Sources of Exposure

General Populations

- A few consumer products contain 1,2-dichloropropane, including household stain removers and waxes and sealants for natural stone and other surfaces.
- The use of 1,2-dichloropropane in consumer products has been diminished, minimizing the potential for exposure to the general population.
- The general public may be exposed to low levels of 1,2-dichloropropane through inhalation of ambient air, ingestion or use (e.g., showering, bathing)of contaminated water, or dermal contact.

Occupational Populations

- Occupational exposure to 1,2-dichloropropane is primarily via inhalation and dermal contact; however, it is primarily used in closed systems, which limits exposure potential.
- Exposure may result during its production, use in chemical reactions, use as an industrial solvent, and disposal of processing wastes containing the chemical.
- The elimination of 1,2-dichloropropane from agricultural fumigants, photographic film manufacture, and paint strippers has minimized the number of workers with potential exposure.
- Workers involved in cleaning up hazardous waste or spill sites that contain 1,2-dichloropropane may potentially be exposed.

Toxicokinetics and Biomonitoring

Toxicokinetics

- 1,2-Dichloropropane is rapidly and extensively absorbed following inhalation and oral exposure. The rate and extent of dermal absorption is unknown.
- Absorbed 1,2-dichloropropane is widely distributed; highest levels were found in the liver, kidney, and blood; high levels were also observed in the lung following inhalation exposure.
- The predominant pathway for 1,2-dichloropropane metabolism consists of oxidation of the parent compound followed by glutathione conjugation resulting in formation of mercapturic acids. It may also conjugate with lactate, forming carbon dioxide and acetyl Co-A.
- The primary routes of excretion following oral, inhalation, or intraperitoneal exposure are urine and expired air, with small amounts excreted in feces following oral exposure.

NHANES Biomonitoring

- In the 2011–2012 National Health and Nutrition Examination Survey (NHANES), 1,2-dichloropropane blood levels were below the limit of detection.

Biomarkers/Environmental Levels

Biomarkers

- 1,2-Dichloropropane measured in the blood or urine has been proposed as a reliable biomarker of exposure.
- Detection of metabolites in the urine or serum could also be considered as a biomarker of exposure (such as glutathione conjugated metabolites).

Environmental Levels

Air

- The mean level of 1,2-dichloropropane measured at 128 locations across the United States (2019) was 0.0025 ppb with a median of 0.119 ppb.

Water

- In nationwide surveys of water samples, the mean concentrations of 1,2-dichloropropane detected in groundwater and surface water were 12.6 and 0.6 µg/L, respectively, with median values of 1 and 0.5 µg/L, respectively.

Sediment and Soil

- There are no recent nationwide monitoring data for levels of 1,2-dichloropropane in the sediment or soil. Site-specific sediment levels range from undetected to 1,700 ppm.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2021. Toxicological Profile for 1,2-Dichloropropane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for 1,2-Dichloro-propane

$C_3H_6Cl_2$

CAS # 78-87-5

November 2021

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

1,2-Dichloropropane is a Liquid

- 1,2-Dichloropropane is a volatile organic compound (VOC). It is a colorless liquid with a chloroform-like odor.
- 1,2-Dichloropropane has relatively high water solubility.
- 1,2-Dichloropropane is used as a chemical intermediate, in the manufacture of chlorinated solvents, and as an industrial solvent for material such as plastics, fats, and oils, and as an intermediate in rubber processing.
- Before the early 1980s, 1,2-dichloropropane was used in farming as a soil fumigant.

Routes of Exposure

- Inhalation – Likely route of exposure for general and occupational populations
- Oral – Likely route of exposure for the general population through ingestion of contaminated water.
- Dermal – Possible route of exposure for general population through contact with consumer products containing the substance. Occupational populations may be exposed via dermal route.

1,2-Dichloropropane in the Environment

- There are no natural sources of 1,2-dichloropropane. Environmental levels are due to anthropogenic activity.
- Atmospheric 1,2-dichloropropane photodegrades relatively slowly (half-life >16 days); thus, longer-range transport is possible.
- 1,2-Dichloropropane has relatively high water solubility; therefore, washout by rain is an important process for removal from the atmosphere.
- 1,2-Dichloropropane volatilizes from surface waters. This is the dominant removal process from water since it is resistant to hydrolysis and does not biodegrade readily.
- 1,2-Dichloropropane does not adsorb appreciably to soil, sediment, or suspended solids in water; therefore, migration to groundwater is possible. 1,2-Dichloropropane is unlikely to bioconcentrate in aquatic or terrestrial organisms.

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 acute-duration (≤14 days) inhalation MRL of 0.02 ppm was derived for 1,2-dichloropropane.
- An intermediate-duration (15–364 days) inhalation MRL of 0.002 ppm was derived for 1,2-dichloropropane.
- No chronic duration inhalation MRL was derived for 1,2-dichloropropane.

Oral

- An acute-duration (≤14 days) oral MRL of 0.3 mg/kg/day was derived for 1,2-dichloropropane.
- An intermediate-duration (15–364 days) oral MRL of 0.07 mg/kg/day was derived for 1,2-dichloropropane.
- No chronic-duration oral MRL was derived for 1,2-dichloropropane.

Health Effects

- Ingestion or inhalation of high levels of 1,2-dichlopropane in humans resulted in respiratory tract irritation, hemolytic anemia, disseminated intravascular coagulation, hepatic effects (impaired liver function, hepatic necrosis, liver failure), central nervous system (CNS) depression and coma.

Health Effects

- Inhalation and oral studies in animals show 1,2-dichlopropane leads to CNS depression, hemolytic anemia, and damage to the upper respiratory tract and liver.
- Developmental toxicity (delayed skeletal development, decreased neonatal weight and survival) was seen in animals at high oral doses. Maternal toxicity (decreased body weight, CNS depression) was observed at similar doses.
- Case reports and retrospective cohort studies indicate that high air levels of 1,2-dichloropropane may increase risk of developing cholangiocarcinoma, a rare bile duct cancer. It is unknown if cancer was due to 1,2-dichloropropane alone because there were concurrent chemical exposures.
- Inhalation exposure resulted in respiratory tract cancer in mice and rats and neoplastic lesions in the Harderian gland and spleen in mice. Oral exposure led to mammary and liver tumors in mice.
- The International Agency for Research on Cancer (IARC) has determined that 1,2-dichloropropane is carcinogenic to humans. The U.S. Environmental Protection Agency (EPA) has determined that 1,2-dichloropropane is likely carcinogenic to humans.

Children's Health

- It is not known if children are more sensitive to 1,2-dichloropropane exposure than adults.