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HEALTH SERVICES

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NITRATE FACT SHEET

What Are Nitrates?

Nitrate is a chemical that dissolves in water in a similar manner as table salt. It is colorless, odorless and tasteless when dissolved in water.

Where Do Nitrates Come From?

There are numerous sources for nitrates that are found in groundwater. The largest sources are: septic tank wastewater, fertilizers (organic and chemical), decomposition of organic matter, and atmospheric nitrogen that is transformed to nitrate by soil bacteria.

How Do Nitrates Get Into Groundwater?

Nitrates only move through soil when dissolved in water. Rain, irrigation and septic tank liquid waste are all transportation materials to push nitrates downward toward groundwater.

Can Nitrates Be Removed From The Soil Before Reaching the Groundwater?

Nitrates are partially removed from soil in two ways. If the nitrates are located within the root zone of growing plants, some removal can be accomplished by the plant. As the dissolved nitrates move through unsaturated soil, they are partially removed by attraction to soil particles.

Can Nitrates Be Removed Once They Are In The Groundwater?

In flat valley regions, the nitrates could be flushed out by natural groundwater movement. This movement is so slow, however, that this would probably take decades and the assumption is made that the nitrates are not readily removed.

What Are The Health Effects On Humans?

The Environmental Protection Agency has set a drinking water limit at 45 parts per million (ppm). The law says that no public water supply can exceed this limit. Drinking water that exceeds 45 ppm is considered to pose a health risk to infants under 6 months of age. Infants risk contracting a condition called methemoglobinemia. This is also called "blue baby syndrome" and is similar to carbon monoxide poisoning (see "Nitrate Toxicity").

Are Older Children And Adults At Risk For Health Problems From Drinking High Nitrate Water?

No, but we would recommend that oral intake of nitrates be minimized.

At What Depths Are Nitrates Found In Groundwater?

Nitrate concentrations are generally highest in shallow groundwater. The concentrations decrease at deeper levels and generally disappear to trace amounts below a clay layer.

Does This Mean That Wells Below A Clay Layer Won't Have Nitrate Problems?

This can't be predicted since the integrity of the clay layer cannot be verified and well casings deteriorate over time. Groundwater studies indicate that nitrates tend to migrate from water of high concentrations to those of lower concentrations.

Can Nitrates Be Removed From A Drinking Supply?

There are several methods of removal. They are quite high-tech and costly. Their application is quite limited because of the cost factor. Drilling a deeper well may succeed in obtaining water that has acceptable nitrate levels.

How Can Individuals On A Private Well Test Their Nitrate Level?

The Environmental Health Division recommends that private wells be tested for nitrates. The Division can supply information regarding laboratories that will perform a nitrate test.

NITRATE TOXICITY

Due to the relationship of high nitrates in drinking water to infant methemoglobinemia, a recommended limit of 45 ppm as nitrate (10 ppm as nitrogen) was included in the 1962 United States Drinking Water Standards. This same limit has been included by the State of California in domestic water quality regulations.

Although nitrates have been shown to be toxic to both humans and animals, they are generally limited to children less than six months old and effects can range from mild illness to death. There have been cases of nitrate poisoning in adults but they are rare.

The following information on nitrates toxicity was extracted from the EPA's 1976 report entitled "Quality Criteria for Water".

In quantities normally found in food or feed, nitrates become toxic only under conditions in which they are, or may be, reduced to nitrites. Otherwise, at "reasonable" concentrations, nitrates are rapidly excreted in the urine. High intake of nitrates constitutes a hazard primarily to warm-blooded animals under conditions that are favorable to their reduction to nitrite. Under certain circumstances, nitrites can be reduced in the gastrointestinal tract to nitrate, which then reaches the bloodstream and reacts directly with hemoglobin to produce methemoglobin, with consequent impairment of oxygen transport.

The reaction of nitrite with hemoglobin can be hazardous in infants under three months of age. Serious and occasionally fatal poisonings in infants have occurred following ingestion of untreated well waters known to contain nitrate at concentrations greater than 45 ppm. High nitrate concentrations frequently are found in shallow farm and rural community wells, often as the result of inadequate protection from barnyard drainage or from septic tanks. Approximately 2,000 cases of infant methemoglobinemia have been reported in Europe and North America since 1945; 7 to 8 percent of the affected infants died. Many infants have consumed water in which the nitrate content was greater than 45 ppm without developing methemoglobinemia. Many public water supplies in the United States contain levels that routinely are in excess of this amount, but only one case of infant methemoglobinemia associated with a public water supply has been reported in the United States. The differences in susceptibility to methemoglobinemia are not yet understood, but appear to be related to a combination of factors including nitrate concentrations, enteric bacteria, and the lower acidity characteristic of the digestive systems of baby mammals. Methemoglobinemia symptoms and other toxic effects were observed when high nitrate well water containing pathogenic bacteria were fed to laboratory mammals. Conventional water treatment has no significant effect on nitrate removal from water.

Because of the potential risk of methemoglobinemia to bottle-fed infants, and in view of the absence of substantiated physiological effects at nitrate concentrations below 45 ppm, this level is the criterion for domestic water supplies.