

***N*-VALERALDEHYDE**

CAS number: 110-62-3

Synonyms: Amyl aldehyde, pentanal, valeric aldehyde, valeryl aldehyde, butyl formal, valeral, *n*-pentanal

Chemical formula: C₅H₁₀O

Workplace exposure standard (retained)

TWA: 50 ppm (176 mg/m³)

STEL: —

Peak limitation: —

Notations: —

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 50 ppm (175 mg/m³) is recommended to protect for irritation of the respiratory tract, skin and eyes in exposed workers.

Discussion and conclusions

N-Valeraldehyde is used as a flavouring agent, in resin chemistry and as a rubber accelerator.

The critical effects of exposure are irritation to respiratory tract, skin and eyes.

The only human toxicological data pertains to a closed-patch test and maximisation test, both of which were negative (HCOTN, 2003). No chronic toxicological studies in animals are available. Of the acute data, rats survived a six-hour exposure at 5,000 mg/m³ (1,400 ppm), with mortality following a four-hour exposure at 14,120 mg/m³ (4,000 ppm) (ACGIH, 2018; HCOTN, 2003). Initial irritation of eyes and face is reported in mice, guinea pigs and rabbits exposed at 2,359 mg/m³ (670 ppm) for up to 10 hours, followed by respiratory effects, convulsion and death (HCOTN, 2003). A NOEL of 1,000 mg/kg/day (highest dose tested) is reported in a 28-day oral study in rats (ECHA, 2019).

The TWA is consistent across the primary sources and the TWA of 50 ppm (176 mg/m³) is recommended to be retained to limit irritant effects reported in animal studies.

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 based on the available evidence.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1991	TWA: 50 ppm (176 mg/m³)
ACGIH	2001	TLV-TWA: 50 ppm (176 mg/m³)
TLV-TWA recommended to minimise the risk of respiratory, skin and eye irritation. Derivation of the TLV-TWA is not provided. Summary of data: No human data available. Animal data: • LD₅₀ of 4,860 mg/kg (rabbit, dermal) • LD₅₀ of 4,590 mg/kg (rat, oral) • Inhalation at 4,000 ppm for 4 h was lethal to 3/6 rats • Severely irritating to guinea pig skin and rabbit eye (no further information) • RD₅₀ of 1,121–1,190 ppm; head-only exposure in mice (10 min): ◦ occupational exposure value of between 11 and 112 ppm recommended by study authors (extrapolated from lower RD₅₀). Insufficient data to recommend Skin, SEN or carcinogenicity notations or a TLV-STEL.		
DFG	NA	NA
No report.		
SCOEL	NA	NA
No report.		
OARS/AIHA	NA	NA
No report.		
HCOTN	2003	TWA: 175 mg/m³
Summary of additional data: • No irritation at 2% in petrolatum in 48-h closed-patch test in humans • No sensitisation in 25 volunteers following maximisation test • Moderately irritating to intact or abraded skin of rabbits; 24 h covered application • Injury grade of 5 (scale of 1–10) following instillation of 0.005 mL undiluted compound in rabbit eye • 6/6 rats survived 6 h exposure at 5,000 mg/m³ (1,400 ppm); no further information • Groups of 50 mice, 20 guinea pigs and 5 rabbits exposed at 2,359 mg/m³ (670 ppm) to a series of aldehydes (as aerosol, ≤10 h duration):		

Source	Year set	Standard
		- o following initial irritation (eyes and face), respiration slowed and deepened until animals convulsed and died - o for n-valeraldehyde 2 mice died during exposure; 5 guinea pigs and 2 mice died post-exposure. No mortality in rabbits - o autopsy revealed fluid in lungs and pleural cavity, distended alveoli, ruptured alveolar septa and enlarged livers in all animals (no further information) • No data on repeated-dose toxicity, carcinogenicity or reproduction toxicity were found • Positive in forward mutation assay in V79 Chinese hamster lung cells, on induction of DNA double and single strand breaks in bacteriophage PM2 DNA, on induction of DNA single strand breaks in CHO cells and UDS assay in rat hepatocytes • Committee consider insufficient toxicological database to recommend HBROEL or provide comment on present administrative value.

Secondary source reports relied upon

Source	Year	Additional information
ECHA	✓	• Caused irritation in a study following application of 0.5 mL (semi-occlusive) to shaved rabbit skin (4 h exposure and observed for 14 d) • No adverse effects in male and female rats from oral exposure (gavage) at 0, 300 and 1,000 mg/kg/d, 28 d duration • No <i>in vivo</i> genotoxicity data found; negative results <i>in vitro</i> with bacterial cells but positive results with mammalian cells; same results <i>in vitro</i> from closely related aldehydes and negative results <i>in vivo</i>; based on read-across ECHA conclude it is not genotoxic • Classification for carcinogenicity not warranted.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?

No

The chemical is not a non-threshold based genotoxic carcinogen.

Notations

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

Source	Notations
DFG	NA
SCOEL	NA
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:

Dermal LD₅₀ ≤ 1000 mg/kg: no

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 not warranted

IDLH

Is there a suitable IDLH value available? No

Additional information

Molecular weight:	86.13
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 3.52 mg/m ³ ; 1 mg/m ³ = 0.284 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.

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).

Health Council of the Netherlands (HCOTN) (2003) Valeraldehyde. Health-based Reassessment of Administrative Occupational Exposure Limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/066.