

Nitrate

in Manitoba Water Supplies

In some Manitoba water supplies, nitrate has been found at concentrations exceeding health guidelines. High nitrate levels are a particular concern for pregnant or nursing women and for infants less than one year old.

What is nitrate?

Nitrate and nitrite are naturally occurring forms of nitrogen found in the environment. Nitrate is essential for plant growth and is present in all vegetables and grains. Nitrate is commonly used in fertilizer. Nitrite is less stable and therefore less common in the environment.

Common sources of nitrate in well water are:

- chemical fertilizers used to improve plant growth
- animal waste from livestock barns and manure storage areas
- manure applied to land
- human waste from septic fields, leaking septic tanks or holding tanks
- soil that contains nitrogen compounds from naturally decaying organic matter

Exposure to nitrate

Everyone is exposed to small amounts of nitrate. Food contributes about 87 per cent of the average daily intake of nitrate for a typical North American adult. Most of the remaining 13 per cent comes from drinking water and a small contribution comes from the air we breathe. For bottle-fed infants, water used to prepare infant formula is usually the main source of nitrate.

Drinking water standard for nitrate

Health Canada has established a maximum acceptable concentration (MAC) for nitrate in drinking water of 45 milligrams per litre (mg/L). This guideline value is intended to protect infants, the group at risk of nitrate effects. Concentrations of nitrate and nitrite in drinking

water are often expressed in units of nitrate-nitrogen or nitrite-nitrogen - 45 mg/L nitrate is equal to 10 mg/L nitrate-nitrogen.

Where nitrate and nitrite are measured separately, the Health Canada Guideline recommends nitrite not exceed 3.2 mg/L (approximately 1 mg/L nitrite-nitrogen).

The provincial standard for all public (municipal) drinking water supplies is 45 mg/L nitrate (10 mg/L nitrate-nitrogen).

Health effects of nitrate

The primary health concern associated with nitrate exposure is methaemoglobinaemia, or blue-baby syndrome. Nitrate is converted to nitrite in the stomach and absorbed into the bloodstream where it interferes with the ability of hemoglobin in red blood cells to carry oxygen. Symptoms of methaemoglobinaemia include cyanosis (bluish discolouration of the skin and mouth), shortness of breath and fatigue. Most cases occur in infants under one year of age. Infants less than three months of age are particularly susceptible.

Water high in nitrate should not be used to prepare infant formula and should not be given to infants to drink. As nitrate may be present in breast milk or transported through the placenta, nursing mothers and pregnant women should also avoid drinking water high in nitrate.

Evidence of other health problems associated with drinking well water with high levels of nitrate or nitrite over a lifetime is inconclusive. Some studies suggest a possible association with stomach cancer, whereas others do not. Overall, evidence of associations with cancer, birth defects and other health effects is insufficient to be able to draw firm conclusions.

How nitrate gets into well water

Nitrate in Manitoba well water tends to be found in groundwaters from shallow wells in rural or agricultural areas. Nitrate moves faster through light, sandy soils than through clay soils. Heavy rains and flooding can increase nitrate levels

in well water. Shallow wells are more susceptible than wells drilled into deeper aquifers. Wells drilled into deeper aquifers rarely have a nitrate problem.

Nitrate in Manitoba water supplies

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

For information on your drinking water system, contact your water supplier or the drinking water officer in your region. Large, public water suppliers must make annual reports available to the public, and post a copy of that report on the Internet.

What to do if there is nitrate in your water supply

If the nitrate level in the water is above the drinking water standard, private home owners should consider how they are using this water and may wish to contact their local public health office or discuss health risks with their doctor, who can consult their regional medical officer of health for more information.

Private home owners may also wish to consider options to increase the safety of water used for drinking or food preparation (such as for beverages, soup and coffee). Do not use the water for preparing baby formula. Other options include:

- installing a water cistern and arranging for the delivery of safe drinking water by a water hauler
- using commercially bottled water from a supplier who is a member of the Canadian Bottled Water Association or International Bottled Water Association
- treating the water

Treating the water

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

Water treatment methods that can remove nitrate from drinking water include reverse osmosis, distillation, anion exchange units and special filters. 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 the NSF International (NSF)/American National Standards Institute (ANSI) standard for removal of nitrate. Accredited certification organizations include:

- NSF International (NSF)
- Canadian Standards Association (CSA)
- Underwriters Laboratories Incorporated (UL)
- Quality Auditing Institute
- International Association of Plumbing and Mechanical Officials (IAPMO)
- Water Quality Association (WQA)

Certified devices are tested to ensure the safety of 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 nitrate 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 water supply and treated drinking water should be tested annually for nitrate to confirm that the treatment system is working properly.

For more information

For more information on nitrate, refer to Health Canada's website at www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index_e.html.

For more information on water treatment, contact Manitoba Water Stewardship's Office of Drinking Water at 204-945-5762, or refer to the website at www.manitoba.ca/waterstewardship/odw/reg-contacts/index.html for a local office near you.

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

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