

Ethylidene Dichloride (1,1-Dichloroethane)

75-34-3

Hazard Summary

Ethylidene dichloride is primarily used as an intermediate in chemical synthesis. Acute (short-term) inhalation exposure to high levels of ethylidene dichloride in humans results in central nervous system (CNS) depression and a cardiostimulating effect resulting in cardiac arrhythmias. Studies in animals have reported effects on the kidney. No information is available on the chronic (long-term), reproductive, developmental, or carcinogenic effects of ethylidene dichloride in humans. An oral animal study reported a significantly positive dose-related trend in hemangiosarcomas, mammary tumors, liver tumors, and endometrial stromal polyps. EPA has classified ethylidene dichloride as a Group C, possible human carcinogen.

Please Note: The main source of information for this fact sheet is the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for 1,1-Dichloroethane. (1) Other sources include the Hazardous Substances Data Bank (HSDB) (2), a database of summaries of peer-reviewed literature, and the Registry of Toxic Effects of Chemical Substances (RTECS), a database of toxic effects that are not peer reviewed. (3)

Uses

- Ethylidene dichloride is primarily used as an intermediate in the manufacture of other chemicals such as vinyl chloride and 1,1,1-trichloroethane, and to manufacture high vacuum rubber. (1)
- Ethylidene dichloride has limited use as a solvent for plastics, oils, and fats. (1)
- In the past, ethylidene dichloride was used as an anesthetic, but that use has been discontinued. (1)

Sources and Potential Exposure

- Ethylidene dichloride has been detected in ambient air; average concentrations in seven urban locations ranged from 0.1 to 1.5 parts per billion (ppb). (1)
- Drinking water supplies have been found to contain ethylidene dichloride at a maximum level of 4.8 ppb. (1)
- Occupational exposure to ethylidene dichloride may occur for those workers in the rubber and plastic, chemical, electrical equipment and supply, medical and other health services, and oil and gas industries. (1)

Assessing Personal Exposure

- Tests are available that measure ethylidene dichloride in urine, blood, breath, and body tissues. (1)

Health Hazard Information

Acute Effects:

- Acute inhalation exposure to high levels (105,000 milligrams per cubic meter [mg/m^3]) of ethylidene dichloride in humans results in CNS depression and a cardiostimulatory effect, resulting in cardiac arrhythmias. (1)
- Acute dermal exposure to ethylidene dichloride in humans can cause skin burns, scaliness, or rashes. (2)
- Tests involving acute exposure of rats and mice have shown ethylidene dichloride to have low acute toxicity

from inhalation exposure and moderate acute toxicity from oral exposure. (3)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of ethylidene dichloride in humans. (1)
- No adverse clinical effects have been noted in rats, rabbits, or guinea pigs exposed to ethylidene dichloride via inhalation, while studies in cats have noted effects on the kidneys. (1)
- The only adverse health effect noted in two oral animal studies was body weight depression. (1)
- EPA has calculated a provisional Reference Concentration (RfC) of 0.5 mg/m³ based on kidney effects in cats. 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. The provisional RfC is a value that has had some form of Agency review, but it does not appear on IRIS. (5)
- EPA has calculated a provisional Reference Dose (RfD) of 0.1 milligrams per kilogram body weight per day (mg/kg/d) based on no observed adverse effects in rats. (5)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of ethylidene dichloride in humans. (1)
- Retarded fetal development (but no malformations) was observed in animals from inhalation exposure to ethylidene dichloride. (1)

Cancer Risk:

- No information is available on the carcinogenic effects of ethylidene dichloride in humans. (1)
- No animal inhalation cancer studies are available on ethylidene dichloride. (1)
- An oral study by the National Cancer Institute (NCI) reported a significantly positive dose-related trend in hemangiosarcomas, mammary tumors in female rats and liver tumors and endometrial stromal polyps in mice. However, only the incidence of endometrial stromal polyps was significantly increased over the controls. (4,6)
- EPA has classified ethylidene dichloride as a Group C, possible human carcinogen. (4)
- The California Environmental Protection Agency (CalEPA) has calculated an oral cancer slope factor of 5.7×10^{-3} (mg/kg/d)⁻¹ and an inhalation unit risk factor of 1.6×10^{-6} (µg/m³)⁻¹. (10)

Physical Properties

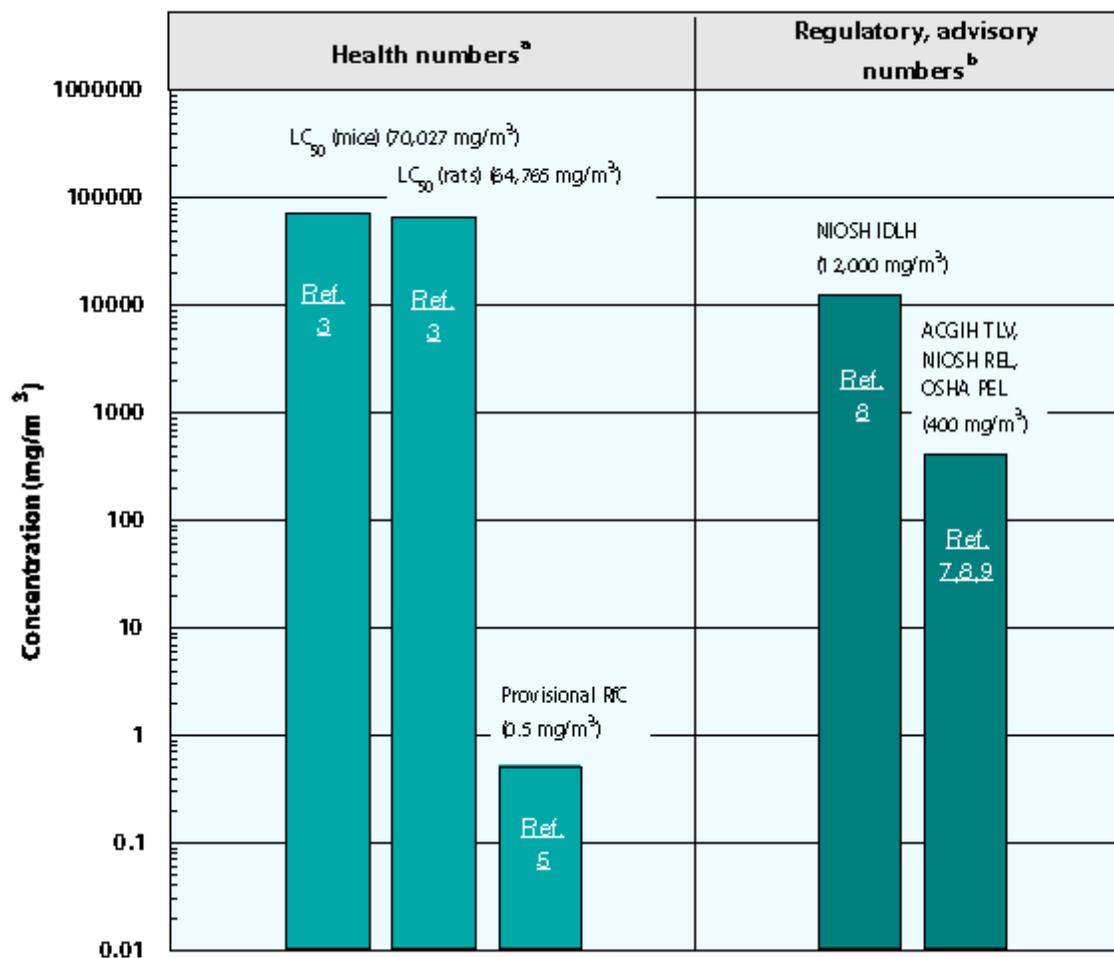
- Ethylidene dichloride is a colorless oily liquid which is very volatile. (1)
- Ethylidene dichloride has an odor similar to ether; the odor threshold is 120 parts per million (ppm). (1)
- The chemical formula for ethylidene dichloride is C₂H₄Cl₂, and the molecular weight is 98.97 g/mol. (1)
- The vapor pressure for ethylidene dichloride is 230 mm Hg at 25 °C, and it has a log octanol/water partition coefficient (log K_{ow}) of 1.79. (1)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m³: $\text{mg/m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For ethylidene dichloride: 1 ppm = 4.05 mg/m³.

Health Data from Inhalation Exposure

1,1-Dichloroethane



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 Concentration ₅₀)--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.

NIOSH IDLH --National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; 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.
 NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

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 fact sheet 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.

Summary created in April 1992, updated January 2000

References

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