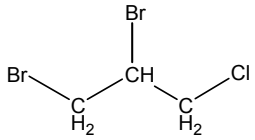
1,2-DIBROMO-3-CHLOROPROPANE
CAS No. 96-12-8
First Listed in the *Second Annual Report on Carcinogens*



CARCINOGENICITY

1,2-Dibromo-3-chloropropane is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1977, 1979, 1987, 1999, NTP 1982). When administered by gavage, 1,2-dibromo-3-chloropropane induced squamous cell carcinomas of the forestomach in rats and mice of both sexes, and carcinomas of the mammary gland in female rats (NCI 1978). When rats were exposed by inhalation, 1,2-dibromo-3-chloropropane increased the incidences of adenocarcinomas and carcinomas or squamous cell carcinomas of the nasal cavity and squamous cell papillomas of the tongue in both sexes, and adrenal cortical adenomas and squamous cell papillomas or carcinomas of the pharynx in females. When mice were exposed by inhalation, the compound increased the incidences of carcinomas and squamous cell carcinomas of the nasal cavity in males; carcinomas, adenocarcinomas, and squamous cell carcinomas of the nasal cavity in females; and alveolar/bronchiolar adenomas or carcinomas of the lung of both sexes (NTP 1982).

No adequate data were available to evaluate the carcinogenicity of 1,2-dibromo-3-chloropropane in humans (IARC 1987). A cohort of chemical workers exposed to 1,2-dibromo-3-chloropropane and many other compounds indicated a slight increase in mortality from all cancers, mainly respiratory. Another group of workers exposed to 1,2-dibromo-3-chloropropane also showed a nonsignificant increase in mortality from cancer, especially lung cancer. Among another group of workers exposed to the compound on a routine basis, no cancer deaths were observed. IARC (1999) reviewed three cohort studies in which workers were exposed to 1,2-dibromo-3-chloropropane. One studied observed an excess of liver and biliary tract cancer, however; overall cancer mortality was not elevated. Another study reported overall cancer mortality was similar to that expected based on mortality of white men in the U.S., while the third study found cancer rates to be less than expected based on national rates. In a case-control study, no correlation was found between gastric cancer and leukemia and 1,2-dibromo-3-chloropropane detected in water (IARC 1999).

PROPERTIES

1,2-Dibromo-3-chloropropane is a dark amber to dark brown liquid (colorless when pure) with a pungent odor. It is slightly soluble in water and miscible in aliphatic and aromatic hydrocarbon solvents. Technical-grade 1,2-dibromo-3-chloropropane was available in the U.S. containing not less than 95% of the pure chemical. Commercial formulations include an emulsifiable concentrate containing 70.7 to 87.8%, a solution containing 47.2%, granules containing 5.25 to 34%, or fertilizer mixtures containing 0.6 to 5% 1,2-dibromo-3-chloropropane (HSDB 2000).

USE

EPA banned all uses of 1,2-dibromo-3-chloropropane in 1985 (EPA 1988). Prior to the ban, it was used as a pesticide that was registered by EPA as a soil fumigant to control nematodes during growth of field crops, vegetables, fruits and nuts, greenhouse and nursery crops, and turf. In 1977, EPA suspended all registrations for the use of products containing the compound except for use on pineapples in Hawaii; this exception was revoked in 1985. In 1974, U.S. farmers applied 9.8 million lb of 1,2-dibromo-3-chloropropane to crops. In 1977, 831,000 lb of 1,2-dibromo-3-chloropropane was used in California alone, primarily on grapes and tomatoes (IARC 1979). 1,2-Dibromo-3-chloropropane is now used only as an intermediate in organic synthesis and for research purposes (ATSDR 1992).

PRODUCTION

1,2-Dibromo-3-chloropropane was first produced commercially in the U.S. in 1955 (IARC 1979); however, the chemical is no longer commercially manufactured in the U.S. (ATSDR 1992). Chem Sources (2001) identified eight U.S. suppliers of the compound. In 1989, one supplier was listed for domestic research purposes (ATSDR 1992). In 1977, three companies producing 1,000 lb of 1,2-dibromo-3-chloropropane were identified, along with one importer (no volumes provided) (TSCA 1979). Estimates of annual production during 1974 and 1975 were 18 million to 20 million lb, respectively (IARC 1999). Since its use as a fumigant and nematocide was cancelled, significant amounts of imports are unlikely. Exports, too, are negligible since the compound is not manufactured in the United States (ATSDR 1992).

EXPOSURE

Widespread exposure of the general population and of workers to 1,2-dibromo-3-chloropropane is not likely, since use of the chemical as a soil fumigant was banned in 1985. Exposure of the general population to 1,2-dibromo-3-chloropropane may occur with ingestion of previously contaminated drinking water and food. Because the areas in which 1,2-dibromo-3-chloropropane was used as a soil fumigant were limited in size and number, and since 1,2-dibromo-3-chloropropane is moderately volatile and is degraded in moist soil, this type of exposure is probably minimal (IARC 1979, ATSDR 1992).

Due to a lack of recent comprehensive monitoring data, the average daily intake of 1,2-dibromo-3-chloropropane cannot be determined. A National Occupational Hazard Survey (NOHS) conducted for NIOSH between 1972 and 1974 estimated that 9,682 workers were exposed to 1,2-dibromo-3-chloropropane in 1972. These data, however, are no longer valid to predict current worker exposure because of the 1985 ban on the use of 1,2-dibromo-3-chloropropane as a soil fumigant and because it is likely that only small amounts are used for chemical synthesis and research purposes. 1,2-Dibromo-3-chloropropane was not included in the National Occupational Exposure Survey (NOES) conducted by NIOSH in 1983-1984 (ATSDR 1992).

REGULATIONS

EPA regulates 1,2-dibromo-3-chloropropane under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Superfund Amendments and Reauthorization Act (SARA), and Toxic Substances Control Act (TSCA). A reportable quantity (RQ) of 1 lb has been established for 1,2-dibromo-3-chloropropane under CERCLA. EPA unconditionally suspended all 1,2-dibromo-3-chloropropane-containing products for end uses, except for use on pineapples in Hawaii, which was subsequently revoked. Under TSCA, EPA requires production and use data to be collected for potential exposure estimates. 1,2-Dibromo-3-chloropropane is designated as a hazardous constituent of waste under RCRA which requires reporting and record-keeping on releases of the compound, whereas under SARA, EPA has placed it on the list of toxic chemicals subject to reporting requirements. EPA has set a maximum contaminant level goal (MCLG) of zero and a maximum contaminant level (MCL) of 0.2 μg/L for 1,2-dibromo-3-chloropropane in drinking water.

FDA established maximum residue levels in raw milk and in all other raw agricultural commodities for 1,2-dibromo-3-chloropropane.

NIOSH recommended that exposure be reduced to the lowest feasible concentration. OSHA established a permissible exposure limit (PEL) of 1 ppb (0.01 mg/m^3) as an 8-hr time-weighted average (TWA), and requires personal protective equipment, training, medical surveillance, signs and labeling, and engineering controls. OSHA also regulates 1,2-dibromo-3-chloropropane under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 58.

REFERENCES

ATSDR. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,2-Dibromo-3-chloropropane. (Final Report). Atlanta, GA: ATSDR, Public Health Service, U.S. Department of Health and Human Services. 1992. 161 pp. NTIS Accession No. PB93-110906.

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NTP. National Toxicology Program. Technical Report Series No. 206. Carcinogenesis Bioassay of 1,2-Dibromo-3-chloropropane (CAS No. 96-12-8) in F344 Rats and B6C3F$_1$ Mice (Inhalation Study). NIH Publication No. 82-1762. 174 pp. National Toxicology Program, Research Triangle Park, NC, and Bethesda, MD, 1982.

TSCA. Toxic Substances Control Act, Chemical Substance Inventory, 1979: public record.