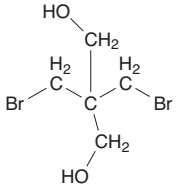
2,2-Bis(bromomethyl)-1,3-propanediol (Technical Grade)

CAS No. 3296-90-0

Reasonably anticipated to be a human carcinogen

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

Also known as BBMP



Carcinogenicity

The flame retardant 2,2-bis(bromomethyl)-1,3-propanediol, technical grade, 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 2,2-bis(bromomethyl)-1,3-propanediol (BBMP), technical grade, caused tumors at several different tissue sites in rats and mice. In two-year studies, dietary administration of BBMP caused tumors of the oral cavity, esophagus, mammary gland, and thyroid gland in rats of both sexes. In male rats, it also caused mononuclear-cell leukemia and tumors of the skin, subcutaneous tissue, Zymbal gland, forestomach, small and large intestines, mesothelium, urinary bladder, lung, and seminal vesicle. In similar studies with mice, BBMP caused tumors of the Harderian gland and lung in both sexes, the kidney in males, and the subcutaneous tissue in females (NTP 1996, Dunnick *et al.* 1997, IARC 2000). Dietary administration of BBMP for three months, followed by maintenance on a control diet for up to two years, caused tumors in male rats at the same tissue sites as in the two-year study of male rats described above. However, this study found higher incidences of tumors of the oral cavity, forestomach, small and large intestines, lung, Zymbal gland, thyroid gland, and mesothelium than did the two-year study; these tumors were considered to be related to BBMP exposure (NTP 1996, Dunnick *et al.* 1997).

Cancer Studies in Humans

No epidemiological studies were identified that evaluated the relationship between human cancer and exposure specifically to BBMP (IARC 2000).

Studies on Mechanisms of Carcinogenesis

BBMP caused mutations in *Salmonella typhimurium* strains TA100 and TA1535 only in the presence of mammalian metabolic activation (Zeiger *et al.* 1992). In cultured Chinese hamster ovary cells, BBMP caused chromosomal aberrations only in the presence of mammalian metabolic activation, and it did not cause sister chromatid exchange with or without activation. *In vivo* exposure to BBMP under various conditions induced micronucleus formation in the erythrocytes of mice (NTP 1996). There is no evidence to suggest that mechanisms by which BBMP causes tumors in experimental animals would not also operate in humans.

Properties

BBMP is a brominated alkyl (neopentyl) glycol with an aliphatic neopentyl structure that exists at room temperature as a white solid material with a mild musty odor. It is soluble in water and benzene, very soluble in acetone, isopropanol, and methanol, and slightly soluble in carbon tetrachloride and xylenes (HSDB 2009). Physical and chemical properties of BBMP are listed in the following table.

Property	Information
Molecular weight	262.0[a]
Melting point	111°C to 113°C[a]
Log K_{ow}	2.29[a]
Water solubility	38 g/L at 25°C[b]
Vapor pressure	1.3×10^{-5} mm Hg at 25°C[b]
Dissociation constant (pK_a)	13.57[c]

Sources: [a]HSDB 2009, [b]ChemIDplus 2009, [c]Akron 2009.

Use

BBMP is used as a flame retardant in unsaturated polyester resins, for molded products, and in the production of rigid polyurethane foam. It is also used as a chemical intermediate in the production of pentaerythritol ethers and other derivatives used as flame retardants (IARC 2000, HSDB 2009).

Production

Annual U.S. production of BBMP was estimated at over 2,300 kg (5,000 lb) in 1977 and 1979 (HSDB 2009) and at 3 million to 4 million pounds in 1983 (NTP 1996). BBMP was listed by the U.S. Environmental Protection Agency as a high-production-volume chemical in 1990, indicating that annual production exceeded 1 million pounds (EPA 2006). In 2009, BBMP was produced by one manufacturer each in the United States, Middle East, and China (SRI 2009) and was available from 14 suppliers, including 7 U.S. suppliers (ChemSources 2009).

Exposure

The primary routes of human exposure to BBMP are inhalation and dermal contact. BBMP may enter the environment as dust and through wastewater (NTP 1996). If released to air, BBMP is expected to exist in both vapor and particulate phases. The half-life of the vapor phase is estimated to be 2 days. If released to water, BBMP is expected to be adsorbed to sediments and suspended solids and not to volatilize from the surface of the water. If released to soil, it is expected to have moderate mobility, based on a soil-water partition coefficient of 420 (HSDB 2009). Occupational exposure to BBMP may occur in industries where it is used as a flame retardant, for example, in production of unsaturated polyester resins, molded products, and rigid polyurethane foam (NTP 1996).

Regulations

Environmental Protection Agency (EPA)

Emergency Planning and Community Right-To-Know Act

Toxics Release Inventory: Listed substance subject to reporting requirements.

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