# 2-Methoxyethyl acetate

| CAS number: | 110-49-6 |
| --- | --- |
| Synonyms: | EGMEA, ethylene glycol monomethyl ether acetate, ethylene glycol monomethyl ether monoacetate, 2‑MEA, methyl cellosolve acetate |
| Chemical formula: | C5H10O3 |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **0.1 ppm (0.5 mg/m3)** |
| --- | --- |
| STEL: | **–** |
| Peak limitation: | **–** |
| Notations: | **Sk.** |
| IDLH: | **200 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 0.1 ppm (0.5 mg/m3) is recommended to protect for haematological, developmental and reproductive effects in exposed workers.

## Discussion and conclusions

2-methoxyethyl acetate (EGMEA) is used in photographic films, lacquers and textile printing and as a solvent for waxes, oils, various gums and resins, cellulose acetate and nitrocellulose. It has also been used in semiconductor and electronics manufacturing.

EGMEA is rapidly metabolised to 2‑methoxy-ethanol (EGME) and the primary source agencies consider the toxicological profiles as comparable (ACGIH, 2018; DFG 2008; HCOTN, 2011; SCOEL, 2006). The critical effects of exposure are haematological, developmental and possibly reproductive effects.

Anaemia was reported in workers with inhalational exposure to EGME at 35.7 ppm. Dermal exposure through unprotected hands was also reported along with inhalation exposure in this study, although no further information was presented. Anaemia did not occur once airborne exposure concentrations were lowered to 0.55 ppm and dermal exposure was reduced (ACGIH, 2018). No haematological effects were identified in workers exposed *via* inhalation at 2.3 ppm (SCOEL, 2006). An increased prevalence of reduced sperm cells was noted in workers exposed at mean workplace airborne concentrations of 0.8 ppm (2.6 mg/m³) EGME (TWA concentration of 5.6 ppm) along with co-exposure to 21.5 ppm of 2-ethoxy-ethanol (NICNAS, 2014). A LOAEC of 3 ppm for haematological effects and a benchmark dose (10%) of 1.3 ppm (4.1 mg/m3) EGME relating to delayed ossification in fetuses was derived in an inhalation study in pregnant rats (HCOTN, 2011).

Given the absence of anaemia in workers at 0.55 ppm, effects on workers sperm production at 0.88 ppm and developmental effects in animals at 10 ppm, the TWA of 0.1 ppm (0.5 mg/m3) derived by ACGIH (2018) is recommended. Although the same developmental study in animals was used by the HCOTN (2011) to derive a TWA, ACGIH (2018) took into consideration of evidence in humans and therefore, the recommendation by ACGIH (2018) is considered more appropriate. The recommended TWA is expected to be protective against haematological, developmental and reproductive 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 evidence of dermal uptake and systemic effects in humans.

# Appendix

### Primary sources with reports

| **Source Year set Standard** |
| --- |
| SWA 1991 TWA: 5 ppm (24 mg/m3) | |
|  |
| ACGIH 2006 TLV-TWA: 0.1 ppm (0.5 mg/m3) |
| TLV-TWA recommended to protect for hematologic and reproductive effects and should also minimise the potential for adverse effects on the immune system organs and depression of CNS.  Summary of data:  Rapidly metabolised to 2 methoxy-ethanol (ethylene glycol monomethyl ether, EGME); toxicological effects similar.  EGME readily absorbed dermally in amount enough to produce systemic toxicity; basis of skin notation.  Human data:   * Anaemia in workers exposed *via* inhalation to EGME at 35.7 ppm; dermal exposure of the hands also reported along with the inhalation exposure (no further information is presented); the anaemias did not occur once airborne concentration were lowered to 0.55 ppm and dermal exposure reduced * Increased rates of miscarriages and birth defects reported in women workers exposed to mixed glycol ethers; no further information * Case study in female worker; first child born with normal karyotype with congenital hypospadia, chordee, micropenis and bifida scrotum; second son also of normal karyotype with chordee, cryptorchidism, penile hypospadia and bifida scrotum; exposure to 2‑methoxyethyl acetate (EGMEA) exposure *via* unprotected hands.   Animal data:   * Mucous membrane irritation in guinea pigs and rabbits at 4,500 ppm for 1 h * Reported LOAEL of 3 ppm EGME for hematologic abnormalities; sub-chronic exposures in pregnant rabbits; no further information * Reduced packed cell volume and white blood cell, haemoglobin, platelet and serum protein concentrations reported in rats and rabbits exposed (inhalation) for 13 wk at 300 ppm EGME; none of these effects occurred at 30 ppm; no further information * Gestational exposures to EGME: * delayed ossification in rabbits at 10 ppm and in rats at 25 ppm * 50 ppm resulted in major congenital malformations occur in rabbits; no further information.   Insufficient data to recommend a sensitisation or carcinogenicity notation or TLV-STEL.  TLV-TWA justified based metabolism of EGMEA to EGME and the absence of anaemia in humans at 0.55 ppm and reproductive effects at 10 ppm. |
| DFG 2008 MAK: 1 ppm (4.9 mg/m3) |
| MAK recommended based on analogy to 2-methoxyethanol (EGME, 2ME).  Summary of additional data:   * No new studies with 2-methoxyethyl acetate which are suitable for the derivation of a MAK value or to indicate a carcinogenic or genotoxic effect. |
| SCOEL 2006 TWA: 1 ppm (5 mg/m3) |
| TWA for 2-methoxyethanol (2ME, EGME) and 2-methoxyethyl acetate (2MEA, EGMEA) recommended to protect for haematological effects and possible reproductive effects.  Summary of additional data:   * Anaemia in 26% of workers exposed at average of 4 ppm EGME; no further information; additional study identified no effects at 2.3 ppm; basis for TWA of 1 ppm * NOEL of 10 ppm for embryotoxic, fetotoxic and teratogenic effects in rats, rabbits and mice; exposed to EGME for 6 h/d through gestation; support evidence for TWA. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2011 TWA: 0.16 ppm (0.8 mg/m3) |
| Summary of additional data:   * Considers the toxicology profile of EGMEA as comparable to EGME * Pregnant rabbits exposed at 0, 3, 10 and 50 ppm 6 6/d on GD 6–15 (cited by ACGIH, 2018): * 50 ppm significantly increased the incidence of malformations, minor variations and resorptions of the offspring, as well as decreased fetal body weight * at 10 ppm, the number of implantations resorbed and the number of litters with resorptions increased significantly; a significant increase in delayed ossification of the sternebrae was observed in the offspring * at 3 ppm, no effects were observed in the female rabbits or their offspring * BMDL10 of 1.3 ppm (4.1 mg/m3) derived from study results * TWA based on BMDL10 of 1.3 ppm (4.1 mg/m3) EGME for delayed ossification in fetuses; inhalation study in pregnant rats exposed 6 h/d GD 6–15; uncertainty factor of 9 for inter- and intraspecies variation. |

### Secondary source reports relied upon

| **Source** |  | **Year** | **Additional information** |
| --- | --- | --- | --- |
| NICNAS |  | 2014 | * An increased prevalence of oligospermia and azoospermia was noted in workers exposed to mean work-place concentrations were 0.8 ppm (2.6 mg/m³) EGME; TWA concentration of 5.6 ppm (17.7 mg/m3); co-exposure to 21.5 ppm, 2-ethoxy-ethanol * Adverse developmental effects, in the absence of maternal toxicity, in several species following exposure by all routes * Developmental effects were generally observed at lower doses than both reproductive effects and haematological effects * NOAEC of 3 ppm (9 mg/m3), LOEC of 10 ppm (32 mg/m3) EGME in rabbits; delayed ossification. |

### 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 |
| HCIS | — |
| NICNAS | — |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Skin |
| DFG | H (skin) |
| SCOEL | Skin |
| 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 |
| --- |
| |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | | Adverse effects in human case study: | yes | 4.00 |  | | Dermal LD50 ≤1000 mg/kg: |  |  |  | | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  | | Estimated dermal exposure at WES >10%: |  |  |  | |  |  |  | **a skin notation is warranted** | |

### IDLH

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

## Additional information

| Molecular weight: | 118.13 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.83 mg/m3; 1 mg/m3 = 0.207 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) (2009) 2-Methoxyethylacetat – MAK value documentation.

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).

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2006) Recommendation from the Scientific Committee on Occupational Exposure Limits for 2-Methoxyethanol. SCOEL/SUM/120.

Health Council of the Netherlands (HCOTN) (2011) Ethyleneglycol monomethyl ether (EGME) and ethyleneglycol monomethyl ether acetate (EGMEA). Health-based recommended occupational exposure limits. The Hague: Health Council of the Netherlands; publication no. 2011/10.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2014) Alkoxyethanols (C1-C2) and their acetates: Human health tier II assessment – IMAP report.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Methyl Cellosolve® acetate.