ALLYL ALCOHOL

CAS number:	107-18-6
Synonyms:	Prop-2-en-1-ol, vinyl carbinol
Chemical formula:	C_3H_6O
Structural formula:	

Workplace exposure standard (amended)

TWA:	**1 ppm (2.4 mg/m^3)**
STEL:	**4 ppm (9.5 mg/m^3)**
Peak limitation:	**—**
Notations:	**Sk.**
IDLH:	**20 ppm**
Sampling and analysis:	The recommended value is readily quantifiable through currently available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 1 ppm (2.4 mg/m^3) is recommended to protect for eye and upper respiratory tract irritation and adverse systemic effects in the liver and kidneys in exposed workers.

A STEL of 4 ppm (9.5 mg/m^3) is recommended to protect for ocular and upper respiratory tract irritation in acutely exposed workers.

Discussion and conclusions

Allyl alcohol is a precursor to many specialised compounds used in flame-resistant materials, drying oils and plasticisers. It causes irritation of the eyes and upper respiratory tract in humans and animals and has been reported to produce systemic long-term effects in the liver and other organs (ACGIH, 2018; DFG, 2001; SCOEL, 1993; NICNAS, 2017).

A sub-chronic inhalation study in animals observed adverse effects in the liver and kidneys and reported a NOEL for irritation at 2 ppm. Slight eye irritation in humans has been reported at 5 ppm (ACGIH, 2018; NICNAS, 2017).

The recommended TWA is based on a NOEL of 2 ppm in animals for systemic effects with application of an uncertainty factor of two to account for a lack of robust dose-response data in humans. The STEL is recommended to be retained and is based on reports of irritation of the eye in humans.

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 as evidence indicates absorption through skin resulting in systemic effects in animals and humans.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 2 ppm (4.8 mg/m^3); STEL 4 ppm (9.5 mg/m^3)***
ACGIH	***2001***	***TLV- TWA: 0.5 ppm (1.2 mg/m^3)***

TLV-TWA recommended to reduce the potential for significant ocular and upper respiratory tract irritation. TLV based primarily on evidence in animals.

Summary of data:

Human data:

- Three cases of acute inhalation exposure related to accidental poisoning (no further data)
  - effects included dyspnoea, difficulties in ocular accommodation and general malaise in 1 individual
  - 2 workers exposed to spilled allyl alcohol on floor and clothes resulting in nausea, vomiting and slight haemoptysis; both cases reversible
- Eye irritation: slight >5 ppm, severe at 25 ppm; reported as 'brief exposure' duration
- Systemic toxicity following dermal contact in humans (nausea and vomiting)
- Upper respiratory irritation: 5 ppm (no further data).

Animal data:

- Sub-chronic NOEL: 2 ppm (dogs, rats, rabbits, and guinea pigs at 7 h/d, 5 d/wk for 6 mo)
- RD_{50}: 1.6–3.9 ppm (mice, 5–30 min)
- LD_{50}: 45 mg/kg (rabbits, dermal)
- No carcinogenic response in hamsters via gavage or drinking water (study considered inadequate)
- Systemic toxicity following dermal contact to liquid in animals (periportal necrosis, congestion of the liver, haematuria, nephritis, and mortality)
- Direct acting mutagen in *Salmonella typhimurium* and cultured V79 cells.

Metabolised by alcohol dehydrogenase to acrolein.

No evidence of reproductive effects reported.

DFG	***2001***	***NA***

MAK value not established as a suspected carcinogen (as an analogue of acrolein) and due to limited studies of local toxicity after long-term inhalation exposure.

No additional data presented.

Source	Year set	Standard
SCOEL	***1993***	***TWA: 2 ppm (4.8 mg/m^3); STEL 5 ppm (12.1 mg/m^3)***
TWA and STEL recommended to prevent irritation of the eyes and upper respiratory tract in workers. Summary of additional data: • TWA based on reported NOAEL of 20 ppm for irritation (rats, 7 h/d, 60 d) and uncertainty factor of 10 for the absence of human data on systemic effects • STEL based on irritation of the eyes and nose commencing at 5 ppm in humans.		
OARS/AIHA	***NA***	***NA***
No report		
HCOTN	***NA***	***NA***
No report		

Secondary source reports relied upon

Source		Year	Additional information

NICNAS	✓	2017	• Case study, volunteers exposed 5 min for 1–3 times/wk; 50d:
			  ○ 6.25 ppm: olfactory cognition
			  ○ 12.5 ppm: nose irritation
			  ○ 25 ppm: slight eye irritation
			• Reported eye discomfort at 5 ppm, corneal necrosis and temporary blindness at 25 ppm in humans
			• LC_{50}: 50–76 ppm (rats, 8h)
			• Inhalation study in dogs, rats, rabbits and guinea pigs (7 ppm; 7 h/d, 5 d/wk for 6 mo): observations of cloudy swelling and focal necrosis of the liver, kidney necrosis of convoluted tubules and proliferation of interstitial tissues
			• Allyl alcohol, or its metabolite acrolein, not considered to have carcinogenic potential
			• Not significantly toxic to reproduction or development
			• Not expected to have skin sensitisation potential.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?	Yes
Is the chemical carcinogenic with a mutagenic mechanism of action?	No

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

Notations

Source	Notations
SWA	Skin
HCIS	—
NICNAS	—

Source	Notations
EU Annex	—
ECHA	NA
ACGIH	Carcinogenicity – A4; Skin
DFG	Carcinogenicity – 3B; H (skin)
SCOEL	Skin
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:	yes	
Dermal LD_{50} ≤1000 mg/kg:	yes	
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 warranted

IDLH

Is there a suitable IDLH value available?	Yes

Additional information

Molecular weight:	58.08
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) (2001) Allyl alcohol – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (1993) Recommendation from the Scientific Committee on Occupational Exposure Limits for Allyl alcohol. SCOEL/SUM44.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2017) Allyl alcohol Human health tier II assessment – IMAP report.

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