

Ethyl chloride (Chloroethane)

75-00-3

Hazard Summary

Exposure to ethyl chloride may occur from the use of consumer products containing it. The acute (short-term) effects of ethyl chloride from inhalation exposure in humans consists of temporary feelings of drunkenness, and higher levels cause lack of muscle coordination and unconsciousness. The chronic (long-term) health effects resulting from exposure to air containing low levels of ethyl chloride in humans is not known. Some animal studies indicate effects on the lungs, liver, kidneys, and heart due to exposure to ethyl chloride via inhalation. No studies were located regarding carcinogenic effects following ethyl chloride inhalation exposure in humans. A study by the National Toxicology Program (NTP) indicated that inhaled ethyl chloride is carcinogenic in female mice and may be carcinogenic in rats. EPA has not classified ethyl chloride for carcinogenicity.

Please Note: The main sources of information for this fact sheet are the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Chloroethane (1) and EPA's Integrated Risk Information System (IRIS), which contains information on inhalation chronic toxicity of ethyl chloride and the Reference Concentration (RfC). (4)

Uses

- Ethyl chloride is used in the production of ethyl cellulose, use as a solvent, refrigerant, and topical anesthetic, in the manufacture of dyes, chemicals, and pharmaceuticals, and as a medication to alleviate pain associated with insect burns and stings. (1)
- In the past, ethyl chloride was used in the production of tetraethyl lead, an anti-knock additive to leaded gasoline. Government-mandated reduction in the amount of lead additives used in gasoline in the United States and a shift to the use of unleaded gasoline has caused a drastic reduction in the amount of ethyl chloride required for the production of tetraethyl lead. (1)

Sources and Potential Exposure

- Sources of possible ethyl chloride exposure include the inhalation of contaminated air and ingestion of contaminated drinking water at very low levels. (1)
- The general population can be exposed to ethyl chloride by skin contact with consumer products that contain ethyl chloride such as solvents and refrigerants. (1)
- Occupational exposure by inhalation or dermal contact with ethyl chloride can occur in industries such as medical and health services; automotive dealers and service stations; wholesale trade, electric, gas, and sanitary services; machinery (except electrical) and special trade contractors; fabricated metal productions; printing and publishing; painting; rubber and plastic products; and food. (1)

Assessing Personal Exposure

- Although chemists use tests such as gas chromatography to measure ethyl chloride in blood, milk, or urine, no commonly used medical tests are available to determine whether or not a person has been exposed to ethyl chloride. (1)

Health Hazard Information

Acute Effects:

- Acute inhalation exposure to high levels of ethyl chloride in humans has resulted in temporary feelings of drunkenness, dizziness, lack of muscle coordination and unconsciousness. Accidental death has resulted from its former medical use as an anesthetic during major surgery. (1,2)
- Tests involving acute exposure of animals in rats and mice have shown ethyl chloride to have low toxicity from inhalation exposure. (3)

Chronic Effects (Noncancer):

- Neurological symptoms including ataxia, tremors, speech difficulties, slowed reflexes, involuntary eye movement, and hallucinations, and liver effects were reported in individuals who purposely inhaled very high concentrations of ethyl chloride for a few months. (4)
- Some animal studies indicate effects on the lungs, liver, kidneys, and heart due to ethyl chloride exposure via inhalation. (1)
- The Reference Concentration (RfC) for ethyl chloride is 10 milligrams per cubic meter (mg/m^3) based on delayed fetal ossification in mice. 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 study on which the RfC is based because, although the study is well-conducted, it does not establish a firm concentration-response relationship with an adverse effect and was not performed at levels eliciting maternal toxicity; medium confidence in the database due to the lack of a multigenerational reproductive study and a developmental study in a second species; and, consequently, medium confidence in the RfC. (4)
- EPA has not established a Reference Dose (RfD) for ethyl chloride. (4)

Reproductive/Developmental Effects:

- No studies were located regarding reproductive or developmental effects following ethyl chloride inhalation exposure in humans.
- Several animal studies found no reproductive effects caused by ethyl chloride exposure. (1)
- An animal study reported a decrease in uterine weights, while another study reported minimal evidence of fetotoxicity (increase in centers of unossified bones of the skull) from inhalation exposure to ethyl chloride. (1)

Cancer Risk:

- There are no human cancer data available for ethyl chloride.
- A 2-year bioassay performed by the NTP indicated that inhaled ethyl chloride is carcinogenic in female mice and may be carcinogenic in rats. Female mice experienced a significant increase in the incidence of uterine tumors and hepatocellular tumors, but the data on male mice were considered inadequate because of a low survival rate. Benign and malignant epithelial neoplasms of the skin, and three uncommon malignant astrocytomas of the brain, were reported in male and female rats, respectively. (5)
- EPA has not classified ethyl chloride for carcinogenicity. (4)

Physical Properties

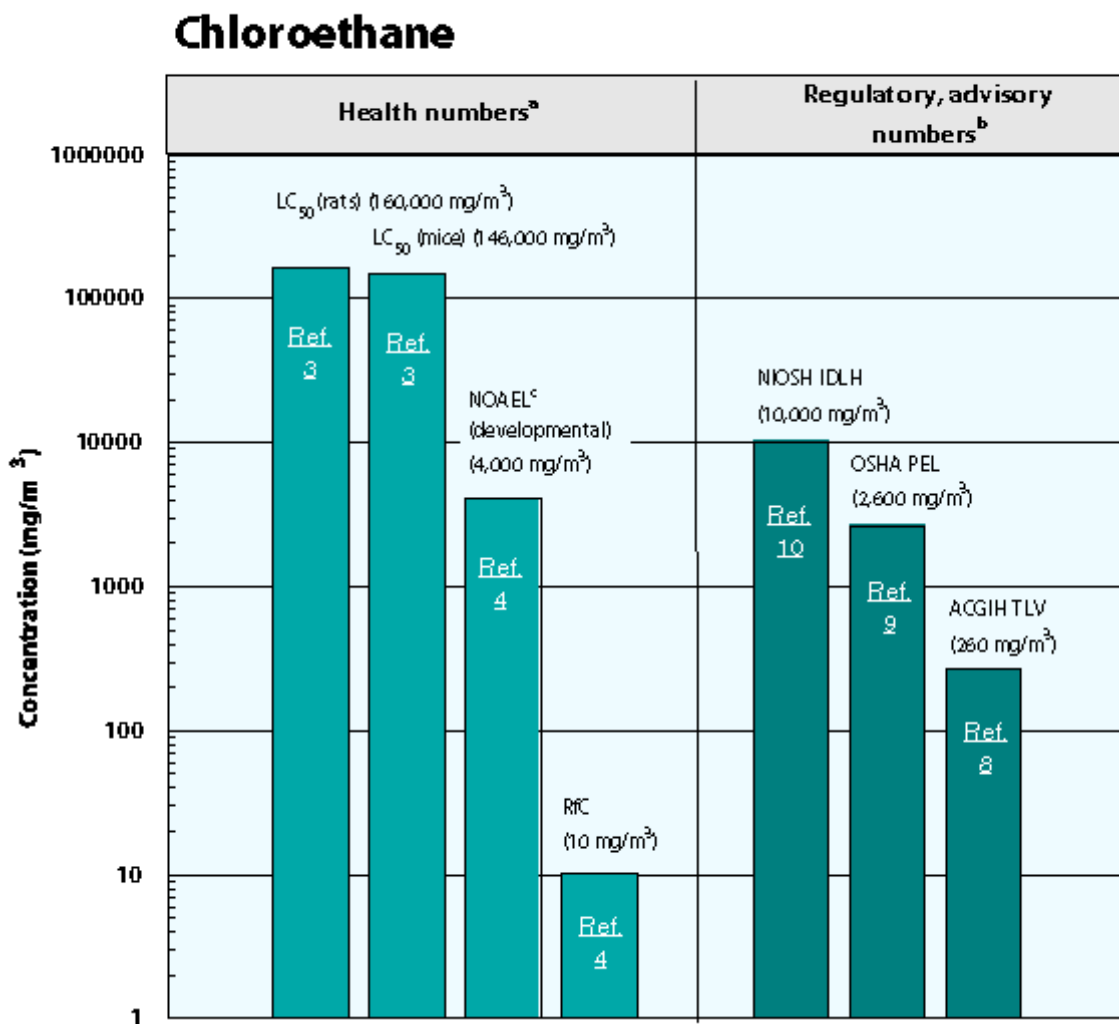
- Ethyl chloride is a colorless gas with an ethereal odor. (1,6)
- Ethyl chloride has an odor threshold of 4.2 parts per million (ppm). (7)
- Ethyl chloride is slightly soluble in water. (1)
- The chemical formula for ethyl chloride is $\text{C}_2\text{H}_5\text{Cl}$, and it has a molecular weight of 64.52 g/mol. (1,3)
- The vapor pressure for ethyl chloride is 1,008 mm Hg at 20 °C, and the log octanol/water partition

coefficient ($\log K_{ow}$) is 1.43. (1)

Conversion Factors (only for the gaseous form):

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $\text{mg}/\text{m}^3 = (\text{ppm}) \times (\text{molecular weight of the compound}) / (24.45)$. For ethyl chloride: 1 ppm = 2.64 mg/m^3 .

Health Data from Inhalation Exposure



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.

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.

NOAEL --No-observed-adverse-effect level.

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.

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^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 The NOAEL 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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