



Manganese in Drinking Water: Questions and Answers for Consumers

Introduction

This fact sheet is intended to inform you about manganese in drinking water, typical concentrations, its contribution to overall manganese exposure in humans, especially infants, and provide guidance on health protective limits in drinking water.

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 infant formulas.

How are people exposed to manganese?

Manganese exposures can come from air, food or water. This fact sheet focuses on water. The majority of manganese exposure in the general population comes from the diet. Grains, beans, nuts and teas in particular are rich in manganese. It is an **essential** trace mineral for the body to function, however excess manganese exposure has potential health implications.

In situations where manganese levels in drinking water are elevated, the contribution from drinking water can increase the overall intake of manganese.

In a residential setting, breathing in manganese is an unlikely route of concern for exposure, in contrast to certain occupational settings where workers may be exposed to manganese particles in the air (*e.g.*, steel welding). Manganese is poorly absorbed through the skin, thus, skin contact with food or liquid containing manganese is an unlikely exposure route of concern.

What health effects are associated with exposure to manganese?

Manganese is necessary for normal immune system function, digestion and bone strength. At elevated levels, manganese could produce neurological effects with some variation in sensitivity between individuals.

Infants and children younger than 12 months old are potentially most susceptible to excess manganese exposure because of their developing neurological and gastrointestinal systems. Infants appear to absorb more manganese than older age children and adults, but excrete less.

If infant formulas are prepared with water that also contains manganese at concentrations greater than our guideline levels (see below), the infant may get a higher amount of manganese than necessary. This represents a greater potential for exposure and adverse effects in the very young. Thus, it is very important to know what the levels in drinking water are when using it to make baby formula.

What are the levels of concern?

The United States Environmental Protection Agency (US EPA) and MassDEP currently list manganese as a secondary contaminant because of aesthetic concerns including unacceptable taste, staining of fixtures and dark, cloudy water at levels greater than 0.05 milligrams per liter (mg/L).

MassDEP recommends that infants up to 1 year of age should not be given water with manganese concentrations greater than 0.3 mg/L for more than a total of 10-days in a year, nor should the water be used to make formula for more than a total of 10-days in a year.

The recommended water concentration limit for lifetime exposures to manganese is 0.3 mg/L. People may also want to limit consumption of waters containing greater than 1 mg/L. See the MassDEP Advisory at: <https://www.mass.gov/doc/massdep-office-of-research-and-standards-guideline-orsg-for-manganese/download> Individual requirements for, as well as adverse effects from, manganese can be highly variable. The general population water concentration exposure limits of 0.3 and 1 mg/L have been 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 with high levels of manganese to decrease their exposures and to decrease the possibility of adverse neurological effects.

Should I be concerned if I am pregnant or am breastfeeding my child if the manganese levels are above 0.3 mg/L?

No. There is no correlation between manganese levels in water and manganese levels in breast milk and hence, if you are healthy and breastfeeding you should continue to do so. If you are pregnant, have significant health issues and/or are concerned, you should talk to your health care provider and bring a copy of this fact sheet with you.

How does manganese get into my drinking water?

Water that is used as a source of drinking water invariably has some natural manganese in it. In addition, minerals such as manganese can settle out and build up as fine sediment in water pipes as water flows through the distribution system of water mains to your tap. When there is a disturbance in the system, such as a water main break, use of fire hydrants, or a flushing operation to clean the pipes, sediment may get stirred up and drawn into home plumbing. This water may temporarily have higher than normal levels of manganese and may appear visibly discolored.

Can I cook with the water?

You may reduce your potential exposure to manganese by limiting use of this water and substituting bottled water or water from another low manganese source for preparing dried foods (e.g., pasta, rice, hot oatmeal, etc.) that absorb considerable amounts of water and for soups made with added water.

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.

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.

I have already been using the water for some time for cooking, making ice and drinks. Should I be concerned? Is this something I should go to the doctor about?

See answers to concerns about these uses above. If you have still have concerns or have significant health issues, you should talk to your health care provider. When you meet with them, provide a copy of your manganese sampling results and this fact sheet.

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

If you have concerns, you should speak to your health care provider. When you meet with them, provide a copy of your manganese sampling results and this fact sheet.

Can I give the water to my pets?

No information is available on the effect of elevated manganese in drinking water on pets.

How can I find out about manganese in my water?

If you get your water from a public water system you should contact them for this information. For a contact list for all public water systems in the Commonwealth you may visit: <https://www.mass.gov/media/831461/>

For private well owners, MassDEP recommends that a baseline sample be taken to determine the manganese concentration in their well water. Thereafter, the well owner should follow the: "Private Wells - Testing Parameters and Frequency Guidelines", which can be found on the MassDEP website <http://www.mass.gov/eea/agencies/massdep/water/drinking/private-wells.html>. First click on "A guide to water quality testing for private wells" and then scroll down to "Private Wells –Testing Parameters and Frequency Guidelines".

What options are available when manganese in drinking water is elevated?

- You may use:
 - ✓ Bottled water. Bottled water should only be used if it has been tested. The Massachusetts Department of Public Health requires companies licensed to sell or distribute bottled water or carbonated non-alcoholic beverages to test for manganese. See <https://www.mass.gov/info-details/water-quality-standards-for-bottled-water-in-massachusetts> For manganese, the recognized standard is 0.05 mg/L.
 - ✓ Water from another MassDEP approved public water system that does not have elevated levels of manganese.
 - ✓ A water pitcher filter or a home water filter unit that is capable of removing dissolved metals (using a water softener employing cation exchange technology or reverse osmosis; activated carbon units alone have poor manganese removal capabilities). For more information on these types of filter units please visit National Sanitation Foundation (NSF) at NSF Consumer Information (<http://info.nsf.org/Certified/DWTU/>) or call 1-800-673-8010 or visit MassDEP's website <https://www.mass.gov/service-details/home-water-treatment-devices-point-of-entry-and-point-of-use-drinking-water-treatment> for consumer information on home water treatment.
- Do not:
 - ⊗ boil the water as boiling will not destroy manganese. If boiled too long, the manganese will be concentrated in the water.
 - ⊗ freeze or try to filter the water through paper filters to remove manganese as neither will reduce its concentrations.

- ⊙ try to reduce manganese concentrations by letting the water stand overnight since it is not volatile but stays in the water

Please note: Only a Massachusetts state certified laboratory or another party who complies with Massachusetts General Law Chapter 111, Section 160D should test your water for manganese.

<https://eeaonline.eea.state.ma.us/DEP/Labcert/Labcert.aspx>

<https://www.mass.gov/doc/required-disclosure-of-water-test-results-0/download>

Where can I get more information on manganese?

For more information on manganese in public drinking water please see:

- US EPA Drinking Water Health Advisory for Manganese https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf
- CDC ATSDR information on manganese <https://wwwn.cdc.gov/TSP/substances/ToxSubstance.aspx?toxid=23>

You may also contact the MassDEP Drinking Water Program at program.director-dwp@mass.gov

For questions related to manganese exposure and health you may contact MassDEP's Office of Research and Standards (C.Mark.Smith@mass.gov). You may also contact your Local Board of Health and/or your healthcare provider.