

Propylene Dichloride (1,2-Dichloropropane)

78-87-5

Hazard Summary

Propylene dichloride is used as a chemical intermediate in several industries. Acute (short-term) inhalation exposure to high levels of propylene dichloride by humans results in effects on the lungs, gastrointestinal system, blood, liver, kidneys, central nervous system, and eyes. Limited information is available on the chronic (long-term), reproductive, developmental, and carcinogenic effects of propylene dichloride in humans. Animal studies have reported effects on the respiratory system and blood from chronic inhalation exposure. Animal studies have reported developmental effects from propylene dichloride exposure by gavage (experimentally placing the chemical in the stomach). Animal studies have reported an increased incidence of mammary gland tumors in female rats and liver tumors in male and female mice given propylene dichloride by gavage. EPA has provisionally classified propylene dichloride as a Group B2, probable human carcinogen.

Please Note: Propylene dichloride is also known as 1,2-dichloropropane. The main sources of information for this fact sheet are the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for 1,2-Dichloropropane (1) and EPA's Integrated Risk Information System (IRIS) (4), which contains information on inhalation chronic toxicity of propylene dichloride and the [RfC](#).

Uses

- Propylene dichloride is used as a chemical intermediate in the production of chlorinated organic chemicals, as an industrial solvent, in ion exchange manufacture, in toluene diisocyanate production, in photographic film manufacture, for paper coating, and for petroleum catalyst regeneration. (1)
- Propylene dichloride was used in the past as a soil fumigant for a variety of crops. This use has been discontinued, and pesticide formulations containing propylene dichloride are no longer available in the United States. (1)

Sources and Potential Exposure

- Propylene dichloride has been detected at low levels in ambient air, with an average level in air of about 0.022 parts per billion (ppb). (1)
- An early 1980s nationwide survey of water supplies derived from groundwater found that 13 of 945 water supplies contained propylene dichloride at levels around 1 ppb. (1)
- Occupational exposure to propylene dichloride may occur during its production, during its use in chemical reactions or as an industrial solvent, or from evaporation from wastewater that contains the chemical. (1)

Assessing Personal Exposure

- Medical tests can detect propylene dichloride in urine and blood. Propylene dichloride leaves the body quickly, and thus the tests should be done soon after the exposure. (1)

Health Hazard Information

Acute Effects:

- Acute exposure of humans to very high levels of propylene dichloride from inhalation and oral exposure results in effects on the gastrointestinal system, blood, liver, kidneys, and central nervous system. Additional effects noted in humans, from inhalation exposure only, are effects on the lung (chest discomfort, shortness of breath, and cough) and the eyes (conjunctival hemorrhages). (1)
- Animal studies have reported effects on the respiratory system, liver, kidneys, eyes, and central nervous system from acute inhalation exposure to propylene dichloride. (1)

Chronic Effects (Noncancer):

- No information is available on the effects from chronic exposure to propylene dichloride in humans from inhalation or oral exposure. (1)
- Subchronic animal studies, via inhalation exposure, have reported effects on the respiratory system and blood, while chronic oral animal studies have noted effects on the blood, liver, and central nervous system. (1,3)
- The Reference Concentration (RfC) for propylene dichloride is 0.004 milligrams per cubic meter (mg/m^3) based on hyperplasia of the nasal mucosa in rats. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (4)
- EPA has medium confidence in the RfC based on: high confidence in the study on which the RfC was based because it used an adequate number of animals, exposure concentrations, and controls, examined three species, focused on known target organs, and the incidence and severity of the nasal lesions were exposure-related, and medium confidence in the database because there are no chronic inhalation studies. (4)
- EPA has not established a Reference Dose (RfD) for propylene dichloride. (4)
- ATSDR has established an acute oral minimal risk level (MRL) of 0.1 milligrams per kilogram per day ($\text{mg}/\text{kg}/\text{d}$) based on neurological effects in rats; an intermediate oral MRL of 0.07 $\text{mg}/\text{kg}/\text{d}$ based on hematological effects in rats; and a chronic oral MRL of 0.09 $\text{mg}/\text{kg}/\text{d}$ based on liver effects in mice. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. (1)

Reproductive/Developmental Effects:

- A case was reported of a woman who was hospitalized with metrorrhagia (bleeding from the uterus between menstrual periods) after acute inhalation exposure to propylene dichloride. No other information is available on the reproductive or developmental effects of propylene dichloride in humans. (1)
- No reproductive effects were noted in several animal inhalation studies. (1)
- Developmental effects, such as an increased incidence of delayed ossification of the bones of the skull, and reproductive effects such as testicular degeneration and increased incidences of infection of the ovary, uterus, or other organs, have been observed in animals exposed to propylene dichloride by gavage (experimentally placing the chemical in the stomach). It is not known if the infections observed were related to propylene dichloride treatment since controls were also infected. (1)

Cancer Risk:

- No studies are available regarding carcinogenic effects in humans from inhalation or oral exposure to propylene dichloride. (1)
- An increased incidence of mammary gland tumors in female rats and liver tumors in male and female mice were reported in studies in which propylene dichloride was given by gavage. (1)

- EPA has provisionally classified propylene dichloride as a Group B2, probable human carcinogen, with an oral cancer slope factor of $6.8 \times 10^{-2} \text{ (mg/kg/d)}^{-1}$. (5)

Physical Properties

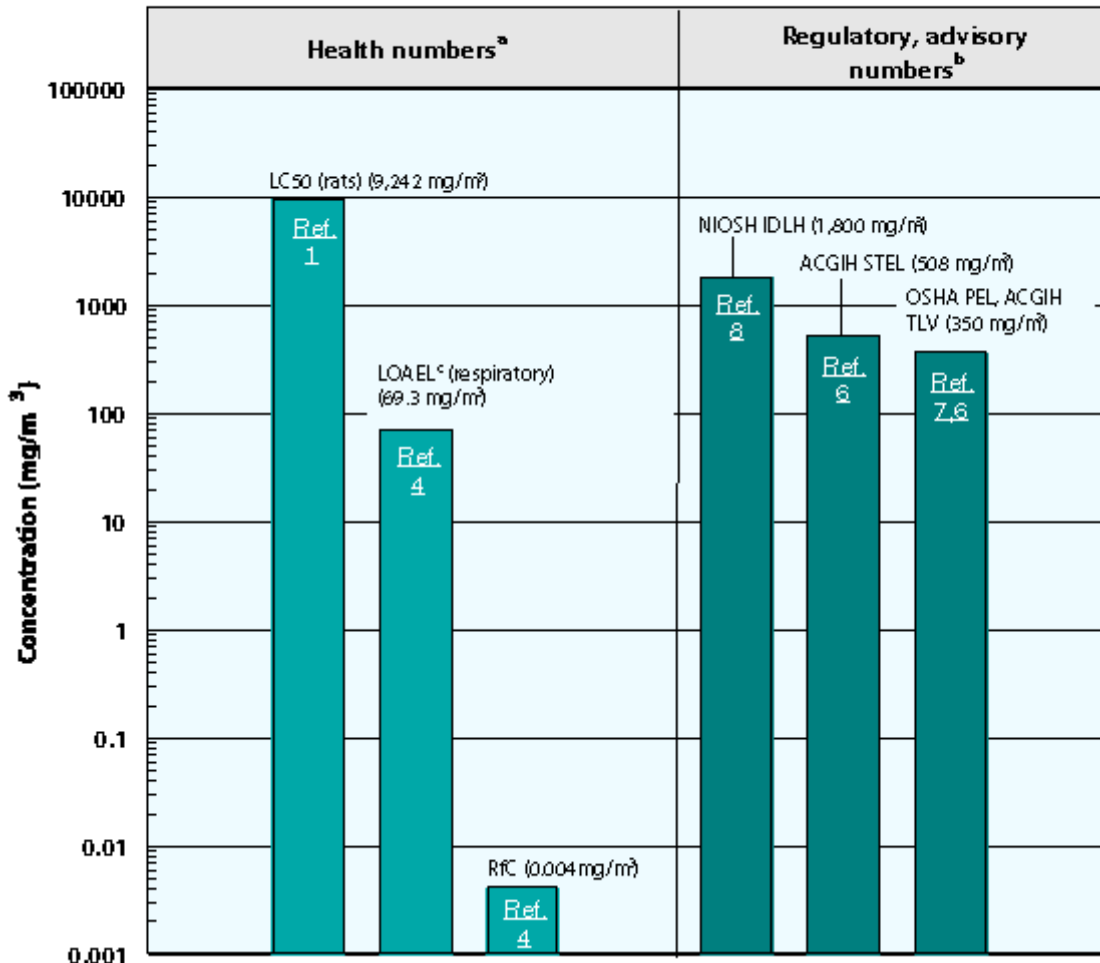
- The chemical formula for propylene dichloride is $\text{C}_3\text{H}_6\text{Cl}_2$, and the molecular weight is 112.99 g/mol. It is also known as 1,2-dichloropropane. (1)
- Propylene dichloride is a colorless liquid which evaporates quickly at room temperature. (1)
- Propylene dichloride has a chloroform-like odor and an odor threshold of 0.25 parts per million (ppm). (1)
- The vapor pressure for propylene dichloride is 49.67 mm Hg at 25 °C, and it has a log octanol/water partition coefficient ($\log K_{ow}$) of 1.99. (1)
- Propylene dichloride has a half-life in air ranging from 16 to greater than 23 days. (1)

Conversion Factors:

To convert concentrations in air (at 25°C) from ppm to mg/m^3 : $\text{mg/m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For propylene dichloride: $1 \text{ ppm} = 4.62 \text{ mg/m}^3$.

Health Data from Inhalation Exposure

1,2-Dichloropropane



ACGIH STEL --American Conference of Governmental and Industrial Hygienists' short-term exposure limit; 15-min time-weighted-average exposure that should not be exceeded at any time during a workday even if the 8-h time-

weighted-average is within the threshold limit value.

ACGIH TLV --American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

LOAEL --Lowest-observed-adverse-effect level.

NIOSH IDLH -- National Institute of Occupational Safety and Health's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

OSHA PEL --Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

^c This LOAEL is from the critical study used as the basis for the EPA RfC.

Summary created in April 1992, updated January 2000

References

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