# Acrolein

| CAS number: | 107-02-8 |
| --- | --- |
| Synonyms: | Acrylaldehyde, prop-2-enal |
| Chemical formula: | C3H4O |
| Structural formula: |  |

 Workplace exposure standard (amended)

| TWA: | **0.02 ppm (0.05 mg/m3)** |
| --- | --- |
| STEL: | **0.05 ppm (0.12 mg/m3)** |
| Peak limitation: | **—** |
|  Notations: | **Sk.** |
| IDLH: | **2 ppm** |
| Sampling and analysis: | The recommended value is below the current limit of detection for available sampling and analysis techniques. |

## Recommendation and basis for workplace exposure standard

A TWA of 0.02 ppm (0.05 mg/m3) and a STEL of 0.05 ppm (0.12 mg/m3) is recommended for acrolein to protect for irritation of the eyes, the mucous membrane and skin of exposed workers.

## Discussion and conclusions

The recommended TWA is based on the lowest reported LOAEL of 0.2 ppm (0.47 mg/m3) for a critical health endpoint of damage to the bronchial mucosa in rats in all reported studies. An uncertainty factor of 10 is applied to account for the absence of a NOAEL and limited human data on chronic exposure.

An acute adverse effect of eye irritation, not associated with severe chronic outcomes, was reported at 0.06 ppm (0.14 mg/m3). Based on this information a STEL has been recommended.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling on Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

A skin notation is recommended based on a dermal absorption study in rabbits.

# Appendix

### Primary sources with reports

| Source Year set Standard  |
| --- |
| SWA 1991 TWA: 0.1 ppm (0.23 mg/m3); STEL: 0.3 ppm (0.69 mg/m3) |
|  |
| ACGIH 2001 TLV-Ceiling: 0.1 ppm (0.23 mg/m3); |
| TLV-Ceiling recommended to reduce the potential for intense irritation of the eyes, mucous membranes, respiratory tract and the development of pulmonary oedema.Summary of data:The recommended TLV-Ceiling was based on:Human data:* Reported to cause human fatalities at 10 ppm (no duration provided)
* Mucous membrane irritation threshold for humans reported at 0.25 ppm (5 min exposure).

Animal Data: * LOAEC: 0.22 ppm (90 d; monkeys, dogs and guinea pigs; emphysema and inflammation of the lung, liver, kidney and heart)
* RD50: 0.88 ppm (mouse)
* Mutagenic in *Salmonella* reverse mutation assays and produced bacterial DNA adducts
* Carcinogenicity not adequately evaluated; metabolite (glycidaldehyde) considered carcinogenic
* Reported as a potent teratogen in cultured rodent embryos.

A skin notation recommended based on a single dermal absorption study that reported an LD50 of 560 mg/kg (rabbit; duration not provided)Insufficient data available to recommend a sensitiser notation. |
| DFG 2001 Not assigned |
| MAK withdrawn in 2001 based on evidence indicating genotoxicity. Therefore a concentration that is protective of carcinogenic effects in humans cannot be confidently identified.Summary of additional data:* NOAEL: 0.4 ppm (hamsters and rabbits; 6 h/d, 5 d/wk for 13 wk)
* LOAEL: 0.4 ppm (rats; 6 h/d, 5 d/wk for 13 wk)
* LC50: 21 ppm (rats; 4 h)
* Mutagenic in adequately conducted mutagenicity tests
* Genotoxic in *in vitro* tests and in *Drosophila melanogaster*
* No carcinogenic studies in humans identified
* Metabolism of cyclophosphamide produces acrolein in humans. Cyclophosphamide identified as carcinogen based on the formation of bladder tumours
* Studies in hamsters, rats and mice (dermal, inhalation and oral exposure) yielded no evidence of carcinogenic effects.
 |
| SCOEL 2007 TWA: 0.02 ppm (0.05 mg/m3); STEL: 0.05 ppm (0.12 mg/m3) |
| TWA and STEL recommended to protect for irritation of the eyes, the mucosae and skin in exposed workers.Summary of additional data:* TWA was based on LOAEL of 0.2 ppm (0.47 mg/m3); damage to the bronchial mucosa of rats. An uncertainty factor of 10 was applied to account for the absence of a NOAEL and of human data on prolonged exposure
* STEL based on an OAEL of 0.06 ppm (0.14 mg/m3) for eye irritation in human volunteers, exposure >5 min.
 |
| OARS/AIHA NA NA |
| No report  |
| HCOTN NA NA |
| No report  |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| HSE |  | 1993 | * TWA of 0.02 ppm and STEL of 0.05 ppm
* No additional information
 |
| NICNAS |  | 2017 | * The critical health effects are systemic acute effects (acute toxicity from oral, dermal and inhalation exposure); and local effects (corrosivity and respiratory irritation)
* Based on the weight of evidence, classification for mutagenicity is not warranted
* Not considered carcinogenic based on available animal data and the results for genotoxicity indicating lack of systemic mutagenic potential,
* Sensory irritation in humans following acute exposure is reported at airborne concentrations of 0.34 mg/m3 and above, below the current STEL
* A review of the current exposure standard may be beneficial to mitigate the risk of adverse effects
 |
| IARC |  | 1995 | * Inadequate evidence in humans and animals to determine carcinogenicity
 |
| US EPA |  | 2003 | * LOAEL: 0.4 ppm (0.9 mg/m3) from sub chronic rat inhalation study (based on evidence of nasal histopathology)
* Reported HEC LOAEL: 0.01 ppm (0.02 mg/m3); derived by adjusting the dosing regimen of 0.4 ppm (0.9 mg/m3) by 6 h/d, 5 d/wk and applying a RGDR for rat to human (0.14).
 |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |

## Notations

| Source | Notations  |
| --- | --- |
| SWA | — |
| HCIS | — |
| NICNAS | — |
| EU Annex | NA |
| ECHA | — |
| ACGIH | Carcinogenicity – A4, Skin  |
| DFG | Carcinogenicity – 3B |
| SCOEL | — |
| HCOTN | NA |
| IARC | —  |
| 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: |  | 4.00 |   |
| Dermal LD50 ≤1000 mg/kg: | yes | 3.00 |   |
| Dermal repeat-dose NOAEL ≤200 mg/kg: |   |   |   |
| Dermal LD50/Inhalation LD50 <10: |   |   |   |
| *In vivo* dermal absorption rate >10%: |   |   |   |
| Estimated dermal exposure at WES >10%: |   |   |   |
|   |   | 3 | **a skin notation is warranted** |

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### IDLH

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

## Additional information

| Molecular weight: | 56.06 |
| --- | --- |
| 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 [x]  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.

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US Environmental Protection Agency (US EPA) (2003) Toxicology Review of Acrolein. In Support of Summary Information on the Integrated Risk Information System (IRIS).