ETHANOLAMINE

CAS number: 141-43-5

Synonyms: 2-Aminoethanol, monoethanolamine

Chemical formula: C_2H_7NO

Workplace exposure standard (retained)

TWA: **3 ppm (7.6 mg/m^3)**

STEL: **6 ppm (15 mg/m^3)**

Peak limitation: **—**

Notations: **Sk.**

IDLH: **30 ppm**

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

Recommendation and basis for workplace exposure standard

A TWA of 3 ppm (7.6 mg/m^3) is recommended to protect for irritant effects.

A STEL of 6 ppm (15 mg/m^3) is recommended to protect for acute irritation effects from intermittent exposure fluctuations.

Discussion and conclusions

Ethanolamine is used in the manufacture of antibiotics, hair waving solutions, as a chemical dispersal agent, in the synthesis of surface-active agents and in emulsifiers and polishes. Limited data are available in humans.

Critical effects of exposure include eye and skin irritation and hepatotoxicity (liver effects) at very high concentrations. Limited data available in humans. A NOAEC of 4 ppm (10 mg/m^3) is identified in a 28 day study of rats for effects in the lining of the larynx, trachea and lungs (DFG, 2016). Exposure at 5 ppm for 90 days resulted in skin irritation in rats and guinea pigs and slight apathy and poor appetite in dogs (ACGIH, 2018). A LOAEC of 5 ppm (13 mg/m^3) is identified in rats based on behavioural effects following two to three weeks of exposure (SCOEL, 1996).

A TWA of 3 ppm and STEL of 6 ppm are recommended based on the weight of evidence presented and are considered protective for irritation effects and potential systemic effects reported in animals.

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 evidence in animals for dermal absorption.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 3 ppm (7.6 mg/m^3); STEL: 6 ppm (15 mg/m^3)***
ACGIH	***2001***	***TLV-TWA: 3 ppm (8 mg/m^3); TLV-STEL: 6 ppm (15 mg/m^3)***

TLV-TWA recommended to minimise the risk of eye and skin irritation in exposed workers.

TLV-STEL recommended to provide a greater margin of safety from exposure for potential systemic effects for which data are lacking.

Summary of data:

Animal data:

- LD_{50}: 3,320 mg/kg (rat, oral)
- LD_{50}: 1,000 mg/kg (rat, dermal)
- Irritant and necrotic to skin of rabbit; slightly less injurious to eye than ammonia
- Pulmonary, hepatic and renal lesions observed in rats, mice, rabbits, and guinea pigs at 1,250 ppm (mist and vapour; 5 wk); no further information
- Inhalation exposure at 5 ppm 24 h/d, 7 d/wk, 90 d resulted in skin irritation in rats, guinea pigs, dogs
    - slight temporary weight loss and slight decrease in activity and alertness in dogs
    - continuous exposure tends to result in higher incidence or severity of toxicity on laboratory animals than intermittent exposure
- Evidence suggests elimination is faster in rats than humans; indicating a percentage is retained in the human body and potentially affect toxicity.

TLV-TWA of 3 ppm based on the reported 5 ppm exposure from the 90 d study in animals taking into consideration continuous exposure and rapid elimination by rats.

TLV-STEL of 6 ppm is recommended to reduce systemic effects from intermittent exposure fluctuations.

Insufficient data to recommend a carcinogen, skin or sensitiser notation.

DFG	***2016***	***MAK: 0.2 ppm (0.5 mg/m^3)***

Summary of additional data:

Human data:

- Insufficient data in humans to derive MAK
- Acute liver damage and subsequent chronic hepatitis reported after one only inhalation exposure to a high concentrations while handling an undiluted solution in an unventilated room; no further details
- Inflammation of the upper respiratory passages, chronic bronchitis and chronic hepatitis in workers at 1 mg/m^3, exact concentrations or conditions unknown, inadequate, not regarded as suitable for inclusion in the present evaluation
- Erythema and oedema reported after undiluted exposure to skin for 1.5 h
- Negative result in skin sensitisation test.

Animal data:

- NOAEC of 10 mg/m^3 (4 ppm) in rats, 28 d; changes to the epithelium of the larynx, trachea and lungs.

Source	Year set	Standard
TWA based on rat NOAEC of 10 mg/m^3; corresponds to NOAEC of 0.56 mg/m^3 (0.22 ppm) in humans (method not described).		
SCOEL	***1996***	***TWA: 1 ppm (2.5 mg/m^3); (15 mins): 3 ppm (7.6 mg/m^3)***
Summary of additional data: • LOAEL of 5 ppm (13 mg/m^3) for behavioural effects in rats; 2–3 wk exposure • Uncertainty factor of 5 for extrapolation from animal to humans; TWA of 1 ppm • STEL of 3 ppm recommended to prevent exposure to irritating levels; no further information.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***NA***	***NA***
No report.		

Secondary source reports relied upon

Source		Year	Additional information
NICNAS	✓	2013	• NOAEL 320 mg/kg/d in rats; oral, 90 d; increased liver and kidney weights at ≥640 mg/kg/d • 28 d inhalation study in rats; exposed (nose only) at 10, 50, and 150 mg/m³; NOAEC of 10 mg/m³ for local effects, based on concentration-related lesions in the larynx, trachea and lung; adverse systemic effects not noted at the highest tested concentration; systemic NOAEC of 150 mg/m³ (cited by DFG, 2016) • Not sensitising to the skin of guinea pigs.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic? No

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

Notations

Source	Notations
SWA	—
HCIS	—
NICNAS	NA
EU Annex	NA
ECHA	—
ACGIH	—

Source	Notations
DFG	H (skin)
SCOEL	Skin
HCOTN	NA
IARC	NA
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:	
Dermal LD_{50} ≤1000 mg/kg:	yes
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	
In vivo dermal absorption rate >10%:	
Estimated dermal exposure at WES >10%:	
	consider assigning a skin notation

IDLH

Is there a suitable IDLH value available?	Yes

Additional information

Molecular weight:	61.08
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 2.5 mg/m^3; 1 mg/m^3 = 0.401 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

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the *TLVs® and BEIs® Guidelines section* on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (1999) 2-Aminoethanol – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (1996) Recommendation from the Scientific Committee on Occupational Exposure Limits for Ethanolamine. SCOEL/SUM/24.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2013) Ethanol, 2-amino: Human health tier II assessment – IMAP report.