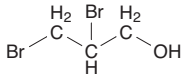
2,3-Dibromo-1-propanol

CAS No. 96-13-9

Reasonably anticipated to be a human carcinogen

First listed in the *Tenth Report on Carcinogens* (2002)

Also known as 2,3-dibromopropan-1-ol



Carcinogenicity

2,3-Dibromo-1-propanol is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in experimental animals.

Cancer Studies in Experimental Animals

Dermal exposure to 2,3-dibromo-1-propanol caused tumors at several different tissue sites in rats and mice. 2,3-Dibromo-1-propanol painted onto the skin increased the combined incidence of benign and malignant skin tumors (squamous-cell papilloma or carcinoma, basal-cell tumors, sebaceous adenoma, or keratoacanthoma) in rats and mice of both sexes. It also caused tumors (benign or malignant) at numerous other tissue sites, including the nasal mucosa, digestive tract, Zymbal gland, liver, and kidney in rats of both sexes; the mammary gland (adenocarcinoma) in female rats; the spleen (vascular tumors) and mesothelium (mesothelioma of the abdominal cavity or the tunica vaginalis of the testes) in male rats; the forestomach in mice of both sexes; and the liver and lung in male mice (NTP 1993, IARC 2000).

Cancer Studies in Humans

No epidemiological studies were identified that evaluated the relationship between human cancer and exposure specifically to 2,3-dibromo-1-propanol.

Studies on Mechanisms of Carcinogenesis

2,3-Dibromo-1-propanol was genotoxic in bacterial and mammalian *in vitro* test systems, including *Salmonella typhimurium, Escherichia coli,* V79 hamster cells, and L5178Y mouse lymphoma cells. It also caused sex-linked recessive lethal mutations and reciprocal translocations in *Drosophila melanogaster.* It caused sister chromatid exchange and chromosomal aberrations in cultured Chinese hamster ovary cells, but did not cause micronucleus formation in the bone marrow of mice administered 2,3-dibromo-1-propanol by intraperitoneal injection (IARC 2000). There is no evidence to suggest that mechanisms by which 2,3-dibromo-1-propanol causes tumors in experimental animals would not also operate in humans.

Properties

2,3-Dibromo-1-propanol is a halogenated alcohol that is a colorless to slightly yellow viscous liquid at room temperature. It is soluble in water, acetone, alcohol, ether, and benzene and is stable under normal temperatures and pressures (IARC 2000, Akron 2009). Physical and chemical properties of 2,3-dibromo-1-propanol are listed in the following table.

Property	Information
Molecular weight	217.9
Specific gravity	2.12 at 20°C/4°C
Melting point	8°C
Boiling point	219°C
Log K_{ow}	0.96
Water solubility	52 g/L at 25°C
Vapor pressure	0.09 mm Hg at 25°C
Vapor density relative to air	2.12

Source: HSDB 2009.

Use

The major use of 2,3-dibromo-1-propanol is as an intermediate in the production of flame retardants, insecticides, and pharmaceuticals, and the chemical itself has been used as a flame retardant. 2,3-Dibromo-1-propanol was used in the production of tris(2,3-dibromopropyl) phosphate, a flame retardant used in children's clothing and other products (HSDB 2009). Tris(2,3-dibromopropyl) phosphate was banned from use in sleepwear in 1977 by the Consumer Product Safety Commission after studies showed that it caused cancer in experimental animals (NTP 1993, HSDB 2009).

Production

Production of 2,3-dibromo-1-propanol in the United States was more than 10 million pounds in 1976, but decreased drastically after the use of tris(2,3-dibromopropyl) phosphate in sleepwear was banned (NTP 1993). In 2009, 2,3-dibromo-1-propanol was produced by two manufacturers in East Asia (SRI 2009) and was available from 16 suppliers, including 9 U.S. suppliers (ChemSources 2009). Reports filed in 1986, 1990, and 1998 under the U.S. Environmental Protection Agency's Toxic Substances Control Act Inventory Update Rule indicated that U.S. production plus imports of 2,3-dibromo-1-propanol totaled 10,000 to 500,000 lb; no inventory update reports for 2,3-dibromo-1-propanol were filed in 1994 or 2002 (EPA 2004).

Exposure

The primary routes of human exposure to 2,3-dibromo-1-propanol are inhalation and dermal contact. 2,3-Dibromo-1-propanol is a metabolite of tris(2,3-dibromopropyl) phosphate in humans (NTP 1993). Over 50 million children who wore treated sleepwear before the 1977 ban may have been exposed to 2,3-dibromo-1-propanol as a metabolite of tris(2,3-dibromopropyl) phosphate (Blum *et al.* 1978). 2,3-Dibromo-1-propanol could be released into the environment through its production and use (HSDB 2009). If released to air, 2,3-dibromo-1-propanol is expected to exist as a vapor and to be degraded by photochemically produced hydroxide radicals, with a half-life of 8 days. It is not expected to volatilize from water or soil or to adsorb to soil or sediment, and so is expected to enter groundwater if released to water or soil. Limited data suggest that it might biodegrade under aerobic conditions and that the potential for bioaccumulation is low.

Occupational exposure to 2,3-dibromo-1-propanol could occur through inhalation and dermal contact in industries where 2,3-dibromo-1-propanol is produced or is used to produce flame-retardant materials, pharmaceuticals, and insecticides (HSDB 2009). No estimates of occupational exposure to 2,3-dibromo-1-propanol were found.

Regulations

No specific regulations or guidelines relevant to reduction of exposure to 2,3-dibromo-1-propanol were identified.

References

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