Dichloroethyl ether (BIS(2-Chloroethyl)Ether)

111-44-4

Hazard Summary

Dichloroethyl ether is mainly used as a chemical intermediate in industry. Limited health effects information is available on this chemical. The major effect from acute (short-term) inhalation exposure to dichloroethyl ether in humans is extreme irritation of the respiratory tract and skin. Dichloroethyl ether has been shown to be carcinogenic in animal studies; an increased incidence of liver tumors in mice has been reported. EPA has classified dichloroethyl ether as a Group B2, probable human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (5), which contains information on the carcinogenic effects of dichloroethyl ether including the unit cancer risk for inhalation exposure, EPA's Health Effects Assessment for Bis(2-chloroethyl)ether (6) and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Bis(2-chloroethyl)ether. (1)

Uses

- Dichloroethyl ether is primarily used as a chemical intermediate for the manufacture of pesticides. A small amount of dichloroethyl ether is used as a solvent. (1)
- In the past, dichloroethyl ether was used as a solvent for fats, waxes, greases, and esters. It has also been used as a constituent of paints and varnishes, as a cleaning fluid for textiles, and in the purification of oils and gasoline. (1)

Sources and Potential Exposure

- No information is available on the concentration of dichloroethyl ether in ambient air. (1)
- Low levels (0.01 to 0.5 parts per billion [ppb]) of dichloroethyl ether were detected in the drinking water supplies of several cities, and higher levels (840 ppb) were detected in groundwater near some waste disposal sites. (1)
- Occupational exposure to dichloroethyl ether may occur in chemical plants where dichloroethyl ether is manufactured or used. (1)

Assessing Personal Exposure

- There is no medical test currently available to measure for dichloroethyl ether in humans. (1)

Health Hazard Information

Acute Effects:

- Acute inhalation exposure to dichloroethyl ether in humans results in extreme irritation of the respiratory tract and skin. (1-3)
- Animal studies have reported respiratory effects such as irritation of the nose and eyes; congestion, edema, and hemorhage of the lung; congestion of the brain, liver, and kidneys; and central nervous system (CNS) effects from inhalation exposure to dichloroethyl ether. (1)
- Acute animal tests in rats and mice have shown dichloroethyl ether to have high acute toxicity from

inhalation and oral exposure and extreme acute toxicity from dermal exposure. (1,4)

Chronic Effects (Noncancer):

- No information is available on the chronic (long-term) effects of dichloroethyl ether in humans. (1) Animal
- studies have reported decreased body weights in rats exposed to dichloroethyl ether by inhalation and oral exposure. (1)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for dichloroethyl ether. (5)
- ATSDR has calculated an intermediate inhalation minimal risk level (MRL) of 0.1 milligrams per cubic meter (mg/m^3) (0.02 parts per million [ppm]) based on decreased body weights in rats. (1)

Reproductive/Developmental Effects:

- No information is available on the developmental or reproductive effects of dichloroethyl ether in humans. (1)
- In one animal study, no effects were observed on the reproductive tissues of the animals, but no tests on reproductive function were performed. (1)

Cancer Risk:

- No information is available on the carcinogenic effects of dichloroethyl ether in humans. (1)
- Animal studies have reported an increased incidence of liver tumors in mice exposed to dichloroethyl ether via oral exposure. (1,2,5,6)
- EPA has classified dichloroethyl ether as a Group B2, probable human carcinogen. (5)
- EPA uses mathematical models, based on animal studies, to estimate the probability of a person developing cancer from breathing air containing a specified concentration of a chemical. EPA calculated an inhalation unit risk estimate of 3.3×10^{-4} $(\mu g/m^3)^{-1}$. EPA estimates that, if an individual were to continuously breathe air containing bis(2chloroethyl)ether at an average of 0.003 $\mu g/m^3$ (3×10^{-6} mg/m^3) over his or her entire lifetime, that person would theoretically have no more than a one-in-a-million increased chance of developing cancer as a direct result of breathing air containing this chemical. Similarly, EPA estimates that breathing air containing 0.03 $\mu g/m^3$ (3×10^{-5} mg/m^3) would result in not greater than a one-in-a-hundred thousand increased chance of developing cancer, and air containing 0.3 $\mu g/m^3$ (3×10^{-4} mg/m^3) would result in not greater than a one-in-ten-thousand increased chance of developing cancer. For a detailed discussion of confidence in the potency estimates, please see IRIS. (5)
- EPA has calculated an oral cancer slope factor of 1.1 $(mg/kg/d)^{-1}$. (5)

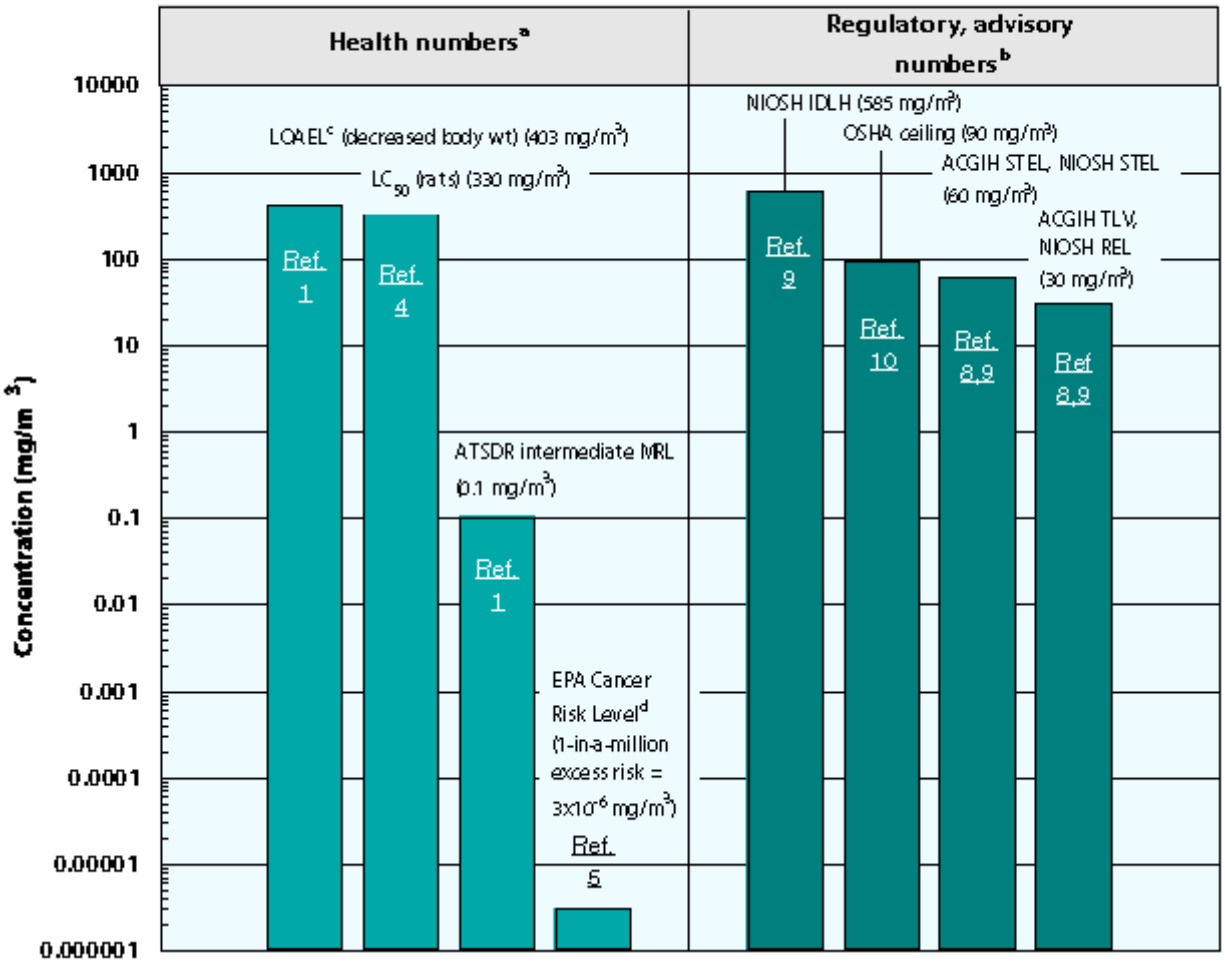
Physical Properties

- Dichloroethyl ether is a colorless nonflammable liquid with a strong unpleasant odor. (1)
- The odor threshold for dichloroethyl ether is 0.049 ppm. (7)
- The chemical formula for dichloroethyl ether is $C_4H_8Cl_2O$, and it has a molecular weight of 143.04 g/mol. (1)
- The vapor pressure for dichloroethyl ether is 0.71 mm Hg at 20 °C, and it has a log octanol/water partition coefficient (log K_{ow}) of 1.58. (1)

Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to mg/m^3: $mg/m^3 = (ppm) \times (\text{molecular weight of the compound})/(24.45)$. For dichloroethyl ether: 1 ppm = 5.85 mg/m^3.
To convert concentrations in air from $\mu g/m^3$ to mg/m^3: $mg/m^3 = (\mu g/m^3) \times (1\ mg/1{,}000\ \mu g)$.

Health Data from Inhalation Exp osure

Bis(2-chloroethyl)Ether



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.

ACGIH STEL--ACGIH's threshold limit value short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

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--NIOSHs' recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

NIOSH STEL--NIOSH's recommended short-term exposure limit; a 15-minute TWA exposure which should not be exceeded at any time during a workday.

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.

OSHA PEL ceiling--Occupational Safety and Health Administration's permissible exposure limit ceiling value; the concentration of a substance that should not be exceeded at any time.

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]

[c] This LOAEL is from the critical study used to derive the ATSDR intermediate MRL.
[d] These cancer risk estimates were derived from oral data and converted to provide the estimated inhalation risk.

Summary created in April 1992, updated January 2000

References

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7. J.E. Amoore and E. Hautala. Odor as an aid to chemical safety: Odor thresholds compared with threshold limit values and volatilities for 214 industrial chemicals in air and water dilution. Journal of Applied Toxicology, 3(6):272-290. 1983.
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