

## Nitrate plus Nitrite as N Fact Sheet

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### What are nitrate and nitrite?

Nitrate and nitrite are soluble compounds containing nitrogen and oxygen. In the environment, nitrate ( $\text{NO}_3^-$ ) generally converts to nitrite ( $\text{NO}_2^-$ ), which means nitrite occurs very rarely in groundwater. Nitrate is essential for plant growth and is present in all vegetables and grains. For this reason, the predominant use of nitrate in industry is for fertilizer. Nitrite is used for curing meats, manufacturing explosives, and for maintenance of industrial boilers. According to the World Health Organization, the average American male consumes 9-22 mg of nitrate-N per day primarily from leafy greens and root vegetables like carrots, beets, and radishes. Average nitrite-N consumption is much lower at 0.1-0.8 mg per day, primarily from cured meats. Intake at these levels is not considered a health risk.

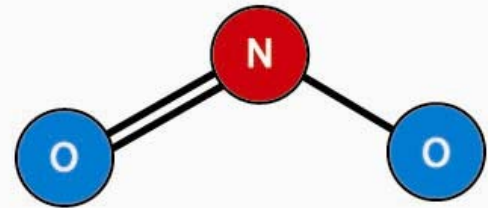
### How much nitrate/nitrite is too much in drinking water?

The Safe Drinking Water Act gives the Environmental Protection Agency (EPA) the responsibility for determining drinking water standards for all public water supplies in the United States. The drinking water standard for nitrate-N is 10 mg/L, or 1 hundredth of a gram in one liter of water. The nitrite-N standard is 1 mg/L. These standards only regulate public water supplies but are useful as a guide for private well owners.

### Nitrate plus Nitrite Test Results

Testing labs report nitrate and nitrite results together usually written nitrate+nitrite as N. The drinking water standard for nitrite is 1 mg/L but because nitrite is very uncommon in ground water, it is generally assumed that almost all of the nitrate plus nitrite is actually nitrate. Natural levels of nitrate vary from zero to about 4 mg/L. If the value is above 4 it is possible that nitrates are moving into ground water from a surface landuse or a septic tank. Nitrate values exceeding 8 mg/L are approaching the health standard and should be monitored regularly especially if an infant under 1 year of age is using the water. Nitrate values over 10 mg/L are unsatisfactory and action should be taken to determine the source and discontinue use of the water for infants or people with cardiac problems.

Nitrite Molecule



### What are the health risks?

- The major health risk from nitrate/nitrite is to infants under 6 months of age. At this early stage of development, nitrate in the body is transformed to nitrite, which reacts with hemoglobin (the oxygen carrier in the blood) and prevents transport of oxygen. The result is a decreased oxygen supply to the body, often called blue baby syndrome (or methemoglobinemia). It gets this name because the skin often turns a blue or grayish color, especially around the mouth. If these symptoms are noticed, seek medical attention immediately.
- Adults are at low risk from this syndrome.
- Adults with chronic health problems, such as heart or lung disease or enzyme deficiencies, may be at higher risk from elevated nitrate/nitrite levels.
- Pregnant and nursing mothers should also avoid drinking water high in nitrate/nitrite because of potential effects passed on to the fetus or infant.
- There have been a few studies suggesting high nitrate/nitrite may cause certain types of cancer, but this connection is not well understood.

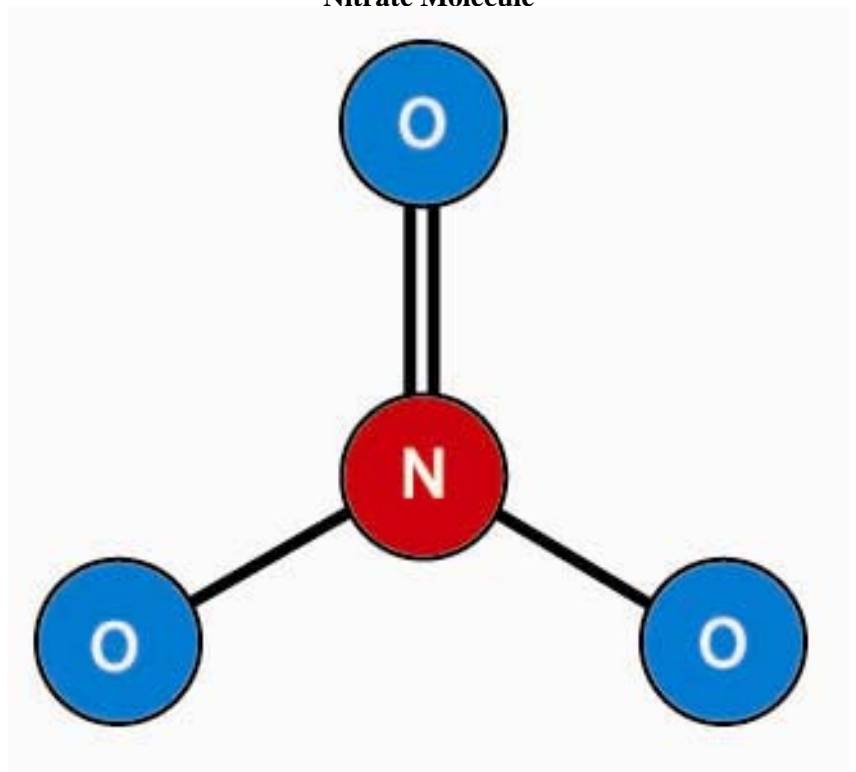
### **How does nitrate get into water supplies?**

Nitrate is found naturally in soil and water but usually at relatively low concentrations (less than 4 mg/L in water). However, nitrate is highly soluble and is easily transported when contamination sources come into contact with water. Common sources for nitrate contamination include sewage systems, refuse dumps, fertilizers, manure, and decaying plant matter. When water from precipitation or other events is flushed over these sources, the water carries the nitrates with it. As this water percolates into the ground and runs over the surface, the nitrates are carried into groundwater and/or surface water. Because nitrates are readily mobilized in water, they are often thought of as an early indicator that a pollution source is reaching a water supply.

### **What steps can be taken to deal with high nitrate levels in well water?**

- Bottled or treated water should be used for infants under 6 months of age.
- If an infant shows any blue or grey skin coloration (changes often occur around the mouth first), seek medical attention immediately.
- Pregnant women and nursing mothers should avoid consuming contaminated water.
- Other people who should limit consumption of elevated nitrates are those with chronic health condition such as heart or lung disease, enzyme deficiencies, or cancer.
- Do not boil water to treat for nitrate; this will increase the concentration.
- Steps should be taken to determine and remove the source of the contamination. This could mean reduced fertilizer application, moving of manure piles, cleaning and/or moving of septic systems, and manipulating surface water to flow away from the well head.
- In some cases drilling a deeper well into a clean aquifer might be worth consideration.
- After receiving results of high nitrate in your well water, retesting the water to confirm the value is recommended before investing in a new well or a treatment system.
- Treatment systems available for nitrate removal include ion exchange, reverse osmosis, and electro dialysis. See the NSF website referenced below for more information.

Nitrate Molecule



### **Additional Resources:**

**Contact your County Sanitarian or Water Quality District.**

**World Health Organization Document (a comprehensive nitrate/nitrite document)**

[http://www.who.int/water\\_sanitation\\_health/dwq/chemicals/rnitrates/en/](http://www.who.int/water_sanitation_health/dwq/chemicals/rnitrates/en/)

**EPA Safewater Page (General Nitrate/Nitrite information and drinking water standards)**

[http://www.epa.gov/safewater/contaminants/dw\\_contamfs/nitrates.html](http://www.epa.gov/safewater/contaminants/dw_contamfs/nitrates.html)

**NSF International Home Water Treatment Devices**

[http://www.nsf.org/consumer/drinking\\_water/dw\\_treatment.asp?program=WaterTre](http://www.nsf.org/consumer/drinking_water/dw_treatment.asp?program=WaterTre)