

What about a water treatment unit?

Home water treatment units are not recommended for treating high nitrate water which will be given to infants. There is no foolproof way of knowing when the treatment system may fail, and blue baby syndrome has been known to occur after just one day of exposure to high nitrate water.

Should I test my well for anything other than nitrate?

Yes. Private wells should be tested at least once a year for **bacterial safety**. It is also wise to test well water for bacteria any time the water changes in taste, odor, or appearance. A brochure on *Bacterial Safety of Well Water* is available from the MDH.

In addition, water can absorb **lead** from old lead pipes, lead-soldered copper pipes, or brass plumbing components, when the water stands idle in the pipes for more than a few hours. It is recommended to either **flush standing water** until you feel the water get colder (usually 30–60 seconds), or **have your water tested for lead** after it has been standing in the pipes at least six hours. Also, never use water from hot water faucets for drinking or cooking. A brochure, *Lead in Well Water Systems*, is available from the MDH.

Arsenic occurs naturally in about half the wells in Minnesota, and about 10 percent of wells produce water which exceeds 10 micrograms per liter (parts per billion), the federal drinking water standard. Arsenic is more prevalent in western Minnesota, but can occur almost anywhere in the state.

Long-term consumption of arsenic above the drinking water standard may increase the risk of health problems of the skin, circulatory system, nervous system, lungs, and bladder, including some forms of cancer. Every private well should be tested at least once or twice to determine if arsenic is present in the water. A brochure, *Arsenic in Minnesota's Well Water*, is available from the MDH.

Other contaminants sometimes occur in private water systems, but much less frequently than bacteria, nitrate, arsenic, or lead. If the well is located close to fuel tanks or a commercial or industrial area, a test for “**volatile organic chemicals**” (VOCs) is a good idea. A brochure, *VOCs*, is available from the MDH. **Agricultural chemicals** are sometimes found in wells located near cropped fields or handling areas for agricultural chemicals. Shallow wells are more vulnerable to pesticide contamination than are deep wells. If your well is located in an agricultural area, and especially if it is a shallow well, testing for several of the pesticides most commonly used in the area may be warranted.

If children or adolescents are drinking the water, a test for natural levels of **fluoride** will give your dentist useful information when considering fluoride supplements. A small number of wells in Minnesota (primarily northeastern Minnesota) do have naturally-occurring levels of fluoride that exceed the health standard.

Where can I get more information?

If you have any questions about your well or well water quality, or would like more information, contact your nearest MDH office and ask to speak with a well specialist.

MDH District Offices

625 North Robert Street
P.O. Box 64975
St. Paul, Minnesota 55164-0975
651-201-4600 or 800-383-9808

705 Fifth Street Northwest
Bemidji, Minnesota 56601
218-308-2100

11 East Superior Street
Duluth, Minnesota 55802
218-302-6166

1505 Pebble Lake Road
Fergus Falls, Minnesota 56537
218-332-5150

3333 West Division Street
St. Cloud, Minnesota 56301
320-223-7300

1400 East Lyon Street
Marshall, Minnesota 56258
507-476-4220

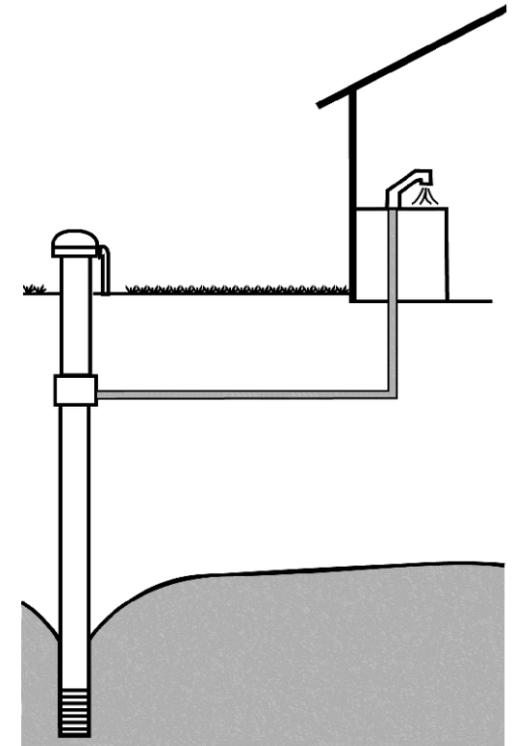
18 Wood Lake Drive Southeast
Rochester, Minnesota 55904
507-206-2700

Visit the MDH Well Management Section website at:
www.health.state.mn.us/divs/eh/wells.

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Nitrate in Well Water



Well Management Section
Environmental Health Division

NITRATE IN WELL WATER

Nitrate is a common contaminant found in many wells in Minnesota. Too much nitrate in drinking water can cause serious health problems for young infants. This brochure provides a basic explanation of nitrate in wells and gives steps that you as a well owner can take to protect your family and visitors from illness.

What is nitrate?

Nitrate (NO₃) is a naturally occurring chemical made of nitrogen and oxygen. Nitrate is found in air, soil, water, and plants. Much of the nitrate in our environment comes from decomposition of plants and animal wastes. People also add nitrate to the environment in the form of fertilizers.

How does nitrate get into well water?

Natural levels of nitrate in Minnesota groundwater are usually quite low (less than 1 milligram per liter [mg/L] of nitrate-nitrogen). However, where sources of nitrate such as fertilizers, animal wastes, or human sewage are concentrated near the ground surface, nitrate may seep down and contaminate the groundwater. Elevated nitrate levels in groundwater are often caused by runoff from barnyards or feedlots, excessive use of fertilizers, or septic systems.

Wells most vulnerable to nitrate contamination include shallow wells, dug wells with casing which is not watertight, and wells with damaged, leaking casing or fittings.

Nitrate contamination of a well is often regarded as a first sign of deteriorating groundwater quality.

What are the health risks of nitrate in well water?

Too much nitrate in drinking water poses a risk to infants under six months of age. If an infant is fed water or formula made with water that is high in nitrate, a condition called "blue baby syndrome" (or "methemoglobinemia") can develop. Bacteria which are present in an infant's stomach can convert nitrate to nitrite (NO₂), a chemical which can interfere with the ability of the infant's blood to carry oxygen. As the condition worsens, the baby's skin turns a bluish color, particularly around the eyes and mouth. If nitrate levels in the water are high enough and prompt medical attention is not received, death can result.

Why are young infants more susceptible?

As an infant ages, its stomach acidity increases, reducing the numbers of nitrite-producing bacteria. After six months, the conversion of nitrate to nitrite in the stomach no longer occurs. Most adults can consume large amounts of nitrate with no ill effects. In fact, the average adult in the United States consumes about 20–25 milligrams of nitrate-nitrogen every day in food, largely from vegetables.

Pregnant women, people with reduced stomach acidity, and people with certain blood disorders may also be susceptible to nitrate-induced methemoglobinemia. Some research has suggested that nitrate may also play a role in the development of some cancers. However, at this time there is no clear evidence that nitrate ingestion results in an increased cancer risk.

How much nitrate is too much?

The federal drinking water standard for nitrate is 10 mg/L of nitrate-nitrogen, which provides newborns with reasonable protection against blue baby syndrome. This level is mandatory for all public water systems, and recommended for private wells.

How do I know if my well water has nitrate?

Nitrate is tasteless, odorless, and colorless. To find out if there is nitrate in your water, have it tested by a laboratory that is certified for nitrate testing by the Minnesota Department of Health (MDH). Laboratories will provide sampling bottles and instructions. The price for the test typically ranges from \$7 to \$25. Contact your local health department, find a certified lab on the MDH website at: www.health.state.mn.us/labsearch or look in the Yellow Pages under "Laboratories - Testing" or "Water Analysis" for a certified laboratory serving your area.

How often should I have my well tested for nitrate?

It's a good idea to have a routine nitrate test every two or three years, more frequently if nitrate has been detected in previous samples. State regulations require well contractors to have a water sample tested for bacteria and nitrate when they construct a new well. After that, owners of private wells must arrange for their own water testing.

You should also have your water tested for nitrate if you are a woman planning on becoming pregnant or if infants will be using the water.

What if nitrate is found in my water?

1. If the nitrate-nitrogen concentration exceeds the health limit of 10 mg/L, do not give the water to any infant under six months of age, either directly or in formula. Infants should be provided with water from a source which has been tested and shown to be low in nitrate and bacterially safe. Commercially bottled water is required to meet the nitrate standard, and can be given to infants.

2. Do not boil to "treat" high nitrate water. Nitrate is not removed from the water by boiling. Boiling actually concentrates the nitrate, due to evaporation of the water.

3. Have your well inspected. It is a good idea to have your well inspected by a licensed well contractor if the well is old, or you do not know if it is structurally sound. Nitrate and bacteria problems are sometimes caused by structural flaws which allow contaminated surface water to enter the well. Repairing the well or constructing a new, deeper well often results in a significant reduction in the nitrate level. To find a contractor, look in the Yellow Pages under "*Well Drilling and Service.*" The MDH also has a list of licensed well contractors on the MDH Well Management Section website at: www.health.state.mn.us/divs/eh/wells/lwc.

4. Identify and remove sources of nitrate near the well. Fertilizers, animal wastes, and sewage systems should be located and managed so that they do not contaminate the well. If a nitrate source is too close to the well and cannot be moved, then you may need to consider having the well permanently sealed and replaced by a licensed well contractor.