



## Nitrate — A drinking water concern

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Groundwater is the source of drinking water for nearly half the population of the United States. The purity of this water has become a health concern because a number of potentially toxic substances have been discovered in groundwater serving communities throughout the nation. Many of these compounds are naturally occurring substances that have always been present in the environment. One of the most common examples is nitrate.

Although nitrate occurs naturally in drinking water, elevated levels in groundwater usually result from human activities such as overuse of chemical fertilizers and improper disposal of human and animal wastes. These fertilizers and wastes are sources of nitrogen-containing compounds which are converted to nitrates in the soil. Nitrates are extremely soluble in water and can move easily through soil into the drinking water supply.

High levels can build up over time as nitrate accumulates in the water, but even at elevated levels, they are not likely to be a health hazard for most adults. However, the ingestion of excessive amounts of nitrate can cause adverse health effects in very young infants and susceptible adults. Consequently, the federal government has established a maximum acceptable level, known as the Maximum Contaminant Level (MCL), for nitrate in public drinking water supplies. This level is 10 milligrams per liter (mg/l)- often expressed as 10 parts per million (ppm)- measured on the basis of the nitrogen content of nitrate. It is often written as "nitrate-nitrogen" or " $\text{NO}_3\text{-N}$ ." (This MCL is the equivalent of 45 mg/l when expressed as nitrate, rather than nitrate-nitrogen.)

### Nitrate in the Environment

The most common sources of nitrate are municipal and industrial wastewaters, refuse dumps, animal feed lots, and septic systems. Other sources are runoff or leachate from manured or fertilized agricultural lands and urban drainage. In addition, nitrogen compounds are emitted into the air by power plants and automobiles and are carried from the atmosphere to the earth with rainfall.

Once nitrate is formed, its movement in soil and potential for contamination of ground water depend on several factors including the soil characteristics, location and characteristics of the underground water formations (aquifers), and climatic conditions. Potential for nitrate contamination of drinking water also depends on the depth and construction of wells. Identifying the source of nitrates for an individual well is often very difficult. Because nitrates move with the flow of groundwater, the source may be located a considerable distance from the well. In many cases, the time needed for nitrate to pass through the soil into groundwater is difficult to predict due to many variables including application rate, the soil type, and the depth to the water table.

## Human Exposure

Human exposure to nitrates occurs primarily through the diet because nitrate is a natural substance found in both water and plants. In the United States, the average dietary intake of nitrate is about 75 to 100 mg. per day. About 80 to 90 percent of this amount comes from vegetables. Some common vegetables with high nitrate content are beets, celery, lettuce, and spinach. People following a vegetarian diet may have nitrate intakes of up to 250 mg per day.

Drinking water generally accounts for 5 to 10 percent of nitrates consumed. However, where drinking water is contaminated to a level of 50 mg/l (5 times the MCL), it may supply as much as half of the total daily intake.



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