

Nitrate, Nitrite and Groundwater

What are Nitrate and Nitrite?

Nitrate and nitrite are nitrogen-based chemicals which occur naturally in water, soil, plants, and food. Nitrate and nitrite are found more commonly in groundwater than in surface water, and are two of the more commonly detected well water contaminants.

Principle sources of nitrate or nitrite contamination are fertilizers, septic tank waste, livestock manure and erosion of natural deposits. The most vulnerable wells are those in farm communities or areas with large numbers of aging septic tanks.

What are the health effects of Nitrate and Nitrite?

Ingestion of water containing high nitrate or nitrite concentrations can be fatal to infants. When ingested, nitrate is converted to nitrite by bacteria in saliva and in the digestive tract. In babies, this process can interfere with the ability of the child's blood to carry oxygen, which can lead to a blood disorder called methemoglobinemia or "blue baby syndrome." Symptoms include shortness of breath and blue-tinged skin. Water containing nitrate or nitrite should not be used to prepare food or formula for infants.

Nitrate and nitrite are rarely a problem for people older than six months. However, some individuals are more susceptible to health problems from nitrate or nitrite, due to certain health conditions. These include:

- Women who are pregnant or trying to become pregnant, as some studies have shown an increased risk of spontaneous abortion or birth defects.
- Persons without sufficient stomach acids to metabolize and excrete nitrate or nitrite.
- Persons who lack the enzyme, methemoglobin reductase, which converts affected red blood cells back to normal.

In addition, long term exposure to nitrate and nitrite can lead to diuresis, starchy deposits, and hemorrhaging of the spleen.

How do I test for Nitrate and Nitrite?

The amount of nitrate and nitrite in groundwater is closely related to the land use activities in the upstream watershed or on the land over the aquifer that serves your well. Contact a certified laboratory to have your water tested for nitrate and nitrite.

Your test results may show levels of nitrate, nitrite, and a total nitrate/nitrite level. The EPA's maximum limit for nitrate in drinking water is 10 milligrams per liter (mg/L) or 10 parts per million (ppm); for nitrite, the limit is 1 ppm. In addition, the sum of the amount of nitrate and nitrite in drinking water should not total more than 10 ppm. For example, if the nitrate level of your well is 10 ppm and the nitrite level is 1 ppm, the total nitrate/nitrite level is 11 ppm, which exceeds the maximum safe limit set by the EPA and should be treated.

Contaminant	EPA Limit
Nitrate	10 parts per million
Nitrite	1 part per million
Total (Nitrate + Nitrite)	10 parts per million

You should test for nitrate and nitrite yearly, as their levels can fluctuate over time. In addition, if the initial test reflects nitrate levels of more than 5 parts per million, or nitrite levels of greater than 0.5 parts per million (50 percent of the EPA's maximum limit), the EPA recommends that you test your water every 3 months to see if the level is increasing.

What are the treatments for Nitrate and Nitrite in drinking water?

Three treatments to reduce nitrate and nitrite include ion exchange, electrodialysis and reverse osmosis processes. Distillation may also be used for smaller quantities of water. These technologies may have a wide range of effectiveness based on the amount of nitrate or nitrite in the water supply and the balance of other ions in the water. A well professional can help you select the right treatment. Boiling your water WILL NOT remove nitrate or nitrite, and in fact will increase their concentration in your water due to evaporation during heating.

For more information about Nitrate and Nitrite

Contact the Lincoln-Lancaster County Health Department, Environmental Health Division at 402-441-8030.

Agency for Toxic Substances & Disease Registry. Nitrate/Nitrite Toxicity Physiologic Effects.

American Academy of Pediatrics Press Release. (September 6, 2005). New Report Outlines Dangers of Well Water in Infant Nitrate Poisoning.