



FACT SHEET

OFFICE OF DRINKING WATER & MUNICIPAL ASSISTANCE – ENVIRONMENTAL ASSISTANCE CENTER 800-662-9278

NITRATE IN DRINKING WATER FOR NONCOMMUNITY WATER SUPPLIES

A noncommunity water supply, otherwise known as a type II water supply, serves any nonresidential facility that provides water for drinking or domestic purposes to 25 or more at least 60 days per year or, has 15 or more service connections. Examples would include motels, factories, schools, restaurants, campgrounds, churches, and businesses that have their own water supply and serve 25 or more people per day.

Act 399, the Michigan Safe Drinking Water Act, requires most water supplies, including all noncommunity supplies, to monitor for nitrates and nitrites on a frequency based upon whether the water is from a groundwater or surface water source.

How often should samples be collected?

All noncommunity water supplies using groundwater are required by law to sample at least once every year for nitrate and once (unless notified otherwise) for nitrite. If results exceed 5 mg/l for nitrate or 0.5 mg/l for nitrite, quarterly sampling (once every three months) is required.

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 is from food rather than water; but sometimes excessive amounts of nitrate get into drinking water.

How does nitrate get into drinking water?

It can get into water if a well is improperly constructed or located where it is subject to contamination sources. Typical sources of nitrate include:

- sewage disposal systems
- run-off from barnyards
- over applying of residential and agricultural fertilizers
- industrial wastes
- naturally occurring nitrate in the soil, as found in some parts of Michigan

What illnesses can nitrate consumption cause?

Large amounts of nitrate in drinking water are a cause of a disease called *methemoglobinemia*, a blood disorder primarily affecting infants under six months of age. It affects the ability of the red blood cells to carry oxygen, effectively causing a type of suffocation due to lack of oxygen in an acutely poisoned person. A person experiencing this disease will have a blue discoloration of the skin due to the reduction of oxygen in the blood system, giving rise to the phrase, "blue baby syndrome." Anyone affected in this way requires immediate attention by a physician, to prevent possible brain or tissue damage, or even death.

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

1. Infants have a lower stomach acidity which allows growth of bacteria capable of converting nitrate to nitrite. Nitrite can change hemoglobin into 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 more 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.

Also, because nitrate contamination can be related to human, animal, or industrial waste practices, excessive levels of nitrate in drinking water may indicate potential for the presence of other types of contaminants which may cause health problems.

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 milligrams per liter (mg/l) for water systems. The Department of Environmental Quality (DEQ) has adopted these standards.

What do I do if I get a nitrate or nitrite result higher than the MCL level?

Noncommunity water supplies with nitrate levels above 10 mg/l or nitrite above 1.0 mg/l are required to notify the local health department and take corrective action. A “repeat” sample must be collected from the same tap as the original sample within 24 hours of receiving the initial sample results. If the cumulative average of the two consecutive nitrate/nitrite samples exceeds 10.0 mg/l, an MCL violation has occurred. There are requirements to provide public notice and an alternate approved water source until the problem has been corrected. Contact your local health department immediately for complete information on requirements.

It is the position of the DEQ that an alternate source of drinking water that meets the nitrate standard be developed where possible. The local health department should be consulted for information on deepening or replacing wells or changing aquifers to reduce nitrate levels.

What happens if there is no other available source?

There are several possible means of removing or reducing the amount of nitrate/nitrite in the water through treatment:

- reverse osmosis
- ion exchange
- distillation

This 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 these types of equipment if poorly maintained or operated. If a nitrate removal system is to be used, one with the National Sanitation Foundation (NSF) or equivalent certification should be selected. Public water supplies must obtain health department approval prior to installing this type of treatment equipment. Boiling water will not remove nitrate and may concentrate it to dangerous levels.

Can a water supply be properly evaluated on the basis of one sample result?

No. A sample may be collected during dry weather from a poorly located and improperly constructed well near an industrial site, and found to contain little, if any, nitrate. The same well sampled following a rain could contain a nitrate concentration of 100 mg/l, N or more. Therefore, a sanitary survey is necessary to fully evaluate the supply and determine what may be done to eliminate or reduce the nitrate contamination. Such a survey includes information of the well depth, construction, location from potential sources of contamination, area geology, and groundwater quality. Periodic sanitary surveys are required for most public water supplies, including noncommunity water systems.

What kind of container should I use for collecting a sample for nitrate determination?

Any laboratory certified for nitrate analysis of drinking water can provide you with the proper container. The regular partial chemical sample container furnished by the DEQ is used by that lab for nitrate analysis. Local health departments have a supply of these bottles or they can be ordered directly from the laboratory. Sample containers may be ordered from the DEQ lab by calling 517-335-8184. Ask for Unit 32 when ordering and indicate test code R when submitting a sample to the DEQ lab.

When a water sample is analyzed for nitrate, how are the results reported?

The DEQ state laboratory reports Nitrate as milligrams of nitrogen (N) per liter of water (mg/l, N). Other labs may report milligrams of nitrate (NO₃) per liter of water (mg/l, (NO₃)). Nitrite is reported as NO₂. It is important to know which units are used for reporting because they differ by a factor of 4.4. In other words, 10 mg/l, N can also be reported at 44 mg/l, NO₃. Most laboratory reports will indicate which unit is used. Noncommunity water supplies must always include their supply serial number (WSSN) when noncommunity water supplies must include their water supply serial number (WSSN) and well number when submitting samples for analysis to insure proper identification. Failure to do so will result in your facility receiving a monitoring violation which may lead to an enforcement action.

How do I find out more?

Questions regarding nitrate or nitrite sampling requirements or other information for your supply should be directed to your local health department.