

Manganese and Drinking Water

Summary

Manganese is a naturally occurring element in Minnesota rocks and soil. Our bodies require a small amount of manganese but high amounts can be harmful to our health, especially for infants. Too much manganese in drinking water may affect learning and behavior in infants. In older children and adults, consuming high amounts of manganese in drinking water over time may cause neurological problems. Some home-use filters may remove manganese in your water. Short-term bottled water use may reduce exposure to manganese in drinking water, especially for infants.

Manganese

Manganese occurs naturally in rocks and soil and can be found in water, food, and air. It occurs naturally in drinking water across Minnesota. Our bodies require some manganese to maintain health. Adults and children get enough manganese from the foods we eat. Infants and children younger than one year old get enough manganese from breast-milk, food, or formula.

Manganese in Minnesota Waters

Manganese occurs naturally in groundwater across Minnesota. Based on an MDH study, groundwater in southeastern Minnesota tends to have low levels of manganese (below 50 micrograms per liter [$\mu\text{g}/\text{L}$]*). Southwestern Minnesota tends to have higher levels—some over 1,000 $\mu\text{g}/\text{L}$. There are no clear patterns in the other parts of the state.

Although public water systems are not required to test for manganese, some Minnesota community public water systems test for manganese either before or after treating water. Based on test results and treatment practices, MDH estimates about 90 percent of Minnesotans using community public drinking water systems receive water with levels of manganese below 100 $\mu\text{g}/\text{L}$. About 3 percent of Minnesotans on community public water systems receive water with levels above 300 $\mu\text{g}/\text{L}$. You can contact your public water system to find out if they test the water for manganese. If your public water system does not test for manganese, you can arrange and pay for an accredited laboratory to test your water.

The only way to know if manganese is present in your private well is to test your water. If you have a private well, you may want to test your drinking water, especially if an infant drinks your tap water. To test your water, choose a laboratory that can test for manganese at: [Environmental Laboratory Accreditation Program \(http://www.health.state.mn.us/labsearch\)](http://www.health.state.mn.us/labsearch).

*One microgram per liter ($\mu\text{g}/\text{L}$) is the same as one part per billion (ppb).

MDH Guidance Value

Based on available information, MDH developed health-based guidance for manganese in drinking water is at 100 $\mu\text{g}/\text{L}$.¹ MDH guidance values are developed to protect people who are most vulnerable to the potentially harmful effects of a contaminant. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects. For infants that are not drinking tap water or formula mixed with tap water, children over one year old, and adults, manganese in drinking water up to 300 $\mu\text{g}/\text{L}$ poses little or no health risk.

Potential Health Effects

Even though our bodies need some manganese, too much manganese from drinking water may be harmful. New research shows that too much manganese in drinking water may affect learning and behavior in infants. In older children and adults, drinking water with high amounts of manganese for a long time can cause problems with memory, attention, and motor skills. Health effects in children are not usually obvious and have only been measured in large studies of school-aged children.

Infants are at greater risk from manganese in drinking water than children and adults because:

- their brains are developing rapidly,
- they absorb more manganese and are less able to remove manganese from their bodies, and
- they drink more water and eat more food based on body weight.

Formula-fed infants get enough manganese from formula to meet their dietary needs. However, they may get too much manganese (above the recommended amount for nutrition) in their bodies when formula is mixed with water that contains manganese.

Breast-milk is best for infants and it contains healthy amounts of manganese. According to the Institute of Medicine, breast-milk, food, and formula should be the only sources of manganese for newborns and infants younger than one year old.

Filtering Drinking Water

In some cases, you may want to filter your drinking water to reduce the amount of manganese. If infants will be regularly drinking tap water or formula mixed with tap water, use a filter if manganese is detected above 100 µg/L. If only children and adults will be drinking tap water, use a filter if manganese is detected above 300 µg/L.

Short-Term Bottled Water Use

You may choose to reduce your exposure to manganese by using bottled water. For infants up to one year old who are regularly drinking water or formula mixed with water, you should use bottled water that is labeled as *distilled* or *purified* because manganese levels will be below the health-based guidance of 100 µg/L for infants. Other bottled water is likely to have manganese levels less than 300 µg/L and should be suitable for household members over one year of age.

Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in drinking water sources and develops health-based guidance values for drinking water. MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of contaminants in water.

References

1. Minnesota Department of Health. Toxicological Summary for: Manganese. March 2018.
<http://www.health.state.mn.us/divs/eh/risk/guidance/gw/manganese.pdf>.

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