

MANGANESE

What is manganese?

- Manganese is a mineral that is found naturally in the environment and is one of the most abundant metals on the earth's surface, in air, water, and soil. It can be found in both groundwater and surface water from natural sources or as a result of human activity such as mining and industrial discharges.
- Manganese is used in various industries, including the manufacture of iron and steel alloys, batteries, glass, fireworks, various cleaning supplies, fertilizers, varnish, fungicides, cosmetics, and livestock feeding supplements.
- Drinking water can be a source of exposure to manganese. Elevated manganese concentrations can occur in municipal water as well as water from private wells. In general, manganese is more prevalent and found at higher concentrations in groundwater than surface water. Most exposure occurs from ingestion and not from bathing/showering.
- Food is a significant source of exposure, but bioavailability (meaning the amount that your body absorbs) is greater from drinking water.

What are the potential health and aesthetic impacts of manganese in drinking water?

- Although manganese is an essential nutrient at low doses, elevated levels are a health concern.
- The likelihood of health impacts from manganese are dependent on factors such as the route of exposure, the chemical form, the age at exposure, and an individual's nutritional status. Certain groups that are more sensitive to manganese include infants, the elderly, and those with liver disease.
- Studies suggest an association between exposure to manganese in drinking water and neurological issues in infants and children, such as changes in behavior, lower IQ, speech and memory difficulties, and lack of coordination and movement control.
- Manganese in drinking water can also cause aesthetic issues such as metallic-tasting water and black stains on tubs/showers, toilets, plumbing fixtures, and laundry.

Is there manganese in my drinking water?

- If you are experiencing black stains on your shower, toilet, plumbing fixtures, or laundry, it is likely you have manganese in your drinking water and it is recommended you have your water tested.
- To have your water tested for manganese, find a certified drinking water laboratory. You can contact your local drinking water authority for a list of certified labs in your area, or search online using EPA's drinking water lab certification page: <https://www.epa.gov/dwlabcert>
- You can also contact a water treatment professional to come to your home to test your water. You can use WQA's *Find Water Treatment Providers* to search for treatment professionals near your zipcode: <http://www.wqa.org/find-providers>

Is manganese in drinking water regulated?

- Currently, there is no federal enforceable maximum contaminant levels (MCLs) for manganese in drinking water. Public water systems are not required to test for manganese under the Safe Drinking Water Act (SDWA).
- However, EPA also has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards (secondary maximum contaminant levels or SMCLs) that are used as

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guidelines to assist water systems with managing drinking water for aesthetic considerations, such as taste, color, and odor. The EPA has set a SMCL for manganese of 0.05 mg/L in order to protect against black staining and bitter metallic-tasting water.

- In 2004, EPA set a non-enforceable lifetime health advisory (HA) level of 0.3 mg/L for chronic exposure to manganese and a 1-day and 10-day HA of 1 mg/L for acute exposure. The EPA suggests 0.3 mg/L be used for both chronic and acute exposure for infants younger than 6 months old. These health advisory levels are meant to serve as technical guidance to assist regulatory officials with protecting public health and provides practical guidelines for addressing manganese contamination.
- In 2019, Health Canada set a health-based maximum acceptable concentration (MAC) of 0.12 mg/L and an aesthetic objective (AO) of 0.02 mg/L for manganese in Canadian drinking water supplies.

How do I remove manganese from my water?

- Water treatment technologies that have been shown to be capable of removing manganese from drinking water in your home include cation exchange water softening, distillation, filtration, and reverse osmosis.
- Product Certification provides an additional level of assurance to consumers who want protection from manganese. During the process, the Certification Body reviews confidential information on how and where the product is built and labeled and who the suppliers are for each material or component; conducts regular factory audits to ensure the product is not changed without authorization or retesting; reviews product packaging and labeling to ensure that important information is conveyed to consumers; and conducts additional testing to ensure that the products are made with materials that will not leach harmful chemicals into the water and that will not develop leaks due to pressure spikes. Product certification for products that remove manganese down to 0.5 mg/L is available for cation exchange, distillation, filtration, and reverse osmosis.
- Drinking water treatment products which remove manganese, as demonstrated through independent testing and certification by WQA, can be found here: <https://www.wqa.org/find-products#/>.

Additional information on manganese:

- Health Canada Guidelines for Canadian Drinking Water Quality Guideline Technical Document for Manganese: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-manganese.html>
- EPA Secondary Drinking Water Standards: <https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals>
- EPA Drinking Water Health Advisory for Manganese: https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf
- Agency for Toxic Substances & Disease Registry Toxicological Profile for Manganese: <https://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=102&tid=23>
- Agency for Toxic Substances & Disease Registry Public Health Statement for Manganese: <https://www.atsdr.cdc.gov/phs/phs.asp?id=100&tid=23>
- World Health Organization Guideline Document for Manganese in Drinking Water: https://www.who.int/water_sanitation_health/dwg/chemicals/manganese.pdf
- CDC Manganese ToxFAQs: <https://www.atsdr.cdc.gov/toxfaqs/tfacts151.pdf>
- AWWA Occurrence of Manganese in Drinking Water and Manganese Control: <http://www.waterrf.org/PublicReportLibrary/91147.pdf>