# Mercury, alkyl compounds (as hg)

| CAS number: | 7439-97-6 |
| --- | --- |
| Synonyms: | Methylmercury, ethylmercury, phenylmercury |
| Chemical formula: | — |
| Structural formula: | — |

Workplace exposure standard (interim)

| TWA: | **0.01 mg/m3** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Sk.** |
| IDLH: | **2 mg/m3 (as Hg)** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 0.01 mg/m3 is recommended to protect for central nervous system (CNS) and peripheral nervous system effects in exposed workers. The TWA will also reduce the risk of developmental effects in the progeny of exposed workers.

A STEL is not recommended as available evidence does not demonstrate acute effects.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

Alkyl mercury compounds are used as fungicides in seed dressings and foliage sprays. It is also used as preservative solutions for wood, paper pulp, textiles and leather. Common alkyl mercurial includes methylmercury (MeHg), ethylmercury and phenylmercury and their salts.

Limited dose-response data are available in humans and animals. Alkyl mercury compounds rapidly pass through the blood-brain barrier and placenta. Critical effects of exposure include CNS and peripheral nervous system toxicity. Methylmercury is a known teratogen in humans and animals. However, no exposure-response data are available. No symptoms of mercury poisoning are identified in humans exposed at concentrations as low as 0.01 mg/m3. However, within these cases, exposure is reported to include occasional sizeable fluctuations for brief periods. In animals, the main target organ is the brain with effects in other organs including the kidneys, liver, gastrointestinal tract and gonads (ACGIH, 2018). There is some evidence of carcinogenic effects in animals. However, this is not considered relevant to occupational exposures.

Given the limited available data, the TWA of 0.01 mg/m3 is recommended in the interim to protect for CNS and peripheral nervous system toxicity. This TWA is considered to protect for effects in other organs.

The available evidence did not demonstrate acute effects associated with short-term exposures and as such, a STEL is not recommended.

Given the limited data available from primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## 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 review of the classification for skin sensitisation by NICNAS is recommended as there is evidence of dermal sensitisation reported in the primary sources.

A skin notation is recommended due to evidence of dermal absorption and contribution to adverse systemic effects.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.01 mg/m3; STEL: 0.03 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.01 mg/m3; TLV-STEL: 0.03 mg/m3 |
| TLV-TWA and TLV-STEL recommended to minimise the potential for CNS and peripheral nervous system toxicity and effects on the kidney in exposed workers.  Summary of data:  Methyl mercury is a known teratogen in humans and animals.  Human data:   * Alkyl Hg compounds rapidly pass through blood-brain barrier and placenta compared to inorganic Hg compounds * MeHg lethal dose 200 mg; paraesthesia of the hands, feet and mouth at total body burden of 40 mg; half-life= 40–105 d * Severe CNS damage in children from orally exposed mothers; foetus more susceptible than mother to MeHg; evidence males more susceptible than females * MeHg eliminated in breast milk; can cause permanent blindness in newborns * 2 fatalities following exposure to an estimated 1 mg/m3 for 3 mo * No symptoms of poisoning at 0.01–0.1 mg/m3; occasional sizeable exceedances of this range for brief periods; no duration provided * A 1948 study suggested limit of 0.01 mg/m3 based on Swedish industrial experience.   Animal data:   * Main target organ of alkyl mercurials is the brain; produce gastro-, pancreo-, hepato-, cardio- and gonadotoxic effects in mice and rats * Report of death in mice following 3–5 h exposure at 10–30 mg/m3 organic Hg; no further information * Reports that methyl, ethyl, n-propyl and n-butyl mercurials are volatile, readily penetrate the skin and the blood–brain barrier contributing to neurotoxic effects * Considered mutagenic in standard *in vitro* tests.   Skin notation recommended as dermal absorption contributes to systemic alkyl Hg intoxication.  Insufficient evidence to recommend sensitiser or carcinogen notations. |
| DFG 2001 Not assigned |
| No MAK recommended because of suspicion of carcinogenic effects with possible genotoxic mechanism.  Summary of additional data:   * Organic Hg compounds are highly lipophilic; assumed to readily penetrate the skin * Skin sensitisation by phenylmercury compounds documented in case reports, in the results of patch tests and in one study with experimental animals * Positive results in patch tests of patients sensitised to thimersol; organic group of MeHg and ethylmercury compounds is identical with part of the thimerosal structure * Methylmercuric chloride induced renal adenocarcinomas in male but not in female mice; long-term feeding study * 103 wk study with phenylmercuric acetate in drinking water; demonstrated dose-dependent increase in renal cell adenomas; high dose group significant increase compared to controls. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2000 Not assigned |
| Report on the evaluation of the effects on reproduction, recommendation for classification for mercury and compounds including inorganic.  No further data. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US EPA |  | 2001 | * MeHg – Possible human carcinogen; systemic non-cancer effects would be seen at methylmercury exposures lower than those required for tumour formation * MeHg – oral RfD of 0.1 µg/kg-d based on BMDL05 in range of 46–79 ppb in maternal blood for different neuropsychological effects in the offspring at 7 yr of age, corresponding to a range of maternal daily intakes of 0.857–1.472 µg/kg-day. |
| ECHA |  | 2006 | * MeHg – LD50:35 mg/kg (rats, oral) * Some evidence of a carcinogenic activity in male rats based on the increased incidence squamous cell papillomas of the forestomach; no further information. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Yes |
| --- | --- |
| 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 | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | — |
| ACGIH | Skin |
| DFG | Carcinogenicity – 3, H (skin), Sh (dermal sensitiser) |
| 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: | 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: | 200.59 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number 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) (2001) Mercury, organic compounds – 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) (2007) Recommendation from the Scientific Committee on Occupational Exposure Limits for elemental mercury and inorganic divalent mercury compounds. SCOEL/SUM/84.

Health Council of the Netherlands (HCOTN) (2000) Mercury and its compounds. Evaluation of the effects on reproduction, recommendation for classification. The Hague: Health Council of the Netherlands; publication no. 2000/05OSH.

International Agency for Research on Cancer (IARC) (1993) Volume 58, Beryllium, Cadmium, Mercury, and Exposures in the Glass Manufacturing Industry. IARC Monographs on the evaluation of the carcinogenic risk to humans.

US Environmental Protection Authority (US EPA) (2001) Integrated Risk Information System (IRIS) Chemical Assessment Summary – methylmercury (MeHg).

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Mercury (organo) alkyl compounds (as Hg).