

Boron in Manitoba Well Water

This fact sheet is part of a series on naturally occurring elements sometimes found in well water. In some Manitoba wells, boron has been found at concentrations exceeding health guidelines.

What is boron?

Boron is a naturally occurring trace element found in many igneous and sedimentary rocks, and may also be present in residual sea waters in some geologic settings. Boron compounds, particularly boric acid and sodium borate or borax - are used to make disinfectants and borosilicate glass, as anti-oxidants for soldering, and in the cosmetics, leather, paint and wood processing industries. They are also used as plant fertilizers.

Exposure to boron

Manitobans can be exposed to boron through diet - mainly fruits and vegetables (1 to 3 mg/day), drinking water, airborne matter, consumer products (cosmetics, detergents, cellulose insulation) and health products.

Drinking water guideline for boron

Health Canada has established a maximum acceptable concentration (MAC) of 5.0 milligrams per litre (mg/L) for boron in drinking water. Private well owners are not legally required to meet the guideline but where levels are high, a treatment device or other corrective action is recommended.

Health effects of boron

The health effects of boron depend on the level of exposure. Adverse health effects have been reported after accidental intake of very large amounts of boron. Symptoms of acute boron poisoning may include nausea, vomiting, diarrhea, headache, skin rashes and seizures. Children, the elderly and individuals with kidney problems are most susceptible to the acute, toxic effects of boron. The level of boron found naturally in drinking water is not sufficient to produce toxic effects. Studies have indicated that exposure to high levels of boron over a long period of time may result in reproductive effects in males. Animal studies indicate effects on the fetus may occur at high doses. This has not been observed in human studies. Currently, there is no evidence suggesting boron is associated with cancer. However, very few studies have been conducted.

How boron gets into well water

Boron found in well water in Manitoba occurs naturally. It is the result of groundwater coming into contact with soil and rocks containing boron. The concentration of boron in a well water sample depends on a number of factors, such as the amount of boron present in the rock or the soil through which the groundwater has passed and whether the water chemistry is favourable for boron to remain dissolved.

Boron in Manitoba well water

Manitoba Sustainable Development evaluated the results of groundwater samples obtained through a number of regional groundwater quality surveys and its provincial observation well sampling program. A map of the distribution of boron in the groundwater samples is available online at www.manitoba.ca/sd/water/drinking-water/well-videos/index.html.

Boron concentrations above the drinking water quality guideline (5.0 mg/L) were found in only a few areas of the province:

- in groundwater from bedrock sandstone aquifers in the Swan River and Porcupine Mountain areas, and
- in groundwaters from some bedrock aquifers near Gypsumville.

While elevated boron concentrations have sometimes been found in groundwater produced by wells drilled into the shale bedrock aquifer of south-central Manitoba and the sandstone aquifer of south-eastern Manitoba, concentrations exceeding 5.0 mg/L in these areas have been rare.

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. All wells should be tested to ensure there are no boron concerns. In general, well water should be tested for boron every three to five years in areas known to have elevated levels. More frequent testing is recommended if boron levels are at or near the drinking water quality guideline.

Difficulty in growing houseplants may indicate a need to test your well water for boron. Boron is an essential nutrient for crop production but can be toxic for some plants, even at low concentrations. The growth of indoor and outdoor plants may be affected when they are watered with groundwater that has high concentrations of boron. Initially, vulnerable plants will show browning around the edges of leaves. Eventually, the plants may die. Water containing more than 1 mg/L of boron may negatively affect both indoor and outdoor plants.

Public (municipal) water systems that use well water are tested regularly by the water system owner or the Office of Drinking Water as required under *The Drinking Water Safety Act*.

How to test well water for boron

Boron does not create a taste or odour in water. The only way to know if well water contains boron is to have a water sample tested by a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA). Information on accredited laboratories is available from your local telephone directory yellow pages (refer to Laboratories - Testing).

Three accredited laboratories in Manitoba have created test packages for the five elements addressed in this series of fact sheets, including boron:

ALS Environmental

12-1329 Niakwa Road E.
Winnipeg, MB R2J 3T4
Phone: 204-255-9720
Toll Free: 1-800-607-7555
Fax: 204-255-9721

Horizon Lab Ltd.

4055 Portage Avenue
Winnipeg, MB R3K 2E8
Phone: 204-488-2035
Fax: 204-488-4772

Bureau Veritas Canada Inc.

Unit D, 675 Berry Street
Winnipeg, MB R3H 1A7
Phone: 204-772-7276
Fax: 204-772-2386

Private well owners should ask for the Manitoba Trace Elements Package. Test costs will vary from year to year, and well owners should contact the laboratories directly for an estimate.

Well owners should use the bottle(s) provided by the laboratory and collect samples carefully, following the instructions provided.

What to do if boron is found in your well water

If the boron level in the well water is above the drinking water guideline, private well owners should consider how they are using this water and may wish to discuss health risks with their doctor, who can consult their regional medical officer of health for more information.

Private well owners may also wish to consider options to increase the safety of water used for drinking or food preparation (such as for beverages, baby formula, soup and coffee). These options include:

- Hooking up to a public (municipal) piped water system if one is available in the area.
- Installing a cistern and arranging for the delivery of safe drinking water by a water hauler.
- Drilling a new well at a different location or to a different depth. This may or may not solve a boron problem. Manitoba Water Stewardship can be consulted for advice.
- Using commercially bottled water from a supplier who is a member of the Canadian Bottled Water Association or International Bottled Water Association.
- Treating the well water.

Treating the well water

Common treatment systems like water softeners, carbon filters and sediment filters cannot adequately remove boron from drinking water. Boiling will only concentrate the boron, it will not remove it.

Water treatment methods that can remove boron from drinking water include reverse osmosis, distillation, anion exchange units and adsorption with magnesium oxide or other special filter media. A treatment device may be installed at the kitchen faucet (point-of-use) or where the water enters the home (point-of-entry).

Generally, it is recommended that a treatment device be certified to meet the NSF International (NSF)/ American National Standards Institute (ANSI) standard for removal of boron. However, due to the low toxicity of boron and the lack of a regulatory limit in the U.S., there is currently no applicable standard for the removal of boron.

Certification is still recommended though, since certified devices are tested to ensure the safety of the materials used in the devices and to ensure they perform as claimed. Accredited certification organizations include NSF, the Canadian Standards Association (CSA), Underwriters Laboratories Incorporated (UL), the International Association of Plumbing and Mechanical Officials (IAPMO), and the Water Quality Association (WQA).

Quotes should be obtained from reputable water treatment equipment suppliers. The supplier should provide information on how much boron will be removed, maintenance requirements and costs.

Once installed, manufacturer's instructions on the use and maintenance of treatment devices and disposal of filter media should be followed. The well water and treated drinking water should be tested annually for boron to confirm that the treatment system is working properly.

For more information

For more information on boron, refer to Health Canada's website at www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-boron.html or the Agency for Toxic Substances and Disease Registry at www.atsdr.cdc.gov/ToxProfiles/tp26.pdf.

For more information on well construction or on relocating your well, contact Manitoba Sustainable Development's Groundwater Management Section at 204-945-6959.

For more information on water treatment, contact Manitoba Sustainable Development's Office of Drinking Water at 204-945-5762, or refer to the website at www.manitoba.ca/sd/pubs/water/drinking_water/odw_contact.pdf for a local office near you.

For information on certification of water treatment devices visit www.nsf.org.

For health related questions on boron, call Health Links/Info Santé at 204-788-8200 or toll free at 1-888-315-9257 or your local public health office.