



TRIETHANOLAMINE

CAS number: 102-71-6

Synonyms: Daltogen, 2,2,2-nitrilotriethanol, sterolamide, TEA, trihydroxytriethylamine

Chemical formula: $C_6H_{15}NO_3$

Workplace exposure standard (retained)

TWA: 5 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 5 mg/m³ is recommended to protect for irritation in exposed workers.

Discussion and conclusions

Triethanolamine is used in dry cleaning and wool scouring. It is found in cosmetics, household detergents, metalworking fluids, polishes, emulsions, antifoam agents, water repellents and similar products.

The critical effects of exposure are respiratory, skin and eye irritation.

Triethanolamine is identified as causing allergic contact dermatitis, erythematous vesicular lesions, eczema, contact dermatitis and irritation in workers. No exposure data for humans are available (ACGIH, 2018). Inflammation of the larynx was observed in a 28-day study in rats with a BMDL₀₅ of 14 mg/m³ reported (DFG, 2018). NICNAS (2013) reported a LOAEC of 20 mg/m³ from the same study. DFG (2018) used the reported BMDL₀₅ and applied with scaling factors to derive a MAK of 1 mg/m³. Adverse effects on liver, kidneys and nerve fibres were reported in oral animal experimental studies (ACGIH, 2018).

A TWA of 5 mg/m³ by ACGIH (2018) is recommended to be retained as based on the weight of evidence presented it is considered protective for irritation 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 sensitizer or respiratory sensitizer according to the GHS.

A skin notation is recommended based on *in vivo* evidence of dermal uptake and potential systemic effects demonstrated in animals.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1995	TWA: 5 mg/m³
ACGIH	2001	TLV-TWA: 5 mg/m³
<p>TLV-TWA recommended to minimise the potential for eye and skin irritation contact dermatitis and as reported in experimental animals, adverse effects on liver, kidneys and nerve fibres reported in animal studies.</p> <p>Summary of data:</p> <ul style="list-style-type: none"> No inhalation exposure data or derivation of the TLV-TWA in this primary source. <p>Human data:</p> <ul style="list-style-type: none"> Identified as causing allergic contact dermatitis, erythematous vesicular lesions, eczema, contact dermatitis and irritation in exposed workers Negative results reported in a cohort study in which cancer morbidity and mortality were investigated in workers exposed to cutting fluids with nitrates and amines (among them triethanolamine). <p>Animal data:</p> <ul style="list-style-type: none"> Relatively nontoxic following oral administration Reversible irritation following instillation in the rabbit eye Groups of 24 guinea pigs (gavage) and 24 rats (diet) administered 0, 200, 400, 800, or 1,600 mg/kg/d, 5 d/wk; sacrificed after 12 or 24 wk; or dosed 24 wk and a recovery period of 3 mo after dosing: <ul style="list-style-type: none"> incremental increase in severity of adverse effect reported at all dose included cloudy swelling of convoluted tubules and Henli loop in kidneys slight cloudy swelling in the peripheries of the acini along with some fatty changes in the inner halves of the acini in liver scattered degeneration in the myelin sheath of the individual fibres in sciatic nerves LOAEL of 20 mg/kg/d kidney regeneration not as complete as liver regeneration at the end of the recovery period Reduced growth, altered organ weights, microscopic lesions and death reported in rats study (n=10 rats/dose) administered doses of 0, 0.005 to 2.61 g/kg/d in the diet for 30 d; responses ranged from: <ul style="list-style-type: none"> NOEL of 0.08 g/kg reported Inconclusive evidence from reports on chronic bioassays with rodents for carcinogenic potential of triethanolamine. <p>Insufficient evidence to recommend a skin, sensitiser or carcinogenicity notation or TLV-STEL.</p>		
DFG	2018	MAK: 1 mg/m³ (inhalable fraction)
<p>Summary of additional data:</p> <ul style="list-style-type: none"> Critical effect is inflammation in the laryngeal epithelium of rats after 28 d inhalation exposure 		

Source	Year set	Standard
		<ul style="list-style-type: none"> Concentration-dependent increases in the incidences of laryngeal inflammation at all exposure concentration in rats exposed to 0, 20, 100, 500 mg/m³ for 28 d (LOAEC of 20 mg/m³): <ul style="list-style-type: none"> only grade 1 and grade 2 severities recorded only grade 1 and grade 2 severities recorded a BMDL₀₅ of 14.8 mg/m³ calculated (severity grading not presented) MAK derivation: <ul style="list-style-type: none"> by extrapolating the data from animal studies to humans (1:3) and assuming an intensification of the effects found in a subacute study over time (1:6), a concentration of 0.8 mg/m³ is obtained from the BMDL₀₅ of 14.8 mg/m³ as triethanolamine did not cause irritation of the skin or eyes in the Draize test, a MAK of 1 mg/m³ has been justified instead of the 0.5 mg/m³ that would have resulted with rounding approach MAK also considered to be protective or sensory irritation effects.
SCOEL	NA	NA
No report.		
OARS/AIHA	NA	NA
No report.		
HCOTN	NA	NA
No report.		

Secondary source reports relied upon

Source	Year	Additional information
NICNAS	✓ 2013	<ul style="list-style-type: none"> In dermal studies, 70% of 14C- labelled triethanolamine applied to the skin of mice and rats with or without occlusion, absorbed within 24–48 h by skin In a rat study (strain not specified) exposed to the chemical (1.8 mg/m³), no deaths reported: <ul style="list-style-type: none"> 1/12 rats exposed showed signs of chronic bronchitis; no further information In a 28-d repeated dose inhalation toxicity study in male and female rats, LOAEC is estimated to be 20 mg/m³ in male rats only: <ul style="list-style-type: none"> histopathological investigations indicated inhalation of 20 and 500 mg/m³ (in males and females, respectively) caused irritation of the URT (larynx) as indicated through inflammatory changes in the mucosal lining Critical health effects are respiratory, skin and eye irritation.

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	Sen
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	NA
DFG	NA
SCOEL	NA
HCOTN	NA
IARC	Carcinogenicity – Group 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:

Dermal LD₅₀ ≤ 1000 mg/kg:

Dermal repeat-dose NOAEL ≤ 200 mg/kg:

Dermal LD₅₀/Inhalation LD₅₀ < 10:

In vivo dermal absorption rate > 10%: **yes**

Estimated dermal exposure at WES > 10%:

consider assigning a skin notation

IDLH

Is there a suitable IDLH value available? No

Additional information

Molecular weight:	149.22
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 6.19 mg/m ³ ; 1 mg/m ³ = 0.161 ppm
This chemical is used as a pesticide:	<input type="checkbox"/>
This chemical is a biological product:	<input type="checkbox"/>



Molecular weight:	149.22
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 6.19 mg/m ³ ; 1 mg/m ³ = 0.161 ppm
This chemical is used as a pesticide:	<input type="checkbox"/>
This chemical is a by-product of a process:	<input type="checkbox"/>
A biological exposure index has been recommended by these agencies:	<input type="checkbox"/> ACGIH <input type="checkbox"/> DFG <input type="checkbox"/> 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) (2018) Triethanolamine – MAK value documentation.

International Agency for Research on Cancer (IARC) (2000) Volume 77, Some industrial chemicals. IARC Monographs on the evaluation of the carcinogenic risk to humans.

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