



STIBINE

CAS number: 7803-52-3

Synonyms: Antimony hydride

Chemical formula: SbH_3

Workplace exposure standard (amended)

TWA: —

STEL: —

Peak limitation: —

Notations: —

IDLH: 5 ppm

Sampling and analysis: N/A

Recommendation and basis for workplace exposure standard

This chemical has been nominated for removal from the *Workplace exposure standards for airborne contaminants* due to a lack of evidence that it is used or generated in Australian workplaces or that it presents a potential for legacy exposure. Therefore, a TWA is not recommended.

Discussion and conclusions

Stibine is used as a fumigant and in semiconductor production. There is lack of evidence that this chemical is used or generated in Australian workplaces or that it presents a potential for legacy exposure.

Critical effects of exposure are haemolysis, pulmonary irritation and kidney damage.

Quantitative exposure data are limited to acute inhalation studies with animals near maximally tolerable concentrations. Workplace exposures to unspecified mixtures of stibine, arsine and hydrogen sulfide are associated with haematuria, weakness, headache, abdominal pain and nausea (ACGIH, 2018; DFG, 2004). Signs of eye irritation are reported in acutely exposed rats and guinea pigs above 191 ppm, and adverse histopathological changes to lungs and vasculature are observed above 330 ppm (DFGH, 2004).

This chemical has been nominated for removal from the WES list. A TWA is not recommended.

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 sensitizer or respiratory sensitizer according to the GHS.

There are insufficient data to recommend a skin notation.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1991	TWA: 0.1 ppm (0.51 mg/m³)
ACGIH	2001	TLV-TWA: 0.1 ppm (0.51 mg/m³)
TLV-TWA intended to protect for haemolysis, pulmonary irritation, and kidney damage. Summary of information: TLV-TWA based, in part, on analogy to arsine (AsH₃), which is also a haemolytic agent. AsH₃ is more bioavailable and therefore more toxic with a TLV-TWA of 0.05 ppm. Given the toxicological similarity of these compounds, 0.1 ppm is expected to be protective of the critical effects (no further information on the derivation of the TLV-TWA provided). Human data: - Cases of haematuria, weakness, headache, abdominal pain and nausea in workers exposed to gases from quenching hot Sb dross with water: - cited article notes the presence of Al and As in Sb waste - causal role of Sb for effects uncertain (exposure details not provided). Animal data: - Delayed death >1 d at 100 ppm (mice, 20 min, no further details provided) - Death from pulmonary oedema within 24 h at 40–45 ppm (cats, dogs, 1 h) - Haemoglobinuria at 65 ppm (guinea pigs, 1 h) - No mutagenicity or ADME data presented. Insufficient data to recommend a TLV-STEL or notations for carcinogenicity, skin absorption, or sensitisation.		
DFG	2004	Not assigned
Summary of additional information: Toxic effects likely due to reaction with thiol groups on enzymes and proteins, especially Hb. The formation of ROS is likely cause of damage to isolated DNA <i>in vitro</i>. Available toxicological data are insufficient to derive a MAK. Agency notes that the previous MAK of 0.1 ppm could be used as an “orientation value” for an OEL. Human data: - Renal excretion t_{1/2}: 4 d in workers exposed at 12.3 µg/m³: - urine levels increased from 10.1 to 15.2 µg/g creatinine during a shift - Quenching of hot Sb waste with water liberated SbH₃, AsH₃ and H₂S and caused haematuria, weakness, headache, abdominal pain, nausea and jaundice in workers (also cited in ACGIH, 2018). Animal data: - Signs of eye irritation at 191 ppm in single dose inhalation study with dose groups 29.1, 191, and 330 ppm (rats, guinea pigs, 30 min): - histopathological changes including intravascular congestion and lung oedema and fibrosis at 330 ppm		

Source	Year set	Standard
- Damage to isolated pBR322 plasmid DNA in aqueous solution considered due to generation of ROS: - cited article suggests an atmospheric concentration of 6,000 mg/m³ required to trigger DNA damage (no further details provided). Insufficient data to recommend notations for carcinogenicity, skin absorption or sensitisation.		
SCOEL	NA	NA
No report.		
OARS/AIHA	NA	NA
No report.		
HCOTN	2008	Not assigned
Summary of additional information: - Assessment is of carcinogenic potential only, no OEL recommendation is made in the evaluation - Extrapolation from toxicological data from other Sb compounds not considered feasible due to solid state and poor solubility e.g. Sb₂O₃, and the fact that SbH₃ does not react to form these compounds under physiological conditions - The carcinogenic mechanism of action of arsine, which is toxicologically similar, is not fully understood, extrapolation from these data is therefore also not considered feasible - Single example of damaging effect in isolated DNA not considered sufficient to evaluate genotoxicity (also cited in DFG, 2004) - HCOTN concludes that available toxicological data are insufficient to evaluate carcinogenicity of the substance.		

Secondary source reports relied upon

Source	Year	Additional information
US NIOSH	✓ 1994	IDLH based on acute inhalation toxicity data in animals.

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	—
HCIS	NA



Source	Notations
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	—
DFG	—
SCOEL	NA
HCOTN	—
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

Insufficient data to assign a skin notation.

IDLH

Is there a suitable IDLH value available? Yes

Additional information

Molecular weight:	124.78
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 5.11 mg/m ³ ; 1 mg/m ³ = 0.196 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) (2004) Antimonwasserstoff – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2008) Stibine. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2008/09OSH.

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