

# Diethyl Sulfate

64-67-5

---

## Hazard Summary

Diethyl sulfate is used as an ethylating agent and as a chemical intermediate. No information is available on the acute (short-term), chronic (long-term), reproductive, or developmental effects of diethyl sulfate in humans. In an epidemiological study, an excess mortality rate from laryngeal cancer was associated with occupational exposure to high concentrations of diethyl sulfate. In one study, rats orally exposed to diethyl sulfate developed tumors in the forestomach. EPA has not classified diethyl sulfate with respect to potential carcinogenicity. The International Agency for Research on Cancer (IARC) has classified diethyl sulfate as a Group 2A, probable 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. (5)

## Uses

- Diethyl sulfate is primarily used as an ethylating agent, and also as an accelerator in the sulfation of ethylene and in some sulfonations. (1,6)
- Diethyl sulfate is also a chemical intermediate for ethyl derivatives of phenols, amines, and thiols, and as an alkylating agent. (1)

## Sources and Potential Exposure

- The most probable routes of exposure to diethyl sulfate are by dermal contact or inhalation during its production or use. (1)
- Individuals may also be exposed to diethyl sulfate in the ambient environment from fugitive emissions. (1)

## Assessing Personal Exposure

- No information was located regarding the measurement of personal exposure to diethyl sulfate.

## Health Hazard Information

### Acute Effects:

- No information is available on the acute effects of diethyl sulfate in humans.
- Tests involving acute exposure of rats, mice, and rabbits have demonstrated diethyl sulfate to have **moderate** acute toxicity when ingested and **high** acute toxicity from dermal exposure. (2)

### Chronic Effects (Noncancer):

- No information is available on the chronic effects of diethyl sulfate in humans or animals.
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for diethyl sulfate. (3)

### Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of diethyl sulfate in humans.
- After a single subcutaneous dose to pregnant rats, malignant tumors of the nervous system were reported

in the offspring. (1,4,5)

#### Cancer Risk:

- In an epidemiological study, an excess mortality rate from laryngeal cancer was associated with occupational exposure to high concentrations of diethyl sulfate. (5)
- In one study, rats exposed to diethyl sulfate by gavage (experimentally placing the chemical in the stomach) developed tumors in the forestomach. In another study, local tumors and metastasis of the lung were observed in rats exposed by subcutaneous injection. (1,4,5)
- EPA has not classified diethyl sulfate with respect to potential carcinogenicity. (3)
- IARC has classified diethyl sulfate as a Group 2A, probably carcinogenic to humans, based on limited evidence in humans and sufficient evidence in animals. (1,5)

## Physical Properties

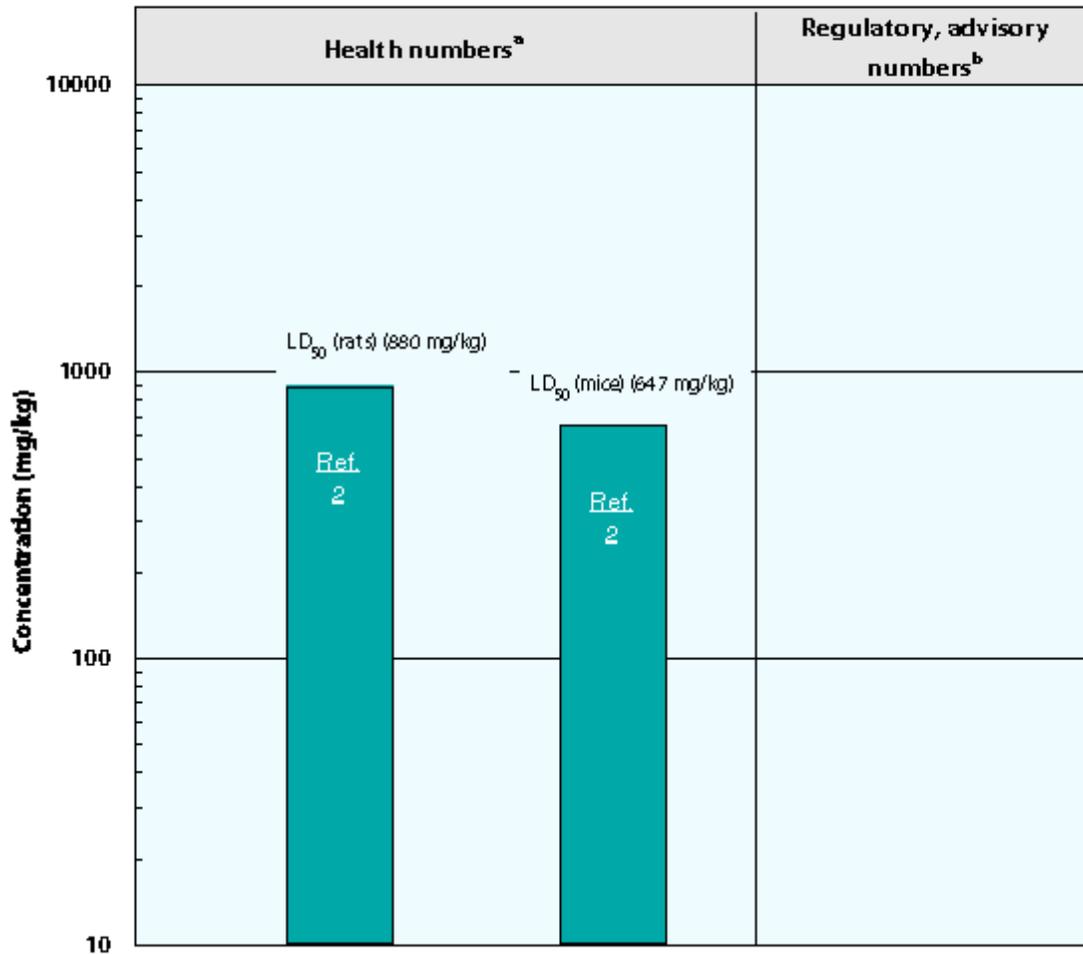
- The chemical formula for diethyl sulfate is  $C_4H_{10}O_4S$ , and its molecular weight is 154.19 g/mol. (6)
  - Diethyl sulfate occurs as a colorless, oily liquid that darkens with age and is practically insoluble with water. (1,6)
  - Diethyl sulfate has a faint ethereal or peppermint odor; the odor threshold has not been established. (1,6)
  - The vapor pressure for diethyl sulfate is 0.29 mm Hg at 25 °C, and its log octanol/water partition coefficient ( $\log K_{ow}$ ) is 1.14. (1)
- 

#### 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 diethyl sulfate: 1 ppm = 6.31  $mg/m^3$ .

### Health Data from Inhalation Exposure

# Diethyl Sulfate



LD<sub>50</sub> (Lethal Dose 50)—A calculated dose of a chemical in water to which exposure for a specific length of time is expected to cause death in 50% of a defined experimental animal population.

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

<sup>a</sup> Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

<sup>b</sup> 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.

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. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Diethyl Sulfate. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
4. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Aromatic Amines, Hydrazine and Related Substances, N-Nitroso Compounds and Miscellaneous Alkylating Agents. Volume 4. World Health Organization, Lyon. 1974.
5. International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of the

Carcinogenic Risk of Chemicals to Humans: Chemicals, Industrial Processes and Industries Associated with Cancer in Humans. Supplement 4. World Health Organization, Lyon. 1982.

6. The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 11th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1989.