# Monochloroacetic acid

| CAS number: | 79-11-8 |
| --- | --- |
| Synonyms: | Chloroactic acid, α-chloroacetic acid, MCAA |
| Chemical formula: | C2H3ClO2 |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **0.5 ppm (2.0 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 0.5 ppm (2.0 mg/m3) is recommended to protect for respiratory and eye irritation and systemic effects in exposed workers.

## Discussion and conclusions

Monochloroacetic acid is used as a post-emergence herbicide and detergent, disinfectant and drying agent for canning processes. It is also used as an intermediate for several chemicals including synthetic caffeine and dyes (ACGIH, 2018).

Based on cases of accidental exposure in humans, monochloroacetic acid is corrosive to eyes and skin and highly irritating to the respiratory tract. It caused chemical burns, acute systemic toxicity and death (ACGIH, 2018). Based on chronic studies, rats have been identified as the most sensitive species (DFG, 2019). A sub-chronic LOAEL of 15 mg/kg/day (administered by aqueous gavage) and a chronic NOAEL of 3.5 mg/kg/day (administered by drinking water) based on reduced body weight gains and reduced liver and kidney weights was identified in rats (ACGIH, 2018 and DFG, 2019).

A TWA of 0.5 ppm (2.0 mg/m3) by ACGIH (2018) and DFG (2019) is recommended. Based on the weight of evidence presented, the recommended TWA is considered adequately protective of irritant and systemic 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 warranted as evidence indicates rapid absorption through the skin and reports of acute poisonings in the workplace.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.3 ppm (1.2 mg/m3) | |
|  |
| ACGIH 2006 TLV-TWA: 0.5 ppm (2.0 mg/m3) |
| TLV-TWA recommended to minimise potential for respiratory and eye irritation and systemic effects in exposed workers. The TLV-TWA provides an adequate degree of protection based on estimated minimum toxic concentration for irritation from read across with acetic acid and a suggested threshold for irritation of 6 mg/m3.  Summary of data:  Human data:   * 3 separate cases of accidental exposure to skin resulted in first degree burns despite quick and prolonged washing, then deterioration in condition resulting in death. Autopsy findings included congestion, haemorrhage, confluent petechia of heart, lungs, thymus and blood in the lungs * Systemic poisoning symptoms include disorientation, agitation, metabolic acidosis, cerebral oedema, cardiac failure and coma * Accidental ingestion of 1 teaspoon in 5 yr old girl, which was immediately vomited, caused death due to metabolic acidosis and cardiac arrhythmias * Acute irritant that causes severe damage to eyes, respiratory tract, and mucous membranes; air concentrations causing these effects not available * Poorly documented reports indicate threshold for irritation of ≈6 mg/m3.   Animal data:   * LD50: 55–580 mg/kg (rats); 165–260 mg/kg (mice); 80 mg/kg (guinea pigs) * Acute toxicity signs in rats included clonic, tonic convulsions, followed by respiratory depression * Very steep dose-lethality curves * Neurotoxicity reported in mice, geese, sheep and cattle following single oral doses * LD50: 145 mg/kg (rats, dermal) * LC50: 180 mg/m3 (rats, inhalation, 24 h) of condensed aerosol * Threshold for irritation (reported as increased breathing frequency): 23.7 mg/mg3 (rats) * Concentrated solutions (≥1%) caused severe conjunctivital burns to eyes of rabbits * NOAEL: 100 mg/kg/d in 13 wk mice study administered by oral gavage 5 d/wk; 500 ppm (male rat, 208 d) * LOEL: 15 mg/kg/d (rats, aqueous gavage, 90 d); chronic heart inflammation reported at all doses in males, but 30 mg/kg or greater in females * 4 mo inhalation study (poorly documented) with rats and guinea pigs exposed to ≈6 mg/m3 and 21 mg/m3: * rats at 6 mg/m3 mostly unaffected and at 21 mg/m3 weight loss, reduced oxygen consumption and body temperature, haemoglobinuria, reduced chloride levels and inflammatory changes in respiratory tract (effects in guinea pigs not reported) * Negative results for carcinogenicity * Evaluation of genotoxicity data by NTP found potential to cause DNA damage and mutagenicity was probably low.   Insufficient data to recommend a SEN notation or TLV-STEL. |
| DFG 2019 MAK: 0.5 ppm (2.0 mg/m3) |
| Summary of additional data:   * MAK established based on analogy to phosphoric acid * Recent studies demonstrated DNA damage *in vitro*, however it occurs at cytotoxic concentrations and caused by oxidative stress * Of chronic studies, rats considered the most sensitive species and NOAEL of 3.5 mg/kg/d (2 yr, drinking water, rats); based on reduced bw gains and reduced liver and kidney weights. |
| SCOEL 2008 Not assigned |
| Summary of additional data:   * European Risk Assessment Report concluded MCAA is not genotoxic * No evidence to suggest it is a skin sensitiser * Threshold for respiratory irritation not supported by available data and OEL not assigned. |
| OARS/AIHA 2004 8-hr TWA: 0.5 ppm |
| No additional information. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

NIL.

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | No |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | Skin |
| HCIS | — |
| NICNAS | Skin |
| EU Annex | NA |
| ECHA | — |
| ACGIH | Carcinogenicity – A4, Skin |
| DFG | H (skin) |
| SCOEL | — |
| HCOTN | NA |
| 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: | yes | 3.00 |  |
| Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  |
| Dermal LD50/Inhalation LD50 <10: | yes | 3.00 |  |
| *In vivo* dermal absorption rate >10%: |  |  |  |
| Estimated dermal exposure at WES >10%: |  |  |  |
|  |  | 3 | **a skin notation is warranted** |

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| Molecular weight: | 94.50 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 3.87 mg/m3; 1 mg/m3 = 0.259 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) (2019) Monochloressigsäure, Natriummonochloracetat – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2008) Recommendation from the Scientific Committee on Occupational Exposure Limits for Monochloroacetic Acid. SCOEL/SUM/131.

Occupational Alliance for Risk Science (OARS) (2004) Workplace environmental exposure level – Monochloroacetic Acid.