# N-Ethylmorpholine

| CAS number: | 100-74-3 |
| --- | --- |
| Synonyms: | 4-Ethylmorpholine |
| Chemical formula: | C6H13NO |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **5 ppm (24 mg/m3)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Sk.** |
| IDLH: | **100 ppm** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

The current TWA of 5 ppm (24 mg/m3) is retained to protect for eye and nasal irritation, distorted vision and corneal damage in exposed workers.

## Discussion and conclusions

N-Ethylmorpholine is used as a catalyst in the manufacture of urethane foam and as an intermediate for dyestuffs, pharmaceuticals, rubber accelerators and emulsifying agents and as a solvent for dyes, resins and oils. Critical effects reported in humans are eye and nasal irritation and visual disturbances (ACGIH, 2018).

Toxicological data in human and animal are limited. Humans exposed to 50 ppm reported slight irritation to eyes, nose and throat (LOAEC) while no irritation was reported at 25 ppm (NOAEC). The corneal effects caused by N-ethylmorpholine are reversible (ACGIH, 2018).

The current TWA of 5 ppm is recommended to be retained to limit irritant effects based on the recommendation by ACGIH (2018) and supported by evidence from the HCOTN (2002) and NIOSH (2007).

## 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 has been recommended based on evidence (analogous to morpholine) suggesting potential dermal absorption and adverse systemic effects in animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 5 ppm (24 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 5 ppm (24 mg/m3) |
| TLV-TWA recommended to minimise the potential for eye and nasal irritation, distorted vision and corneal damage in exposed workers.  Summary of data:  Human data:   * Exposure to 100 ppm in 10 humans for 2.5 min produced irritation to eyes, nose and throat and olfactory fatigue. Slight irritation at 50 ppm and absent at 25 ppm (same duration) * Workers exposed to 3–4 ppm (duration not reported) but not above 11 ppm experienced drowsiness, optical halos and foggy vision * Corneal oedema occurred in workers exposed to 40 ppm for several hours, with effects reversible within 3–4 h of cessation of exposure.   Animal data:   * 1 of 6 rats died following 4 h inhalation exposure at 2,000 ppm * LD50: 1,780 mg/kg (rats, oral).   A skin notation is assigned since it is analogous to morpholine which is reported to cause systemic toxicity in humans and animals following dermal application. Insufficient data to recommend SEN notation or TLV-STEL. |
| DFG 1983 Not assigned |
| Summary of additional data:   * No further information on distribution, metabolism and excretion following absorption through the skin * A drop of pure liquid N-ethylmorpholine to the eye of an anaesthetised rabbit caused redness of the eyelids and nictitating skin after a few seconds up to a few minutes * 450 mg applied to rabbit skin produced slight irritation * Findings of mutagenicity tests appear inconclusive as indicative of impurity present * Insufficient animal data to establish MAK. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2002 TWA: 5 ppm (25 mg/m3) |
| Summary of additional data:   * Used as an intermediate for dyestuffs, pharmaceuticals, rubber accelerators and emulsifying agents and as a solvent for dyes, resins and oils * Committee considered that insufficient toxicological data is available to recommend health-based OEL and insufficient information to comment on administrative OEL value. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2019 | * No additional information. |
| US NIOSH |  | 2007 | * TWA 5 ppm (23 mg/m3) (skin) * No additional information. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Insufficient data |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | Skin |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Skin |
| DFG | — |
| SCOEL | NA |
| HCOTN | Skin |
| 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 |
| --- |
| Insufficient data to assign a skin notation |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 115.17 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.70 mg/m3; 1 mg/m3 = 0.213 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*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (1983) N-Ethylmorpholin – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2002) 4-Ethylmorpholine. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/034.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2019) Chemical Inventory - Morpholine, 4-ethyl-.

NIOSH Pocket Guide to Chemical Hazards (2007) NIOSH Pocket Guide to Chemical Hazards – N-Ethylmorpholine.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – N-ethylmorpholine.