

## DIETHYLENE TRIAMINE

**CAS number:** 111-40-0

**Synonyms:** 2,2'-Diaminodiethylamine, 1,4,7-tri-(aza)-heptane, DETA, 2,2'-Iminoethylamine

**Chemical formula:**  $C_4H_{13}N_3$

**Structural formula:** —

### Workplace exposure standard (retained)

**TWA:** 1 ppm (4.2 mg/m<sup>3</sup>)

**STEL:** —

**Peak limitation:** —

**Notations:** Sk., DSEN

**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 1 ppm (4.2 mg/m<sup>3</sup>) is recommended to protect for respiratory and eye irritation, and for dermal sensitisation in exposed workers.

### Discussion and conclusions

Diethylene triamine is used as a solvent, fuel component and saponification agent for acid materials.

Critical effects include respiratory and ocular irritation, pulmonary and dermal sensitisation in exposed workers. Limited toxicological evidence exists in humans and animals. As such, ACGIH have based the recommendation for the TLV-TWA by analogy to less toxic ethylamine. Respiratory tract irritation and sensitisation potential is reported as greater than those of ethylamine (ACGIH, 2018). In their review of the current TWA, HCOTN (2005) recommend a health-based OEL of 1.2 ppm (5 mg/m<sup>3</sup>). This concentration was derived from a NOAEL of 47 mg/kg/day derived from an oral rat study (HCOTN, 2005).

The current TWA of 1 ppm is recommended to be retained as the data indicate it is protective for irritation and sensitisation in exposed workers.

### Recommendation for notations

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

Classified as a skin sensitiser and not a respiratory sensitiser according to the GHS.

A skin notation is recommended based on evidence suggesting potential dermal absorption and adverse systemic effects in animals.

## APPENDIX

### Primary sources with reports

Source	Year set	Standard
<b>SWA</b>	<b>1991</b>	<b>TWA: 1 ppm (4.2 mg/m<sup>3</sup>)</b>
<b>ACGIH</b>	<b>2001</b>	<b>TLV-TWA: 1 ppm (4.2 mg/m<sup>3</sup>)</b>
<p>TLV-TWA recommended to minimise the risk of respiratory and ocular irritation, pulmonary and cutaneous sensitisation in exposed workers. The recommendation was by analogy to ethylamine (TLV-TWA of 5 ppm [9 mg/m<sup>3</sup>]).</p> <p>Summary of data:</p> <p>Human data:</p> <ul style="list-style-type: none"> <li>• Solution of 15% to 100% reported to cause severe corneal injury</li> <li>• Solution of 5% reported to caused minor corneal injury and potential sensitisation of skin and respiratory tract unless controlled</li> <li>• Respiratory tract irritation and sensitisation potential reported as greater than those of ethylamine.</li> </ul> <p>Animal data:</p> <ul style="list-style-type: none"> <li>• LD<sub>50</sub>: 71–74 mg/kg (mice and rats, IP)</li> <li>• LD<sub>50</sub>: 1,080 mg/kg (rats, oral)</li> <li>• LD<sub>50</sub>: 1,090 mg/kg (rabbits, dermal)</li> <li>• LD<sub>50</sub>: 162 mg/kg (guinea pigs, dermal)</li> <li>• Rats survived exposure at 300 ppm (8 h).</li> </ul> <p>Sensitiser notation was deferred until additional evidence is available.</p> <p>Insufficient data to recommend a carcinogen notation.</p>		
<b>DFG</b>	<b>NA</b>	<b>NA</b>
No report.		
<b>SCOEL</b>	<b>NA</b>	<b>NA</b>
No report.		
<b>OARS/AIHA</b>	<b>NA</b>	<b>NA</b>
No report.		
<b>HCOTN</b>	<b>2005</b>	<b>TWA: 1 ppm (4 mg/m<sup>3</sup>)</b>
<p>No explanation of derivation for current TWA.</p> <p>The committee recommends a health-based OEL of 1.2 ppm (5 mg/m<sup>3</sup>).</p> <p>Summary of data:</p> <p>Human data:</p> <ul style="list-style-type: none"> <li>• Volunteer study and case reports described occupation-related allergic skin reactions.</li> </ul> <p>Animal data</p>		



Source	Year set	Standard
		<ul style="list-style-type: none"><li>Exposure at 130 ppm (550 mg/m<sup>3</sup>) (rats, 6 h/d, 5 d/wk, inhalation) for 3 wk produced no toxic signs other than coarsened hair, parameter included at gross and microscopic post-mortem examination, organ examination</li><li>DETA dihydrochloride salt NOAEL: 70–80 mg/kg/d (rats, 90 d, oral), ≈47 mg/kg/d Diethylene triamine; changes in a number of haematological and clinical chemistry values, decreases in body weights and body weight gains and increases in relative kidney and liver weights, without macroscopic or microscopic lesions</li><li>Negative results in mutagenicity assays.</li></ul>
Recommended TWA derivation:		
		<ul style="list-style-type: none"><li>Starting point NOAEL of 47 mg/kg/d</li><li>Adjust for animal 7 d/wk exposure to 5 d work week exposure 7/5 to give a NAEL of 66 mg/kg/d</li><li>Adjust by 4 for allometric scaling from rats to humans to arrive and an overall factor of 27 for inter- and intraspecies variation</li><li>Results in a NAEL for humans of 0.61 mg/kg/d</li><li>Converted to equivalent inhalation concentration via 70-kg worker inhaling 10 m<sup>3</sup> per 8-h, shift assuming 100% absorption and rounding up to 5 mg/m<sup>3</sup> (1.2 ppm).</li></ul>

## Secondary source reports relied upon

NIL.

## 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	Skin, Sen
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	Skin Sens. 1
ACGIH	Skin
DFG	Sh (dermal sensitiser)
SCOEL	NA
HCOTN	—
IARC	NA



Source	Notations
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: no
Dermal LD <sub>50</sub> ≤1000 mg/kg: yes
Dermal repeat-dose NOAEL ≤200 mg/kg:
Dermal LD <sub>50</sub> /Inhalation LD <sub>50</sub> <10:
<i>In vivo</i> dermal absorption rate >10%:
Estimated dermal exposure at WES >10%:
consider assigning a skin notation

## IDLH

Is there a suitable IDLH value available? No

## Additional information

Molecular weight:	103.17
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 4.21 mg/m <sup>3</sup> ; 1 mg/m <sup>3</sup> = 0.237 ppm
This chemical is used as a pesticide:	<input type="checkbox"/>
This chemical is a biological product:	<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 7<sup>th</sup> 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) List of MAK and BAT values.

European Chemicals Agency Regulation (ECHA) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Health Council of the Netherlands (HCOTN) (2005) 2,2'-Iminodi(ethylamine). Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/153.

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