

HEXACHLOROETHANE

CAS number: 67-72-1

Synonyms: Carbon hexachloride, carbon trichloride, HCE, perchloroethane

Chemical formula: C₂Cl₆

Workplace exposure standard (retained)

TWA: 1 ppm (9.7 mg/m³)

STEL: —

Peak limitation: —

Notations: —

IDLH: 300 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 1 ppm (9.7 mg/m³) is recommended to protect for liver and kidney damage in exposed workers.

Discussion and conclusions

Hexachloroethane (HCE) is commonly used as an anthelmintic, an insecticide, in pyrotechnics and chemical manufacture and as a chlorination by-product.

Critical effects of exposure include damage to the liver and kidneys. Limited toxicological evidence exists in humans with irritant effects reported when in fume and particulate forms. ACGIH has based TLV-TWA recommendations on a NOAEL of 1 mg/kg/day derived from an ingestion study in rats. This equates to an inhalation concentration of 0.7 ppm in humans after applying generic conversion factors (ACGIH, 2018). Supporting this are several NOAEC from sub-acute studies in multiple species, the lowest of which is 15 ppm.

The TWA of 1 ppm (9.7 mg/m³) is recommended to be retained and is considered sufficiently low to minimise the potential for liver and kidney damage in exposed workers.

Recommendation for notations

Classified as a category 2 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: 1 ppm (9.7 mg/m³)
ACGIH	2001	TLV-TWA: 1 ppm (9.7 mg/m³)
<p>TLV-TWA recommended to minimise the risk of liver and kidney damage in exposed workers.</p> <p>Summary of data:</p> <p>Human data:</p> <ul style="list-style-type: none"> Limited data suggests an irritant effect in fume and particulate form. <p>Animal data:</p> <ul style="list-style-type: none"> LD₅₀: >1,000 mg/kg (rabbits, oral), 4,460 mg/kg (rats, oral) LD₅₀: 32,000 mg/kg (rabbits, dermal) NOAEC: 15–48 ppm (rats, quail, guinea pigs or dogs, 5 d/wk, 6 wk, inhalation) for bw effects, gross necropsy and organ weights NOEL: 1 mg/kg/d (rats, 16 wk, oral) for kidney effects (≅0.7 ppm, inhalation) for renal effects including increased kidney weight, gross pathologic alterations and microscopic changes Positive response in gavage studies provide evidence of carcinogenic activity Negative response in teratogenic studies in rats Positive response for induction of SCE in hamster ovary cells Negative response in multiple other mutagenic assays. <p>Assigned a notation of A3, confirmed animal carcinogen with unknown relevance to humans.</p>		
DFG	2014	MAK: 1 ppm (9.8 mg/m³)
<p>Existing MAK based only on rough estimates. There are no adequate acute or chronic inhalation tests.</p> <p>Summary of additional data:</p> <ul style="list-style-type: none"> Asymptomatically tolerated by rats at 1,000 mg/kg (dermal). 		
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	<ul style="list-style-type: none"> LD₅₀: 4,460–7,690 mg/kg (rats, oral) LD₅₀: 32,000 mg/kg (rabbits, dermal) NOAEL: 2,500 mg/m³ (rats, 8 h) 11 munition workers exposed to 10–20 mg/m³ (<5 wk, inhalation) reported skin and mucous membrane irritation, mucous membrane effects were the result of a local trauma effect from the protective equipment.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic? Insufficient data

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	NA
HCIS	Carcinogenicity – category 2
NICNAS	Carc. Cat 3
EU Annex	NA
ECHA	NA
ACGIH	Carcinogenicity – A3, Skin
DFG	NA
SCOEL	NA
HCOTN	NA
IARC	Carcinogenicity – Group 2B
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: no
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: 236.74
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
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[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) (2014) Substance overview of hexachloroethane.

International Agency for Research on Cancer (IARC) (1999) Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2014) Ethane, hexachloro: Human health tier II assessment – IMAP report.

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

DRAFT