Technical Factsheet on: VINYL CHLORIDE

List of Drinking Water Contaminants

This fact sheet is part of a collection of fact sheets for volatile organic chemicals with drinking water regulations.

Health Effects Summary

Acute: Occupational inhalation exposure to high levels (e.g., 40 - 900 ppm) may cause neurological effects such dizziness, headaches, or narcosis in workers.

EPA's short-term health advisory a 10-kg (22 lb.) child consuming 1 liter of water per day is 3 mg/L for one-day to ten-day exposures.

Chronic: Oral ingestion at high levels (0.1 mg/L) may cause liver effects from life-time exposure.

Cancer: Based on epidemiological and animal studies, vinyl chloride is carcinogenic in humans when inhaled, and it is considered to be a human carcinogen from oral exposure.

Drinking Water Standards

MCLG: zero mg/L

MCL: 0.002 mg/L

Usage Patterns

Production of vinyl chloride in 1993 was nearly 14 billion lbs.

Vinyl chloride is used in the manufacture of numerous products in building and construction, automotive industry, electrical wire insulation and cables, piping, industrial and household equipment, medical supplies, and is depended upon heavily by the rubber, paper, and glass industries.

Limited quantities of vinyl chloride were used in the United States as an aerosol propellant, a refrigerant, an extraction solvent and as an ingredient of drug and cosmetic products. Proportions consumed for various uses in 1989 were: polyvinyl chloride products, 91%; exports, 7%; other, including chlorinated solvents, 2%.

Release Patterns

Although vinyl chloride is produced in large quantities, almost all of it is used captively for the production of polyvinyl chloride (PVC) and other polymers. Therefore, its major release to the environment will be as emissions and wastewater at these production and manufacturing facilities. Vinyl chloride is also a product of anaerobic degradation of chlorination solvents such as would be expected to occur in groundwater and landfills.

Small quantities of vinyl chloride can be released to food by migration of vinyl chloride monomer present in polyvinyl chloride food wrappings and containers. Major human exposure will be from inhalation of occupational atmospheres and from ingestion of contaminated food and drinking water which has come

into contact with polyvinyl chloride packaging material or pipe which has not been treated adequately to remove residual monomer.

Environmental Fate

If vinyl chloride is released to soil, it will be subject to rapid volatilization with reported half-lives of 0.2 and 0.5 days for evaporation from soil at 1 and 10 cm incorporation, respectively, based on a high vapor pressure of 2,600 mm Hg at 25 degrees C. Based on a reported water solubility of 2,700 mg/L, a Koc of 56 was estimated. According to estimated Koc values, vinyl chloride will be expected to be highly mobile in soil and it may leach to the groundwater. It may be subject to biodegradation under anaerobic conditions such as exists in flooded soil and groundwater.

If released to water, vinyl chloride will rapidly evaporate. Using a reported Henry's Law constant of 0.0560 atm/cu m-mole, a half-life of 0.805 hr was calculated for evaporation from a model river 1 m deep with a current of 3 m/sec and with a wind velocity of 3 m/sec. In waters containing photosensitizers such as humic acid, photodegradation will occur fairly rapidly. Limited existing data indicate that vinyl chloride is resistant to biodegradation in aerobic systems and therefore, it may not be subject to biodegradation in aerobic soils and natural waters. It will not be expected to hydrolyze in soils or natural waters under normal environmental conditions.

If vinyl chloride is released to the atmosphere, it can be expected to exist mainly in the vapor-phase in the ambient atmosphere and to degrade rapidly in air by gas-phase reaction with photochemically produced hydroxyl radicals with an estimated half-life of 1.5 days.

Some data indicate that vinyl chloride is too readily volatilized to undergo bioaccumulation, except perhaps in the most extreme exposure conditions. Based on a reported water solubility of 2,700 mg/l, a BCF of 7 was estimated, indicating that vinyl chloride will not be expected to significantly bioconcentrate in aquatic organisms.

Chemical/Physical Properties

CAS Number: 75-01-4

Color/ Form/Odor: Colorless gas, sweet odor

M.P.: -13.37 C B.P.: -153.2 C

Vapor Pressure: 2600 mm Hg at 25 C

Density/Spec. Grav.: 0.91 at 20 C

Octanol/Water Partition (Kow): Log Kow = 0.6 (calculated)

Solubility: 2.7 g/L of water; Slightly soluble in water

Soil sorption coefficient: Koc estimated at 56; highly mobile in soil

Odor/Taste Thresholds: N/A

Bioconcentration Factor: Estimated BCF = 7; not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: 0.0560 atm-cu m/mole;

Trade Names/Synonyms: Chlorethene; Chlorethylene; monochloroethene; Monovinyl chloride (MVC); Trovidur

Other Regulatory Information

Monitoring:

- For Ground/Surface Water Sources:
  - Initial Frequency- 4 quarterly samples every 3 years
  - Repeat Frequency- Annually after 1 year of no detection
- Triggers - Return to Initial Freq. if detect at > 0.0005 mg/L

Analysis

Reference Source	**Method Numbers**
EPA 600/4-88-039	502.2; 524.2

Treatment/Best Available Technologies: Granular Activated Charcoal and Packed Tower Aeration

For Additional Information

EPA can provide further regulatory or other general information:

EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:

- Toxic Substance Control Act Information Line - 202/554-1404
- Toxics Release Inventory, National Library of Medicine - 301/496-6531
- Agency for Toxic Substances and Disease Registry - 404/639-6000