

ETHYL CARBAMATE

Ethyl carbamate is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 51-79-6

$\text{NH}_2\text{C}(\text{O})\text{OC}_2\text{H}_5$

Molecular Formula: $\text{C}_3\text{H}_7\text{NO}_2$

Ethyl carbamate is found as colorless, columnar crystals or white granular powder. It is odorless and soluble in water, benzene, ether, chloroform, glycerol, and olive oil (HSDB, 1991).

Physical Properties of Ethyl Carbamate

Synonyms: Urethan; carbamic acid; ethyl ester; urethane; ethyl urethan; leucothane

Molecular Weight:	89.09
Boiling Point:	182 °C
Melting Point:	48 °C
Density/Specific Gravity:	0.9862 (water = 1)
Vapor Density:	3.07 (air = 1)
Log/Octanol Water Partition Coefficient:	-0.15
Vapor Pressure:	0.36 torr at 25 °C
Conversion Factor:	1 ppm = 3.64 mg/m ³

(Sax, 1987; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Ethyl carbamate is used as an intermediate in organic synthesis, in the preparation and modification of amino resins, as a solubilizer, as a co-solvent for pesticides and fumigants, as an intermediate in the production of pharmaceuticals, as an anti-neoplastic agent, and as a reagent in biochemical research (HSDB, 1991).

The primary stationary sources of ethyl carbamate in California are cutlery, handtools and general hardware manufacturers, manufacturers of paints and varnishes, and national security installations. Other industries that have reported emissions of ethyl carbamate are communications equipment manufacturers, musical instrument manufacturing, and miscellaneous textile goods manufacturers (ARB, 1997b).

B. Emissions

The total emissions of ethyl carbamate from stationary sources in California are estimated to be at least 2,000 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Foods made by a fermentation process (beer, wine, bread, soy sauce, yogurt, olives) have been found to contain ethyl carbamate (U.S. EPA, 1994a).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of ethyl carbamate.

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of ethyl carbamate was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Reaction with the hydroxyl radical is expected to be the dominant tropospheric loss process for ethyl carbamate (Atkinson, 1995). Ethyl carbamate is very soluble in water and so may be subject to rainout (HSDB, 1991). No information about the atmospheric half-life or lifetime of ethyl carbamate was found in the readily-available literature.

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of April 1996, urethane prepolymer contributed to the total cancer risk in 1 of the approximately 550 risk assessments reporting a total cancer risk equal to or greater than 1 in 1 million (OEHHA, 1996a).

HEALTH EFFECTS

Probable routes of human exposure to ethyl carbamate (urethane) are inhalation, ingestion, and dermal contact (HSDB, 1991).

Non-Cancer: Acute exposure to high levels of ethyl carbamate may injure the liver, kidneys, central nervous system, and hemopoietic system. Symptoms include dizziness, vomiting, unconsciousness, coma, and hemorrhages (Sittig, 1991; U.S. EPA, 1994a). The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration

(RfC) or an oral Reference Dose (RfD) for ethyl carbamate (U.S. EPA, 1994a).

Developmental effects such as fetal abnormalities and fetal mortality from maternal exposure to ethyl carbamate have been reported in animal studies (U.S. EPA, 1994a). The State of California has determined under Proposition 65 that ethyl carbamate is a developmental toxicant (CCR, 1996).

Cancer: Rodents exposed to ethyl carbamate by inhalation or ingestion showed an increased incidence of lung tumors. The U.S. EPA has classified ethyl carbamate in Group B2: Probable human carcinogen based on sufficient animal but no human evidence (U.S. EPA, 1994a). The International Agency for Research on Cancer (IARC) has classified ethyl carbamate as Group 2B: Possible human carcinogen (IARC, 1987a).

The State of California has determined under Proposition 65 that ethyl carbamate is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 2.9×10^{-4} (microgram per cubic meter)⁻¹ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of ethyl carbamate is estimated to be no greater than 290 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 1.0 (milligram per kilogram per day)⁻¹ (OEHHA, 1994).

