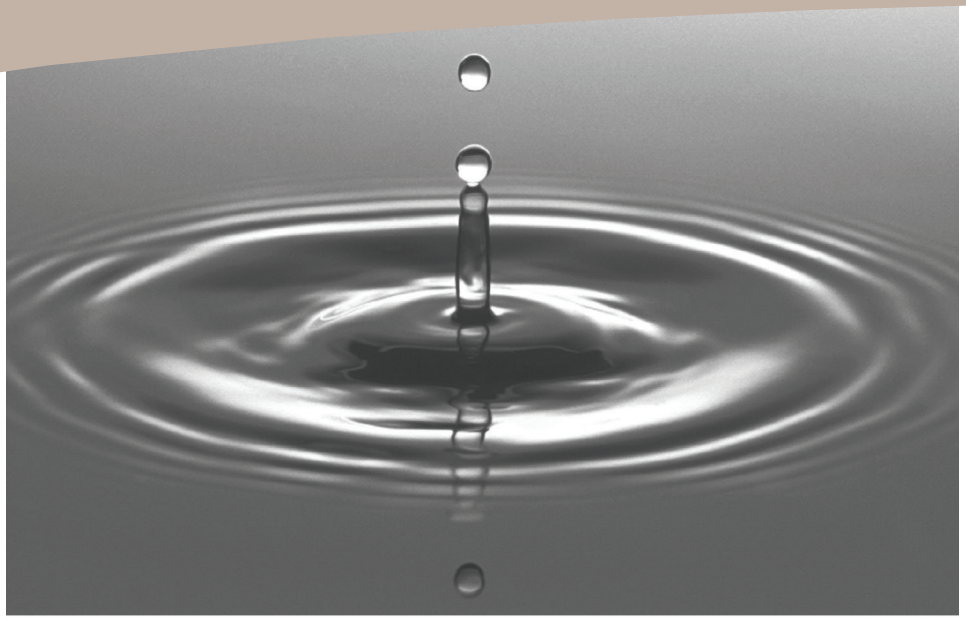
Nitrate



What is Nitrate?

Nitrate is a naturally occurring substance that 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 (NO3), nitrate-nitrogen (NO3-N), nitrite (NO2) and nitrate plus nitrite (NO3 + NO2). 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 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 and therefore it converts to nitrites. It is the nitrites in the system that 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. (Adults can consume large quantities of nitrates in drinking water or food with no known ill effects; their stomachs produce the strong acids that do not promote the growth of bacteria that convert nitrate to nitrite.) 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.

Nitrates Water Quality

The Ontario Drinking Water Standards Act has set a safe level, or Maximum Acceptable Concentration (MAC), for nitrates in drinking water as10mg/l. MACs are standards that provide a minimal level of risk to health from consuming a contaminant over the course of a lifetime. The following table provides a guide for the MACs of the various forms of nitrates.

Name	Symbol	MAC
Nitrate	NO3-N	10 mg/l
Nitrite	NO2	1 mg/l
Nitrate + Nitrite	NO3+NO2	10 mg/l

If your water exceeds the MAC 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	Guideline
0-9	Safe for adults and children.
10-20	Generally safe for adults. Do not use for infants under 6 months of age and pregnant women.
21-40	Short-term use for adults acceptable; long-term use is risky. Do not use for infants or pregnant women.
Over 40	Hazardous to humans and should not be used.

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 pretreatment of the water to be effective. Contact your local Health Unit, or water treatment dealer (look under water treatment in your yellow pages) for more information on these devices. Boiling the water will not reduce the nitrate concentration; in fact, it actually INCREASES the concentration by evaporating off the water.

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. 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 wellhead or well house, such as mixing or storing chemicals, where spillage could cause contamination.

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