1,2-Epoxybutane

106-88-7

Hazard Summary

1,2-Epoxybutane is primarily used as a stabilizer in chlorinated hydrocarbon solvents. No information is available on the acute (short-term), chronic (long-term), reproductive, developmental, or carcinogenic effects of 1,2-epoxybutane in humans. Irritation and inflammation of the nasal passageways, lungs, and skin have been observed in animal studies following acute inhalation and dermal exposures. Chronic inhalation exposure of rats and mice to 1,2-epoxybutane causes degenerative lesions of the nasal cavity. In a National Toxicology Program (NTP) study, tumors of the nasal cavity and alveolar/bronchial tumors were produced in rats, while no tumors were observed in mice. The International Agency for Research on Cancer (IARC) has classified 1,2-epoxybutane as a Group 2B, possibly carcinogenic to humans.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (4), which contains information on inhalation chronic toxicity of 1,2-epoxybutane and the RfC, and the NTP toxicology and carcinogenesis studies of 1,2-epoxybutane in rats and mice. (3)

Uses

- The primary use of 1,2-epoxybutane is as a stabilizer in chlorinated hydrocarbon solvents. (3)
- 1,2-Epoxybutane is used in the production of the corresponding butylene glycols and their derivatives. It is also used to make butanolamines, surface-active agents, and gasoline additives. (1,3)

Sources and Potential Exposure

• Individuals are primarily exposed to 1,2-epoxybutane by dermal contact or inhalation in occupational settings. (1)

Assessing Personal Exposure

• No information was located concerning the measurement of personal exposure to 1,2-epoxybutane.

Health Hazard Information

Acute Effects:

- No information is available on the acute effects of 1,2-epoxybutane in humans.
- Irritation and inflammation of the nasal passageways and lungs have been observed in animal studies following acute inhalation exposure to 1,2-epoxybutane at high concentrations. (1)
- Brief dermal contact to 1,2-epoxybutane causes mild irritation in rabbits. (1)
- Tests involving acute exposure of rats and rabbits, have demonstrated 1,2-epoxybutane to have moderate acute toxicity from oral and dermal exposure. (2)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of 1,2-epoxybutane in humans.
- Chronic inhalation exposure of rats and mice to 1,2-epoxybutane causes degenerative lesions of the nasal cavity. Pulmonary hemorrhage has been observed in rats exposed to the highest levels. (3,4)

- Atrophy and necrosis of the spleen and thymus, and renal necrosis have been observed in mice chronically exposed to high concentrations of 1,2-epoxybutane in air. (3,4)
- Chronic inhalation exposure of rats to high levels has been reported to result in hematological effects. (4)
- Prolonged or repeated dermal exposure of humans to 1,2-epoxybutane may cause blistering and necrosis.
- The Reference Concentration (RfC) for 1,2-epoxybutane is 0.02 milligrams per cubic meter (mg/m³) based on degenerative lesions of the nasal cavity in mice. The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups), that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfC, the potential for adverse health effects increases. Lifetime exposure above the RfC does not imply that an adverse health effect would necessarily occur. (4)
- EPA has medium confidence in the study on which the RfC was based because although the study was well-conducted, used an appropriate number of animals, chose well-spaced exposure levels, and provided a thorough histopathological examination of the respiratory tract, it did not establish a no-observed-adverse-effect level (NOAEL); medium confidence in the database because there is a chronic inhalation study in two species supported by subchronic inhalation studies in several species and because inhalation studies are available on developmental effects although there are no multigenerational reproductive studies available; and, consequently, medium confidence in the RfC.
- EPA has not established a Reference Dose (RfD) for 1,2-epoxybutane. (4)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of 1,2-epoxybutane in humans.
- In a developmental inhalation study, the pregnancy rate of rabbits was reduced but birth defects were not observed at high doses; these results may be confounded by a high rate of maternal mortality. (1,3,4)
- No reproductive or developmental effects were observed in an inhalation study of rats. (1,3,4)

Cancer Risk:

- No information is available on the carcinogenic effects of 1,2-epoxybutane in humans.
- In an NTP inhalation study of 1,2-epoxybutane in rats and mice, tumors of the nasal cavity were observed in male and female rats and alveolar/bronchial tumors were produced in male rats, while no tumors were observed in mice. NTP noted that there was clear evidence of carcinogenic activity for male rats. (3)
- EPA has not classified 1,2-epoxybutane for potential carcinogenicity. (4)
- IARC has classified 1,2-epoxybutane as a group 2B, possibly carcinogenic to humans. (5)

Physical Properties

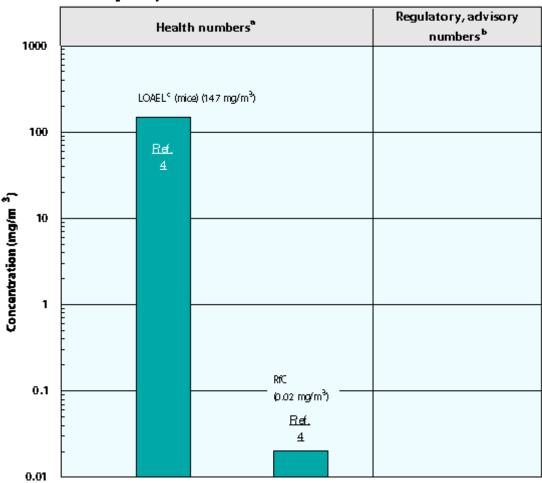
- The chemical formula for 1,2-epoxybutane is C₁H₂O, and its molecular weight is 72.1 g/mol. (3)
- 1,2-Epoxybutane is a watery, white liquid that is highly flammable. (3)
- The odor of 1,2-epoxybutane is sweetish and disagreeable; the odor threshold has not been established.
- The vapor pressure for 1,2-epoxybutane is 176 mm Hg at 25 °C. (1,3)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m^3 : $mg/m^3 = (ppm) \times (molecular weight of the compound)/(24.45). For 1,2-epoxybutane: 1 ppm = 2.95 mg/m .$

Health Data from Inhalation Exposure

1,2-Epoxybutane



LOAEL--Lowest-observed-adverse-effect level.

RfC--Reference concentration.

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

This LOAEL is from the critical study used as the basis for the RfC.

Summary created in April 1992, updated January 2000

References

- 1. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 2. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 3. National Toxicology Program. Toxicology and Carcinogenesis Studies of 1,2-Epoxybutane (CAS No. 106-88-7) in F344/N Rats and B6C3F₁ Mice (Inhalation Studies). NTP TR 329. U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD. 1988.
- 4. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on 1,2-Epoxybutane. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
- 5. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the

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

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.

Carcinogenic Risk of Chemicals to Humans. Supplement 7. World Health Organization, Lyon. 1986.