# Propyl acetates (all isomers)

| CAS number: | 109-60-4 (n-propyl acetate)  108-21-4 (isopropyl acetate) |
| --- | --- |
| Synonyms: | Acetic acid propyl ester, propyl ethanoate |
| Chemical formula: | C5H10O5 |

Workplace exposure standard (amended)

| TWA: | **100 ppm (417 mg/m3)** |
| --- | --- |
| STEL: | **150 ppm (626 mg/m3)** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **1,700 ppm** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 100 ppm (417 mg/m3) is recommended to protect for eye and upper respiratory tract irritation and potential narcosis in exposed workers.

A STEL of 150 ppm (626 mg/m3) is recommended to protect for acute eye and upper respiratory tract irritation and potential narcosis in exposed workers.

## Discussion and conclusions

Propyl acetates are used as solvents and flavouring agents.

Critical effects of exposure are irritation of the eyes followed by upper respiratory tract irritation as evidenced in humans and subsequent narcosis as observed in animals.

Limited substance-specific human exposure data indicate concentrations of 100 ppm are tolerable over an eight-hour period (ACGIH, 2018). However, due to extensive similarities in their metabolism and acute toxicity, subchronic and chronic exposure data for other structurally related acetate esters are included in the assessments of the available sources (ACGIH, 2018; DFG, 2013; NICNAS, 2014). Principally, a sub-chronic NOAEC of 500 ppm with a corresponding LOAEC of 1,500 ppm for n-butyl acetate in rats is used to support the evaluation as published by ACGIH (2018).

A TWA of 100 ppm as derived by ACGIH (2018) and DFG (1999) is recommended be adopted to protect for irritation effects and potential narcosis in exposed workers.

The STEL of 150 ppm is derived from the substance-specific LOAEC of 200 ppm in humans and is expected to protect for acute eye and upper respiratory tract irritation (ACGIH, 2018). A STEL of 150 ppm by ACGIH (2018) is recommended to protect for acute irritation 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 not recommended based on the available evidence.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 200 ppm (835 mg/m3); STEL: 250 ppm (1,040 mg/m3) | |
|  |
| ACGIH 2018 TLV-TWA: 100 ppm (417 mg/m3); TLV-STEL: 150 ppm (626 mg/m3) |
| TLV-TWA and TLV-STEL intended to protect eye and respiratory tract irritation and central nervous system impairment at higher concentrations.  Summary of data:  Grouped assessment for both propyl acetate esters.  TLV-TWA based on limited substance-specific database and NOAEL of 500 ppm for sedation and olfactory irritation with n-butyl acetate in rats. TLV-STEL supported by acute volunteer inhalation study reporting eye irritation ≥200 ppm over 15 min. Human nasal pungency threshold data suggest increasing potency with increasing carbon chain length, i.e. propyl congeners are less irritating than butyl- and more irritating than ethyl acetates.  Skin notation not warranted based on high dermal LD50 values in animals.  Human data:   * Eye irritation at 200 ppm in volunteers (15 min):   + higher concentrations (not specified) caused throat and nose irritation   + cited study considered 100 ppm acceptable for 8 h exposure * Mild irritation of eyes, nose and throat at 236 ppm, mild lachrymation and dryness in throat at 3,500 ppm in volunteer inhalation study (5 min) * Overexposure (not specified) causes weakness, drowsiness and unconsciousness (no further details provided) * Upper respiratory tract and eye irritation reported by exposed workers (concentrations and durations not specified); no systemic effects reported * Repeated skin contact can cause defatting and cracking.   Animal data:   * Dermal LD50: >17,760 mg/kg (rabbits), >8,880 mg/kg (guinea pigs) * Limiting narcotic concentration (5 h): 9,000 ppm (cats), 6,000 ppm (mice): * salivation and lachrymation above 2,600 ppm (cats) * LC50: <8,000 ppm (rats, 4 h) * RD50 in mice: 793 ppm (n-propyl), 4,259 ppm (isopropyl) * Metabolism of related acetates, e.g. sec-butyl acetate, suggest that propyl acetates are hydrolysed enzymatically on absorption to corresponding alcohols and acetic acid * No sub-chronic inhalation studies available for assessment, studies of n-butyl acetate summarised as supporting analogy:   + transient sedation, changes to relative organ weights and testes, at 1,500 and 3,000 ppm (rats, 6 h/d, 5 d/wk, 13 wk);   + degeneration of olfactory epithelia at 3,000 ppm   + NOAEL: 500 ppm. * No chronic inhalation data available for assessment, chronic study of isopropanol, a major metabolite of isopropyl acetate, summarised as supporting analogy:   + no evidence for carcinogenicity up to highest tested dose of 5,000 ppm (mice, 2 yr) * No reproductive toxicity data available; major metabolite, isopropanol, showed no reproductive toxicity ≤400 mg/kg/d in rodents ≡1,400 ppm * Cytotoxic concentrations of n-propyl acetate (1.23%) are slightly clastogenic in *Saccharomyces cerevisiae*, otherwise non-mutagenic *in vitro*.   Insufficient data to recommend notations for carcinogenicity or sensitisation. |
| DFG 1999 MAK: 100 ppm (420 mg/m3) |
| Summary of additional data:  Grouped assessment for both propyl acetate esters.  Critical effects are eye and upper respiratory tract irritation.  MAK based on acute exposure studies in volunteers reporting weak irritation responses ≥200 ppm (also cited in ACGIH, 2018). These studies do not meet modern standards, but are supported by analogies to other structurally related acetate esters. Other data gaps are closed by analogies to these compounds. No systemic toxicity is expected based on toxicological profiles of the major metabolites, propyl alcohols and acetic acid. MAK of 100 ppm is considered protective of critical effects based on weight of evidence including substance-specific acute exposure data in humans and MAKs of structurally related acetate esters.  Skin notation not warranted based on absence of systemic toxicity in dermally exposed rabbits.  No carcinogenic potential expected from structure of compounds and their metabolites.  No evidence for sensitisation of either isomer; therefore, no sensitiser notation is assigned.  Human data:   * Calculated skin penetration rate: 0.09–1.2 mg/cm2/h * Distributed evenly in the body, highest accumulation in adipose tissue * No data for narcotic thresholds in humans.   Animal data:   * Adverse CNS effects above 1,439 ppm (mice, 4 h) * Irritational effects likely caused by the formation of acetic acid upon hydrolysis:   + CNS depression results from hydrophobic interactions of the substances and their metabolites with neuronal membranes (mice, intraperitoneal injection) * Non-mutagenic *in vitro* in bacteria. |
| 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 |  | 2014 | * Grouped assessment of C2–C4 alkyl acetates:   + similar hazard profiles expected due to similar ADME kinetics * Data gaps closed with exposure data from corresponding alcohols, which are the major metabolites * Propyl acetates have similar uses * Overall, chemicals of this group have genotoxic potential. |
| ECHA |  | 2019 | * Short- and long-term DNELs for worker exposures are adopted from the DFG (2013) interpretation of the available toxicological dataset:   + long-term DNEL: 100 ppm (analogous to MAK)   + short-term DNEL: 200 ppm (analogous to peak limitation with excursion factor of 1). |
| US NIOSH |  | 1994 | * IDLH for n-propyl acetate is 1,700 ppm based on acute inhalation toxicity data in animals * IDLH for isopropyl acetate is 1,800 ppm based on analogies to ethyl acetate and n-propyl acetate * IDLH for n-propyl acetate is adopted conservatively due to its lower value and basis on experimental results. |

### 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 | *All isomers*: — |
| HCIS | *All isomers*: — |
| NICNAS | *All isomers*: — |
| EU Annex | *All isomers*: — |
| ECHA | *All isomers*: — |
| ACGIH | *All isomers*: — |
| DFG | *All isomers*: — |
| 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? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 102.13 |
| --- | --- |
| 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  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) (2013) n-Propyl acetate and Isopropyl acetate – MAK value documentation.

European Chemicals Agency (ECHA) (2019) n-Propyl acetate – REACH assessment.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2014) Acetate esters (C2-C4): Human health tier II assessment – IMAP report.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – n-Propyl acetate.