

Ethyl Carbamate (Urethane)

51-79-6

Hazard Summary

Ethyl carbamate is used as an intermediate in the synthesis of a number of chemicals. Acute (short-term) exposure of humans to high levels of ethyl carbamate may result in injury to the kidneys and liver and induce vomiting, coma, or hemorrhages. No information is available on the chronic (long-term), reproductive, or developmental effects of ethyl carbamate in humans. An increased incidence of lung tumors has been observed in rodents exposed to ethyl carbamate by oral or inhalation exposure. The International Agency for Research on Cancer (IARC) has classified ethyl carbamate as a Group 2B, possibly carcinogenic to humans.

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 World Health Organization's International Agency for Research on Cancer (IARC) monograph on the carcinogenic risk to humans of ethyl carbamate. (2)

Uses

- Ethyl carbamate is used as an intermediate in the synthesis of a variety of products (e.g., pharmaceuticals) and as a solubilizer and cosolvent for pesticides and fumigants. (1,2,7)
- Ethyl carbamate has also been used as an anti-neoplastic agent. (2)

Sources and Potential Exposure

- Individuals are most likely to be exposed to ethyl carbamate in the workplace. (1)
- Ethyl carbamate has been found to occur in food made by a fermentation process, including beer, wine, whiskey, brandy, bread, soy sauce, yogurt, and olives. (1)
- Ethyl carbamate has been detected in some drinking water supplies. (1)

Assessing Personal Exposure

- Analysis of blood samples through titration techniques has been used to measure the amount of ethyl carbamate in the blood. (2)

Health Hazard Information

Acute Effects:

- Acute exposure of humans to high levels of ethyl carbamate may result in injury to the kidneys and liver and induce vomiting, coma, or hemorrhages. (1)
- Acute exposure of animals has been reported to cause bone marrow and central nervous system depression. (3)
- Acute animal tests in mice have demonstrated ethyl carbamate to have moderate acute toxicity from oral exposure. (4)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of ethyl carbamate in humans or animals.
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for ethyl carbamate. (5)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of ethyl carbamate in humans.
- Animal studies have reported effects on the developing fetus from maternal exposure to ethyl carbamate, including fetal abnormalities and fetal mortality. (1)
- Lung tumors have been reported in the offspring of mice injected with ethyl carbamate while pregnant. (1,2)

Cancer Risk:

- No adequate human epidemiological data are available on the carcinogenic effects of ethyl carbamate. (1,2,6)
- Nearly 200 studies have been identified demonstrating the carcinogenicity of ethyl carbamate in animals. (6)
- An increased incidence of lung tumors has been observed in mice exposed to ethyl carbamate by inhalation. (1,2)
- In several studies, oral exposure of mice and hamsters to ethyl carbamate has resulted in an increased incidence of lung tumors; lymphocytic leukemia, hepatomas, forestomach papillomas, and melanotic tumors of the skin have also been reported in animals. (1,2)
- EPA has not classified ethyl carbamate for carcinogenicity.
- IARC has classified ethyl carbamate as Group 2B, possibly carcinogenic to humans. (2)
- The California Environmental Protection Agency (CalEPA) has calculated an oral cancer slope factor of 1 (mg/kg/d)^{-1} and an inhalation unit risk factor of $2.9 \times 10^{-4} \text{ (}\mu\text{g/m}^3\text{)}^{-1}$. (6)

Physical Properties

- The chemical formula for ethyl carbamate is $\text{C}_3\text{H}_7\text{NO}_2$, and its molecular weight is 89.09 g/mol. (7)
- Ethyl carbamate occurs as colorless crystals or white granular powder and is very soluble in water. (1,2)
- Ethyl carbamate is almost odorless; the odor threshold has not been established. (2)
- The vapor pressure for ethyl carbamate is 0.36 at 25 °C, and its log octanol/water partition coefficient ($\log K_{ow}$) is -0.15. (1)
- Urethane is a common synonym for ethyl carbamate. (2,7)

Note: There are very few health numbers or regulatory/advisory numbers for ethyl carbamate; thus, a graph has not been prepared for this compound. The health information cited in this factsheet was obtained in December 1999.

Summary created in April 1992, updated January 2000

References

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.
4. 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.
5. U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Ethyl Carbamate. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
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Guidelines: Part II. Technical Support Document for Describing Available Cancer Potency Factors. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1999.

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