GLYCIDOL

CAS number: 556-52-5

Synonyms: 2,3-Epoxy-1-propanol, epoxypropyl alcohol, glycide, Oxiranemethanol

Chemical formula: $C_3H_6O_2$

Workplace exposure standard (interim)

TWA: **2 ppm (6.1 mg/m^3)**

STEL: **—**

Peak limitation: **—**

Notations: **Carc. 1B, Sk.**

IDLH: **150 ppm**

Sampling and analysis: The recommended value is likely to be below the current limit of detection for standard sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 2 ppm (6.1 mg/m^3) is recommended to minimise the potential for cancer in exposed workers.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

Discussion and conclusions

Glycidol is primarily used as a stabiliser in the manufacture of vinyl polymers.

Based on evidence in animals, it is considered to be an animal carcinogen with the potential to cause cancer in humans (ACGIH, 2018; DFG, 2015; NICNAS, 2015). Insufficient evidence exists to determine if carcinogenicity is manifested *via* a non-threshold genotoxic mechanism.

Toxicological data in humans are limited to one worker study that reported no adverse effects at 2 ppm (ACGIH, 2018). A TWA of 2 ppm (6.1 mg/m^3) is recommended as derived by ACGIH (2018). This TWA is cited to minimise the potential risk of cancer.

Recommendation for notations

Classified as a category 1B 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 based on evidence of systemic effects in rabbits following dermal application and the potential for multi-organ cancer effects.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 25 ppm (76 mg/m^3)***
ACGIH	***2001***	***TLV-TWA: 2 ppm (6.1 mg/m^3)***

TLV-TWA is recommended to minimise the potential risk of cancer and genotoxicity.

Summary of data:

Human data:

- Glycidol manufacturer report: 70 workers exposed ≤2 ppm; no adverse effects.

Animal data:

- LC_{50}: 450 ppm (mice, 4 h)
- LD_{50}: 1,980 mg/kg (rabbits, dermal)
- Irritating to rabbit skin; repeated applications caused severe irritation after 4 d
- Dose-related increase in neoplasia in rats and mice exposed by gavage dosing for 2 yr; 37.5 or 75 mg/kg/d in rats or 25 or 50 mg/kg/d in mice:
  - prominent lesion in male rats include mesothelioma in the tunica vaginalis with metastasis into the peritoneal cavity; mesotheliomas occurred in 3/49 of the vehicle controls, 34/50 of the low-dose (38 mg/kg), and 39/47 of high-dose (75 mg/kg) male rats
  - neoplasms of the mammary gland were prominent in female rats
  - dose-related increases in the incidences of neoplasms of the mammary gland, brain, thyroid gland and forestomach in male and female rats
  - harderian gland neoplasms were increased in mice of each sex
  - incidences of adenomas, fibroadenomas or adenocarcinomas (combined) of the mammary gland in female mice were markedly increased; combined incidences of fibroadenomas and adenocarcinomas were 14/50 in vehicle control, 34/48 in the low-dose, and 37/48 in high-dose female rats
  - forestomach, liver and lung neoplastic lesions were increased in male mice.

Genotoxicity:

- Induced unscheduled DNA synthesis in human W138 cells
- Induced mutations in *S. typhimurium* both with and without S9 activation; no further information
- Positive in the absence of exogenous metabolic activation in the mouse lymphoma assay.

DFG	***2015***	***Not assigned***

Summary of additional data:

- No MAK due to carcinogenicity
- Carcinogenic in various organs of the rat and mouse after oral administration
- Genotoxic *in vitro* and *in vivo* in almost all somatic cell tests.

Source	Year set	Standard
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	✓	2015	• Repeated dermal exposure for 7 d caused mortalities in rabbits:
			  ○ indication of systemic toxicity effects in animals 48 h before death
			  ○ the dose administered ≈114 mg/kg/d
			• 520 d dermal carcinogenicity study in mice; no tumours observed.

IARC	✓	2000	• Direct-acting alkylating agent that is mutagenic in a wide range of *in vivo* and *in vitro* test systems.
NTP	✓	2009	• Reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in experimental animals.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?	Yes
Is the chemical carcinogenic with a mutagenic mechanism of action?	Insufficient data

Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	Carc. 1B
HCIS	Carcinogenicity – category 1B
NICNAS	Carc. Cat 2, Skin
EU Annex	Carcinogenicity – category 1B
ECHA	Carc. 1B
ACGIH	Carcinogenicity – A3
DFG	Carcinogenicity – 2, H (skin)

Source	Notations
SCOEL	NA
HCOTN	NA
IARC	Carcinogenicity – Group 2A
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	
Conclusion:	
Adverse effects in human case study:	
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%:	
consider assigning a skin notation	

IDLH

Is there a suitable IDLH value available? Yes

Additional information

Molecular weight:	74.08
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 3.03 mg/m^3; 1 mg/m^3 = 0.33 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 (ECHA) (2019) 2,3-epoxypropan-1-ol; glycidol; oxiranemethanol – REACH assessment.

Deutsche Forschungsgemeinschaft (DFG) (2015) Glycidol – MAK value documentation.

International Agency for Research on Cancer (IARC) (2000) Glycidol. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2015) Oxiranemethanol: Human health tier II assessment – IMAP report.

National Toxicology Program (NTP) (2009) NTP-RoC: Glycidol.

Tenth Adaptation to Technical Progress Commission Regulation (EU) No 2017/776 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (the CLP Regulation).

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