Manganese in Drinking Water: Questions and Answers

Maine Center for Disease Control and Prevention
An Office of the Department of Health and Human Services
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Use this document to answer common questions about

- Manganese and health
- Using water with high levels of manganese

What is manganese and where does it come from?

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. It is also present in breast milk and infant formulas.

How are people exposed to manganese?

The majority of manganese exposure in the general population comes from the food we eat. Grains, beans, nuts and teas are rich in manganese. A normal adult diet provides 1 to 11 milligrams (mg) of manganese per day.

Manganese is an **essential** trace mineral for the body to function. The Institute of Medicine lists the following Adequate Intake levels:

Age Group	*Adequate Manganese Daily Intake Levels*
0 – 6 months	0.003 mg/day
7 – 12 months	0.6 mg/day
1 – 3 years	1.2 mg/day
4 – 8 years	1.5 mg/day
≥ 9 years	1.9 – 2.3 mg/day
Pregnant (lactating) women	2 mg/day (2.6 mg/day)

Source: http://www.nationalacademies.org/hmd/~/media/Files/Activity%20Files/Nutrition/DRI-Tables/4_%20UL%20Values_Vitamins%20and%20Elements.pdf?la=en

As an essential element, our bodies control both the uptake and elimination of manganese to control the amount of manganese in the body. Uptake is regulated so that when dietary manganese intake is high, gastrointestinal absorption is reduced. Manganese is also rapidly cleared from the blood in the liver via biliary excretion. Only a small fraction (less than 5 percent) of ingested manganese is normally absorbed by adults. Manganese retention is greater in infants; infants appear to have less well developed abilities to regulate manganese levels, and can absorb as much as 20 percent of ingested manganese and they also have lower excretion of manganese via bile.

Manganese is poorly absorbed through the skin. We are not concerned about manganese exposure through skin contact with food or liquid containing manganese.

What health effects are associated with exposure to manganese?

Manganese is necessary for normal development, immune system function, digestion, and bone strength.

Too much exposure to manganese could produce neurological effects. Studies (mostly occupational) have shown that exposure to manganese by inhalation can result in neurological effects such as generalized cognitive and motor disturbances. Some recent epidemiological studies have suggested an association between exposure to manganese in drinking water and intellectual impairment and poorer neurobehavioral function in young children.

Infants are potentially most susceptible to excess manganese exposure because of their developing neurological and gastrointestinal systems. Infants appear to both absorb more manganese than older age children and adults, and excrete less.

What are the levels of concern?

The United States Environmental Protection Agency (US EPA) has developed a health advisory level for manganese in drinking water of 0.3 mg/Liter (L) which is intended to be protective of life-time exposure for the general population.

The US EPA recommends that 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 the water be used to make formula for more than 10 days per year.

The US EPA recommends that the general population should not ingest water with manganese concentrations greater than 1 mg/L for more than a total of 10 days per year.

Much lower manganese levels in water can result in noticeable staining and taste complaints. It is for this reason that US EPA has a "*secondary*" drinking water guideline of 0.05 mg/L.

The US EPA health advisory levels of 0.3 mg/L and 1 mg/L were set based upon typical daily dietary manganese intake levels not known to be associated with adverse health effects. This does not imply that intakes above these levels will necessarily cause health problems. As a precaution, the general population should consider limiting their consumption of drinking water when levels of manganese are above the US EPA health advisory to decrease their exposures and to decrease the possibility of adverse neurological effects.

Frequently Asked Questions About Water High in Manganese (above 0.3 mg/L)

I have used this water to make formula for my baby. Is this something I should go to the doctor about?

The most important thing to do is to switch to bottled water or water that is low in manganese to make formula. If you have concerns about your child, you should speak to your health care provider. Bring this fact sheet with you when you meet with them. You can also call a toxicologist in our office at 866-292-3474.

Should I stop drinking the water if I am breastfeeding my child?

No. There is no correlation between manganese levels in water and manganese levels in breast milk. If you are healthy and breastfeeding you should continue to do so.

Should I be concerned if I am pregnant?

Remember that adults have the ability to control both the uptake and elimination of ingested manganese to regulate the amount of manganese in the body. If you are pregnant and are concerned, you should talk to your health care provider and bring a copy of this fact sheet with you.

Can I cook with water?

Yes. The primary concern and exposure is from drinking and using the water to make beverages (e.g., coffee, tea, juices, infant formula). Exposures from using water to cook foods are likely to be small compared to the amount of manganese you will get from food. If you want to reduce your potential exposure to manganese from using water to cook foods, focus on substituting bottled water or water from another low manganese source when preparing dried foods (e.g., rice, pasta, hot oatmeal, etc.) that absorb a lot of water and for soups made with added water.

Can I use ice made with the water?
Occasional use of ice for use in drinks represents only a fraction of water consumed daily and will not greatly increase your manganese intake. If you use ice frequently in drinks and your water has high manganese concentrations, you may choose to use bottled water or water from another low manganese source to make ice or you may just purchase ice.

Can I brush my teeth with the water?
Yes. You are unlikely to ingest enough manganese to be of concern.

Can I bathe, shower or wash my hands with the water? Can I bathe my infant in this water?
Yes. Manganese is poorly absorbed through the skin.

Can I use it to wash dishes?
Yes. The amount of manganese left on dishes after washing will be very small.

I get my water from a private well. Should I be concerned about manganese in my well water?
Elevated levels of manganese can occur in private wells nearly everywhere in Maine. Some towns are more likely to have wells with elevated manganese. Data about manganese levels found in well water can be viewed for many Maine towns on the Maine Tracking Network (https://data.mainepublichealth.gov/tracking).

The Maine CDC recommends that all wells have a standard water test every 3 to 5 years, as well as when water changes in smell, taste or color. Manganese is included in most standard water tests. You can find more information about how to test your well water at wellwater.maine.gov/.

What options are available when manganese in drinking water is elevated?
Switching to bottled water for drinking and for making drinks such as infant formula, juice, tea and coffee is very effective at reducing the majority of water-related exposure.

Boiling water will not destroy or remove manganese. If boiled too long, the manganese will be concentrated in the remaining water.

Where can I get more information on manganese?
For questions related to manganese exposure and health contact Maine CDC State Toxicologists at 866-292-3474 or visit our website at: wellwater.maine.gov/.

To view town-level data on manganese in private wells, visit the Maine Tracking Network at: https://data.mainepublichealth.gov/tracking/.

Portions of this fact sheet were adapted from "Manganese in Drinking Water: Questions and Answers for Consumers" from the Massachusetts Department of Environmental Protection Drinking Water Program.