

Kansas Department of Health and Environment Public Drinking Water Supply Section

Frequently asked Questions about Manganese 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. Manganese is a natural component of most foods. Manganese is an essential nutrient, and eating a small amount of it each day is important to stay healthy.

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 and it is also found in infant formula. A normal, balanced diet typically provides adequate manganese intake. The principal source of exposure to manganese is from food, but in situations where manganese levels in drinking water are elevated, the contribution from drinking water can increase the overall intake of manganese. Adults and children get enough manganese from the foods we eat. For example, EPA's drinking water health advisory for manganese says:

- food at 3.5 to 7 mg manganese/day is the greatest source of manganese exposure to the general population,
- an average intake from Western and vegetarian diets is 0.7 to 10.9 mg manganese/day,
- an average cup of tea may contain 0.4 to 1.3 mg of manganese, and
- 12% of the population takes manganese supplements that have a median concentration of 2.4 mg/day.

Is manganese regulated in Drinking Water?

No. Manganese is not currently regulated as a national primary drinking water standard which means there is no enforceable limit for manganese in drinking water. However, EPA is in the process of determining whether to regulate manganese due to updated health effects information and additional occurrence data. EPA included manganese testing in the fourth Unregulated Contaminant Monitoring Rule (UCMR4), which requires all public drinking water systems serving over 10,000 people and selected small systems to monitor for manganese. EPA will also consider any health effects in their regulatory determination and evaluate potential risks to adults, children, and infants based on recent studies. Some states have set their own standards for manganese. Kansas currently follows the National Primary Drinking Water Regulations secondary guidance levels (SMCL) for manganese.

Why are the drinking water advisories for manganese being issued now?

Recent guidance from EPA has prompted this action. The EPA health advisory levels for manganese were established in 2004. Based on more recent health studies, EPA has elevated their interest in manganese based on additional occurrence data through their fourth round of monitoring under their Unregulated Contaminant Monitoring Rule (UCMR4). EPA as a precautionary effort is recommending that States work with systems to notify the public when an existing health advisory level has been exceeded. The Kansas Department of Health and Environment will notify a public water system when testing indicates Manganese concentrations are above the health advisory levels. EPA recommends water systems issue an Advisory to their customers within 24 hours of notification.

More information on EPA's regulatory determination process can be found at the following link: <https://www.epa.gov/dwregdev/how-epa-regulates-drinking-water-contaminants>

More information on the UCMR4 can be found at the following link: <https://www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule>

What level of manganese is a concern in drinking water?

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

population. When manganese levels in drinking water are above 0.3 mg/L, infants under 6 months of age should immediately stop consuming the water and formula that was prepared with the water.

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. These health advisories are intended to protect a 10-kg (22 pound) child consuming 1 liter of water per day.

The US EPA recommends that the general population should not ingest water with manganese concentrations greater than 1.0 mg/L for more than a total of 10 days per year. These health advisories are intended to protect a 70-kg (154 pound) adult consuming 2 liters of water per day.

Much lower manganese levels in water can result in noticeable staining and taste complaints. It is for this reason that the 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.

Currently, there is no regulatory maximum contaminant level (MCL) set by the US EPA or the Kansas Department of Health and Environment (KDHE)

What are the Potential Manganese Health Effects?

Too much manganese can increase the risk of health problems, particularly for infants under 6 months old. Infants are more at risk than older children and adults because their brains and bodies are developing quickly. Infants exposed to manganese over 0.3 mg/L may experience learning or behavioral problems. Some studies have shown that too much manganese during childhood may also have effects on the brain, which may affect learning and behavior.

Adult’s drinking water with high levels of manganese for many years may experience impacts to their nervous system, resulting in behavioral changes and other nervous system effects, including slow and clumsy movements. Exposure to high levels of manganese can cause harm to the nervous system. A disorder similar to Parkinson’s disease called Manganism can result. Tremors, shaking, and an unsteady gait are characteristic of very high exposure to manganese. This type of effect is most likely to occur in the elderly after exposure to high levels of manganese or with individuals exposed to welding vapor that contains high levels of manganese. The EPA’s health advisory is intended to protect against this effect. Manganese is poorly absorbed through the skin. There are no concerns about manganese exposure through skin contact with food or water containing manganese.

If you are concerned about your health from manganese exposure, discuss your concerns with your healthcare provider.

How long is manganese retained in a person? Does it bioaccumulate?

The human body has a number of biological systems operating that control absorption of manganese from the diet and from manganese in drinking water. There are other biological systems that are responsible for removing manganese from the body. These biological control systems maintain the internal concentration of manganese within a narrow range. If excess manganese is absorbed, it is usually eliminated within 24 hours. Manganese typically does not bioaccumulate in a person.

Can I drink this water?

If the tap water contains manganese above 0.3 mg/L, it is recommended that you use an alternate water source for drinking. Elevated levels of manganese in the water can cause discoloration. If the water contains elevated levels of manganese or is discolored, it is recommended that you use an alternate water source for drinking.

If you have an in-home water softener or reverse osmosis treatment system you may wish to check with your service provider to ensure your system is effective at the removal of manganese.

How do I find out about manganese levels in my drinking water?

If you get your water from a public water supply system you should contact representatives of your public water supply system and request the concentrations of manganese. If you obtain your water from a private well and suspect high manganese in your drinking water, you should contact your local county health department.

Should I use this water to make formula for my baby? 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.

Should I stop drinking the water if I am breastfeeding my child? 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? If you are concerned, you should talk to your health care provider.

Can I cook with the water? No. As a precaution, do not use the water for cooking.

Do not boil the water. Boiling will concentrate the levels of manganese.

Can I use the water to make ice and drinks? No. As a precaution, do not use the water for making ice or drinks.

Can I use the water to wash dishes? Yes.

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

Can I brush my teeth with the water? Yes.

Can I give the water to my pets and livestock? Information is not available on the effect of elevated manganese in drinking water on pets and livestock. Please contact your veterinarian.

For more information:

EPA's Office of Ground water and Drinking Water: <https://www.epa.gov/ground-water-and-drinking-water>

EPA's Drinking Water Health Advisory for Manganese: https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf

EPA's Secondary Drinking Water Standards: <https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals>

EPA's Drinking Water Criteria Document for Manganese: <https://www.epa.gov/wqc/drinking-water-criteria-document-manganese>

Frequently Asked Questions About Manganese from the Centers for Disease Control: <https://www.atsdr.cdc.gov/toxfaqs/tfacts151.pdf>

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