

Nitrates/Nitrites

Health Effects

There are two health concerns when drinking water with high levels of nitrates or nitrites. The first health concern is with young infants being put at risk of "blue baby syndrome" (also called *methemoglobinemia*). Infant poisonings can occur when infants drink formula made with nitrate or nitrite contaminated tap water. The infant's blood is less able to carry oxygen. Affected infants develop a blue-grey color and need emergency medical help immediately.

The second health concern with nitrates/nitrites is the formation of chemicals called nitrosamines in the digestive tract. Nitrosamines are being studied for long term links to cancer. No standards have been set for this situation.

Ordinarily, exposure to nitrates is from food we eat. Many vegetables and cured meats contain nitrates and to a lesser extent nitrites. For infants, however, the water used to mix formula may put them at high risk of nitrate poisoning. Therefore, well water needs to be tested for nitrate/nitrite content before using it to prepare formula.

There is no danger of methemoglobinemia to adults or older children or to breastfed young infants. Research continues on the effects of nitrates/nitrites during pregnancy. The safest choice for pregnant women is to only drink water that has been tested for nitrates/nitrites and does not have high levels. Nitrates and nitrites in water are not a health concern when showering or bathing.

The U.S. Environmental Protection Agency (EPA) sets Maximum Contaminant Levels (MCLs) for nitrogen in public drinking water systems. Vermont has adopted these standards. The MCL for nitrates is 10 milligrams per liter (NO_3^- -N mg/l). The MCL for nitrites is 1 milligrams per liter (NO_2^- -N mg/l).

Sources

Nitrogen can take different forms in nature and is important for life in both plants and animals. In well water, the most common form of nitrogen is nitrate. Wells with high levels of nitrates are more likely to be private wells or shallow wells that are being affected by human activities. If human or animal waste contaminates a well, nitrites will be detected first but will quickly convert to nitrates. Therefore, it is nitrates for which most drinking water tests are done.



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Possible sources of nitrates are:

- Nitrogen based fertilizers
- Septic systems or leaking sewage lines
- Manure Storage Areas
- Fertilizer or manure applied to agricultural fields
- Compost piles

A well with a nitrate level equal to or greater than 10 mg/l should not be used for drinking or food preparation water. When the level of nitrate exceeds 5 mg/l, try to identify the source of nitrate and make a plan to reduce or remove it if possible. Use an alternative known safe source of water or bottled water until nitrate levels can be reduced to an acceptable level. Treatment of the water source may be needed if efforts to remove/reduce the source of the nitrates are not successful in lowering levels. **Boiling water will not reduce nitrate levels.**

Other alternatives are to locate a new well and discontinue use of the contaminated one, to blend the water from the two wells to reduce the nitrates down to an acceptable level, or to obtain all drinking and cooking water elsewhere and use the high nitrate water for other household purposes. The location of the new well should be investigated thoroughly by a qualified professional, such as an engineer or hydrogeologist, because it is possible that nitrates have entered the groundwater aquifer under a wide area.

Treatment

Treatment methods such as anion exchange and reverse osmosis can remove nitrates from drinking water. Anion exchange is a water treatment technology which uses equipment and technology similar to a water softener. It treats all the water for the home. The nitrates are removed from the water as they are exchanged for (harmless) chlorides. The chlorides are supplied from a salt tank which must be re-filled on a schedule.

Reverse osmosis uses a membrane through which water (but not nitrates) can travel. The system is typically installed beneath the kitchen sink with a small tank holding the nitrate-free water. Water used for drinking and food preparation comes from this tank under the sink. If the well water is hard or contains too much iron, a softener or iron removal system must be installed before using the reverse osmosis system.

Consult a water treatment specialist (yellow pages). After installation of either treatment, it is strongly recommended that proper maintenance and periodic re-testing of nitrates be planned to ensure that the system is working effectively.

Caution: Nitrate treatments are not effective against bacterial contamination. If nitrate levels are thought to be linked to manure or household wastewater, test the drinking water also for bacterial contamination.

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