

Manganese in Manitoba Water Supplies

What is manganese?

Manganese is a naturally-occurring element widely distributed in air, water, soil, and rocks. It is an essential nutrient in our diet, and is found in many healthy foods and supplements, including nuts, beans, fruits and leafy green vegetables.

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). In its permanganate form, it is also used in the treatment of drinking water.

Exposure to manganese

Everyone is exposed to small amounts of manganese through its presence in air, food, consumer products, soil, and drinking water. However, the main source of exposure is through diet.

Manganese is naturally found in many groundwater or well water sources and in some surface waters. Manganese may also be added to the water as part of the water treatment process.

Drinking water guidelines for manganese

Currently, there is no Canadian guideline recommending a limit for manganese in drinking water related to health concerns. The *Guidelines for Canadian Drinking Water Quality* contain an aesthetic objective of 0.05 milligrams per litre (mg/L) for manganese in drinking water. Aesthetic objectives are targets intended to minimize problems with the colour, taste or smell of the water.

Health Canada is currently reviewing new information on manganese and is proposing to reduce the aesthetic objective to 0.02 mg/L and introduce a new health-based maximum acceptable concentration (MAC) of 0.1 mg/L. At this level, the water would likely be discoloured and may have a bitter metallic taste. As a precaution it is recommended that people avoid drinking discoloured water.

Manganese in Manitoba Water Supplies

Health effects of manganese

Manganese, an essential nutrient in our diet, is found in many foods and supplements. It is important to consume a small amount in our diet to stay healthy. In general, food contributes approximately 100 to 1,000 times more total manganese to our daily intake than drinking water does.

Information on manganese in drinking water is emerging. There are few studies available on the risks of exposure to manganese from drinking water. In some studies, increased levels of manganese in drinking water were associated with neurological effects but other studies did not support this finding. In the last couple of years, new studies have become available and have been reviewed by Health Canada as part of the guideline development process. There is evidence to suggest that manganese in drinking water may affect people differently than manganese in food. The proposed guideline is protective of potential neurological effects in infants, the most sensitive population.

What is the aesthetic objective based on?

The current 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 may precipitate out creating colour, or dirt or sediment that can build up inside distribution pipes. Changes in the flow patterns within a distribution system may disturb the sediments causing intermittent discoloured water events. The proposed aesthetic objective is intended to minimize potential build-up of manganese sediments in distribution system piping.

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 or particulate forms. In the presence of oxygen, iron and manganese will oxidize creating coloured water, and may also form particles that settle out. Iron tends to turn water a reddish-brown or rust colour, and may similarly settle out as reddish-brown particles. 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?

Water users are advised not to drink discoloured water or use it for purposes such as preparing food, beverages or infant formula. Occasional consumption of small amounts of discoloured water should not cause an increased health risk. Discoloured water events should be reported to your water service provider. They will give you 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. Discoloured water can stain clothing and other items washed in the water.

Manganese in Manitoba Water Supplies

How manganese gets 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. Temperature changes cause turnover that 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.

Manganese in Manitoba water supplies

Most water system owners test manganese levels every one to three years. Where manganese is known to be problematic, water system owners may monitor more frequently. Check with your local water service provider for more information on manganese levels in your water supply.

Since manganese can precipitate out and build up inside the distribution system piping, the level of manganese at your household water tap may vary depending on water flow rates, temperature and other factors. Levels of manganese above the current aesthetic objective can be noticeable, as the water may become slightly coloured.

What to do if there is manganese in your water supply

Water users may wish to consider options for reducing their exposure to manganese from drinking water. Manganese levels at your household tap may fluctuate. When they are high, the water may take on a slight brown colour. Avoiding drinking discoloured water should help to reduce your exposure.

If your water is always 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 (204-255-9720); Horizon Lab (204-488-2035); or Maxxam Analytics (204-772-7276 or 1-866-800-6208). If the manganese levels are high, you may wish to consider using an alternate source of water such as bottled water for drinking, and preparing food and beverages, including infant formula. Other options include treating the water, or installing a cistern and arranging for delivery of hauled water.

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 home owners connected to public water system, it is generally easier just to avoid doing laundry during discoloured water events. If the water supply is always discoloured, some home owners connected to a public water supply may wish to install POE treatment.

POE treatment devices for removal of manganese include reverse osmosis (RO) membrane filters, greensand filters and ion exchange filters (ex: water softeners). POU devices include RO membrane filters, and ion exchange or carbon filters that can be mounted on the kitchen tap. Pitcher-type carbon or ion exchange filters are also available. RO units have been shown to be the most effective and reliable POU treatment devices for reducing manganese concentrations.

Manganese in Manitoba Water Supplies

The treatment device should be certified to meet the NSF International (NSF)/American National Standards Institute (ANSI) standard for removal of manganese. Certified devices are tested to ensure the safety of materials used in the devices and to ensure they perform as claimed.

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) – 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

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 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 www.nsf.org or call their toll free hotline at 1-877-867-3435. Information is also available on the websites of other certifying bodies (www.csagroup.org; www.ul.com; www.iapmo.org; or www.wqa.org).

For detailed information on manganese in drinking water, refer to Health Canada's website at: www.healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-manganese-eau/index-eng.php.

For information on Health Canada's proposed changes to the manganese guideline or to comment on those changes go to: www.healthycanadians.gc.ca/health-system-systeme-sante/consultations/manganese/index-eng.php.

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