

ETHYLENE THIOUREA

CAS number: 96-45-7

Synonyms: 2-Mercaptoimidazoline, ET, ETU

Chemical formula: $C_3H_6N_2S$

Structural formula: —

Workplace exposure standard (new)

TWA: 0.02 mg/m³

STEL: —

Peak limitation: —

Notations: Sk.

IDLH: —

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 0.02 mg/m³ is recommended to protect for adverse thyroid effects in exposed workers.

Discussion and conclusions

Ethylene thiourea (ETU) is used as an intermediate for antioxidants and in the manufacture of synthetic resins.

Adverse effects include reduced thyroxine serum levels in the thyroid gland. Limited human data are available in the primary sources. Occupational exposure in workers is reported to produce effects on thyroid hormone levels with a LOAEL of 0.120 mg/m³ (HCTON, 1999). Some case studies report dermal sensitisation in workers. Developmental effects are identified in rats at doses greater than 5 mg/kg/day. ETU induced thyroid cancer in rats, but these effects are related to characteristics of rodent thyroid gland physiology and are not considered relevant to humans (DFG, 1995; HCOTN, 1999). A LOAEL of 0.25 mg/kg is identified in rats for increased incidence of thyroid hyperplasia (US EPA, 1991).

The HCOTN (1999) assigned a TWA of 0.024 mg/m³ based on the LOAEL of 0.120 mg/m³ for reductions in serum thyroxine levels and an uncertainty factor of 5. This TWA is supported by evidence presented in animal studies. Therefore, a TWA of 0.02 mg/m³ is recommended to protect for listed effects in exposed workers.

Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

A skin notation is recommended based on case study evidence of systemic effects following dermal exposure in humans.

DRAFT

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	NA	NA
No report.		
ACGIH	NA	NA
No report.		
DFG	1995	Not assigned
No MAK assigned due to potential carcinogenicity. Summary of data: Human data: - A study in workers in 2 factories; with employment 5 to 20 yr: 1st factory 330 µg/m³ (personal air samplers in 1976; no further details); lower T₄ (thyroxine) values than controls 2nd factory 120–160 µg/m³ (personal air samplers in 1976; no further details); significantly lower T₄ than controls - Case studies of dermal sensitisation reported. Animal data: - LD₅₀: 545 mg/kg (rats, oral) - NOEC: 11 mg/m³ in 28 d inhalation study in rats; thyroid effects - NOAEL: 0.4 mg/kg for histopathological effects; NOEL 0.2 mg/kg; 2-yr feeding study 2-yr feeding study; 5 mg/kg increased incidence of adenomas and carcinomas in thyroid; probably the result of the thyrostatic effects - Dose-dependent fetotoxic and strongly teratogenic effects >5 mg/kg/d (rats). Reported weak genotoxic potential based on evidence <i>in vitro</i> and <i>in vivo</i>.		
SCOEL	NA	NA
No report.		
OARS/AIHA	NA	NA
No report.		
HCOTN	1999	TWA: 0.024 mg/m³
TWA is considered protective of thyroxine level reduction in serum in workers. Summary of additional data: - Induces thyroid cancer in rats: - dose-dependent response - carcinogenic effects appear to be related to characteristics of rodent thyroid gland physiology and not relevant to humans - Considers 120 µg/m³ as LOAEL in humans; same study as DFG (1995) - Applies an inter-individual factor of 5 to the LOAEL to arrive at TWA of 0.024 mg/m³.		

Secondary source reports relied upon

Source	Year	Additional information
US EPA	✓ 1991	LOAEL 0.25 mg/kg in rats; 2-yr feeding study; increased incidence of thyroid hyperplasia.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic? Insufficient data

Is the chemical carcinogenic with a mutagenic mechanism of action? No

The chemical is not a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	NA
HCIS	NA
NICNAS	—
EU Annex	NA
ECHA	—
ACGIH	NA
DFG	Carcinogenicity – 3B
SCOEL	NA
HCOTN	—
IARC	Carcinogenicity – 3
US NIOSH	NA

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

Skin notation assessment

Calculation	
Adverse effects in human case study:	yes
Dermal LD ₅₀ ≤ 1000 mg/kg:	
Dermal repeat-dose NOAEL ≤ 200 mg/kg:	
Dermal LD ₅₀ /Inhalation LD ₅₀ < 10:	
<i>In vivo</i> dermal absorption rate > 10%:	
Estimated dermal exposure at WES > 10%:	
a skin notation is warranted	

IDLH

Is there a suitable IDLH value available? No

Additional information

Molecular weight:	102.2
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m ³ ; 1 mg/m ³ = Number ppm
This chemical is used as a pesticide:	☐
This chemical is a biological product:	☐
This chemical is a by-product of a process:	☐
A biological exposure index has been recommended by these agencies:	☐ ACGIH ☐ DFG ☐ SCOEL

Workplace exposure standard history

Year	Standard
Click here to enter year	

References

Deutsche Forschungsgemeinschaft (DFG) (1998) Ethylene thiourea – MAK value documentation.

European Chemicals Agency (ECHA) (2019) Ethylene thiourea – REACH assessment.

Health Council of the Netherlands (HCOTN) (1999) Ethylene thiourea. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 1999/03OSH.

International Agency for Research on Cancer (IARC) (2001) Ethylenethiourea. IARC Monographs on the evaluation of the carcinogenic risk to humans.