# Dichloroacetic acid

| CAS number: | 79-43-6 |
| --- | --- |
| Synonyms: | Dichloroethanoic acid, Urmer’s liquid, DCA |
| Chemical formula: | C2H2Cl2O2 |

Workplace exposure standard (new)

| TWA: | **0.5 ppm (2.5 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 (2.5 mg/m3) is recommended to protect for liver toxicity, developmental and neurotoxic effects in exposed workers.

## Discussion and conclusions

Dichloroacetic acid (DCA) is used as a starting material for glyoxylic acid, dialkyloxy and diaryloxy acids and sulphonamides, and as a substitute for formaldehyde. DCA has also been used as a therapeutic agent for reducing lactate, hyperglycaemia or circulating lipid and lipoprotein levels.

Central nervous system (CNS) symptoms), including headache dizziness, and polyneuropathy reported in a human study after one dose of DCA at 50 mg/kg (ACGIH, 2018). A NOAEL of 3.6 mg/kg/day is reported for liver effects in rats (DFG, 2019); and 14 mg/kg/day for developmental effects in rats (ACGIH, 2018).

Using a weight of evidence approach, the most appropriate NOAEL is 3.6 mg/kg/day in rats for liver effects. Starting with this NOAEL and assuming a 70 kilogram worker breathing 10 m3 of air per eight hour shift with 100% lung absorption, the equivalent airborne concentration is 25 mg/m3. An uncertainty factor of 10 is then applied to account for inter- and intraspecies differences, and a TWA of 2.5 mg/m3 (0.5 ppm) is recommended to protect for all systemic effects. This recommendation by the TLV-TWA assigned by the ACGIH (2018)

## 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 suggesting dermal absorption and adverse systemic effects in animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA NA NA | |
| No report. |
| ACGIH 2005 TLV-TWA: 0.5 ppm (2.6 mg/m3) |
| TLV-TWA recommended to protect for irritation, neurotoxic effects, male reproductive effects, developmental toxicity and cancer.  Summary of data:  Human data:   * No undesirable effects reported in healthy subjects receiving 10 or 25 mg/kg, 5 infusions, 0.5 h duration,every 2 h * drowsiness, moderate sedation and temporary nausea at 50 mg/kg * CNS effects (headache, dizziness or somnolence) in some subjects given 2 infusions, 0.5  h duration, 8 h apart(30–100 mg/kg) * Oral administration of 50 mg/kg/d for 16 wk caused polyneuropathy * Also observed during DCA therapy, sequential treatment 3 times/d 80 mg/kg for 8 wk: 60 mg/kg for 4 wk: 25 mg/kg for 4 wk: 40 mg/kg for 4 wk: 50 mg/kg for 4 wk: * 6 mo following cessation of therapy, walking and motor nerve conduction velocity had returned to normal.   Animal data:   * NOAEL: 14 mg/kg/d (rats, oral gavage); developmental effects * LOAEL: 12.5 mg/kg/d (dogs, oral gavage); degeneration of testicular germinal epithelium * LD50: 510 mg/kg (rabbits, 14 d, dermal) * Produced liver tumours at doses and modes of action that may not be relevant for workplace exposures * Not genotoxic based on various genotoxicity studies.   Considers TLV-TWA protective against all potential adverse effects discussed above.  Skin notation is recommended based on dermal toxicity observed in rabbits.  Weakly genotoxic and only carcinogenic at relatively high hepatotoxic doses in mice and rats, therefore confirmed animal carcinogen with unknown relevance to humans.  No indication that SEN notation required and insufficient data to establish TLV-STEL. |
| DFG 2019 MAK: 0.2 ppm (1.1 mg/m3) |
| Evaluation applies to the acid and its salts.  Summary of additional data:   * Induces liver-metabolising enzymes in the liver and promotes tumour-promoting action * NOAEL: 3.6 mg/kg/d (rat, 100 wk, oral drinking water); liver effects * LOAEL: 8 mg/kg/d (mouse, 100 wk, oral) * No data available for repeated inhalation exposure in humans or animals * Weakly mutagenic effect for 2 strains only from *in vitro* studies * The primary mode of action is non-genotoxic * Carcinogenic in rat and mouse liver * MAK derived via read-across from trichloroacetic acid. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2016 | * TWA of 2.4–4.0 mg/m3 (0.5 ppm) Canada * STEL of 1.5 ppm Canada. |
| US EPA |  | 2003 | * No studies examining inhalation exposure to DCA. * Low volatility and inhalation exposure is not considered to be of great concern. |
| ECHA |  | 2019 | * Using overall AF of 1,075 inhalation DNEL 0.081 mg/m3. |

### 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 | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | Skin |
| ACGIH | Carcinogenicity – A3; Skin |
| DFG | Carcinogenicity – 4; H (skin) |
| SCOEL | NA |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 2B |
| 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 |
| --- |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Conclusion:** |  |  |  |  |  |  | |  |  | Adverse effects in human case study: | no |  |  |  | |  |  | Dermal LD50 ≤1000 mg/kg: | yes |  |  |  | |  |  | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  |  | |  |  | Dermal LD50/Inhalation LD50 <10: |  |  |  |  | |  |  | *In vivo* 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: | 128.94 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 5.3 mg/m3; 1 mg/m3 = 0.2 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) Dichloressigsäure und ihre Salze – MAK value documentation.

European Chemicals Agency (ECHA) (2019) Dichloroacetic acid – REACH assessment.

International Agency for Research on Cancer (IARC) (2014) Dichloroacetic acid. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2016) CMR chemicals not registered under REACH: Human health tier II assessment.

US Environmental Protection Authority (US EPA) (1998) Integrated Risk Information System (IRIS) Chemical Assessment Summary – Dichloroacetic acid.