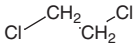
1,2-Dichloroethane (Ethylene Dichloride) CAS No. 107-06-2

Reasonably anticipated to be a human carcinogen
First Listed in the *Second Annual Report on Carcinogens* (1981)



Carcinogenicity

1,2-Dichloroethane is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NCI 1978, IARC 1979, 1987, 1999). When administered by gavage, 1,2-dichloroethane increased the incidence of hepatocellular carcinomas in male mice, mammary gland adenocarcinomas and endometrial stromal neoplasms of the uterus in female mice, and lung adenomas in mice of both sexes. Further, gavage administration of 1,2-dichloroethane increased the incidence of squamous cell carcinomas of the forestomach, subcutaneous fibromas, and hemangiosarcomas in male rats and mammary gland adenocarcinomas in female rats.

No adequate data were available to evaluate the carcinogenicity of 1,2-dichloroethane in humans (IARC 1979, 1987, 1999).

Properties

1,2-Dichloroethane is a clear, colorless, heavy, flammable, oily liquid with a pleasant, chloroform-like odor. It is sparingly soluble in water and soluble in most organic solvents. When heated to decomposition, it produces toxic fumes of hydrochloric acid (IARC 1979, 1999, HSDB 2000).

Use

1,2-Dichloroethane has been replaced as a solvent and degreaser by less toxic compounds. It once served as a solvent for processing pharmaceutical products; for fats, oils, waxes, gums, resins, and particularly for rubber; and in paint, varnish, and finish removers (HSDB 2000). It was also used as an insect fumigant for stored grains and in mushroom houses, a soil fumigant in peach and apple orchards, a cleaner for upholstery and carpets, a solvent in textile cleaning and metal degreasing, a lead scavenger in antiknock gasoline, a starting material for chlorinated solvents such as vinylidene chloride, a dispersant for plastics and elastomers such as synthetic rubber, an ore flotation compound, and as an extractant in certain food processes (IARC 1979, NIOSH 1978, HSDB 2000). Therapeutically, 1,2-dichloroethane was once used as a general anesthetic instead of chloroform, especially in ophthalmic surgery (HSDB 2000). It is currently used primarily to produce vinyl chloride (WHO 1995, IARC 1999).

Production

Commercial production of 1,2-dichloroethane in the United States was first reported in 1922 (IARC 1979). A major industrial chemical, it has previously been ranked in the top 50 highest volume chemicals produced in the country by *Chemical and Engineering News*; its production has remained essentially stable, with more than 13 billion lb produced annually since 1988 (CEN 1991, USITC 1989, 1990). In 1991, the total U.S. production was 13.9 billion lb (WHO 1995). Chem Sources (2001) listed 37 suppliers in the United States.

Greater than 39 million lb of 1,2-dichloroethane were imported into the United States in 1989, while 1200 billion lb were exported that same year (CEN 1985, Chem-Intel 1987, USDOC Exports 1990, USDOC Imports 1985, 1988, 1990). In 2000, greater than 300 million lb were imported and over 2 billion lb were exported (ITA 2001).

Exposure

The primary routes of potential human exposure to 1,2-dichloroethane are inhalation, ingestion, and dermal contact. Currently, occupational exposure is chiefly to workers involved in the production of vinyl chloride (WHO 1995). The greatest source of exposure to 1,2-dichloroethane for most of the U.S. population is inhalation of the compound in contaminated air. There are no known natural sources of 1,2-dichloroethane. Releases of this compound to the environment may result from the manufacture, use, storage, distribution, and disposal of 1,2-dichloroethane (ATSDR 2001). EPA's Toxic Chemical Release Inventory (TRI) listed 96 industrial facilities that produced, processed, or otherwise used 1,2-dichloroethane in 1988 (TRI88 1990). The facilities reported releases of 1,2-dichloroethane to the environment which were estimated to total 5.3 million lb. According to the TRI99 (2001), in 1999, approximately 500,000 lb (88.7% of total on-site environmental releases) of 1,2-dichloroethane were discharged to air, 904 lb (0.15%) to water, and 2,983 lb (0.48%) to land. TRI (2001) also reported a total off-site release of 683,304 lb.

1,2-Dichloroethane has been detected in not only ambient urban and rural air and in indoor samples of residences located near hazardous waste disposal sites, but also in surface water, groundwater, and drinking water (ATSDR 2001). EPA reported that 1,2-dichloroethane was present at concentrations of 1 to 90 ppb in 53 of 204 surface water samples taken near heavily industrialized areas across the United States (IARC 1979). Drinking water samples from a number of urban and rural locations in the United States have been reported to be contaminated with 1,2-dichloroethane. Concentrations in domestic surface waters used as drinking water sources have been reported to range from trace amounts to 4.8 µg/L. Concentrations in domestic groundwater supplies used for drinking water have been reported to range from trace amounts to 400 µg/L. Exposure to 1,2-dichloroethane through ingestion of contaminated drinking water is expected to be an important source for only 4 to 5% of the population; however, for populations with drinking water supplies containing more than 6 µg/L of the compound, oral and dermal routes are expected to be more important than inhalation. 1,2-Dichloroethane has also been detected in food items and in human breath, urine, and milk (ATSDR 2001).

Human exposure to 1,2-dichloroethane is expected to be highest among certain occupational groups (ATSDR 2001). The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that 1,350,941 workers in 111,222 industrial facilities were potentially exposed to 1,2-dichloroethane in the workplace in 1970 (NIOSH 1976). These estimates were derived from observations of the actual use of 1,2-dichloroethane (5% of total estimate), the use of trade name products known to contain 1,2-dichloroethane (3%), and the use of generic products suspected of containing the compound (92%). The largest numbers of exposed workers were found employed in the medical and other health services, automotive dealerships and service stations, and wholesale trade industries (ATSDR 2001). The National Occupational Exposure Survey, conducted by NIOSH from 1981 to 1983, indicated that 77,114 workers, including 32,891 women, in 1,526 plants were potentially exposed to 1,2-dichloroethane in the workplace (NIOSH 1984). The estimates were derived from direct observations of the actual use of the compound (68%) and the use of trade name products known to contain 1,2-dichloroethane (32%). The largest numbers of exposed workers were found employed in the apparel and other textile products, chemical and allied products, business services, and petroleum and coal products industries as machine operators, assemblers, and production inspectors, checkers, and examiners (ATSDR 2001).

Regulations

DOT

1,2-Dichloroethane is considered a hazardous material and special requirements have been set for marking, labeling, and transporting this material

EPA

Clean Air Act
- NESHAP: Listed as a Hazardous Air Pollutant (HAP)
- NSPS: Manufacture of substance is subject to certain provisions for the control of Volatile Organic Compound (VOC) emissions

Clean Water Act
- Effluent Guidelines: Listed as a Toxic Pollutant
- Water Quality Criteria: Based on fish/shellfish and water consumption = 0.38 µg/L; based on fish/shellfish consumption only = 37 µg/L

Comprehensive Environmental Response, Compensation, and Liability Act
- Reportable Quantity (RQ) = 100 lb

Emergency Planning and Community Right-To-Know Act
- Toxics Release Inventory: Listed substance subject to reporting requirements

Resource Conservation and Recovery Act
- Characteristic Toxic Hazardous Waste: TCLP Threshold = 0.5 mg/L
- Listed Hazardous Waste: Waste codes in which listing is based wholly or partly on substance - U077, F024, F025, K018, K019, K020, K029, K030, K096
- Listed as a Hazardous Constituent of Waste

Safe Drinking Water Act
- Maximum Contaminant Level (MCL) = 0.005 mg/L

FDA

Maximum permissible level in bottled water = 0.005 ppm

Ethylene dichloride in spice oleoresins when present as a residue from the extraction of spice is allowed in concentrations not to exceed 30 ppm

OSHA

Acceptable Peak Exposure = 200 ppm (maximum duration = 5 minutes in any 3 hours)

Ceiling Concentration = 100 ppm

Permissible Exposure Limit (PEL) = 50 ppm

Guidelines

ACGIH

Threshold Limit Value - Time-Weighted Average Limit (TLV-TWA) = 10 ppm

NIOSH

Immediately Dangerous to Life and Health (IDLH) = 50 ppm

Recommended Exposure Limit (time-weighted-average workday) = 1 ppm (4 mg/m^3)

Short-term Exposure Limit (STEL) = 2 ppm (8 mg/m^3)

Listed as a potential occupational carcinogen

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