# Ethylene Thiourea

96-45-7

## Hazard Summary

Ethylene thiourea is used in the rubber industry and in the production of some fungicides. No information is available on the acute (short-term) or chronic (long-term) effects of ethylene thiourea in humans. In rodents chronically exposed to ethylene thiourea in their diet, effects on the thyroid have been observed. Ethylene thiourea has been shown to be a potent teratogen (causes birth defects) in rats orally or dermally exposed. A study of female workers occupationally exposed to ethylene thiourea did not report an increased incidence of thyroid cancer. In a study by the National Toxicology Program (NTP), an increased incidence of thyroid tumors in rats, and thyroid, liver, and pituitary gland tumors in mice exposed to ethylene thiourea were noted. EPA has classified ethylene thiourea as a Group B2, probable human carcinogen.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS) (5), which contains information on oral chronic toxicity of ethylene thiourea and the RfD and EPA's Health and Environmental Effects Profile for Ethylene Thiourea. (3) Other secondary sources include 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literature, and the Registry of Toxic Effects of Chemical Substances (RTECS), a database of toxic effects that are not peer reviewed.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

- Ethylene thiourea is used as an accelerator in synthetic rubber production and as a curing agent for epichlorohydrin elastomers. (3,9)
- Ethylene thiourea is also a component of ethylenebisdithiocarbamate fungicides. (1)

## Sources and Potential Exposure

- Occupational exposure by dermal and inhalation routes may occur in the rubber and plastics industry and where ethylenebisdithiocarbamate fungicides are used. (1,2,3)
- Individuals may be exposed to ethylene thiourea through consumption of food contaminated with fungicides (released during cooking). (1,2)

## Assessing Personal Exposure

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

## Health Hazard Information

Acute Effects:

- No information is available on the acute effects of ethylene thiourea in humans.
- Tests involving acute exposure of rats and mice have demonstrated ethylene thiourea to have moderate acute toxicity by oral exposure. (4)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of ethylene thiourea in humans.

- In rodents chronically exposed to ethylene thiourea in their diet, increased incidences of thyroid hyperplasia and thyroid follicular cell hyperplasia and increased liver weights have been observed. (3,5) The
- EPA has not established a Reference Concentration (RfC) for ethylene thiourea. (5)
- The Reference Dose (RfD) for ethylene thiourea is 0.00008 milligrams per kilogram body weight per day (mg/kg/d) based on increased incidence of thyroid hyperplasia in rats. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral 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 RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (5)
- EPA has medium confidence in the study on which the RfD was based since the chronic rat study provides sufficient data with multiple appropriate endpoints; medium confidence in the database because there were adequate group sizes with many test dose groups as well as additional supporting data from other chronic studies; and, consequently, medium confidence in the RfD.
- The California Environmental Protection Agency (CalEPA) has calculated a chronic reference exposure level of 0.003 milligrams per cubic meter ($mg/m^3$) based on thyroid effects in rats. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. (10)

Reproductive/Developmental Effects:

- In an occupational study, reproductive or developmental effects were not observed in humans. (1,6)
- Ethylene thiourea has been shown to be a potent teratogen in rats orally or dermally exposed, causing CNS and skeletal abnormalities. (3)

Cancer Risk:

- A study of female workers occupationally exposed to ethylene thiourea did not report an increased incidence of thyroid cancer. (3,6,7)
- Increased incidences of thyroid carcinomas and hepatomas (liver tumors) have been observed in rats and mice orally exposed to ethylene thiourea. (3,6,7)
- In a study by the NTP, an increased incidence of thyroid tumors in rats, and thyroid, liver, and pituitary gland tumors in mice exposed to ethylene thiourea were noted. (11)
- EPA has classified ethylene thiourea as a Group B2, probable human carcinogen. (8)
- EPA has calculated an oral cancer slope factor of 0.11 $(mg/kg/d)^{-1}$ for ethylene thiourea. (8)

# Physical Properties

- The chemical formula for ethylene thiourea is $C_3H_6N_2S$, and it has a molecular weight of 102.2 g/mol. (3,9)
- Ethylene thiourea occurs as white to pale green crystals or crystalline solid that is highly soluble in water. (1,3,9)
- The odor threshold for ethylene thiourea has not been established.
- The log octanol/water partition coefficient (log $K_{ow}$) of ethylene thiourea is -0.66. (3)

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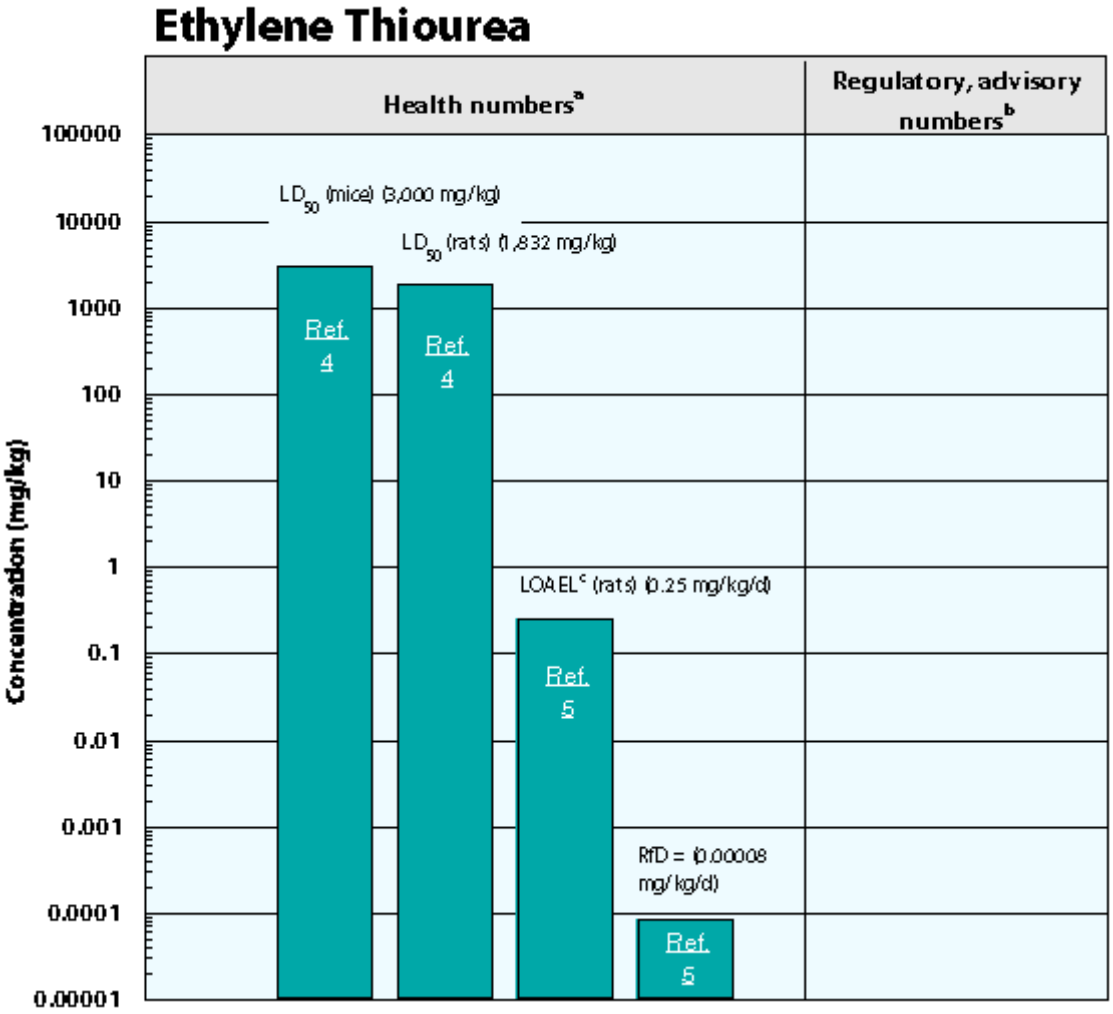
Conversion Factors:

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 ethylene thiourea: 1 ppm = 4.18 $mg/m^3$.

## Health Data from Oral Exposure




$LD_{50}$ (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.

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

The health 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.

[c] This LOAEL is from the critical study used as the basis for EPA's RfD.

Summary created in April 1992, updated January 2000

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