ACETIC ACID

CAS number:	64-19-7
Synonyms:	ethanoic acid; ethylic acid; methane carboxylic acid; glacial acetic acid; vinegar acid
Chemical formula:	$C_2H_4O_2$
Structural formula:	

Workplace exposure standard (retained)

TWA:	**10 ppm (25 mg/m^3)**
STEL:	**15 ppm (37 mg/m^3)**
Peak limitation:	**—**
Notations:	**—**
IDLH:	**50 ppm**
Sampling and analysis:	The recommended value is readily quantifiable through currently available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

The TWA of 10 ppm (25 mg/m^3) is recommended to protect for irritant effects and chronic respiratory conditions in exposed workers.

A STEL of 15 ppm (37 mg/m^3) is recommended to protect for irritant effects in relation to acute exposures in the workplace.

Discussion and conclusions

The critical effects of exposure are irritation of the mucous membranes and chronic respiratory symptoms. Data from human studies indicate that exposures below 10 ppm are reported to be relatively non-irritating and not associated with chronic respiratory symptoms (ACGIH, 2018). A lateralisation (irritation) threshold was identified at 40 ppm with no systemic effects identified at concentrations related to excessive irritation effects (DFG, 2008; SCOEL, 2012).

The recommended TWA and STEL are expected to protect for irritation effects and reduce the risk of the development of chronic respiratory symptoms in workers exposed at the workplace.

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 not recommended as there is no indication of systemic effects resulting from skin absorption.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1996***	***TWA: 10 ppm (25 mg/m^3); STEL: 15 ppm (37 mg/m^3)***
ACGIH	***2018***	***TLV-TWA: 10 ppm (25 mg/m^3); TLV-STEL: 15 ppm (37 mg/m^3)***

TLV-TWA and TLV-STEL recommended to reduce the possibility of upper airway irritation and development of chronic respiratory symptoms in exposed workers.

Summary of data:

Human studies:

- In industrial settings, exposures at 10 ppm were reported as relatively non-irritating
- Exposures at 20–30 ppm not considered dangerous
- Workers exposed to 60 ppm (7–12 yr) plus 1 h daily at 100–260 ppm had no injury except slight respiratory tract irritation
- In a study involving 18 male volunteers, subjects reported odour initially, but did not report unpleasant upper respiratory changes when exposed to concentrations of 2–10 ppm (15–22 d)
- Odour threshold of 0.48 to 1 ppm.

Animal studies:

- Inhalation of concentrations >1,000 ppm produced upper respiratory tract irritation and conjunctiva in mice
- LC_{50}: 5,620 ppm (1 h, mice)
- Limited evidence on the effects of repeated inhalation exposures
- LD_{50}: 1,060 mg/kg (rabbits, dermal)
- RD_{50}: 163 ppm and 227 ppm (mice).

No evidence of mutagenic effects in identified bacterial reverse mutation assays.
Sufficient data not available to assign a sensitiser or skin notation, nor a carcinogen notation.

DFG	***2008***	***MAK: 10 ppm (25 mg/m³)***

MAK value based on the avoidance of irritant effects.

Summary of additional data:

- Human irritation threshold: 40 ppm
- A NOAEC in humans was identified at 10 ppm for subjective effects of irritation to the nose and eyes.

Source	Year set	Standard
SCOEL	***2012***	***TWA: 10 ppm (25 mg/m³); STEL: 20 ppm (50 mg/m³)***
TWA based on the avoidance of irritant effects. Summary of additional data: • With an irritation threshold identified at 40 ppm, exposures to 20 ppm would not result in noticeable irritation over the short term, therefore recommending a 20 ppm STEL • Odour may affect some self-reported ratings of irritation by non-familiarised volunteers in inhalation studies • In patch tests with human volunteers a 10% aqueous solution of acetic acid resulted in slight irritation (4, 24 and 48 h).		
OARS/AIHA	***NA***	***NA***
No report		
HCOTN	***2004***	***TWA: 10 ppm (25 mg/m³)***
TWA recommended to protect for local irritation and corrosion. Summary of additional data: • Based on poorly documented industrial observations: • 8 h exposure to a concentration of 10 ppm may induce irritation of the upper respiratory tract and eyes • Concentrations of 100 ppm reported to induce marked irritation of the respiratory tract and eyes Concentrations of 800–1,200 ppm reported tolerable for 3 min only, resulting in marked irritation of upper respiratory tract and eyes.		

Secondary source reports relied upon

Source		Year	Additional information
NICNAS	✓		• Considered to be of low systemic toxicity • Severe eye and nasal irritation in humans >25 ppm • No data on repeated inhalation exposure • LC_{50} (rats, 4 h) 11.4 mg/L (~4,560 ppm or 11,400 mg/m³)

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?	No

Notations

Source	Notations
SWA	—
HCIS	—
NICNAS	—
EU Annex	NA
ECHA	NA

Source	Notations
ACGIH	—
DFG	—
SCOEL	—
HCOTN	—
IARC	NA
US NIOSH	—

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:	no
Dermal LD_{50} ≤1000 mg/kg:	no
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	
In vivo dermal absorption rate >10%:	
Estimated dermal exposure at WES >10%:	
	a skin notation is not warranted

IDLH

Is there a suitable IDLH value available? Yes

Additional information

Molecular weight:	60.05
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m^3; 1 mg/m^3 = 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* on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2008) Acetic Acid [MAK value supplement documentation, 2008].

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2012) Recommendation from the scientific committee on occupational exposure limits for acetic acid. SCOEL/SUM/98.

Health Council of the Netherlands (HCOTN) (2004) Committee on updating occupational exposure limits. Acetic acid: health-based reassessment of administrative occupational exposure limits. The Hague: Health Council of the Netherlands, 2004, 2000/15OSH/113.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2013). Acetic acid: Human health tier II assessment – IMAP report.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life and health concentrations – acetic acid.