Nitrates in Drinking Water
What You Should Know*

* Adapted from the Central Coast Regional Water Quality Control Board's "Irrigated Lands Regulatory Program: Resources for Growers Regarding Nitrate in Drinking Water" (October 29, 2013)

What is Nitrate (NO3)?

Nitrate is a common contaminant found in groundwater that can have serious health effects if consumed at high levels. Nitrate is colorless and odorless. Small amounts of nitrate are normal, but excess amounts can pollute supplies of groundwater. In pristine areas, shallow groundwater that is unaffected by human activities commonly contains less than 2 milligrams per liter (mg/L) of nitrate.
Common sources of nitrate are fertilizers, livestock waste and septic systems. Excess nitrate in the soil is most often found in rural and agricultural areas. Nitrate travels easily through the soil carried by rain or irrigation water into groundwater supplies.
Wells in agricultural areas that are shallow, placed in sandy soil, or wells that are improperly constructed or maintained are more vulnerable to nitrate contamination. Some agricultural areas of the Central Coast region have high concentrations of nitrate in groundwater and drinking water wells may be affected.

What are the Health Effects from Drinking Water Containing Nitrate?

Nitrate in drinking water poses an acute health concern at certain levels of exposure. Unlike most drinking water Maximum Contaminant Levels (MCL), the nitrate MCL is based upon an observed human effect in highly sensitive persons.
There is no safety factor incorporated into the standard. Infants six months of age and younger, and pregnant and nursing women should avoid consumption of water high in nitrate.
Potential serious health effects associated with consuming water containing nitrate above the MCL include:

- Infants below the age of six months who drink water containing nitrate in excess of the MCL may quickly become seriously ill and, if untreated, may die because high nitrate levels can interfere with the capacity of the infant's blood to carry oxygen, causing condition called Methemoglobinemia ("blue baby syndrome"). This is an acute disease and the symptoms can develop rapidly in infants. In most cases, health deteriorates over a period of days. Symptoms include shortness of breath and blueness of the skin, especially around the eyes and mouth.

- High nitrate levels may also affect the oxygen-carrying ability of the blood of pregnant women.

The good news is that doctors can treat Methemoglobinemia and babies can make a full recovery. In addition, health risks are reduced for children older than six months of age and adults. For more information on the risks of nitrate consumption, consult your doctor.

What Type of Drinking Water Treatment is Available?

Nitrate is easily dissolved in water and there is no simple way to remove all nitrate from water. Although it is common to think of boiling, softening, or filtration as a means of purifying water, none of these methods reduce nitrate contamination. Boiling the water before drinking it does not remove nitrate. In fact, it causes some of the water to evaporate, which increases the nitrate concentration. Softening and filtration do nothing at all to remove nitrate. Some available solutions are presented below. It is up to the individual well owner to evaluate the specific situation that affects his or her well and determine the appropriate solution.

Immediate Solution - If the level of nitrate in your water is high, an immediate solution is to use an alternative source of water for drinking, cooking, and mixing baby formula (such as bottled water). DO NOT BOIL the water that is high in nitrate – it makes the problem worse.

Long-term Solution - For a long-term solution, you can treat the water to remove the nitrate. Treatment technologies that remove nitrate include reverse osmosis, ion exchange, and distillation. Each type of system has advantages and disadvantages, and no single system will correct all water quality problems. Water treatment system vendors are listed in the yellow pages or on the Internet by searching "Water Filtration & Purification Equipment." Treatment systems are also available at some department stores for the do-it-yourself installers.

When you purchase a system, be clear about the type of system that you need, and ask for a guarantee that the system will remove nitrate contamination. It is important to properly operate and maintain your treatment system to ensure it is effective. Also, some systems require proper disposal of waste so that it does not re-contaminate the groundwater supply. Even if treatment is installed, it is the well owner's responsibility to perform a periodic maintenance for the treatment system and ensure its proper function. Therefore, it is suggested to test your well water periodically.

Are Other Options Available for Domestic Well Owners?

Many options are available to help reduce the vulnerability of your domestic well to pollution, including the following:

- Evaluate the well location. Are livestock or animal enclosures located within 100 feet of the well? If so, relocate these enclosures at least 100 feet away from the well.

- Is stockpiled manure stored within 100 feet of the well? If so, relocate the stockpiles at least 100 feet away from the well.
- Is the septic system located less than 100 feet from the well? If possible, consider relocating the septic system.
- Is the well located in an area of heavy agricultural or fertilizer use? Consider the restricting or controlling the use of fertilizers near the well. Also, make sure irrigation water does not flow towards or accumulate near the well.
- If nitrate exceeds the MCL, test for nitrate through a state certified lab quarterly to determine if any preventative measures have any effect on the nitrate contamination levels.
- Nitrate may be confined in shallow fractures or aquifers. In some situations, it may be possible to reconstruct an existing well to extend the casing and annular seal to a depth sufficient to avoid drawing water from the zones contaminated with nitrate. This can be a very expensive process, which still has a possibility of not correcting the problem.
- Another option may be to drill a new well in a more suitable location, and destroy the contaminated well.
- Consider drinking and cooking with bottled water if the nitrate contamination levels cannot be reduced.
- For more information about domestic wells and addressing water quality problems, including a "Guide for Domestic Well Owners", please go to the Water Board's website at: http://www.waterboards.ca.gov/gama/wq_privatewells.shtml

Where Can I Get Assistance?

For specific questions regarding the safety of your domestic well and more information concerning human health risks associated with drinking water containing elevated levels of nitrate, please contact CDPH or your local County Environmental Health Office using the contacts provided below. In addition, if you have concerns regarding your health or for information on the risks of nitrate consumption, you should consult your doctor.

Local Public and Environmental Health Contacts

- Monterey County Environmental Health
  Phone: 831-755-4500
  Website: http://montereycountyhealth.org/
- California Department of Public Health (CDPH) Drinking Water Program
  Phone: 916-449-5600
  Website: www.cdph.ca.gov

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