

Manganese in Manitoba Water Supplies

What is manganese?

Manganese is a naturally-occurring element found in air, water, soil, and rocks. It is an essential nutrient in our diet and is found in many foods.

Manganese may also be found in the environment due to human activities such as mining, industrial discharges, and landfill leaching. Manganese is used in various industries, including in the steel industry, and in the manufacture of various products (e.g., fireworks, dry-cell batteries, fertilizers, fungicides, cosmetics, and paints).

What are the common sources of exposure to manganese?

Everyone is exposed to small amounts of manganese. The main source of manganese is food. However, manganese in drinking water is more easily absorbed than when eaten in food.

Manganese is naturally found in many groundwater sources and in some surface waters. Manganese, in its permanganate form, can also be used in the treatment of drinking water.

Other sources of manganese exposure include occupational exposure usually by inhalation.

Drinking water guideline for manganese

The Guideline for Canadian Drinking Water Quality established by Health Canada in 2019 recommends drinking water meet a health-based maximum acceptable concentration (MAC) of 0.12 mg/L for manganese and an aesthetic objective (AO) of 0.02 mg/L. Prior to 2019, the national guideline contained an aesthetic objective only. At the MAC, the water is often discoloured and may have a bitter, metallic taste. However, in some cases, manganese levels above the guideline may not be apparent by taste or colour of the water. The only way to determine the manganese levels is to test the water.

What are the health effects of manganese in drinking water?

Updates to the national guideline were driven by new evidence suggesting that manganese in drinking water may affect people differently than manganese in food. The evidence indicates that drinking water with high levels of manganese may harm brain development in infants and young children. These new studies were reviewed by Health Canada as part of the guideline development process. The guideline is protective of potential neurological effects in infants, the most sensitive population. For adults and older children, short term exposure to manganese in drinking water slightly above the guideline is unlikely to cause negative health effects.

What is the aesthetic objective based on?

The aesthetic objective for manganese is based on taste, and staining of laundry and plumbing fixtures. At higher concentrations or in the presence of chlorine, manganese cause a change in the colour of the water, or cause sediment to build up inside the pipes. Changes in the flow patterns within a water distribution system may disturb the sediments causing intermittent discoloured water events. The aesthetic objective of 0.02 mg/L is intended to minimize potential buildup of manganese sediments in the water distribution system piping.

What is the role of manganese in discoloured water?

Dirty, cloudy or discoloured water may be caused by a number of different things, including air bubbles, sediments or particles, organic matter, and iron or manganese. Both iron and manganese, which tend to be found together, can be present in water in either dissolved form or as sediment, and can cause discoloured water. Manganese tends to turn water a purplish or dark brown colour and settle out as blackish-brown particles. Both colour and sediments can be caused by matter other than iron or manganese. The only way to know if manganese is present is to test for it.

Is discoloured water safe to drink?

Manitoba Health Seniors and Active Living advise not to drink discoloured water or use it for purposes such as preparing food, beverages or infant formula until the source of the discoloured water is investigated and found not to exceed recommended drinking water guidelines and standards. Discoloured water events should be reported to your water service provider. Your water service provider can give instructions on how to deal with the problem. Reporting the concern to your water service provider helps them to track discoloured water events, identify the cause and address the problem.

Is it safe to bathe, wash dishes or do laundry with discoloured water?

There are no known health effects associated with bathing or showering in discoloured water, or with using it to wash dishes. However, discoloured water can stain clothing and other items washed in the water.

How does manganese get into water supplies?

Most of the manganese found in well water occurs naturally. It is a result of groundwater coming into contact with rocks or soils containing manganese. The concentration of manganese in well water depends on a number of factors, such as the amount of manganese present in the soil through which the groundwater has passed and whether the water chemistry is favourable for manganese to remain dissolved.

Manganese is more commonly found in groundwater but can also be present in surface water sources. Levels in lakes and reservoirs tend to be highest in the summer or fall when water temperatures are heating or cooling. As the surface water temperature changes, the water circulates and can stir up manganese that had previously precipitated out as sediment on the lake bottom. Manganese may also be introduced through the water treatment process.

What if you are concerned that there is increased manganese in the tap water?

Since manganese can build up inside the water distribution system piping, the level of manganese at your household water tap may vary depending on water flow rates, temperature, and other factors.

Contact your water system for information on manganese levels in your water. When manganese levels are high, the water may take on a slight purple/brown colour. However, the only way to know if there are high levels of manganese in the drinking water is to test the water.

Manitoba Health Seniors and Active Living advises not to drink discoloured water or use it for purposes such as preparing food, beverages or infant formula unless the source of the discoloured water is investigated and found not to exceed recommended drinking water guidelines and standards.

Since exposure is mainly by consuming the water, water can be used for other domestic purposes such as hand washing and washing dishes. However, discoloured water may stain laundry and other items washed in the water.

If your water is periodically discoloured, check with your water provider to determine the cause. You can also have your water tested at one of the three laboratories in Manitoba that are accredited for analysis of manganese in drinking water:

ALS Environmental

12-1329 Niakwa Road E.
Winnipeg, MB R2J 3T4
Phone: 204-255-9720
Toll Free: 1-800-607-7555
Fax: 204-255-9721

alsglobal.com/en/

Our-Company/Global-Locations

Bureau Veritas Canada Inc

Unit D, 675 Berry Street
Winnipeg, MB R3H 1A7
Phone: 204-772-7276
Fax: 204-772-2386

bvlabs.com

Horizon Lab Ltd

4055 Portage Avenue
Winnipeg, MB R3K 2E8
Phone: 204-488-2035
Fax: 204-488-4772

horizonlab.ca

Manganese levels should be tested when the tap water is clear and during a discoloured water event. If the manganese levels are high, it is recommended that you use an alternate source of water, such as bottled water, for drinking and preparing food and beverages, including infant formula. Another option is to treat the water using a residential treatment device.

Residential treatment options

Drinking water treatment devices can be installed where the water enters the house (point-of-entry, POE) or at the tap (point-of-use, POU). Private well owners often treat the water for manganese at the POE so that it does not stain their laundry or plumbing fixtures. For homeowners connected to a public water system, installing a POE system is generally not recommended as it may be easier and more cost effective for homeowners to avoid doing laundry during discoloured water events.

Water treatment devices should be certified to meet applicable NSF International (NSF)/American National Standards Institute (ANSI) standards. Certified devices are tested to ensure the safety of materials used in the devices and to ensure they perform as claimed. Although there are currently no treatment units certified specifically for manganese reduction, there are several treatment technologies that can be effective for manganese removal at the residential scale.

Recommended household POE treatment devices for removal of manganese include greensand filters and ion exchange filters (ex: water softeners). Reverse osmosis (RO) membrane filters are recommended for POU treatment as they have been shown to be the most effective and reliable. Currently, there are no RO units that are certified specifically for manganese removal. However, a unit that is certified to remove other metals, such as arsenic or lead, will also be effective for manganese

removal. Periodic testing should be conducted on both the water entering the treatment unit and the finished water to verify that treatment is effective.

Pour-through (or pitcher-type) filters which are certified for removal of metals such as arsenic or lead will also reduce manganese concentrations but may not be as effective or reliable.

Organizations that are accredited to certify devices to the NSF standard (including NSF itself) are listed below. See the organizations' websites for listings of certified products:

- NSF International (NSF) - nsf.org
- Canadian Standards Association (CSA) - csagroup.org
- Underwriters Laboratories Incorporated (UL) - ul.com
- International Association of Plumbing and Mechanical Officials (IAPMO) - iapmo.org
- Water Quality Association (WQA) - wqa.org
- Bureau de Normalisation du Québec - bnq.qc.ca

POU devices may be available from local home-improvement or plumbing stores. Quotes may also be obtained from reputable water treatment equipment suppliers. Suppliers should provide information on how much manganese will be removed, maintenance requirements, and operational and maintenance costs. Once installed, follow the manufacturer's instructions on the use and maintenance of treatment devices and disposal of filter media.

For more information

For health-related questions, call Health Links-Info Santé at 204-788-8200 or toll free at 1-888-315-9257, or your local public health office.

For information on certification of residential point-of-use or point-of-entry water treatment devices, visit nsf.org or call their toll free hotline at 1-877-867-3435. Information is also available on the websites of other certifying bodies (csagroup.org; ul.com; iapmo.org; or wqa.org).

For more information on manganese in drinking water, refer to Health Canada's website at:

Water Talk Factsheet: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/water-talk-manganese.html>

Guideline Technical Document: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-manganese.html>

For more information about drinking water in Manitoba or to find a local office near you, visit Manitoba Conservation and Climate's Office of Drinking Water at manitoba.ca/drinkingwater, or call 204-945-5762.