

NITRATES/NITRITES IN GROUNDWATER

This is a fact-sheet about a chemical that may be found in some public or private drinking water supplies. It may cause health problems if found in amounts greater than the health standard set by the United States Environmental Protection Agency (EPA).

What are Nitrates/Nitrites and how are they used?

Nitrates and nitrites are a nitrogen-oxygen chemical unit that combines with various organic and inorganic compounds that are commonly used in lawn treatments and fertilizers, and have been for many years. Nitrogen compounds are essential nutrients for plants, which take them from the soil. Crops may eventually deplete these nitrogen compounds from the soil, making it harder to grow additional crops in the future. The soil is treated with nitrogen-based fertilizers, and plants may continue to grow vigorously in this enriched environment. The use of fertilizers and lawn treatments can invade wells, and contaminate the well water. Nitrate and nitrite in the soils, not surprisingly, also seep into groundwater supplies, with shallow wells and groundwater containing much higher levels than deeper water that are not in contact with the surface soils.

Why are Nitrates/Nitrites being regulated?

In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine safe levels of chemicals in drinking water, which may cause health problems. These non-enforceable levels, based solely on possible health risks and exposure, are called Maximum Contaminant Level Goals (MCLG).

The MCLG for nitrates has been set at 10 parts per million (ppm), and 1 ppm for nitrites at, because EPA believes this level of protection would not cause any of the potential health problems described below. Based on this MCLG, EPA has set an enforceable standard called a Maximum Contaminant Level (MCL). The MCL are set as close to the MCLG as possible, considering the ability of public water systems to detect and remove contaminants using suitable treatment technologies.

The MCL for nitrates has been set at 10 ppm, and 1 ppm for nitrites, because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to remove this contaminant should it occur in drinking water.

These drinking water standards and the regulations for ensuring these standards are met, are called National Primary Drinking Water Regulations. All public water supplies must abide by these regulations.

What are the health effects?

Nitrites can cause problems in young children and farm animals, as they bind very strongly to hemoglobin, and can affect the blood's ability to carry and release oxygen. Nitrates are ingested - through water, or food - and nitrate-reducing bacteria in an infant's digestive tract convert these nitrates to nitrites. These nitrites find their way to the circulatory system, and bind very tightly with hemoglobin, which is the component of the blood that attaches to oxygen in the lungs, and releases oxygen to the body tissues that need it. If the nitrites bind to hemoglobin, it is practically useless for oxygen transfer; causing shortness of breath, increased susceptibility to illness, heart attacks, and even death by asphyxiation in extreme cases. As a child develops, the acidity of the stomach becomes stronger, and the nitrate-reducing bacteria are killed. Nitrates are not usually a problem for older children and adults.

Short-term: Excessive levels of nitrate in drinking water have caused serious illness and sometimes death. The serious illness in infants is due to the conversion of nitrate to nitrite by the body, which can interfere with the oxygen-carrying capacity of the child's blood. This can be an acute condition in which health deteriorates rapidly over a period of days. Symptoms include shortness of breath and blueness of the skin.

Long-term: Nitrates and nitrites have the potential to cause the following effect; diuresis, increased starchy deposits and hemorrhaging of the spleen, from a lifetime exposure at levels above the MCL.

How much Nitrates/Nitrites are produced and released to the environment?

Most nitrogenous materials in natural waters tend to be converted to nitrate, so all sources of combined nitrogen, particularly organic nitrogen and ammonia, should be considered as potential nitrate sources. Primary sources of organic nitrates include human sewage and livestock manure, especially from feedlots. The primary inorganic nitrates, which may contaminate drinking water, are potassium nitrate and ammonium nitrate both of which are widely used as fertilizers.

According to the Toxics Release Inventory, releases to water and land totaled over 112 million pounds from 1991 through 1993. The largest releases of inorganic nitrates occurred in Georgia and California.

What happens to Nitrates/Nitrites when they are released to the environment?

Since they are very soluble and do not bind to soils, nitrates have a high potential to migrate to ground water. Because they do not evaporate, nitrates/nitrites are likely to remain in water until consumed by plants or other organisms.

What can I do if Nitrates/Nitrites are in my drinking water?

Water found to contain excessive nitrates could be treated by a variety of methods. Point-of-Use systems reduce the levels by Reverse Osmosis filtration, Distillation, or a disposable mixed-bed deionizer - and can remove the nitrates (and other contaminants) for water specifically to be used for drinking and cooking. Another option is a system very much like a water softening system, using a strong base anionic exchange resin bed rather than the cationic exchange resin bed commonly used for water softening. It is regenerated in a similar way to conventional softeners. This system is most effective in tandem with a water softening system, and provides a whole-house removal solution.

Many communities with a municipal water treatment system split off a portion of the water, and treat it to remove nitrates. This purified water is blended into the general water supply, effectively diluting the nitrate levels to below standards. Consumers especially concerned with nitrate levels may still prefer to use a Point-of-Use system to remove remaining nitrates. These add-on systems may be purchase at your local hardware and building supply stores.

Community water systems must monitor annually for nitrates/nitrites if they use groundwater sources and quarterly if they use surface water sources. It is recommended that personal drinking water supplies be sampled and monitored every year.

Drinking Water Standards (ppm): MCLG/ MCL

Nitrate:	10	10
Nitrite:	1	1

Learn more about your drinking water!

EPA strongly encourages people to learn more about their drinking water, and to support local efforts to protect and upgrade the supply of safe drinking water. Your water bill or telephone book government listings are a good starting point. Your local water supplier can give you a list of the chemicals they test for in your water, as well as how your water is treated.

The Department of Environmental Quality (208) 373-0550 or the Environmental Health office at Central District Health Department (208) 327-7499 can be a valuable source of information. For information on drinking water and drinking water standards in general, call the EPA's Safe Drinking Water Hotline (800) 426-4791. Contact the Community Right-to-Know Hotline: (800) 424-9346 for information on the uses and releases of chemicals in your state.