

# Barium 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, barium has been found at concentrations exceeding health guidelines.

## What is barium?

Barium, a metal, is a naturally occurring trace element found in low concentrations in nature. It is present in certain types of igneous and sedimentary rocks. Barium may also be present in specific minerals in many sand and gravel aquifers. Barium compounds are used in a wide variety of products including plastics, rubber, electronics, textiles and in the oil and gas industries, among others.

## Exposure to barium

Food is usually the primary source of barium for most Canadians. However, if drinking water levels are high, drinking water may contribute up to 50% of the daily barium intake. Barium in groundwater and well water may occur when rocks or minerals that contain barium break down and dissolve.

Air-borne exposure to barium may occur from industrial emissions, specifically, coal and diesel oil combustion and waste incineration. However, in comparison to ingestion, air borne exposure contributes very little to the total barium daily exposure.

Exposure to higher levels of barium can occur through occupational exposure.

## Drinking water guideline for barium

Health Canada has established a maximum acceptable concentration (MAC) of 1.0 milligram per litre (mg/L) for barium 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 barium

The health effects of barium depend on the level of exposure. Adverse health effects have been reported after ingestion of large amounts of barium. Symptoms include vomiting, abdominal pain, diarrhea, difficulties breathing, numbness around the face, and muscle weakness. Eating very high levels of soluble barium compounds (not those usually found in drinking water) can cause changes in heart rhythms, paralysis or death. Laboratory animals fed high levels of barium had an increase in blood pressure. The potential risk for increased blood pressure was considered in the development of the current drinking water guideline. There has been no evidence suggesting barium causes cancer.

Additional studies have indicated long term exposure to high levels of barium may affect kidney function. Studies regarding reproductive or developmental effects are insufficient to draw conclusions with regard to impact. One study in rats fed large amounts of barium showed some decrease in newborn rat birth weight.

## How barium gets into well water

Barium found in Manitoba well water usually occurs naturally. It is the result of groundwater coming into contact with bedrock or minerals containing barium. The concentration of barium in well water depends on a number of factors such as the amount of barium present in the rock or soil through which the groundwater has passed and whether the water chemistry is favorable for barium to remain dissolved.

## Barium in Manitoba well water

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

Of the groundwater samples analyzed for barium, a small number had barium concentrations above the drinking water quality guideline value (1.0 mg/L). Elevated barium concentrations have been found:

- in groundwater from bedrock sandstone and carbonate rock aquifers south and east of Winnipeg; and
- in some shallow sand aquifers in south-central Manitoba.

## 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 barium concerns. In general, well water should be tested for barium every three to five years in areas known to have elevated levels. More frequent testing is recommended if barium levels are at or near the drinking water quality guideline.

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 barium

Barium does not create a taste or odour in water. The only way to know if well water contains barium 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 barium:

### **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 laboratories and should collect samples carefully, following the instructions provided.

## What to do if barium is found in your well water

If the barium 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 should 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 barium problem. Manitoba Sustainable Development 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 carbon and sediment filters cannot adequately remove barium from drinking water. Boiling will only concentrate the barium, it will not remove it.

Water treatment methods that can remove barium from drinking water include reverse osmosis, distillation, special filters and softening or cation exchange units. A treatment device may be installed at the kitchen faucet (point-of-use) or where the water enters the home (point-of-entry).

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

Quotes should be obtained from reputable water treatment equipment suppliers. The supplier should provide information on how much barium 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 barium to confirm that the treatment system is working properly.

## For more information

For more information on barium, 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-barium.html](http://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-barium.html) or the Agency for Toxic Substances and Disease Registry at [www.atsdr.cdc.gov/ToxProfiles/tp24.pdf](http://www.atsdr.cdc.gov/ToxProfiles/tp24.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](http://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](http://www.nsf.org).

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

### Other Fact Sheets in this series

Arsenic in Manitoba Well Water  
Boron in Manitoba Well Water  
Fluoride in Manitoba Well Water  
Uranium in Manitoba Well Water