



NITRATE AND NITRITE

What are NITRATE and NITRITE?

Nitrate and Nitrite are naturally occurring, inorganic ions present in our environment. The decomposition of organic materials in soils releases ammonia. This ammonia oxidizes to form nitrate and nitrite. Though both compounds can be found in groundwater and soils, nitrate is more common.

Where are nitrate and nitrite found and how are they used?

Nitrate and nitrite are found in many places in the environment. They are introduced through the application of fertilizer containing nitrogen compounds; through decomposing animal wastes; and through septic systems and sewage treatment facilities. Nitrate is found naturally in a variety of vegetables, including broccoli, cauliflower, collard greens and root vegetables. The human body can convert nitrate into nitrite.

How can people be exposed to nitrate and nitrite?

You could be exposed to nitrate and/or nitrite through:

Drinking water containing nitrates. Wells with high levels of nitrates can contribute to significant exposure. This is of particular concern for households with infants consuming formula prepared with this water.

Eating foods containing nitrates or nitrites as preservatives, such as processed meats.

How can nitrate and nitrite affect my health?

Nitrates can change normal hemoglobin (the chemical in the blood responsible for oxygen transport) to methemoglobin. Normally, methemoglobin levels are less than 2.5% of the body's total hemoglobin. Nitrates act to increase the methemoglobin, which reduces the ability of the blood to transport oxygen to cells. This oxygen starvation can lead to a bluish tint of the lips, ears and nose in slight cases (known as blue-baby syndrome in infants). In severe cases, it can lead to respiratory and heart problems, and death.

Infants are especially susceptible to the effects of nitrates in drinking water because of their high stomach pH, which increases the conversion of nitrate to nitrite. This is doubly important if the drinking water is used to prepare their formula. Pregnant women are also at more risk from nitrate exposure as their methemoglobin levels are typically as high as 10% during pregnancy. This normal increase in methemoglobin means that they can tolerate less of an exposure to nitrate than when not pregnant.

Most nitrate and nitrite inhaled or ingested is excreted rapidly in the urine. While cases of cancer related to nitrate and nitrite exposure exist, they are isolated. The carcinogenic properties of these compounds are still under review.

How are nitrate and nitrite poisoning treated?

Most healthy people over six months of age have internal mechanisms efficient at removing nitrate from the body. Therefore, treatment of exposure to nitrates and nitrites is typically not required for mild and moderate cases. Hospitals treat extreme cases of exposure by applying 100% oxygen and methylene blue. The most important step in treating persons with nitrate poisoning is to determine and remove the source of the nitrate.



What should I do if exposed to nitrates or nitrites?

The majority of people exposed to nitrates will see little or no effect of exposure. The human body is exposed to nitrates and nitrite every day from a wide variety of sources, including production by our own systems. Children over six months of age, older children and adults have sufficient internal mechanisms to remove nitrate and nitrite from the body. Additionally, most healthy people can counteract the typical negative effects of nitrate and nitrite exposure before any negative health effects are observed. Persons suffering acute symptoms, such as labored breathing or bluish discoloration of the lips, should seek medical assistance.

What factors limit use or exposure to nitrates or nitrites?

The most important step in limiting exposure to these compounds is knowing the quality of your water. If you are served by a municipal water system, you probably get this information in the mail. If you get your water from a private well, you can request information on testing from the Division of Public Health's Office of Drinking Water at 302-741-8630.

Is there a medical test to show whether I was exposed to nitrates or nitrites?

Nitrate levels can be detected through urine and blood tests. After professionals determine that a toxic exposure occurred due to nitrate, the source can be removed.

Technical Information for Nitrate - Nitrite

CAS Number: Nitrate - 14797-55-8
Nitrite - 14797-65-0

Chemical Formula: Nitrate - NO_3
Nitrite - NO_2

Carcinogenicity (EPA): Not classifiable as to human carcinogenicity.

MCL (Drinking Water): Nitrate – 10 mg/L (measured as Nitrogen)
Nitrite – 1 mg/L (measured as Nitrogen)

OSHA Standards: Not Available

NIOSH Standards: Not Available

References and Sources

Cornell Cooperative Extension, Pesticide Safety Education Program, Nitrate: Health Effects in Drinking Water, <http://psep.cce.cornell.edu/facts-slides-self/facts/nit-heef-grw85aspx> - Accessed 12/10/09

ATSDR, Case Studies in Environmental Medicine: Nitrate/Nitrite Toxicity, <http://www.atsdr.cdc.gov/csem/nitrate/no3cover.html> - Accessed 12/10/09