Manganese in Drinking Water

Manganese is an essential nutrient found naturally in the environment. It can be present in:

- air
- food
- water
- soil and rocks

Manganese gets into drinking water sources when water dissolves minerals that contain manganese. It can also enter drinking water sources through human activity, such as:

- mining activities
- industrial discharge
- leaching from landfills

Manganese may also be added during the treatment of drinking water. In Canada, levels of manganese in fresh water are usually low. In groundwater and some lakes and reservoirs, levels of manganese can be higher depending on water chemistry and due to industrial discharges.

Water that contains manganese may be coloured, but not always. It would not have a distinct smell or taste. Testing conducted by your municipality or by an accredited laboratory can determine if manganese is present in water that is clear. These testing results as well as an understanding of the water treatment and the flow of water in the pipes can determine if the water is safe for consumption. Monitoring results from your municipality or by an accredited laboratory can be utilized to determine if, when the water is clear, manganese levels are below Health Canada's maximum acceptable concentration. The municipality must continue to monitor the manganese levels to ensure that this remains unchanged.

Health Effects of Manganese in Drinking Water

Although humans need to consume small amounts of manganese to be healthy, too much manganese in drinking water can lead to some adverse health effects.

Drinking water that contains high levels of manganese, even for a short time, can be a health risk to infants.

Formula-fed infants may be especially at risk if the water used to prepare the formula contains levels above the guideline value. This is because:

- their brains are developing rapidly
- they drink more water based on body weight
- they absorb more manganese and are less able to remove it from their bodies

Exposure to manganese in drinking water can cause:

- neurological and behavioural effects
- deficits in memory, attention and motor skills

For adults and older children, short-term exposure to manganese in drinking water slightly above the guideline is unlikely to cause negative health effects.

Guideline Value for Manganese in Drinking Water in Canada

Health Canada worked with provinces, territories and other federal departments to set a new guideline value for manganese in drinking water of 0.12 milligrams per litre (mg/L). The guideline value is protective of the health of Canadians, including the most vulnerable members of society, such as infants and children.

Manganese has long been considered to be an aesthetic concern in drinking water, because it discolours water and can stain laundry or fixtures. As such, Health Canada has established an aesthetic objective of 0.02 mg/L.

The Guidelines for Canadian Drinking Water Quality for Manganese are based on recent scientific studies and set out the basic parameters that every water authority should strive to achieve in order to provide the cleanest, safest and most reliable drinking water possible.

How to Reduce your Exposure to Manganese in Drinking Water

If you have elevated levels of manganese in your drinking water, there are effective ways to remove it as described below.

Manganese will not enter the body through the skin or by breathing in vapours while showering or bathing. Bathing and showering in water that contains levels of manganese above the guideline value is considered safe.

If you are pregnant, breastfeeding or caring for an infant

If you are pregnant, breastfeeding or preparing infant formula and are concerned about your infant's exposure to high levels of manganese in drinking water you may wish to:

- use an alternate source of drinking water
- install a treatment device to remove manganese from drinking water

Removing Manganese from Drinking Water

There are two categories of treatment units that are capable of reducing manganese in water in your home:

- **units installed directly at the tap:** used to reduce specific contaminants at one tap only (point of use units). Reverse osmosis is the most effective and reliable way to reduce manganese levels in drinking water that will be used for drinking and food preparation.
- **units installed where the water supply enters the home:** used to reduce specific contaminants in water in the entire household (point of entry units). Water softeners and manganese “greensand filters” can be used to reduce the potential for discoloured water and staining of laundry. Greensand filters require careful maintenance to ensure that they are effectively removing manganese.

Make sure that any treatment unit you use is:

- certified as meeting the NSF International / American National Standards Institute standard for the drinking water treatment unit or materials

- installed and maintained (or replaced) according to the instructions given by the manufacturer

Currently, there are no reverse osmosis 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.

Values in Other Countries

Health Canada has established a health-based guideline value for manganese in drinking water of 0.12 mg/L and an aesthetic objective of 0.02 mg/L, some of the lowest limits for manganese in drinking water in the world.

Other countries and organizations have established limits for manganese in drinking water that are different from ours for various reasons (for example, a different value is used to determine how much water a person drinks based on the country average).

Health-based guideline value

Health Canada's health-based guideline value for manganese in drinking water (0.12 mg/L) takes into account new science suggesting potential adverse health effects on the central nervous system, particularly during brain development. Other organizations have also established limits for manganese in drinking water:

- United States: health advisory value of 0.3 mg/L
- Australia: guideline value of 0.5 mg/L
- World Health Organization: health-based value of 0.4 mg/L, but no formal guideline was established

Aesthetic objective

Health Canada's aesthetic objective for manganese in drinking water (0.02 mg/L) is based on new science and is lower than those currently established by other agencies:

- United States: 0.05 mg/L, based on aesthetic considerations
- Australia: aesthetic guideline of 0.1 mg/L
- European Union: limit of 0.05 mg/L