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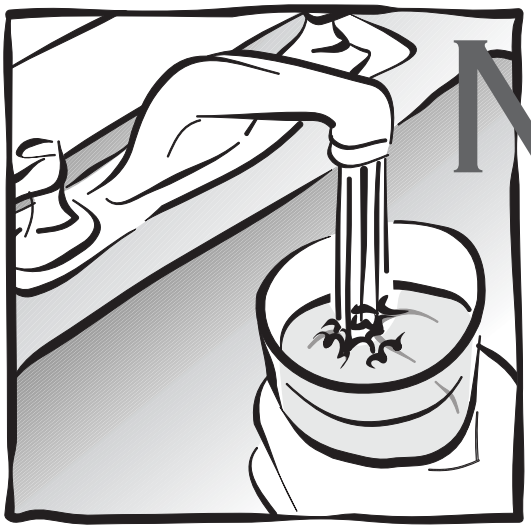
HEALTH CONCERNS RELATED TO NITRATE AND NITRITE IN PRIVATE WELL WATER



Nitrate and nitrite are two chemicals that are sometimes found in private well water. Infants who drink water containing elevated levels of nitrate can develop serious health problems. This fact sheet provides information about these chemicals and includes steps you can take to protect your family's health if your drinking water contains unsafe levels of nitrate and nitrite.

How are You and Your Family Exposed to Nitrate and Nitrite in Drinking Water?

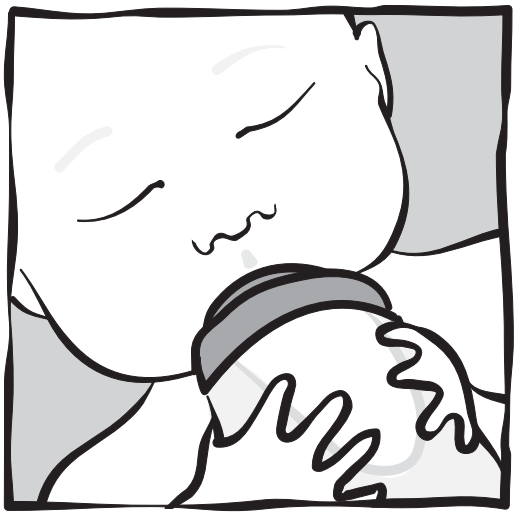
Elevated nitrate levels in drinking water are often caused by groundwater contamination from animal waste run-off from dairies and feedlots, excessive use of fertilizers, or seepage of human sewage from private septic systems. Microorganisms in the soil, water and sewage change the nitrate to nitrite.

How Does Nitrite Affect the Body

Nitrite is of particular health concern in the body because it causes the hemoglobin in the blood to change to **methemoglobin**. Methemoglobin reduces the amount of oxygen that can be carried in the blood. This results in cells throughout the body being deprived of sufficient oxygen to function properly. This condition is called **methemoglobinemia**.

Infants and Methemoglobinemia

Infants, particularly those under six months of age, are the most at risk of developing serious health problems from drinking water that contains elevated levels of nitrate or nitrite. This is because there are differences between the bodies and behaviors of infants and adults or older children.



Infants have relatively low acidity in their stomachs compared to adults. This allows for the growth of certain bacteria that readily convert nitrate to nitrite, which in turn causes methemoglobinemia. In infants, this is commonly called Blue Baby Syndrome, because the lack of oxygen causes the baby's skin to turn a bluish color, particularly around the eyes and mouth. If untreated, infants can die from this condition.

Pregnant Women and Methemoglobinemia

During pregnancy, it is common for methemoglobin levels of the pregnant woman to increase from normal (where 0.5 to 2.5% of the total hemoglobin is in the form of methemoglobin) to a maximum of 10% in the 30th week of pregnancy. The level of methemoglobin declines to a normal level after delivery. Therefore, pregnant women are particularly susceptible to methemoglobinemia and should be sure that the nitrate and nitrite in their well water is at safe levels. (These levels will be discussed later in the fact sheet.)

Effect of Nitrate/Nitrite on Development of the Fetus and the Birth Process

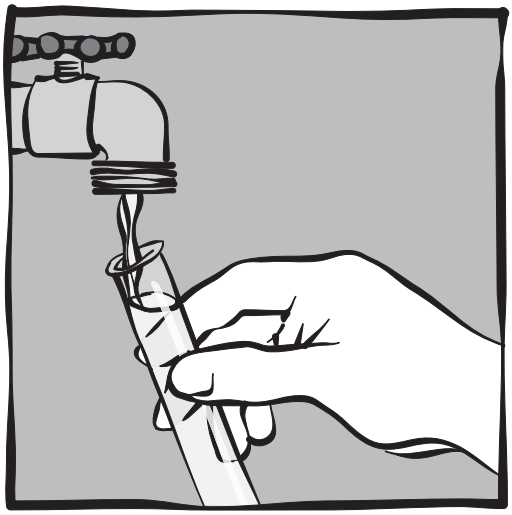
There is no clear evidence that appreciable amounts of nitrate can be transferred to the fetus from the pregnant woman. Although the mother may be experiencing methemoglobinemia, the fetus may not be directly affected. There have not been many studies which look at the effect of nitrate and nitrite on pregnancy or on the normal development of a fetus. Some studies of laboratory animals, where nitrate/nitrite levels are very high, have found a potential negative impact on reproductive and developmental systems. There is also little indication that breastfed infants would develop methemoglobinemia from exposure to nitrate and nitrite through breastmilk.

Does Exposure to Nitrate Cause Cancer?

There is no evidence that nitrate or nitrite causes cancer in laboratory animals or humans. Studies have shown that diets lacking dietary fiber and including foods with high levels of nitrate and nitrite such as smoked meats, may promote stomach cancers. However, studies have not indicated that drinking water high in nitrate is associated with stomach cancer.

Nitrate in Well Water and What to Do About It

If You Use Private Well Water, Have Your Water Tested



Public water systems are tested to insure that they conform to certain drinking water standards, but there are no requirements about the testing of private wells. It is especially critical that you have your water tested if you have an infant, or someone who is planning to become pregnant, in your household. In any case, it's a good idea to have your water tested at least once a year, between April and July when nitrate and nitrite levels are typically the highest. In addition, it is also important to have your well tested once a year for bacteria. If there are changes in the taste, odor or appearance of the water, it should be tested as soon as possible.

If your water comes from a private well and you do not know if there are elevated levels of nitrate and nitrite in the water, your local **county environmental health department** will be able to refer you to a **certified laboratory** that can test your water for the levels of nitrate and nitrite. These tests cost approximately $50. The environmental health department should also have information about the typical levels of nitrate in the groundwater in the area where you live.

How Much Nitrate is Allowed in Drinking Water?

The federal and state governments have set standards for drinking water. These standards, called "Maximum Contaminant Levels" (MCLs), define levels of certain chemicals that are allowed in the drinking water and are not expected to cause any harmful health effects to humans. The standards for nitrate and nitrite have been set at levels which should not cause methemoglobinemia in infants.

What Do Well Water Test Results Mean?

If you decide to have your water tested, the results could be confusing because they can be presented in several different ways. The level of nitrate or nitrite in water can be reported in two different units of measurement: milligrams of nitrate per liter of water (mg/L) or parts of nitrate per million parts of water (ppm). Nitrate can also be reported as "nitrate as nitrogen" and nitrite can be reported

as "nitrite as nitrogen." The table to the right shows the different ways MCLs are reported and the allowable levels of nitrate and nitrite. To determine if the level of nitrate/nitrite in your water is safe, compare your test results to the MCL in the table that uses the same reporting method. **If the level is below the MCL, then the water is considered safe to drink.** One water sample may not take into account fluctuations in nitrate concentrations over time. Therefore, to be cautious, infants and pregnant women may wish to avoid drinking tap water if the levels of nitrate and nitrite are close to the MCL.

	Maximum Contaminant Level (MCL)	
Reporting Method	**Nitrate**	**Nitrite**
mg/L	45	3.3
ppm	45	3.3
as nitrogen (mg/L)	10	1.0
as nitrogen (ppm)	10	1.0

What Can I Do if Levels of Nitrate or Nitrite in My Well Water are Above the MCL?

If the levels of nitrate or nitrite are above the MCL, you have several options:

- Use bottled water for drinking and cooking, and limit well water usage to bathing and showering.
- Check with the county environmental health department about the possibility of getting hooked up to a public water system.
- Consider treatment methods either at the wellhead or the tap. For information, contact the Water Treatment Device Certification Unit of the California Department of Health Services in Sacramento at (916) 449-5600.

Do not boil the water to get rid of nitrate or nitrite. This will actually increase the concentration of chemicals in the water.

Recommendations

- Have your private well water tested for the levels of nitrate and nitrite.
- If your water exceeds or comes close to the MCL (as shown in the table):
  - Do not use well water to make formula for infants under six months.
  - Do not drink well water if you are pregnant.

If you have questions about this fact sheet, or are having trouble contacting your local environmental health department, please call Rubi Orozco (510-620-3671) or Marilyn Underwood (510-620-3610) at the California Department of Health Services, Environmental Health Investigations Branch.

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