Manganese
in Manitoba Well Water

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 national guideline for manganese in drinking water (2019) recommends a health-based maximum acceptable concentration (MAC) of 0.12 milligrams per Liter (mg/L) for manganese in drinking water and an aesthetic objective 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 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?

Elevated levels of manganese may give the water a metallic taste, colour the water a purplish brown or black, stain laundry and plumbing fixtures, or clog water filters. At higher concentrations or in the presence of chlorine, manganese may settle out as black sediments or sludge around filters, or in household/building pipes or water distribution systems. Changes in the water flow may disturb sediments in the pipes 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 system piping and reduce the potential for discoloured water.

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. Manganese can be present in water in either dissolved form or as sediment, and can cause discoloured water or sediment buildup in pipes or around filters. Both discoloured water and sediments can be caused by matter other than 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.

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 manganese gets into well water

Most of the manganese found in Manitoba 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 in Manitoba well water

Naturally-occurring manganese can be found within a wide range of concentrations throughout Manitoba, in all kinds of well depths, aquifer types, and geological settings. Approximately 56% of wells sampled were above 0.02 mg/L, and 34% above 0.12 mg/L. The average manganese concentration found throughout Manitoba is 0.5 mg/L.

Recommendations for testing well water

Private well owners are responsible for testing and, if necessary, treating their water to ensure it is safe to drink and for other domestic uses. All wells should be tested to ensure there are no manganese concerns. In general, well water should be tested for manganese every three to five years in areas known to have elevated concentrations.

How to test well water for manganese

The only way to know if well water contains manganese is to have a water sample tested by a laboratory accredited by the Standards Council of Canada (SCC) or the Canadian Association for Laboratory Accreditation (CALA) to test for manganese in drinking water.

Three accredited laboratories in Manitoba that offer manganese testing of drinking water are:

ALS Environmental
12-1329 Niakwa Road East, Winnipeg, Manitoba R2J 3T4
Phone: 204-255-9720 (Toll Free: 1-800-607-7555);
Fax: 204-255-9721
www.alsglobal.com/en/Our-Company/Global-Locations

Bureau Veritas
Unit D, 675 Berry Street, Winnipeg Manitoba R3H 1A7
Phone: 204-772-7276 (Toll Free: 1-866-800-6208)
Fax: 204-277-2386
www.bvlabs.com

Horizon Lab LTD
4055 Portage Avenue, Winnipeg, Manitoba R3K 2E8
Phone: 204-488-2035
Fax: 204-488-4772
www.horizonlab.ca

Interpreting Manganese Test Results and Recommendations for Drinking

Infants and young children should not drink water with manganese levels over the guideline of 0.12 mg/L. Formula-fed infants are the highest risk group. Pregnant and breast feeding women should also take precautions. For other adults and older children, short term exposure to manganese in drinking water slightly above the guideline is unlikely to cause negative health effects. The higher the level of manganese in the water the greater the risk for health impacts. Long term exposure of adults and older children to levels above the guideline is not recommended.

If the levels of manganese in your well or tap water are above the health-based MAC of 0.12 mg/L, avoid drinking the water or using it for any consumptive purposes, including coffee, beverages, ice, or cooking. **Do not use the water to make infant formula.** Boiling the water will not reduce manganese to safe levels. It is recommended that you use an alternate water source (such as bottled water) for drinking and all other consumptive purposes, or treat the water as described in the section below.

If manganese levels are below the health-based MAC of 0.12 mg/L but above the aesthetic objective of 0.02 mg/L, you should watch for periodic discoloured water, and avoid drinking discoloured water or using it for any consumptive purposes, including making infant formula. You may wish to consider using bottled water for drinking and other consumptive purposes, or treating the water as described in the section below.

If manganese levels are below the aesthetic objective of 0.02 mg/L, you do not need to worry about manganese in your well water.

Treating the well water

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.

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, devices that meets NSF/ANSI Standard 42 are able to reduce manganese to safe levels.

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 not recommended for POE treatment as they have potential to clog quickly.

RO membrane filters are recommended for POU treatment as they have been shown to be the most effective and reliable. Having some type of upstream or POE treatment, will help to reduce potential for clogging. 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/ANSI standard (including NSF itself) are listed below. See the organizations' websites for listings of certified products:

- NSF International (NSF) – **www.nsf.org**
- Canadian Standards Association (CSA) – **www.csagroup.org**
- Underwriters Laboratories Incorporated (UL) – **www.ul.com**
- International Association of Plumbing and Mechanical Officials (IAPMO) – **www.iapmo.org**
- Water Quality Association (WQA) – **www.wqa.org**
- Bureau de Normalisation du Québec – **www.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 manufacturer's instructions on the use and maintenance of treatment devices and disposal of filter media.

Where can I get 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**; **wqa.org**; or **bnq.qc.ca**).

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

- Water Talk Fact Sheet: **www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/water-talk-manganese.html**
- Guideline Technical Document: **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 **www.manitoba.ca/drinkingwater**, or call 204-945-5762..

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