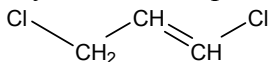


## 1,3-DICHLOROPROPENE (TECHNICAL GRADE)

CAS No. 542-75-6

First Listed in the *Fifth Annual Report on Carcinogens*



### CARCINOGENICITY

Technical-grade 1,3-dichloropropene, containing 1.0% epichlorohydrin as a stabilizer (trade name of the material purchased for testing was Telone II<sup>®</sup>), is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (NTP 1985, IARC 1986, 1987, 1999). When administered by gavage, Telone II<sup>®</sup> increased incidences of squamous cell papillomas and carcinomas of the forestomach and neoplastic nodules of the liver in male rats, and squamous cell papillomas of the forestomach in female rats. When administered by gavage, Telone II<sup>®</sup> increased the incidences of transitional cell carcinomas of the urinary bladder, alveolar/bronchiolar adenomas of the lung, and squamous cell papillomas or carcinomas of the forestomach in female mice. Evidence for carcinogenicity in male mice receiving Telone II<sup>®</sup> by gavage was considered to be inadequate because of reduced survival in the vehicle control group. However, there was some indication that Telone II<sup>®</sup> increased the incidences of transitional cell carcinomas of the urinary bladder, squamous cell papillomas of the forestomach, and alveolar/bronchiolar adenomas and carcinomas of the lung in male mice (NTP 1985). When administered by subcutaneous injection, the *cis* isomer of 1,3-dichloropropene induced injection-site fibrosarcomas in male mice (Van Duuren *et al.* 1979, IARC 1987).

No adequate data were available to evaluate the carcinogenicity of 1,3-dichloropropene in humans. Two cases of malignant histiocytic lymphoma were reported among nine firemen accidentally exposed to 1,3-dichloropropene six years before diagnosis. Because firemen are exposed to a large number of chemicals, the role of 1,3-dichloropropene cannot be evaluated (IARC 1987).

### PROPERTIES

1,3-Dichloropropene is a clear, white to lightly straw-colored liquid with a penetrating, irritating, chloroform-like odor. It is relatively insoluble in water and is soluble in ether, acetone, toluene, and benzene. 1,3-Dichloropropene is flammable, and when heated to decomposition it produces toxic fumes of hydrochloric acid and other chlorinated compounds as well as irritating gases. It reacts readily with aluminum, magnesium, and alloys of these metals (IARC 1987, 1999, HSDB 2000).

Telone II<sup>®</sup> was originally marketed as a mixture of technical-grade 1,3-dichloropropene isomers (89% to 92%) with small amounts of 1,2-dichloropropane, trichloropropane, and epichlorohydrin. As currently marketed, Telone II<sup>®</sup> is approximately 98% 1,3-dichloropropene with traces of 1,2-dichloropropane, and epoxidized soybean oil added as a stabilizer. Other trade names for technical-grade 1,3-dichloropropene products are D-D92, Dorlone II, Nematox II, and Dedisol C.

## USE

1,3-Dichloropropene (technical grade) is used as an intermediate in the manufacture of 3,3-dichloro-1-propene and other pesticides. Telone II<sup>®</sup> is a widely used agricultural soil fumigant for parasitic nematodes (NTP 1985, WHO 1993). Telone II<sup>®</sup> is used in Hawaii to control nematodes on pineapples (Albrecht 1987).

## PRODUCTION

Current production volumes for 1,3-dichloropropene were not found (WHO 1993). Chem Sources (2001) listed 12 U.S. suppliers of 1,3-dichloropropene. The USITC identified only one producer of the compound, with no stated production volume, from 1986 to 1994 (USITC 1987-1991, 1993-1995); the 1997 Directory of Chemical Producers also listed a single producer (SRI 1997). The EPA (OPPT) High Production Volume Chemicals list provided a production volume range of 3.0 to 5.0 million lb (EPA 1997). In 1985, the only domestic manufacturer of Telone II<sup>®</sup> produced an estimated 52 million lb (NTP 1985). U.S. imports constituted approximately 7% of production in 1985 and approximately 9% of production in 1984. In 1982, an estimated 25 million lb of Telone II<sup>®</sup> were produced in the United States (NTP 1985). The 1979 TSCA Inventory reported that eight manufacturers produced between 11 and 60 million lb of Telone II<sup>®</sup> in 1977 (TSCA 1979). No export data on Telone II<sup>®</sup> were available. Telone II<sup>®</sup> is the only technical-grade 1,3-dichloropropene product available in the United States.

## EXPOSURE

The primary routes of potential human exposure to 1,3-dichloropropene are inhalation of vapors, dermal contact, and ingestion of contaminated foods and drinking water (NTP 1985, ATSDR 1992, HSDB 2000). Although data pertaining to its occurrence in foods and water are limited, the presence of 1,3-dichloropropene in various water samples indicates its formation via chlorination of water (ATSDR 1992). Potential consumer exposure to 1,3-dichloropropene residues may occur through ingestion of pineapples fumigated with Telone II<sup>®</sup>. An estimate based on the usual application rate for Telone II<sup>®</sup> would indicate that nearly 2 million lb of the fumigant were used on pineapple fields in Hawaii in 1985 (Albrecht 1987). Workers may be exposed to 1,3-dichloropropene and its residues during the formulation and application of Telone II<sup>®</sup>. Additionally, workers in the pineapple production industry may be exposed during field preparation, planting, field maintenance, and crop harvesting (Albrecht 1987). The National Occupational Exposure Survey (1981-1983) indicated that 1,779 workers, including 33 women, were potentially exposed to 1,3-dichloropropene (NIOSH 1984). This estimate was based on observations of the actual use of the compound (89%) and the use of trade name products known to contain the compound (11%). EPA's Toxic Chemical Release Inventory (TRI) listed eight industrial facilities that produced, processed or otherwise used 1,3-dichloropropene in 1988 (TRI88 1990). The facilities reported releases of 1,3-dichloropropene to the environment, which were estimated to total 58,000 lb.

## REGULATIONS

1,3-Dichloropropene is regulated by EPA under the Clean Water Act (CWA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Superfund Amendments and Reauthorization Act (SARA). A reportable quantity (RQ) of 100 lb has been established for 1,3-dichloropropene under CERCLA and CWA. It is a hazardous substance regulated under RCRA's hazardous waste disposal rule and is subject to reporting requirements under SARA.

ACGIH recommends a threshold limit value (TLV) of 1 ppm (5 mg/m<sup>3</sup>) the potential for skin absorption was noted. NIOSH also has a recommended exposure limit (REL) of 1 ppm (5 mg/m<sup>3</sup>); with the potential for skin absorption noted. OSHA regulates 1,2-dichloropropene under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table 67.

## REFERENCES

Albrecht, W.N. Occupational Exposure to 1,3-Dichloropropene (Telone II) in Hawaiian Pineapple Culture. Arch. Environ. Health. Vol. 42, No. 5, 1987, pp. 286-291.

ATSDR. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,3-Dichloropropene. (Final Report). Atlanta, GA: ATSDR, Public Health Service, U.S. Department of Health and Human Services. 1992. 146 pp. NTIS Accession No. PB93-110765.

Chem Sources. Chemical Sources International, Inc. <http://www.chemsources.com>, 2001.

EPA. U.S. Environmental Protection Agency. OPPT High Production Volume Chemicals. <http://www.epa.gov/oppt/chemtest/cus/90b.pdf>, 1997.

HSDB. Hazardous Substances Data Bank. Online database produced by the National Library of Medicine. 1,3-dichloropropene. Profile last updated March 22, 2000. Last review date, September 24, 1992.

IARC. International Agency for Research on Cancer. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Some Hydrocarbons and Pesticide Exposures. Vol. 41. 434 pp. Lyon, France: IARC, 1986.

IARC. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Overall Evaluations of Carcinogenicity. Supplement 7. 440 pp. Lyon, France: IARC, 1987.

IARC. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Re-evaluation of Some Organic Chemicals, Hydrazine and Hydrogen Peroxide. Vol. 71, Part 3. 1,589 pp. Lyon, France: IARC, 1999.

NIOSH. National Institute for Occupational Safety and Health. National Occupational Exposure Survey (1981-83). Cincinnati, OH: Department of Health and Human Services, 1984.

NTP. National Toxicology Program. Technical Report Series No. 269. Toxicology and Carcinogenesis Studies of Telone II (Technical Grade 1,3-Dichloropropene (CAS No. 542-75-6) Containing 1.0% Epichlorohydrin as a Stabilizer) in F344/N Rats and B6C3F<sub>1</sub> Mice (Gavage

### 1,3-Dichloropropene (Technical Grade) (Continued)

Studies). NIH Publication No. 85-2525. 159 pp. National Toxicology Program, Research Triangle Park, NC, and Bethesda, MD, 1985.

SRI. Directory of Chemical Producers, United States, 1997. Stanford Research Institute, Menlo Park, CA: SRI International, 1997.

TRI88. Toxic Chemical Release Inventory 1988. Data contained in the Toxic Chemical Release Inventory (TRI). Available from National Library of Medicine's TOXNET system, 1990.

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

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1986. USITC Publication No. 2009. Washington, DC: U.S. Government Printing Office, 1987.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1987. USITC Publication No. 2118. Washington, DC: U.S. Government Printing Office, 1988.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1988. USITC Publication No. 2219. Washington, DC: U.S. Government Printing Office, 1989.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1989. USITC Publication No. 2338. Washington, DC: U.S. Government Printing Office, 1990.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1990. USITC Publication No. 2470. Washington, DC: U.S. Government Printing Office, 1991.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1991. USITC Publication No. 2607. Washington, DC: U.S. Government Printing Office, 1993.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1992. USITC Publication No. 2720. Washington, DC: U.S. Government Printing Office, 1994.

USITC. U.S. International Trade Commission. Synthetic Organic Chemicals, United States Production and Sales, 1994. USITC Publication No. 2933. Washington, DC: U.S. Government Printing Office, 1995.

Van Duuren, B.L., B.M. Goldschmidt, G. Loewengart, A.C. Smith, S. Melchionne, I. Seidman, and D. Roth. Carcinogenicity of Halogenated Olefinic and Aliphatic Hydrocarbons in Mice. J. Natl. Cancer Inst. Vol. 63, 1979, pp. 1433-1439.

WHO. World Health Organization. International Programme on Chemical Safety. Environmental Health Criteria 146, 1,3-Dichloropropene, 1,2-Dichloropropane and Mixtures. 261 pp. World Health Organization, Geneva, 1993.