# Ethyleneimine (Aziridine)

151-56-4

## Hazard Summary

Ethyleneimine has many uses, including in polymerization products and in adhesives and binders. Acute (short-term) inhalation exposure to ethyleneimine causes severe respiratory tract irritation and inflammation in humans, but symptoms may be delayed for several hours. Some symptoms of acute inhalation exposure in humans include tearing and burning of the eyes, sore throat, nasal secretion, bronchitis, shortness of breath, and edema of the lungs. Ethyleneimine is a severe blistering agent, causing third degree chemical burns of the skin. It is also corrosive to eye tissue and may cause permanent corneal opacity and conjunctival scarring. At low levels, chronic (long-term) inhalation exposure has been reported to result in effects on the blood in humans. EPA has not classified ethyleneimine for carcinogenicity.

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literature, and the Registry of Toxic Effects of Chemical Substances (RTECS), a database of toxic effects that are not peer reviewed. (4)

## Uses

- Ethyleneimine is used in polymerization products; as a monomer for polyethyleneimine; as a comonomer for polymers (e.g., with ethylenediamine); and in paper and textile chemicals, adhesives, binders, petroleum refining chemicals, fuels and lubricants, coating resins, varnishes, lacquers, agricultural chemicals, cosmetics, ion exchange resins, photographic chemicals, and surfactants. (1,2,7,8)

## Sources and Potential Exposure

- Occupational exposure to ethyleneimine may occur during its manufacture and use. (1,2)

## Assessing Personal Exposure

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

## Health Hazard Information

Acute Effects:

- Acute inhalation exposure to ethyleneimine causes respiratory tract irritation and inflammation in humans, but symptoms may be delayed for several hours. Some symptoms of acute inhalation exposure in humans include tearing and burning of the eyes, sore throat, nausea, vomiting, coughing, headache, dizziness, nasal secretion, laryngeal edema, pronounced changes of the trachea and bronchi, bronchitis, shortness of breath, overwhelming edema of the lungs, and secondary bronchial pneumonia. (1-2)
- Ethyleneimine is a severe blistering agent, causing third degree chemical burns of the skin. It is also corrosive to eye tissue and may cause permanent corneal opacity and conjunctival scarring in humans. (1-2)
- Renal damage and hematological effects have also been observed following acute inhalation exposure in humans. (1-2)
- Ethyleneimine has a corrosive effect on mucous membranes and acute oral exposure may cause scarring of

the esophagus in humans. (5)
- Acute animal tests in rats, mice, and guinea pigs, have demonstrated ethyleneimine to have extreme acute toxicity by inhalation, oral, or dermal exposure. (4)

Chronic Effects (Noncancer):
- At low levels, chronic inhalation exposure has been reported to result in hematological effects in humans and in rats. (1)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for ethyleneimine. (3)

Reproductive/Developmental Effects:
- No information is available on the reproductive or developmental effects of ethyleneimine in humans or animals.

Cancer Risk:
- No information is available on the carcinogenic effects of ethyleneimine in humans.
- Hepatomas and pulmonary tumors have been observed in mice exposed via gavage. Lymphomas, hepatomas, and pulmonary tumors were reported in mice exposed by subcutaneous (s.c.) injections. Sarcomas were reported at the injection site in rats exposed by s.c. injection. (1,5,6,7)
- EPA has not classified ethyleneimine for carcinogenicity. (3)

# Physical Properties

- The chemical formula for ethyleneimine is $C_2H_5N$, and its molecular weight is 43.07 g/mol. (7)
- Ethyleneimine occurs as a colorless, flammable, mobile liquid that is miscible with water. (1,5,7,8)
- Ethyleneimine has an intense ammoniacal odor, with an odor threshold of 1.5 parts per million (ppm). (1,5,7-9)
- The vapor pressure for ethyleneimine is 160 mm Hg at 20 °C. (1,5,7)
- A synonym for ethylenemimine is aziridine. (5)

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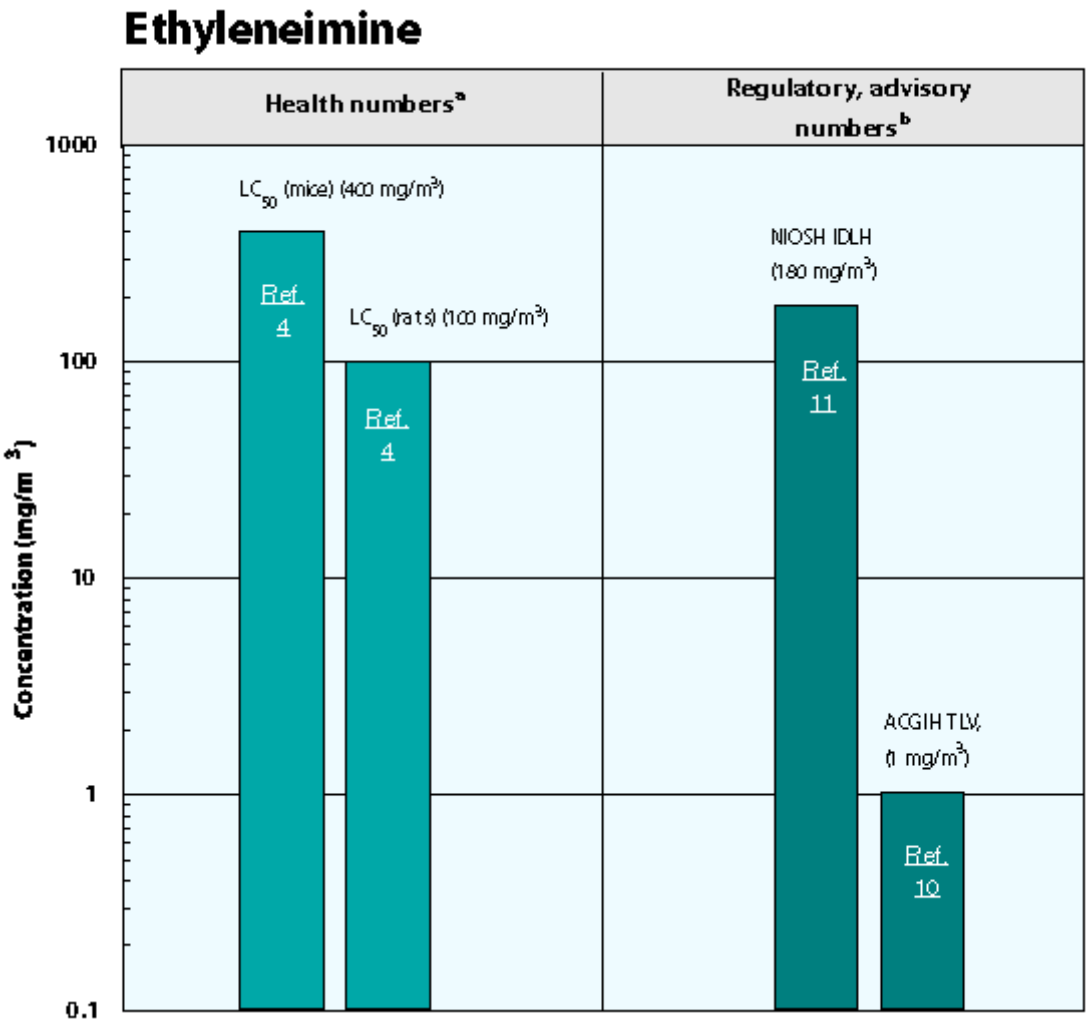
Conversion Factors:
To convert concentrations in air (at 25 °C) from ppm to $mg/m^3$: $mg/m^3$ = (ppm) × (molecular weight of the compound)/(24.45). For ethyleneimine: 1 ppm = 1.76 $mg/m^3$.

## Health Data from Inhalation Exposure




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.

$LC_{50}$ (Lethal Concentration $_{50}$)--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.

NIOSH IDLH--National Institute of Occupational Safety and Health immediately dangerous to life and health; NIOSH concentration representing the maximum level of a pollutant from which an individual could escape within 30 minutes without escape-impairing symptoms or irreversible health effects.

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. NIOSH and ACGIH numbers are advisory.

Summary created in April 1992, updated January 2000

References

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