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Nitrate in well water

What is nitrate?

Nitrate (NO_3-) is a naturally occurring ion in the environment. It is the product of oxidation of nitrogen, which is commonly found in the atmosphere, and water. Other forms of nitrogen include nitrite and ammonia.

Nitrate is essential for plant growth and is present in all vegetables and grains. Nitrate is colourless, tasteless and odorless.

Nitrate should not be confused with nitrite (NO_2-). Nitrite can be found in the environment, but it is mainly used as a preservative in food and drinks. Both nitrate and nitrite can be a health hazard when consumed at concentrations above health guideline levels.

Nitrate concentrations in drinking water are a concern when levels are above the Guidelines for Canadian Drinking Water Quality. The highest acceptable concentration (MAC) for nitrate in drinking water is 45 mg/L. This is equal to 10 mg/L measured as nitrate-nitrogen.

The nitrate level in most groundwater in British Columbia is very low. It is generally less than one mg/L. More than 3 mg/L of nitrate in groundwater is usually due to human activities.

How does nitrate get into well water?

Decomposition of organic matter and biological nitrogen fixation by microorganisms in the soil and plants, or lightning strikes are the natural origins of nitrates. Nitrate also makes its way into well water through other sources such as:

- Agricultural activities (using chemical fertilizers and animal manure, storage and feedlots)
- Leaking sewage lines or improperly functioning septic systems
- Industrial processes
- Motor vehicles
- Some de-icing agents used at airports

How do I know if there is nitrate in my well water?

Since nitrate is colourless, tasteless and odorless, you cannot tell if you have nitrate in your well water unless you test for it.

Nitrate is more often found in groundwater than surface water. Nitrate is commonly found in shallow wells located in agricultural areas. Nitrate levels in ground water may change over time, especially after heavy rainfall. Nitrate concentrations above guideline levels have been found in well water samples throughout B.C., especially near heavily farmed areas. In some cases, wells located near each other may have different levels of nitrate. You cannot rely on test results from a neighbour's well.

Who is most at risk?

Nitrate levels above the guidelines are a health concern for:

- Pregnant women
- Developing babies
- Babies less than 6 months old
- Older adults
- Individuals with weakened immune systems
- Individuals with chronic heart, lung or blood conditions

What are the health risks of high nitrate levels?

Exposure to high levels of nitrate reduces the amount of oxygen in the blood. This condition is called methemoglobinemia. When this condition occurs in infants it is also known as "blue baby syndrome".

Babies under 6 months are particularly at risk. Breast-fed infants have less exposure to nitrate than bottle-fed infants. In severe cases, high levels of nitrate can cause an infant to turn a grey-blue colour, mainly around the eyes and mouth due to the lack of oxygen in their blood. Immediate

medical attention is necessary, as this serious condition can be fatal. New studies suggest that the thyroid gland function in school-age children may be affected by exposure to high levels of nitrate. There may also be an associated link between cancer and exposure to nitrate in drinking water.

What precautions should be taken for babies or women who are pregnant?

The safest choice for pregnant women is to drink water below the guideline levels of nitrate in drinking water. To help keep your family safe:

- Have your well water tested for nitrate
- Never give your baby well water, or infant formula mixed with well water, unless it has first been tested safe for nitrate levels. If possible, breastfeed your baby

Boiling your water can increase the amount of nitrate in it. If you are boiling water to prepare infant formula, boil for no more than 2 minutes. Extended boiling time is not recommended. If you are not breastfeeding and do not have access to a safe water source, use ready-to-feed formula.

For more information on preparing infant formula, visit HealthLinkBC File #69b Feeding your baby formula: Safely making and storing formula.

How can I get my well water tested?

You can test your well water for nitrate through a private laboratory. Search for "Laboratories – Analytical" online to find testing services. Your local environmental health officer may also be able to give you a list of labs in B.C. that test drinking water.

Laboratories can report nitrate levels in 2 different ways: mg /L nitrate, or mg /L nitrate-nitrogen. If your results are higher than the recommended guideline levels, or you're unsure how to read the results, please contact your local health authority.

All wells should be tested for nitrate. For more information on well water testing, visit HealthLinkBC File #05b Well water testing.

What if my water is high in nitrate?

If you have nitrate levels consistently above the guideline levels, consider the following for food and beverage preparation, hygiene (e.g. bathing/showering) or washing dishes:

- Install a drinking water treatment device such as a point of use treatment device that is rated for nitrate removal. It must be tested and certified by NSF International to effectively reduce nitrate

You may need to use an alternative water source such as:

- A relocated or deeper well that has been tested and deemed to be a safe supply
- Water from a municipal distribution system
- Commercially bottled water

Boiling water will not remove nitrate, nor will most counter-top filtration units. There is no substitute for having your water tested.

You should monitor your well water for nitrate at least once per year in the spring and/or fall, when concentrations are the highest. This should be done in addition to other parameters such as total coliform.

For more information

For more information, read the BC Ministry of Environment - Nitrate in Ground Water fact sheet: www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/no3020715_fin2 (PDF 967 KB) or contact the environmental health officer at your local public health authority: www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality/health-authority-contacts.

- First Nations Health Authority 1-866-913-0033
- Fraser Health 604-870-7903
- Interior Health 250-851-7404
- Island Health 250-755-6215
- Northern Health 250-565-2150
- Vancouver Coastal Health 604-815-6841