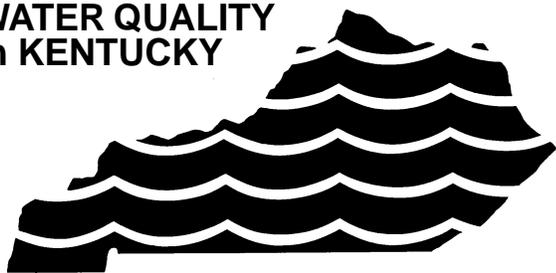




WATER QUALITY in KENTUCKY



Nitrates

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What is Nitrate?

Nitrate is a naturally occurring substance which is an essential ingredient for the growth of plants. Human activities can contribute to higher levels of nitrate in ground and surface waters. The major source of excess nitrate is fertilizer for agricultural, lawn, and garden uses. Other sources include animal manure from feedlots, dairies, and poultry farms; septic tanks; rainwater (acid rain); and sewage sludge. People also can be exposed to nitrates through certain foods, such as cured meats and vegetables, and through tobacco smoke.

Nitrate is odorless and colorless, so it can be detected only through a water test. It can be referred to as nitrate (NO_3), nitrate-nitrogen ($\text{NO}_3\text{-N}$), nitrite (NO_2) and nitrate plus nitrite ($\text{NO}_3 + \text{NO}_2$). Each represents a different measurement of nitrogen's impact on health.

How Does Nitrate Get into Water Supplies?

Nitrate is highly soluble in water and poorly retained in the soil, so it can move through the soil and into groundwater sources. Nitrate contamination depends on factors such as the amount of excess nitrate not used by plants, type of soil, underlying geology, and weather patterns. In general, areas with soils that are sandy, gravelly, or shallow over porous limestone bedrock, and

areas with karst topography (cave areas) have the greatest risk of nitrate contamination of groundwater sources.

What Are the Health Effects of Excess Nitrate?

The main health threat from nitrate is *methemoglobinemia*, or blue baby syndrome. Infants less than six months old do not have the enzyme needed to break down nitrates. Excess nitrogen in the system interferes with the blood's ability to carry oxygen, resulting in a bluish tint to the skin. Although this condition is extremely rare, it can be fatal. Infants should not be exposed to water with high elevations of nitrate. There is no conclusive evidence that nitrates cause cancer in adults. However, there is some evidence that high levels of nitrates consumed over a long period may be toxic.

The EPA has set a safe level, or Maximum Contaminant Level (MCL), for nitrates in drinking water. MCLs are standards which provide a minimal level of risk to health from consuming a

Name	Symbol	MCL
Nitrate	NO_3	44 mg/l
Nitrate-Nitrogen	$\text{NO}_3\text{-N}$	10 mg/l
Nitrite	NO_2	1 mg/l
Nitrate+Nitrite	NO_3+NO_2	10 mg/l

contaminant over the course of a lifetime. The MCLs of the various forms of nitrates are given in the following table.

If your water exceeds the MCL for nitrate, your first response should be to retest the water to make sure the findings are accurate. Furthermore, since nitrate levels vary over time, an elevated test should not be cause for immediate alarm. The table below provides a guide for usage.

Nitrate mg/l	Nitrate-Nitrogen mg/l	Guideline
0-44	0-9	Safe for adults and children.
45-90	10-20	Generally safe for adults. Do not use for infants under 6 months of age and pregnant women.
91-180	21-40	Short-term use for adults acceptable; long-term use is risky. Do not use for infants or pregnant women.
Over 180	Over 40	Hazardous to humans and should not be used.

Prevention of Nitrate Contamination

The best approach to dealing with nitrate contamination in water is prevention. This can be done by eliminating direct entry of nitrate into the well or by changing practices around the well. Contamination is often caused by poor construction or inadequate maintenance of the well. Wells that are shallow (less than 50 feet), older, or dug (versus drilled) tend to have a greater chance of being contaminated. The state requires new

wells to have a minimum of 20 feet of casing, at least four inches of casing above ground, and the use of a pitless adapter instead of a well pit. Owners of older wells may consider rehabilitating their wells to meet these standards. You should also regularly inspect your well for a proper seal and cracks in the casing or grouting. Septic systems should be located at a lower elevation and at least 50 feet away from your well. Finally, avoid activities around the well head or well house, such as mixing or storing chemicals, where spillage could cause contamination.

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Treatment of Nitrate Contamination

Nitrate contamination can be treated, but it can be expensive. If your water requires treatment, consider changing your water source. Alternative water sources include bottled water, constructing a cistern or drilling a new well. Drilling a new well will be effective only if water can be drawn from a deeper, uncontaminated source.

Nitrate-contaminated water can also be treated. Three effective home treatment devices in removing nitrates are ion exchange, distillation, and reverse osmosis. Each is expensive and may require pre-treatment of the water to be effective. Contact your local health department, County Extension office, or water treatment dealer for more information on these devices.