

Nitrate



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What is nitrate and where does it come from?

Nitrate is a form of dissolved nitrogen that occurs naturally in soil and water. It is the primary source of nitrogen for plants. Most natural concentrations of nitrate are not of concern, but when excess nitrate gets into water, it can pose a health hazard to humans. Sources of nitrate in water from human activities include fertilizers, animal feedlots, septic systems, wastewater treatment lagoons, animal wastes, industrial wastes and food processing wastes.

What are health concerns from nitrate exposure?

Infants and pregnant or nursing women are especially vulnerable to health problems from drinking water with nitrate levels above 10 parts per million (ppm, equivalent to 10 milligrams per liter). Nitrate can interfere with the ability of the blood to carry oxygen to vital tissues of the body in infants of six months old or younger. The result is called methemoglobinemia, or "blue baby syndrome." Infants may be especially vulnerable if they are fed with formula mixed with well water that has a high nitrate concentration. Children older than 6 months and adults are not usually at risk for methemoglobinemia, because their digestive systems naturally absorb and excrete the nitrate.

Little is known about the long-term effects of drinking water with elevated nitrate levels. Some research has suggested that nitrate may play a role in spontaneous miscarriages.

An additional human health concern is that water supplies showing nitrate contamination have the potential for other contaminants, such as bacteria and pesticides, to reach groundwater along with the nitrate.



Safe Drinking Water in Utah

What is the drinking water standard for nitrate?

A nitrate level of up to 3 ppm in well water is generally believed to be naturally-occurring and safe for drinking. The U.S. Environmental Protection Agency (USEPA) has set the primary drinking water standard (from public water supplies) for nitrate at 10 ppm. Significantly higher nitrate levels may be harmful to people and animals when found in a drinking

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



If your drinking water comes from a public water supplier, that water must meet state drinking water standards for nitrate. Water must be tested every year and quarterly if the results go above 5 ppm. Your supplier is required to send an annual report to all water users on the amount of nitrate and other contaminants found in these water tests. If the testing reveals nitrate concentrations above the drinking water standard, however, the supplier is required to notify the public within 24 hours. To obtain a copy of the report for your water system, call your water supplier or call the Utah Department of Environmental Quality, Division of Drinking Water at 801-536-4200.



If your water comes from a private well, you can have the water tested for nitrate. Your water should be tested every five years for nitrates.

Contact a testing lab before you collect a water sample; they will have specific instructions for how to collect, store and transport the sample. A test will cost approximately \$12-\$20. A list of certified labs in Utah is at <http://extension.usu.edu/cooperative/waterquality/files/PDF/wqlabs.pdf>.

You may be able to get it tested for free by the Utah Department of Agriculture and Food, State Groundwater Program. Call them at 801-538-9905 or go to <http://ag.utah.gov/mktcons/groundwater.html> to learn about their well water testing program. In addition, the Utah State University Veterinary Diagnostic Lab can analyze water samples for livestock. Contact them at (435) 797-0238.

Use the following table to interpret your well water test results.

Nitrate Level, ppm (parts per million)	Interpretation
0-10	Safe for humans and livestock. However, concentrations of more than 4 ppm are an indicator of possible pollution sources and could cause environmental problems.
11-20	Generally safe for human adults and livestock. Not safe for infants because their digestive systems cannot absorb and excrete nitrate.
21-40	Should not be used as a drinking water source but short-term use acceptable for adults and all livestock unless food or feed sources are very high in nitrates.
41-100	Risky for adults and young livestock. Probably acceptable for mature livestock if feed is low in nitrates.
Over 100	Should not be used.

If you find high levels of nitrate in your well, this may indicate that shallow groundwater drawn by your well may be vulnerable to other types of contaminants moving through the soil, including pesticides and disease causing bacteria. Examine your property and the surrounding area for sources of other contaminants. Consider testing for these chemicals if you think your water may be at risk.



What can I do to reduce nitrate in my drinking water?

The best way to reduce nitrate in your drinking water is to identify any potential sources of nitrate on your property and find ways to manage those sources. A faulty septic system, fertilizers, and animal wastes are common sources of nitrate. Make sure your well head is properly located and has an effective seal.

Other options for managing nitrate include:

- If your well is contaminated by high levels of nitrate (10 ppm or above), infants and pregnant or nursing women should stop drinking well water. If you are using infant formula, make sure that it is prepared with bottled water, or use pre-mixed formula.
- Reverse osmosis, distillation, or ion exchange systems can all be used to treat water to remove nitrate. However, these treatment systems are expensive, and require careful maintenance for effective operation.
- Boiling water does not help because it actually concentrates the nitrate. Charcoal filters, water softeners, or use of chlorine do nothing to remove nitrate from water.
- If excessive nitrates are found, monitor nitrate levels at least twice per year (once in the winter, and once in the summer) and keep records. To protect the health of your family, annual water tests should also be made for bacteria.

Safe Drinking Water in Utah

Where can I get more information on nitrate in drinking water?

American Ground Water Trust Fact Sheet on Nitrates: <http://www.agwt.org/info/pdfs/nitrateingroundwater.pdf>

Utah Department of Environmental Quality Web site: http://drinkingwater.utah.gov/consumer_information.htm

EPA website: http://www.epa.gov/safewater/contaminants/dw_contamfs/nitrates.html

EPA Safe Drinking Water Hotline: 800-426-4791

USU Water Quality Extension Web site: <http://extension.usu.edu/cooperative/waterquality/>

Sources

Eldridge, Audrey. *Nitrate in Drinking Water*. 2002. State of Oregon Department of Environmental Quality Fact Sheet. Retrieved from World Wide Web on 5 November, 2004. <http://www.deq.state.or.us/wq/wqfact/NitrateFactSheet.pdf> Portions of this fact sheet were reprinted with permission.

Lamond, Ray E., John S. Hickman, & G. Morgan Powell. 1989. *Nitrates and Groundwater*. Cooperative Extension Service, Manhattan, Kansas: MF-857. Revised.

Liukkonen, Barbara. 2002. *Nitrates in Drinking Water*. Water Resources Center, University of Minnesota Extension Service. Retrieved from World Wide Web on 5 November, 2004. <http://www.extension.umn.edu/water/nitrate.html>

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