Qs and As on Manganese

1. What is manganese and how am I exposed to it?
Manganese is an essential nutrient that is found in air, food, consumer products, soil and drinking water.

2. What health effects can result from exposure to manganese in drinking water?
Although humans need to ingest small amounts of manganese to be healthy, too much manganese in drinking water can lead to some health effects, primarily on the central nervous system. Exposure to high levels of manganese could lead to the development of learning and behavioural problems, and potentially deficits in memory, attention and motor skills

3. Who is at risk from drinking elevated levels of manganese in drinking water?
Although exposure to high levels of manganese in drinking water can pose a health risk to the general population as a whole, infants are at greater risk from manganese in drinking water than children and adults because their brains are developing rapidly, they drink more water relative to their body weight, and they absorb more manganese and are less able to remove it from their bodies in comparison to children and adults.
Infants consuming formula prepared with contaminated drinking water are particularly at risk.

4. Why was the guideline for manganese in drinking water revised?
Manganese has long been considered to only be an aesthetic concern in drinking water, causing discoloured water and/or staining of laundry or fixtures. However, new scientific studies show health effects related to exposure to high levels of manganese in drinking water. This new information was used as the basis for the new guideline for manganese in drinking water, in order to protect the health of Canadians.

5. If levels of manganese in my water are above the guideline value, can I still use it to bathe and shower?
It is safe to bathe and shower in water that contains levels of manganese above the maximum acceptable concentration (MAC), as it will not enter the body through the skin or by breathing in vapours from showering or bathing in significant amounts.

6. How do I know if there is manganese in my drinking water?
Water that contains manganese may be coloured, but not always. It would not have a distinct smell or taste. The only way to determine if you have elevated levels of manganese in your drinking water is to have it tested. If you are interested in testing your drinking water for the presence of manganese, you should contact your local drinking water authority or a laboratory accredited by the Standards Council of Canada or the Canadian Association for Laboratory Accreditation. In some provinces and territories, the laboratory must also obtain a license or certification from the drinking water authority. The laboratory will provide you with the appropriate sampling container and any required preservative.

7. Are there treatment devices that I can use to remove manganese from my drinking water?

There are residential treatment devices that are capable of removing manganese from drinking water. There two main categories of treatment devices:

1) Point of use (POU) devices are installed directly at the tap, and are used to reduce specific contaminants at one tap only; for manganese, these devices use reverse osmosis. This technology is the most effective and reliable for reducing manganese levels in drinking water that will be consumed (e.g. drinking and food preparation).

2) Point of entry (POE) devices are installed where the water supply enters the home, and are used to reduce specific contaminants in water used in the entire household; for manganese, these devices are water softeners and manganese greensand filters. These technologies are used to reduce the potential for discoloured water and staining of laundry. Greensand filters require careful maintenance to ensure that manganese is adequately removed.

Depending on the level of manganese in your water, you may want to install treatment at the POE to reduce the likelihood of discoloured water and staining of laundry, in addition to treating at the POU to ensure that levels are reliably below the MAC in water that you consume.

Health Canada recommends that consumers use devices that have been certified as meeting the appropriate NSF International/American National Standards Institute standard for drinking water treatment units by an accredited certification body. These standards have been designed to safeguard drinking water by helping to ensure the material safety and performance of products that come into contact with drinking water. Although there are currently no devices certified to remove manganese, reverse osmosis (RO) devices that have been certified to remove other metals (such as arsenic or lead) are effective for manganese removal. You can check the packaging of the device to see it has been certified.

8. Should I be concerned about manganese in my water if I am pregnant or breastfeeding?

The amount of manganese transferred from an expecting mother to her baby is not fully understood, however, it is expected that manganese absorption and excretion would be managed by the mother's body. If the drinking water ingested by the mother is *slightly* above the MAC, exposure of the baby from the expecting mother or from breast milk would not likely be a concern. New and expecting mothers who have concerns or who are exposed to levels of manganese in drinking water that are significantly above the MAC may wish to use an alternate source of drinking water. If you have concerns about your water or health, you may wish to contact your public drinking water authority or public health authority for more information.

9. How does Canada compare internationally?

Health Canada has established a health-based MAC for manganese in drinking water of 0.12 milligrams per litre (mg/L) and an aesthetic objective of 0.02 mg/L.

Health Canada is the first national jurisdiction to develop a health-based limit for manganese in drinking water that takes into account new science suggesting potential effects on the central

nervous system during development. The calculated health-based limit, which is the basis for the MAC, is lower than the United States Environmental Protection Agency's non-regulatory health advisory (0.3 mg/L), the Australian Drinking Water Guideline (0.5 mg/L), and the 'health-based value' established by the World Health Organization (0.4 mg/L, though no formal guideline was established).

Likewise, Health Canada's aesthetic objective is based on new science and is also lower than those currently established by other agencies. The U.S. EPA established a secondary maximum contaminant level for manganese in drinking water of 0.05 mg/L, based on aesthetic considerations. The Australian Drinking Water Guideline has an aesthetic guideline of 0.1 mg/L for manganese in drinking water.

10. How does manganese get in my drinking water? Do groundwater supplies have more manganese than water from lakes or rivers?

Manganese is a naturally occurring element commonly found in soils 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 industrial discharge, mining activities and leaching from landfills. Generally, manganese is more prevalent and found at higher concentrations in groundwater than in surface water because it is more easily dissolved when there is a lack of oxygen, which is more common in groundwater than in surface water. In some cases levels in surface water can be elevated, such as in lakes and drinking water reservoirs under warm and stagnant conditions.

11. I've been drinking water with manganese levels above the new guideline for a long time, should I be concerned about my health?

It is not possible to quantify potential health risks to individuals resulting from past exposures. However, it is recommended that appropriate drinking water treatment be considered if levels of manganese in your drinking water significantly exceed the MAC. Given that infants are particularly susceptible to toxicity from manganese ingested through drinking water, drinking water used to prepare formula should not contain manganese at levels that exceed the MAC. If you have concerns about your health, you may wish to consult your public health authority.

12. Is short-term exposure to manganese in drinking water at levels above the MAC a health risk?

The guideline was established to be protective of the most sensitive population, which is formula-fed infants. If the manganese level in your drinking water is above the guideline, you should consider using an alternate source of water to make infant formula. Short-term exposure to levels of manganese in drinking water above the MAC can be a health risk, particularly to infants. Infants are at greater risk from manganese in drinking water than children and adults because their brains are developing rapidly, they drink more water based on body weight, and they absorb more manganese and are less able to remove it from their bodies.

For adults and older children, who drink less water relative to their body weight than bottle-fed infants, short-term exposure to manganese in drinking water slightly above the guideline is not a

concern. However, if this is a long-term situation, a permanent solution such as the use of a treatment device or an alternate source of drinking water should be considered.

13. Can treatment devices release manganese if not properly maintained?
Water softeners and greensand filters designed to treat water at the point of entry into a home, and treatment devices that use ion exchange material that are installed at the point of use to treat water to one tap, can release manganese if they are not maintained properly. If these devices release manganese, the concentration in the treated water can be higher than the concentration in the untreated water (source water). It is therefore important to verify the expected lifespan of the treatment device and service it when required.

14. Do I need to test my water to make sure the treatment is working?
Routine testing on both water entering a treatment device and the treated water should be conducted to verify that the device is working. Analysis of the water samples should be conducted by an accredited laboratory.

15. How should drinking water systems monitor to determine if the drinking water meets the MAC for manganese?
Monitoring for manganese should be conducted at the entry to the distribution system and from locations within the distribution system from sites that are located in close proximity to the treatment plant (e.g. hydrants and valves). Samples should also be collected from consumer's taps (private or public buildings). At a minimum, monitoring is recommended to be conducted quarterly. In addition, event-based monitoring should be conducted if discoloured water has been reported.