

Nitrate in Drinking Water Information for drinking water well systems.

Nitrate and Health

Large amounts of nitrate in drinking water can cause serious illness in infants under six (6) months of age. This brochure provides information about nitrate contamination and health concerns.

What is nitrate?

Nitrate (NO_3) is a form of nitrogen combined with oxygen. It can be converted in the body to nitrite (NO_2). The major adult intake of nitrate is from food rather than water; but sometimes excessive amounts of nitrate get into drinking water.

How does nitrate get into drinking water?

Nitrate can get into drinking water if a well is improperly constructed or located where it is subject to contamination sources. Typical sources of nitrate include septic tank and drain field effluent, crop and lawn fertilizers, municipal wastewater sludge application, waste from livestock operations, and natural geologic nitrogen.

Nitrate contamination can also be related to human, animal or industrial waste practices. Therefore, excessive nitrate levels in drinking water may indicate potential for the presence of other types of contaminants.

What illnesses can nitrate cause?

Large amounts of nitrate in drinking water are a cause of ***Methemoglobinemia***, a disease also known as blue baby syndrome. This is a blood disorder primarily affecting infants under six months of age. ***Methemoglobinemia*** is a condition in which the ability of the red blood cells to carry oxygen is reduced. The acutely poisoned person will have a blue discoloration of the skin due to the reduction of oxygen in the blood system and must be attended to by a physician immediately.

Why are infants more susceptible than adults to nitrate-induced methemoglobinemia?

There are four reasons why infants are more susceptible.

1. Infants have a lower stomach acidity which allows growth of bacteria capable of converting nitrate to nitrite. Nitrite can change hemoglobin to methemoglobin, which cannot carry oxygen.
2. Young infants still have considerable amounts of fetal hemoglobin, which is more easily converted to methemoglobin than the adult hemoglobin.
3. Infants are deficient in certain enzymes that are able to convert methemoglobin back to normal hemoglobin.
4. In relation to body weight, an infant consumes a much larger volume of water than an adult does.

What is excessive nitrate?

The U.S. Environmental Protection Agency (EPA) has established a Maximum Contaminant Level (MCL) value for nitrate (as nitrogen) at 10 milligrams per liter (mg/l) and nitrite at 1.0 mg/l for public water systems. Michigan has adopted these standards. Public water supplies with nitrate levels above 10 mg/l or nitrite above 1 mg/l are required to notify the health department and take corrective action. Private water supply owners with excessive nitrate or nitrite should contact their local health department or family physician for assistance.

Is there a method to remove nitrate from drinking water?

Reverse Osmosis, ion exchange and distillation are three possible methods for removal of nitrate from drinking water. Such equipment requires frequent, careful maintenance and sampling to achieve and confirm effective operation. Improperly installed, operated or maintained equipment can result in nitrate passing through the treatment process and in some cases concentrating the nitrate above the incoming levels. Bacteriological problems can also develop in improperly installed and poorly maintained systems. Therefore, it is preferred that an alternative source of drinking water meeting nitrate standards be developed where possible. The Macomb County Health Department should be consulted for information regarding the installation of a new well. *Boiling water will not remove nitrate and may concentrate it.*

Can a water supply be properly evaluated on the basis of one laboratory analysis for nitrate?

No. Many factors, such as weather, time of year, well construction, drainage patterns, well depth, etc., can affect the nitrate levels on any given day. Therefore, it is necessary to evaluate the entire site and the well to determine the best course of action in reducing or eliminating the nitrate contamination.

Who Can I Contact For Information and Assistance?

- Macomb County Health Department Environmental Health Services Division (586) 469-5236
- Michigan Groundwater Association, 10475 Noggles Road, Manchester, MI 48158 (734)428-0020
- Michigan Dept. of Environmental Quality, Well Construction Unit (517)241-1377 www.michigan.gov/deq

References: Michigan Department of Environmental Quality, Well Construction Unit.