Methyl chloroform (1,1,1-Trichloroethane)

71-55-6

Hazard Summary

Methyl chloroform is used as a solvent and in many consumer products. Effects reported in humans due to acute (short-term) inhalation exposure to methyl chloroform include hypotension, mild hepatic effects, and central nervous system (CNS) depression. Cardiac arrhythmia and respiratory arrest may result from the depression of the CNS. Symptoms of acute inhalation exposure include dizziness, nausea, vomiting, diarrhea, loss of consciousness, and decreased blood pressure in humans. After chronic (long-term) inhalation exposure to methyl chloroform, some liver damage was observed in mice and ventricular arrhythmias in humans. EPA has classified methyl chloroform as a Group D, not classifiable as to human 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 1,1,1-Trichloroethane (1) and the Hazardous Substances Data Bank (HSDB) (2), a database of summaries of peer-reviewed literature.

Uses

- Methyl chloroform is used as a solvent and degreasing agent in industry. It is an ingredient in consumer products such as household cleaners, glues, and aerosol sprays. (1,3,9)
- Methyl chloroform is also used as a chemical intermediate in the production of vinylidene chloride. It was formerly used as a food and grain fumigant. (1)

Sources and Potential Exposure

- Occupational exposure to methyl chloroform can occur during the use of metal degreasing agents, paints, glues, and cleaning products. (1)
- Individuals are more likely to be exposed to methyl chloroform indoors rather than outdoors because of its widespread use in home and office products. Exposure may also occur by the sniffing of glue or typewriter correction fluid. (1)
- Methyl chloroform has been detected in surface and groundwater; individuals may be exposed through the consumption of contaminated drinking water. (1)

Assessing Personal Exposure

- Samples of breath and urine can indicate the extent to which an individual has been exposed to methyl chloroform. However, these tests are not routinely available in hospitals and clinics. (1)

Health Hazard Information

Acute Effects:

- Effects reported in humans due to acute inhalation exposure to methyl chloroform include hypotension, mild hepatic effects, and CNS depression. Mild motor impairment (e.g., increased reaction time), lightheadedness, impaired balance, and ataxia have been reported in acutely exposed humans. Cardiac arrhythmia and respiratory arrest may result from the depression of the CNS. Symptoms of acute

inhalation exposure include dizziness, nausea, vomiting, diarrhea, loss of consciousness, and decreased blood pressure. (1-4)
- Methyl chloroform is mildly irritating when applied to the skin of humans. (1-4)
- Neurological and liver effects have been observed in animals acutely exposed to methyl chloroform via inhalation. (1)
- Tests involving acute exposure of animals in rats, mice, rabbits, and guinea pigs have demonstrated methyl chloroform to have low acute toxicity from inhalation or oral exposure and low to moderate acute toxicity from dermal exposure. (5)

Chronic Effects (Noncancer):
- Most studies have not reported adverse effects from chronic exposure to low levels of methyl chloroform in humans or animals. (1)
- Some liver damage and neurological effects have been observed in rodents chronically exposed to methyl chloroform by inhalation. (1,2)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for methyl chloroform. (6)
- The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level of 1 milligram per cubic meter (mg/m^3) based on CNS effects in gerbils. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At lifetime exposures increasingly greater than the reference exposure level, the potential for health effects increases. (7)

Reproductive/Developmental Effects:
- Epidemiologic studies have found no relationship between adverse pregnancy outcomes and exposure of mothers or fathers to methyl chloroform. (1)
- Animal studies have not reported developmental or reproductive effects from exposure to methyl chloroform. (1)

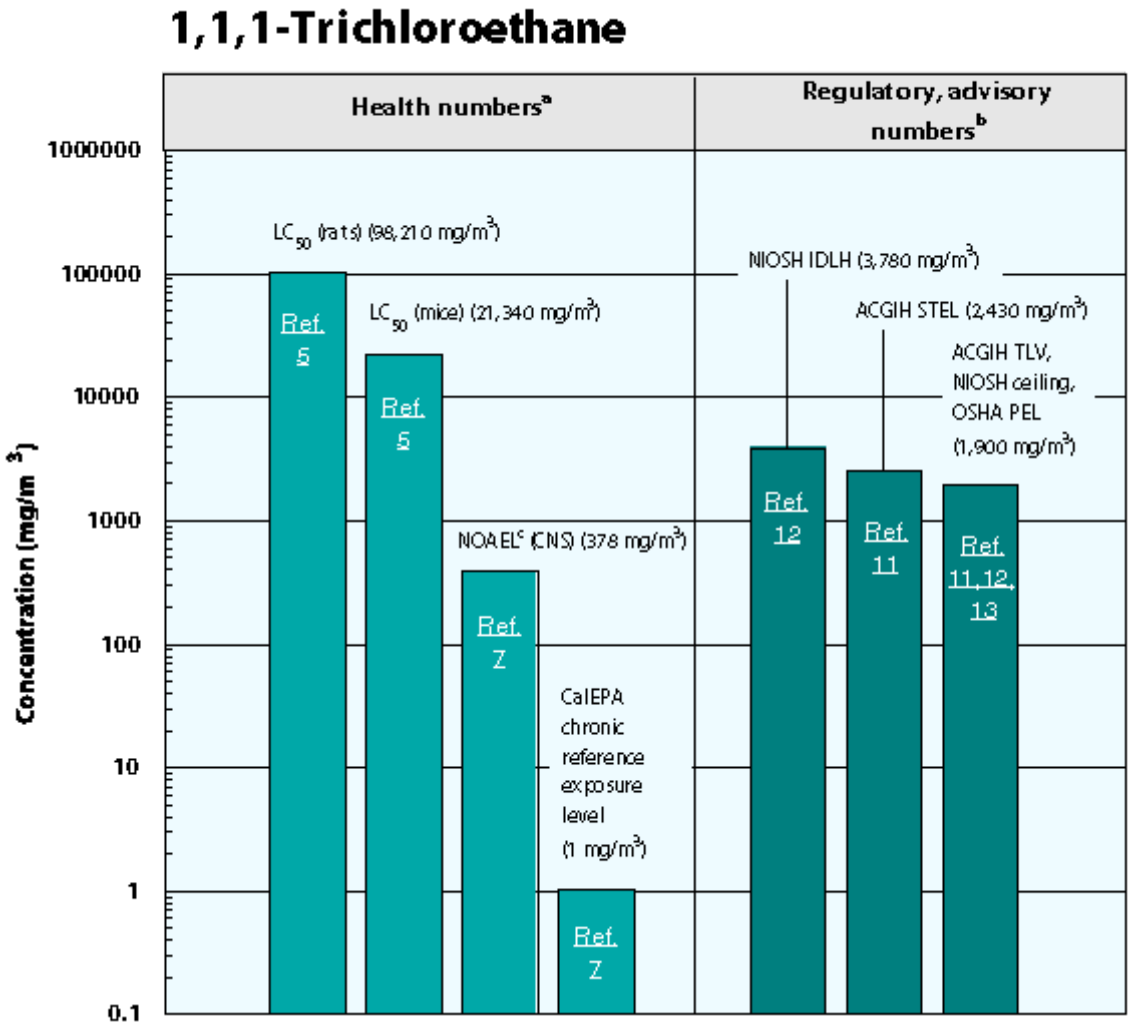
Cancer Risk:
- Information is not available on the carcinogenic effects of methyl chloroform in humans.
- Two animal studies have not demonstrated carcinogenicity from oral or inhalation exposure to methyl chloroform; however, the data are considered to be inadequate due to the low survival of the rats in one study and the low dose levels used in the second study. (1,2,4,6,8,9)
- EPA has classified methyl chloroform as a Group D, not classifiable as to human carcinogenicity, based on no reported human data and inadequate animal data. (6)

Physical Properties

- The chemical formula for methyl chloroform is CH_3CCl_3 , and its molecular weight is 133.42 g/mol.
- (1,10) Methyl chloroform occurs as a colorless, nonflammable liquid that is insoluble in water. (1,9,10)
- Methyl chloroform has a sweet yet sharp odor, similar to that of chloroform; the odor threshold is above 120 parts per million (ppm). (1)
- The vapor pressure for methyl chloroform is 124 mm Hg at 20 °C, and its log octanol/water partition coefficient (log K_{ow}) is 2.49. (1)
- Methyl chloroform is also called 1,1,1-trichloroethane. (1)

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: mg/m^3 = (ppm) × (molecular weight of the compound)/(24.45). For methyl chloroform: 1 ppm = 5.4 mg/m^3.

Health Data from Inhalation Exposure



ACGIH STEL --American Conference of Governmental and Industrial Hygienist's threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

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

LC_{50} (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 immediately dangerous to life and health; NIOSH concentration representing the maximum level of a pollutant from which an individual could escape within 30 minutes without escape-impairing symptoms or irreversible health effects.

NIOSH REL ceiling --NIOSH's recommended exposure limit ceiling; the concentration that should not be exceeded at any time.

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 NOAEL is from the critical study used as the basis for Cal EPA's chronic reference exposure level.

References

Summary created in April 1992, updated January 2000

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