

The drop on water

# Nitrate

Nitrate ( $\text{NO}_3^-$ ) is a naturally occurring chemical made of nitrogen (N) and oxygen (O).

## Sources

Nitrogen and nitrogen compounds, such as nitrate, are found in air, soil, water, and plants.

In groundwater, nitrate primarily comes from decomposing plant and animal material, agricultural fertilizers, manure, and domestic sewage.

Groundwater wells can be contaminated by

- leaching of chemical fertilizers
- leaching of animal manure
- improperly treated septic and sewage discharges

Vegetables are one of the main sources of ingested nitrate.

## Maximum Acceptable Concentration for Drinking Water = 10 mg/L

In water, nitrate has no taste, smell, or colour. It can only be detected through a chemical test.

The Canadian drinking water quality guideline for nitrate depends on the method the laboratory uses to measure nitrate concentrations in water:

- **nitrate measured directly = 45 milligrams per litre (mg/L)**
- **nitrate-nitrogen calculated from the total nitrogen concentration = 10 milligrams per litre (mg/L)**

## QUICK FACTS

- Primary nitrate sources in well water include septic discharges and agricultural nutrients, such as fertilizers.
- Nitrate in drinking water has no taste, smell, or colour.
- Nitrate can only be detected through chemical testing.
- The Canadian drinking water quality guideline for nitrate-nitrogen is **10 mg/L**.
- Nitrate-nitrogen levels greater than **10 mg/L** in drinking water can pose a potentially fatal risk to infants under six months old.
- Well water with nitrate-nitrogen levels greater than **10 mg/L** should not be used for drinking, cooking, or teeth brushing. It may be used for bathing, handwashing, and dishwashing.
- If nitrate is present above the guideline limit in drinking water, consider alternative sources of water or water treatment options.

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## Health Risks

Nitrate-nitrogen levels greater than 10 mg/L can pose a risk to infants under six months old.

Infants who are fed water or formula made with water that contains a high concentration of nitrate can develop a condition called blue baby syndrome (methaemoglobinaemia). The infant's immature digestive system converts nitrate ( $\text{NO}_3^-$ ) to nitrite ( $\text{NO}_2^-$ ). Nitrite can diminish the oxygen-carrying capability of the infant's blood, causing the skin to turn a bluish colour. If the nitrate level in the water is very high, lack of oxygen may lead to death.

The risk to human health is through ingestion only – drinking, cooking, teeth brushing. Well water with nitrate-nitrogen levels greater than 10 mg/L may be used for bathing, handwashing, and dishwashing.

Elevated nitrate levels in groundwater may indicate other water quality problems, which may cause other health problems.

## Testing

Regularly test your well water for a standard suite of chemical parameters, including nitrate. Use an accredited water testing laboratory. Find a list of accredited water testing laboratories at [www.gov.ns.ca/nse/water/waterlabs.asp](http://www.gov.ns.ca/nse/water/waterlabs.asp) or see the Yellow Pages under “laboratories.”

Get the special sampling bottles and instructions on proper sampling from the laboratory.

The cost of analyzing water samples can range from \$15 for a single parameter to \$230 for a full suite of chemical parameters. The cost can vary depending on the lab and the number of parameters being tested.

## REGULAR TESTING

Homeowners are responsible for monitoring the quality of their well water:

- Test for bacterial quality every 6 months.
- Test for chemical quality every 2 years.
- Test more often if you notice changes in physical qualities – taste, smell, or colour.

Regular testing alerts you to problems with your drinking water.



## Solutions

If nitrate is present above the guideline limit in the first test, get a second test to confirm the original results. While you are waiting for your test results, find an alternate source of water for drinking, cooking, and teeth brushing that has been tested and found to be safe.

If nitrate is confirmed to be present above the guideline limit in the well water, determine the source of nitrate:

- Check the bacterial quality of the water.
- Inspect well construction and reconstruct the existing well, if necessary.

If bacterial quality and well construction are acceptable and no evidence of other contamination is found, you have the following options:

- Treat your current source of water to reduce nitrate levels.
- Use bottled water for drinking, cooking, and teeth brushing.

## Treatment

Nitrate cannot be removed from water through boiling. Boiling water may increase the concentration of nitrate.

Effective treatment methods include

- anion exchange
- distillation
- reverse osmosis

Buy a treatment system that has been certified to meet the current NSF standards for nitrate reduction. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at [www.nsf.org](http://www.nsf.org).

Once installed, re-test your water to ensure the treatment system is working properly. Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water.

For more information on water treatment, see our publications *Water Treatment Options* and *Maintaining Your Water Treatment*, part of the *Your Well Water* booklet series at [www.gov.ns.ca/nse/water/privatewells.asp](http://www.gov.ns.ca/nse/water/privatewells.asp).

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## Considerations

Shallow wells, dug wells, improperly constructed wells, and damaged wells are most vulnerable to nitrate contamination.

Nitrate contamination is one of the first signs of deteriorating groundwater quality and could indicate other problems with well water quality.

## Considerations for anion exchange method

Nitrate is a negative ion (anion) in solution. When you use anion exchange treatment, the resin in the unit will remove certain anions more readily than others. If other more preferred anions are present such as uranium, sulphate, or arsenic, the effectiveness of the unit may be reduced. The resin in the anion exchange unit may need to be regenerated more frequently to reduce the concentration of nitrate to a satisfactory level. It is important that a detailed chemical analysis of your water be completed to determine if other substances are present that will affect nitrate treatment.

If the anion exchange unit is not properly maintained, the nitrate contained on the resin bed may rapidly detach, leading to higher levels of nitrate in the treated water than the untreated water. It is important to follow instructions for resin regeneration and replacement.

## FOR MORE INFORMATION

Contact

Nova Scotia Environment at  
1-877-9ENVIRO  
or 1-877-936-8476

[www.gov.ns.ca/nse/water/](http://www.gov.ns.ca/nse/water/)

  
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