems>