

Fact Sheet - Nitrate in Drinking Water

What is nitrate?

Chemically, nitrate is an ion composed of the atoms nitrogen and oxygen and represented by the formula NO_3^- . It can be formed naturally and is also manufactured. It is present in high concentrations in most fertilizers, in manure, and in the liquid waste discharged from septic tanks.

How can nitrate get into my water?

Nitrate dissolves easily in water, so any water source exposed to fertilizers, manure, septic tank wastes or salts containing nitrate (such as saltpeter for curing meats) can pick up and carry the nitrate. For soils containing excess fertilizer, manure, salts or septic tank wastes, rain or irrigation water can carry the nitrate over or down through the soil and into surface water or groundwater. If your drinking water source captures this water, it may contain nitrate.

Why is nitrate in drinking water a problem?

Nitrate in drinking water can be significant for two major reasons: (1) it has direct adverse health effects, and (2) it may signal the presence of other contaminants that may also have significant adverse health effects.

Direct Adverse Health Effects

Nitrate can affect red blood cells and reduce their ability to carry oxygen to the body. In most adults and children these affected blood cells rapidly return to normal. However the blood cells of infants under six months of age can take much longer to return to normal. As a result, infants who are given water with high levels of nitrate (or foods made with nitrate-contaminated water) may develop a serious health condition due to the lack of oxygen. This condition is called methemoglobinemia or **Blue Baby Syndrome**. Some scientists think that diarrhea can make this problem even worse.

Presence of Other Contaminants

Water sources that are protected from contamination rarely have high nitrate levels. More commonly, sources with elevated nitrate levels tend to be shallow and influenced by conditions at the ground surface or by septic tank wastes. In these situations, there is the additional risk of microbiological and chemical contamination that can cause significant adverse health effects if not detected and properly treated.

How is nitrate in drinking water regulated?

The U.S. Environmental Protection Agency has established a federal drinking water standard, called a Maximum Contaminant Level, of 10 milligrams per liter (mg/L), or 10 parts per million (ppm) for nitrate expressed as nitrogen. Colorado's drinking water quality standard is also 10 mg/L (except for certain non-community systems under controlled conditions). Public water systems are required to sample for various contaminants, including nitrate, on a regular basis. There is no sampling required for private individual wells. However, private well owners are encouraged to test their well for nitrate on a regular basis.

Prevention of Blue Baby Syndrome

The best way to prevent Blue Baby Syndrome is to avoid providing infants under six months of age with water that may be contaminated with nitrate. Infants under six months of age should not drink water or be provided with formula made with water that exceeds the drinking water standard of 10 parts per million (ppm) of nitrate. Boiling water will kill microorganisms in the water, but it will not reduce the level of nitrate or prevent Blue Baby Syndrome.

Signs of Blue Baby Syndrome

An infant with moderate to serious Blue Baby Syndrome may have a brownish-blue color due to the lack of oxygen. This condition may be hard to detect in infants with dark skin. In mild to moderate cases babies may have the same symptoms as when they have a cold or another infection (fussy, tired, diarrhea, or vomiting).

While there is a simple blood test to see if an infant has Blue Baby Syndrome, doctors may not think to do this test for babies with mild to moderate symptoms.

What to do about Blue Baby Syndrome

If your baby has a brownish-blue color, get emergency care immediately. There is a medication (methylene blue) that will quickly return your baby's blood to normal. Nitrate in water may not have a long-lasting effect on your baby, so if your baby does not have any of the symptoms of Blue Baby Syndrome after consuming water or food suspected of having elevated nitrate levels, you generally do not need to seek medical care.

Will breast-feeding give my infant Blue Baby Syndrome?

Although nitrate has been found in breast milk, there are no confirmed reports of Blue Baby Syndrome being caused by a nursing mother who consumed water that contained nitrate.

Can nitrate affect adults?

Most older children and adults will not be affected by nitrate because their red blood cells will be quickly converted back to normal. However, some people have conditions that make them susceptible to having health problems from nitrate. They include

- Individuals who don't have enough stomach acids and
- Individuals with an inherited lack of the enzyme that converts affected red blood cells back to normal (methemoglobin reductase).

These individuals should use alternative water sources. Additionally, some studies have found an increased risk of spontaneous abortion or certain birth defects if the mother drank water high in nitrate. Women who are pregnant or who are trying to become pregnant should not consume water that is high in nitrate.

Although the *direct* health threat from nitrate is minimal for most adults, it is important to note that nitrate may signal the presence of other contaminants, such as residuals or byproducts of fertilizers, manure, and septic tank wastes. These contaminants may be harmful to *all* populations,

How can I tell if my water has nitrate?

The only sure way to know if your source is contaminated with nitrate is to have it tested. Public water systems are required to test routinely. Public water systems generally cannot have more than 10 parts per million (or milligrams per liter) of nitrate (expressed as nitrogen or 45 parts per million expressed as nitrate). Systems with nitrate levels above 10 mg/L are required to notify their customers. If you are not served by a public water system and get your water from a private well, have it tested for nitrate levels periodically. The United States Environmental Protection Agency Region 8 recommends that well users test their water every one to three years for both total nitrate and microbiological content (total coliforms). If the taste, odor, or appearance changes, test the water more frequently.

Need More Information?

For individuals served by public water systems, contact your water utility or the Colorado Department of Public Health and Environment at 303 692-3500.

For individuals served by private wells, see our publication *Drinking Water From Household Wells* on our web site at http://www.cdphe.state.co.us/wq/Drinking_Water/Private_wells.htm .