



Nitrite/Nitrates in Drinking Water

Nitrate and nitrite compounds are widespread in the environment, as they are naturally produced by the oxidation of nitrogen during microbial decomposition. The most common sources of these substances are agricultural activities (ex: fertilizer application and animal waste storage), wastewater treatment, and discharges from motor vehicles and industrial processes. Nitrates are used for preserving foods, for chemical production, and in the manufacturing of explosives. Exposure to high levels of nitrates and nitrites can cause adverse health effects.

People can be exposed to nitrates and nitrites through their presence in drinking water, food, air and soil, and to a lesser extent through the use of specific consumer products. The main route of exposure to nitrate/nitrite is food, followed by ingestion of drinking water.

How do nitrates/nitrites get into my water?

Nitrite is easily oxidized to nitrate, the more stable form of oxidized nitrogen; therefore nitrate is the compound most commonly found in raw source water. Nitrate-containing compounds in soil are generally able to dissolve and readily migrate with water from contamination sources such as decaying plant or animal material, agricultural fertilizers, human or animal wastes, industrial wastes and naturally occurring geological formations containing soluble nitrogen compounds.

The presence of free ammonia in the water can also lead to nitrification and the potential increase of nitrate and nitrite in drinking water.

How can nitrates/nitrites affect my health?

Healthy adults can consume fairly large amounts of nitrate with few known health effects. However, prolonged intake of high levels of nitrate can be linked to gastric problems and damage to the spleen.

High concentrations of nitrate in drinking water can cause methemoglobinemia, also known as blue baby syndrome, a condition found typically in formula-fed infants less than six months old. Pregnant women, adults with reduced stomach acidity and people deficient in the enzyme that changes methemoglobin back to normal hemoglobin are all susceptible to nitrite-induced methemoglobinemia. Symptoms include blue skin (cyanosis), weakness, headaches, trouble breathing, and loss of consciousness (coma). Severe methemoglobinemia can result in brain damage and death.

Several studies suggest that nitrate exposure can alter human thyroid gland function. Thyroid hormones are essential for normal biological function and critical for neurological development, skeletal growth, metabolism and the cardiovascular system.

There is evidence to suggest that consumption of nitrates and nitrites may cause cancer, but research is insufficient as a basis for establishing a drinking water guideline based on cancer.

What is the Maximum Acceptable Concentration for nitrates/nitrites in drinking water?

The *Guidelines for Canadian Drinking Water Quality* established by Health Canada has set the maximum acceptable concentration (MAC) of nitrate and nitrite in drinking water at levels designed to be protective for the health of bottle-fed infants, which is the most sensitive subpopulation:

- 45 milligrams per litre (mg/L) nitrate, or 10 mg/L measured as nitrate-nitrogen;
- 3 milligrams per litre (mg/L) nitrite, or 1 mg/L measured as nitrite-nitrogen.

How do I know if there are nitrates/nitrites in my drinking water?

As nitrates and nitrites are both tasteless and odourless, you won't be able to tell if they are in your drinking water. Private water supplies can be tested by an accredited laboratory to determine nitrate and nitrite levels. All public water supplies are regularly tested for nitrates and nitrites.

What if there are high levels of nitrates/nitrites in my drinking water?

Boiling water with elevated nitrate/nitrite levels will not make the water safe. An alternate safe water source, or water treated with an appropriate treatment device must be used for drinking, cooking, making juice, drinks, ice or infant formula, brushing teeth or soaking dentures, washing fruits and vegetables, and making soup, tea or coffee. Water with elevated nitrate/nitrite levels may still be used for handwashing, washing dishes, bathing, and laundry

If high concentrations of nitrate/nitrite are found in your drinking water:

- Look for an alternate water source with low nitrate/nitrite concentrations. Where possible, connect to a public water distribution system.
- Minimize sources of nitrate/nitrites that may be contaminating your private water supply. This may include, but not limited to:
 - Repairing your well to prevent surface water infiltration;
 - Repairing dysfunctional private sewage treatment systems;
 - Improving animal waste storage;
 - Limiting use of nitrogen-containing fertilizers.
- Install an in-home water treatment device that can reduce the levels of nitrates/nitrites. Look for treatment devices that have been certified by an accredited certification organization as meeting the appropriate NSF International (NSF)/American National Standards Institute (ANSI) drinking water treatment unit standards for removing nitrates/nitrites.
 - Reverse osmosis drinking water treatment systems (NSF/ANSI standard 58)
 - Cation exchange water softener (NSF/ANSI standard 44)

After the system is installed, have the treated water tested for nitrates/nitrites at a private accredited lab to make sure your system is working properly. Monitor and maintain your water treatment equipment according to manufacturer instructions.

If you are concerned about health risks from the consumption of water containing nitrates/ nitrites, please contact your doctor.

For more information about nitrates/nitrites in drinking water, contact your local Environmental Health Officer.

Environmental Public Health Services
Regional Delivery Sector, Alberta Region
Edmonton Phone: (780) 495-2712
Calgary Phone: (403) 299-3939