



# NITRATE / NITRITE

## FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINANT

### GENERAL INFORMATION

#### Synonyms:

- Potassium Nitrate: Saltpeter

#### Chemical Description:

- Naturally occurring inorganic ions which make up part of the nitrogen cycle

#### Properties:

- Nitrate ion is the stable form of combined nitrogen in oxygenated water
- Nitrite, the reduced form of nitrate, is relatively unstable and reactive, and tends to be converted to nitrate
- Highly soluble in water
- Non-volatile

#### Production and Use:

- Nitrate is used primarily as an inorganic fertilizer

### ENVIRONMENTAL PROFILE

#### Occurrence:

- Nitrate occurs naturally in food (e.g. spinach, beets, etc.)
- Nitrate predominates in ground and surface waters
- Surface waters generally contain lower levels of nitrate and nitrite than ground waters
- EPA estimates that 1.2% of Community Water System (CWS) wells and 2.4% of rural domestic wells nationally contain concentrations that exceed EPA's Maximum Contaminant Level (MCL) for Total Nitrate/Nitrite (as N)

#### Releases:

- Enters water and soil through runoff from fields treated with nitrogen fertilizer, animal manure, septic tank wastes, and sewage sludge

#### Environmental Fate:

- Due to its high solubility and weak retention by soil, it is highly mobile in soil (moving at approximately the same rate as water through the soil), and has a high potential to migrate to ground water
- Because it does not volatilize, once it enters water, it is likely to remain there until used by plants or other organisms

### HEALTH EFFECTS

#### Humans:

- Toxicity of nitrate is due to its reduction to nitrite in the saliva of humans; by reacting with hemoglobin, nitrite forms methemoglobin, which will not transport oxygen to the tissues and thus can lead to asphyxia
- Infants 6 months old or less, particularly those who are bottle fed, are sensitive to nitrate, possibly because the decreased acidity in their stomachs enables bacteria capable of reducing nitrate to nitrite to proliferate

#### Experimental Animals:

- Effects of acute exposure to high levels of nitrate/nitrite: cardiovascular collapse and shock, and elevated methemoglobin levels
- Effects of chronic exposure to high levels of nitrate/nitrite: diuresis, increased starchy deposits, and hemorrhaging of the spleen
- Inconclusive studies on mutagenic and carcinogenic potential of nitrate/nitrite

### REGULATORY HISTORY

#### Existing Standards:

- **Clean Air Act (CAA):** Not regulated
- **Clean Water Act (CWA):**  
Criteria established
- **Resource Conservation and Recovery Act (RCRA):**  
Not regulated
- **Superfund (CERCLA):**  
• Not regulated  
• **SARA:** Title III, Section 313
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):**  
Not registered
- **Toxic Substances Control Act (TSCA):**  
Regulated

## HEALTH INFORMATION

### Maximum Contaminant Level Goals (MCLG):

- Non-enforceable levels based solely on an evaluation of possible health risks and exposure, and taking into consideration a margin for public safety
- Set at 10 mg/L (as N) to protect against methemoglobinemia

**MCLG for Nitrate (as N) = 10 mg/L**

**MCLG for Nitrite (as N) = 1 mg/L**

**MCLG for Nitrate + Nitrite (as N) = 10 mg/L**

**(all values effective July 1992)**

### Maximum Contaminant Levels (MCL):

- Legally enforceable levels for contaminants in public drinking water supplies
- Based on health risks associated with the contaminants, analytical methods for their assay, and water treatment feasibility and practicality aspects
- Exceedance of the MCL in drinking water may result in adverse effects which will depend upon the contaminant concentration in water, amount of water/contaminant ingested, length of exposure, and other biological parameters
- Current MCL for Nitrate (as N) = 10 mg/L

**MCL for Nitrate (as N) = 10 mg/L**

**MCL for Nitrite (as N) = 1 mg/L**

**MCL for Nitrate + Nitrite (as N) = 10 mg/L**

**(all values effective July 1992)**

### EPA Health Advisories (HA):

- **Short-term HAs:** Provide acceptable concentrations of contaminants in water for up to 10 day exposures, primarily to evaluate the public health risk resulting from an accidental spill or an emergency contamination situation
- **Longer-term HAs:** Provide guidance for persistent water contamination situations to cover a period of up to 7 years
- **Lifetime HAs:** Derived in the same way as an MCLG

#### Health Advisories:

**(HA levels currently under EPA review)**

## ANALYTICAL METHODS

### Nitrate:

- Manual Cadmium Reduction:  
EPA Method 353.3
- Automated Hydrazine Reduction:  
EPA Method 353.1

- Automated Cadmium Reduction  
EPA Method 353.2
- Ion Selective Electrode:  
WeWWG/5880
- Ion Chromatography:  
EPA Method 300.0

### Nitrite:

- Automated Cadmium Reduction:  
EPA Method 353.1
- Manual Cadmium Reduction:  
EPA Method 353.2
- Ion Chromatography:  
EPA Method 300.0
- Spectrophotometric:  
EPA Method 354.1

## TREATMENT OPTIONS

### Permanent Treatment:

- **Best Available Technology (BAT):**

#### Nitrate:

- Ion Exchange
- Reverse Osmosis
- Electrodialysis Reversal

#### Nitrite:

- Ion Exchange
- Reverse Osmosis

## SHORT-TERM HAZARD ELIMINATION

- If the drinking water standards are exceeded, install BAT or use an alternative drinking water supply such as bottled water

## ADDITIONAL HELP

- State or county health officials can indicate a certified laboratory for testing
- Experts in the state Department of Environmental Protection, Natural Resources, or Agriculture may also be of help
- The EPA has toll-free numbers for further information on drinking water quality, treatment technologies, for obtaining Health Advisories, and for other regulatory information
- EPA Hotlines are available Monday through Friday
  - **Safe Drinking Water:** 800-426-4791
  - **National Pesticides:** 800-858-7378
  - **Superfund/RCRA:** 800-424-9346
- For information on the Clean Water Act, call (202) 260-7301
- For information on the Toxic Substances Control Act, call (202) 554-1404
- For information on the Clean Air Act, call (919) 541-2777