METHYL IODIDE

CAS number: 74-88-4

Synonyms: Iodomethane

Chemical formula: CH_3I

Workplace exposure standard (retained)

TWA: **2 ppm (12 mg/m^3)**

STEL: **—**

Peak limitation: **—**

Notations: **Carc 2.,Sk.**

IDLH: **100 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 2 ppm (12 mg/m^3) is recommended to protect for irritation of the eyes and nose in exposed workers and protection against central nervous system (CNS) effects observed in acute exposures.

Discussion and conclusions

Methyl iodide is used primarily in microscopy and as a methylating agent in chemical synthesis.

The critical effects of exposure are irritation of the eyes and nose. An NOAEC of 10 ppm is reported in a 14 week study in rats for eye irritation (ACGIH 2018). A NOAEC of 10 ppm is also reported in a 13 week study in rats for nasal irritation (ECHA 2011). The only human data is from fatalities due to acute occupational exposure at unknown concentrations and unclear exposure pathways; with symptoms including a range of CNS effects (ACGIH 2018).

Based on the evidence presented in humans and rats, the TWA of 2 ppm (12 mg/m^3) is recommended to be retained as it is considered to be protective of irritation in exposed workers and against acute CNS effects observed at higher concentrations.

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 recommended based on evidence suggesting potential dermal absorption and adverse systemic effects in animals and supported by acute workplace poisoning reports.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 2 ppm (12 mg/m^3)***
ACGIH	***2001***	***TLV-TWA: 2 ppm (12 mg/m^3)***

TLV-TWA recommended to minimise the risk of eye irritation and CNS symptoms in exposed workers.
Summary of data:
Human data:
• Fatality in chemical plant worker reported (exposure path unknown), symptoms included nausea, vomiting, diarrhea, oliguria, vertigo, slurring, visual effects, ataxia, tremors, drowsiness and coma (urine iodine level 90 mg/L)
• Several reports of inhalation exposure (unknown concentration) resulted in CNS damage
  ○ reports implied that dermal exposure may have contributed to the observed effects.
Animal data:
• LD_{50}: 150–220 mg/kg (mice, oral)
• Exposure at 3,800 ppm (rats, 15 min, inhalation) was fatal
• Minimum fatal 24 h exposure (mice, inhalation) was 75 ppm
• LC_{50}: 900 ppm (mice, 57 min)
• LC_{50}: 232 ppm (rats, 4 h)
• Rats exposed at 30 and 60 ppm (14 wk) had eye irritation and depressed body weight with no pathological changes
  ○ NOAEC: 10 ppm
  ○ mortality after 4 wk at 143 ppm
• 44 mg/kg/wk (mice, weekly, 24 wk, IP) caused an increase incidence of lung tumours with survival adversely effected
  ○ at 22 mg/kg/wk all subjects survived (≡ inhalation concentration 20–25 ppm over 8 h for a human adult)
• Positive result in mutagen assay with *S. typhimurium* TA1535 and TA100
• Positive result as a direct acting mutagen for mouse lymphoma L5178Y/TK+ cells.
 	
A skin notation is recommended based on indirect evidence of dermal absorption.
Insufficient data to recommend a sensitiser or carcinogen notation.		

DFG	***1996***	***Not assigned***
A MAK value cannot be established • LD_{50}: 76 mg/kg (rats, oral) • Exposure at 30–50 mg/kg/d (rats, 5 d/wk, 1 mo) produced no symptoms • Induced DNA repair in human lymphoblastoid NC37-BaEV cells.		

Source	Year set	Standard
SCOEL	***1999***	***Not assigned***
The limited studies available are not appropriate for evaluation of the carcinogenic potential. Due to these concerns and the limited database, it is not possible to identify a reliable, safe level of exposure.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***NA***	***NA***
No report.		

Secondary source reports relied upon

Source		Year	Additional information
NICNAS	✓	2014	No additional information.
ECHA	✓	2011	• LD_{50}: >2,000 mg/kg (rabbits, dermal) • LC_{50}: 691 ppm (rats, 4 h) • Negative in skin sensitisation test • NOAEL: 1.5 mg/kg/d (dogs, 2 studies 90 d and 52 wk, oral) based on decrease in mean albumin and total protein levels • NOAEL: 30 mg/kg/d (rats, 6 h/d, 21 d, dermal) for histopathological changes and organ weight changes ○ LOAEL 300 mg/kg/d • NOAEC: 20 ppm (rats, 6 h/d, 5 d/wk, 13 wk) based on reduced body weight and nasal irritation • Negative results in *In vivo* micronucleus assay • *In vitro* genotoxicity assays produced mixed results • NOAEC: 20 ppm (rats, 6 h/d, 52–104 wk) for carcinogenicity.

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	NA
HCIS	Carcinogenicity – category 2
NICNAS	Carc. Cat. 3
EU Annex	Carcinogenicity – category 2

Source	Notations
ECHA	NA
ACGIH	Skin
DFG	Carcinogenicity – 2, H (skin)
SCOEL	NA
HCOTN	NA
IARC	Carcinogenicity – Group 3
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 LD_{50} ≤1000 mg/kg:	no
Dermal repeat-dose NOAEL ≤200 mg/kg:	yes
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:	141.95
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) (1996) Methyl iodide – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (1999) Recommendation from the Scientific Committee on Occupational Exposure Limits for methyl iodide. SCOEL/SUM/80.

European Chemicals Agency (ECHA) (2011) Iodomethane – REACH assessment.

International Agency for Research on Cancer (IARC) re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide. IARC Monographs – 71.

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

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 – methyl iodide.