

beta-Propiolactone

57-57-8

Hazard Summary

beta-Propiolactone is used for vaccines, tissue grafts, surgical instruments, and enzymes, as a sterilant of blood plasma, water, milk, and nutrient broth, and as a vapor-phase disinfectant in enclosed spaces. Acute (short-term) inhalation exposure to beta-propiolactone causes severe irritation of the eyes, nose, throat, and respiratory tract in humans. Acute dermal exposure may cause irritation of the skin, blistering, or burns in humans. Contact with the eyes may cause permanent corneal opacification. Burns of the mouth and stomach may occur in humans following acute exposure via ingestion. No information is available on the chronic (long-term), reproductive, developmental, or carcinogenic effects of beta-propiolactone in humans. Squamous cell carcinomas of the forestomach have been reported in orally exposed rats. In dermally exposed rodents, skin tumors have been observed. The International Agency for Research on Cancer (IARC) has classified beta-propiolactone as a Group 2B, possible human carcinogen.

Please Note: The main sources of information for this fact sheet are the Hazardous Substances Data Bank (HSDB) (1), a database of summaries of peer-reviewed literature, and the IARC monographs on chemicals carcinogenic to humans. (6)

Uses

- beta-Propiolactone is used for vaccines, tissue grafts, surgical instruments, and enzymes, as a sterilant of blood plasma, water, milk, and nutrient broth, and as a vapor-phase disinfectant in enclosed spaces. Its sporicidal action is used against vegetative bacteria, pathologic fungi, and viruses. (1,2,8)
- beta-Propiolactone is also used as a chemical intermediate. (1,2,7)

Sources and Potential Exposure

- Occupational exposure to beta-propiolactone may occur through inhalation or dermal contact during its manufacture and use. (1)

Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to beta-propiolactone.

Health Hazard Information

Acute Effects:

- Acute inhalation exposure beta-propiolactone causes severe irritation of the eyes, nose, throat, and respiratory tract in humans. Acute dermal exposure may cause irritation of the skin, blistering, or burns in humans. Contact with the eyes may cause permanent corneal opacification. Burns of the mouth and stomach may occur in humans following acute exposure via ingestion. (1,2)
- Acute oral exposure has been observed to result in muscular spasms, respiratory difficulty, and convulsions at high levels in rats. In rats acutely exposed intravenously, liver and kidney tubular damage has been reported. (1,3)
- Acute animal exposure tests in rats have demonstrated beta-propiolactone to have **extreme** acute toxicity by inhalation. (4)

Chronic Effects (Noncancer):

- No information is available on the chronic health effects of beta-propiolactone in humans.
- Chronic dermal exposure has resulted in skin irritation, scarring, and hair loss in mice. (1,3)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for beta-propiolactone.(2)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of beta-propiolactone in humans or animals.

Cancer Risk:

- No information is available on the carcinogenic effects of beta-propiolactone in humans.
- Squamous cell carcinomas of the forestomach have been reported in orally exposed rats. (1,6,8)
- In several studies of rats and mice exposed to beta-propiolactone via subcutaneous injection, local tumors have been observed at the site of injection. Lymphomas and hepatomas have been reported in mice following intraperitoneal injection. (1,6,8)
- In mice, hamsters, and guinea pigs dermally exposed, skin tumors have been observed. (1,6,8)
- EPA has not classified beta-propiolactone for carcinogenicity. (2)
- IARC has classified beta-propiolactone as a Group 2B, possible human carcinogen. (6)

Physical Properties

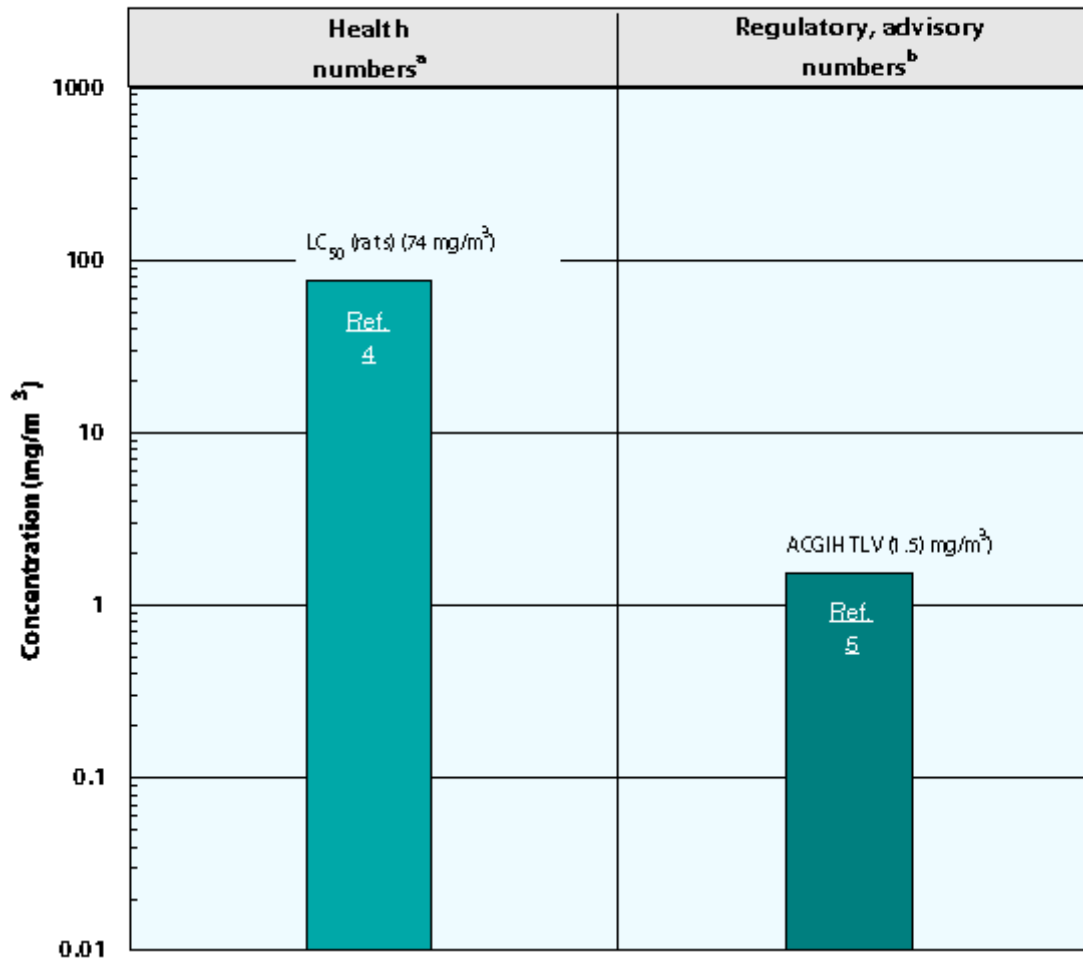
- The chemical formula for beta-propiolactone is $C_3H_4O_2$, and its molecular weight is 72.06 g/mol. (7)
 - beta-Propiolactone occurs as a colorless liquid that is very soluble in water. (1,6)
 - beta-Propiolactone has a pungent, slightly sweetish smell; the odor threshold has not been established.(1,2,6)
 - The vapor pressure for beta-propiolactone is 3.4 mm Hg at 25 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is 0.462. (1,6)
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Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $mg/m^3 = (ppm) \times (\text{molecular weight of the compound}) / (24.45)$. For beta-propiolactone: 1 ppm = 2.95 mg/m^3 .

Health Data from Inhalation Exposure

Propiolactone



ACGIH TLV --American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

LC₅₀ (Lethal Concentration₅₀)--A calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. ACGIH numbers are advisory.

References

Summary created in April 1992, updated in January 2000

1. U.S. Department of Health and Human Services. Hazardous Substances Databank (HSDB, [online database](#)). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
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3. M. Sittig. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*. 2nd ed. Noyes Publications, Park Ridge, NJ. 1985.
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7. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.
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