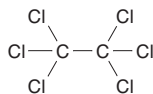


Hexachloroethane

CAS No. 67-72-1

Reasonably anticipated to be a human carcinogen

First listed in the *Seventh Annual Report on Carcinogens* (1994)



Carcinogenicity

Hexachloroethane is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in experimental animals.

Cancer Studies in Experimental Animals

Oral exposure to hexachloroethane caused tumors in two rodent species and at several different tissue sites. Administration of hexachloroethane by stomach tube caused liver cancer (hepatocellular carcinoma) in mice of both sexes and benign and malignant kidney tumors (renal-tubular adenoma and carcinoma) in male rats (NCI 1978, IARC 1979, NTP 1989). The incidence of benign adrenal-gland tumors (pheochromocytoma) also was marginally increased in male rats.

Cancer Studies in Humans

No epidemiological studies were identified that evaluated the relationship between human cancer and exposure specifically to hexachloroethane. Since hexachloroethane was listed in the *Seventh Annual Report on Carcinogens*, one additional epidemiological study has been identified. In a cohort study of workers at aluminum foundries and smelters in Sweden, no association was observed between cancer incidence and exposure to hexachloroethane (IARC 1999).

Properties

Hexachloroethane is a chlorinated alkane that exists at room temperature as a colorless crystalline solid with a camphor-like odor. It is practically insoluble in water, soluble in ethanol, benzene, chloroform, and oils, and very soluble in diethyl ether and tetrachloroethylene (Akron 2009, HSDB 2009). Hexachloroethane is stable under normal temperatures and pressures and is considered nonflammable; however, it is incompatible or reactive with alkalis and with metals such as zinc, cadmium, aluminum, hot iron, and mercury (NIOSH 2005). Physical and chemical properties of hexachloroethane are listed in the following table.

Property	Information
Molecular weight	236.7 ^a
Specific gravity	2.09 at 20°C/4°C ^a
Melting point	185°C (closed capillary) ^a
Boiling point	186°C at 777 mm Hg (sublimes) ^a
Log K_{ow}	4.14 ^a
Water solubility	50 mg/L at 25°C ^b
Vapor pressure	0.21 mm Hg at 20°C ^a
Vapor density relative to air	8.16 ^a

Sources: ^aHSDB 2009, ^bChemIDplus 2009.

Use

The applications of hexachloroethane have been extensive; however, industrial uses are diminishing. Hexachloroethane is used primarily in military smoke munitions (e.g., smoke pots, grenades, cartridges, and projectiles used to generate “smoke” or “fog”) and in pyrotechnics. The estimated average annual use of hexachloroethane from 1966 to

1977 at a major facility manufacturing smoke and pyrotechnic devices was 192,802 lb. In the 1970s, about half of the hexachloroethane distributed was used to manufacture military smoke-producing and pyrotechnic devices, 30% to 40% to manufacture degassing pellets to remove air bubbles from molten ore at aluminum foundries, and 10% to 20% as an antihelminthic to control liver flukes in sheep and cattle. The U.S. Food and Drug Administration withdrew approval for the use of hexachloroethane as an antihelminthic in 1971, and it probably is no longer used for this purpose (ATSDR 1997). Its use for degassing aluminum also has been almost completely phased out in the United States (EPA 1999). Other uses in metallurgy include refining alloys, removing impurities from molten metals, recovering metals from ores or smelting products, and as a degassing agent for magnesium; however, the European Union began phasing out the use of hexachloroethane in nonferrous metals in 1998 (EC 1998).

A number of other past uses of hexachloroethane have been identified, but many of these likely have been discontinued or involve the use of only limited quantities. Hexachloroethane is used as a laboratory chemical and as an ingredient in various fungicidal and insecticidal formulations, extreme-pressure lubricants, and plastics (ATSDR 1997, IARC 1999, HSDB 2009). Other past uses include as a moth repellent and in the chemical industry as a polymer additive, a plasticizer for cellulose esters, an accelerator, a vulcanizing agent, a process solvent in rubber manufacturing, a retardant in fermentation processes, and a component of submarine paints, and in the production of some types of synthetic diamonds. It has also been used as a component of fire-extinguishing fluids, an additive in combustible liquids (ignition suppressant), and an inhibitor of the explosiveness of methane and the combustion of ammonium perchlorate (IARC 1979, 1999, HSDB 2009).

Production

Production of hexachloroethane in the United States for commercial distribution began in 1921 and ended in 1967 (IARC 1979, ATSDR 1997). Currently, hexachloroethane is produced as a by-product of industrial chlorination of two-carbon hydrocarbons. It may be used in-house or recycled in feedstock to produce tetrachloroethylene or carbon tetrachloride. In 2009, hexachloroethane was produced by four manufacturers, all in India (SRI 2009) and was available from 35 suppliers, including 20 U.S. suppliers (ChemSources 2009). U.S. imports of hexachloroethane increased from 1.6 million pounds in 1976 to over 2 million pounds in 1977, 2.5 million pounds in 1985, and 4.5 million pounds in 1986 (ATSDR 1997). U.S. imports in the category of hexachloroethane and tetrachloroethane combined have shown an erratic pattern but have tended to decline in recent years, from 689,000 kg (1.5 million pounds) in 1989 to 139,000 kg (306,000 lb) in 2008 (USITC 2009). U.S. exports of hexachloroethane are not expected (ATSDR 1997). Exports in the category of hexachloroethane and tetrachloroethane combined reached a high of 11 million kilograms (25 million pounds) in 2005 and declined rapidly to 167,000 kg (368,000 lb) in 2008 (USITC 2009). Reports filed under the U.S. Environmental Protection Agency’s Toxic Substances Control Act Inventory Update Rule indicated that U.S. production plus imports of hexachloroethane totaled 10 million to 50 million pounds in 1986 and 1994, 1 million to 10 million pounds in 1990, 500,000 lb to 1 million pounds in 1998, and 10,000 to 500,000 lb in 2002 (EPA 2004). In 2006, the reported quantity was 1 million to 10 million pounds (EPA 2009).

Exposure

The routes of potential human exposure to hexachloroethane are inhalation, dermal contact, and ingestion (ATSDR 1997, NCI 1978). The general population can be exposed to hexachloroethane in the

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