The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

Sources of Exposure

General Populations

- Exposure may occur by inhaling contaminated air or smoke from small cigars or cigarettes.
- Minute amounts, considered safe, may be found in food items stored in materials containing PVC (polyvinyl chloride).
- Exposure via the drinking water is essentially zero.
- Individuals living near hazardous waste sites and landfills may be exposed to higher amounts in air and drinking water.

Occupational Populations

- Occupational exposure occurs in individuals working in facilities where vinyl chloride is produced or used.
- The main use of vinyl chloride is in the manufacture of PVC, a polymer used to make a variety of plastic products including pipes, wire and cable coatings, and packaging materials.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Inhalation absorption of vinyl chloride in humans is rapid. Volunteers exposed to low concentrations retained about 42% of the inhaled amount.
- There are no data regarding oral or dermal absorption in humans.
- There are no data regarding distribution of vinyl chloride in humans.
- In animals, vinyl chloride metabolites were found in the liver, kidney, spleen, and brain.
- Vinyl chloride metabolism in humans is attributed to the P-450 monooxygenases in the liver. Metabolism of vinyl chloride is saturable.
- Intermediates are detoxified primarily via glutathione conjugation and excreted in the urine as cysteine derivatives.
- Excretion of metabolites occurs mainly in the urine at low exposures. At high doses, where metabolic saturation occurs, vinyl chloride is exhaled as the parent compound.
- Vinyl chloride does not accumulate in the body.

Normal Human Levels

- No data available.

Biomarkers/Environmental Levels

Biomarkers

- Vinyl chloride in exhaled air can be used as biomarker of recent exposure, but is of limited utility for low-level exposures.
- Urinary levels of thiodiglycolic acid, a major metabolite of vinyl chloride, have been used to monitor occupational exposure to vinyl chloride, but it is not specific for exposure to vinyl chloride.

Environmental Levels

Air

- Mean <1 ppb in urban air, data from 1999. <1–34 ppb near manufacturing facilities. Up to 400 ppb near hazardous waste sites

Sediment and Soil

- No data are available for levels of vinyl chloride in soil.

Water

- <10 ppb in less than 1% of groundwater supplies tested in the U.S. in 1982.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Vinyl Chloride $CH_2=CH-Cl$

CAS# 75-01-4

July 2006

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
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ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Vinyl Chloride is a gas

- Vinyl chloride is a manufactured substance, but it can be formed in the environment when other chlorinated substances are degraded by microorganisms.
- It is a gas at room temperature with a mild sweet odor.
- It can exist as liquid under pressure or at low temperatures.
- Burns easily and is unstable at high temperatures.
- Vinyl chloride is only slightly soluble in water, but it is soluble in most common organic solvents.

Routes of Exposure

- Inhalation – The primary route of exposure for the general population and workers.
- Oral – Small, still safe, amounts of vinyl chloride may be found in foods stored in materials containing PVC. No significant vinyl chloride exposure is expected from ingestion of drinking water.
- Dermal – Absorption of vinyl chloride gas through the skin is negligible.

Vinyl Chloride in the Environment

- Vinyl chloride can be released into the environment (mainly the air) during its production or use.
- In the air, it is degraded by reaction with photochemically-generated hydroxyl radicals; its half-life is about 18 hours.
- Liquid vinyl chloride evaporates easily.
- Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
- Vinyl chloride can migrate to groundwater. In anaerobic groundwater, degradation occurs slowly.
- Vinyl chloride is also mobile in soil and susceptible to leaching.
- Vinyl chloride does not accumulate in plants or in animals.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- An MRL of 0.5 ppm has been derived for acute-duration inhalation exposure (≤14 days).
- An MRL of 0.03 ppm has been derived for intermediate-duration exposure (15–364 days).
- A chronic-duration inhalation MRL was not derived for vinyl chloride.

Oral

- No acute- or intermediate-duration oral MRLs were derived for vinyl chloride.
- An MRL of 0.003 mg/kg/day has been derived for chronic-duration exposure (≥1 year).

Health Effects

- Acute high-level exposure to vinyl chloride can produce headache, dizziness, drowsiness, and loss of consciousness. Extremely high-levels can be lethal.
- Exposure of workers to high levels of vinyl chloride has resulted in altered blood flow in the hands.
- Long-term exposure of workers has resulted in alterations in the liver ranging from hypertrophy and hyperplasia to hepatocellular degeneration.
- Studies of workers who breathed vinyl chloride over many years have shown an increased incidence of liver cancer, but other cancers have also been associated with occupational exposure to vinyl chloride.
- The EPA considers vinyl chloride to be a known human carcinogen. NTP has determined that vinyl chloride is a known carcinogen.

Children's Health

- The main source of exposure to vinyl chloride for children is inhalation of contaminated air, the same as in adults.
- Children may be exposed to insignificant levels of vinyl chloride in PVC-based toys.
- Vinyl chloride has not been detected in breast milk.
- Animal studies suggest that infants and young children might be more susceptible than adults to vinyl-chloride induced cancer.