SULPROFOS

CAS number: 35400-43-2

Synonyms: O-ethyl O-(4-(methylthio)phenyl)-S-propyl phosphorodithioate, phosphorodithioic acid, O-ethyl O-(4-(methylthio)phenyl) S-propyl ester, BAY NTN 9306®, Bolstar®, Helothion®

Chemical formula: $C_{12}H_{19}O_2PS_3$

Structural formula: —

Workplace exposure standard (amended)

TWA: **0.008 ppm (0.1 mg/m³)**

STEL: **—**

Peak limitation: **—**

Notations: **Sk.**

IDLH: **—**

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 0.008 ppm (0.1 mg/m³) is recommended to protect for cholinergic effects in exposed workers.

Discussion and conclusions

Sulprofos is a contact insecticide.

The critical effect of exposure is red blood cell (RBC) cholinesterase (ChE) inhibition and subsequent cholinergic effects.

No human exposure data are available. In chronically and sub-chronically exposed animals, NOAEL for RBC ChE inhibition from oral administration ranges between 0.2 and 1 mg/kg/day, which is equivalent to 1.4 and 7 mg/m³. This is consistent with the NOAEC of 6 mg/m³ and corresponding LOAEC of 14 mg/m³ reported in a three-week inhalation study in rats (ACGIH, 2018). However, duration of this study is short. Data on dermal toxicity are limited to median lethal dose studies in animals and no quantitative absorption data are presented (ACGIH, 2018).

Only primary agencies that recommend occupation exposure limits are ACGIH and SWA. ACGIH (2018) derived TLV-TWA of 0.008 ppm (0.1 mg/m³) using the lowest oral NOAEL for RBC ChE inhibition in chronically exposed dogs.

In the absence of human exposure data and further inhalational studies, a TWA of 0.008 ppm (0.1 mg/m³) by ACGIH (2018) is recommended to be adopted to protect for cholinergic effects in exposed workers. To account for potential volatile losses during sampling, the value is intended to be measured as both inhalable faction and vapour.

Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). However, no entry was found in the HCIS database.

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

A skin notation is recommended due to evidence of dermal absorption and contribution to adverse systemic effects. Based on the available dermal LD_{50} values in animals, ACGIH (2018) recommends a skin notation despite the absence of quantitative dermal absorption data. Taken together with the structural and toxicological similarities of Sulprofos with other organophosphate pesticides, systemic toxicity may be expected following dermal absorption.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 1 mg/m^3***
No report. Presumably adopted from ACGIH (1984) TLV-TWA of 1 mg/m^3, which was withdrawn by ACGIH in 2009.		
ACGIH	***2009***	***TLV-TWA: 0.008 ppm (0.1 mg/m^3)***

TLV-TWA intended to protect for cholinergic effects.

Summary of information:

Previous TLV-TWA of 1 mg/m^3 (set in 1984) withdrawn in 2009. In the absence of human exposure data, TLV-TWA is based on NOAEL for RBC ChE inhibition from oral doses in animals. Oral NOAEL range from 0.2–1 mg/kg/d ≡1.4–7 mg/m^3 assuming 100% absorption in a 70-kg worker with a respiratory volume of 10 m^3 during an 8 h shift. This is consistent with the NOAEC of 6 mg/m^3 and LOAEC of 14 mg/m^3 reported in sub-chronically exposed rats in a briefly documented 3-wk inhalation study. Therefore, the TLV-TWA of 0.1 mg/m^3 considered protective of RBC ChE inhibition and subsequent cholinergic effects.

Agency noted TLV-TWA should be measured as inhalable fraction and vapour to account for potential volatile losses during sampling.

Human data:

- No reports of poisonings or exposure studies available.

Animal data:

- LC_{50} >490 mg/m^3 (female rats, 4 h)
- Oral LD_{50}: 107–304 mg/kg (male rats); 65–275 mg/kg (female rats)
- Dermal LD_{50}: 820 and 994 mg/kg (male and female rabbits); 5,491 mg/kg (male rats), 1,831 mg/kg (female rats)
- 63–82% reduced RBC ChE activity at 10 mg/kg/d in sub-chronic oral dose study (rats, 4 wk):
  - NOAEL: 1 mg/kg/d
- RBC ChE inhibition at 3 and 15 mg/kg/d in sub-chronic feeding study (rats, 90 d):
  - reduced motor and lachrymation activity at 15 mg/kg/d
  - NOAEL: 0.5 mg/kg/d
- RBC ChE inhibition at 0.8 mg/kg/d (mice, 13–23% inhibition, 10 mo) and 0.5 mg/kg/d (dogs, 90 d) in sub-chronic feeding studies:
  - NOAEL: 0.4 mg/kg/d (mice), 0.3 mg/kg/d (dogs)
- RBC ChE inhibition in females at 14 mg/m^3 reported in briefly documented sub-chronic inhalation study (rats, 3 wk, exposure frequency not specified):
  - NOAEC of 6 mg/m^3
  - LOAEC of 14 mg/m^3 for RBC ChE inhibition
  - typical cholinergic effects at 74 mg/m^3
- No increase in tumour incidence or RBC ChE inhibition at 0.25 mg/kg/d in chronic feeding study (rats, 2 yr)
- No changes in tumour incidence, food consumption, body weight, clinical symptoms or mortality at 0.3 mg/kg/d in chronic feeing study (mice, 22 mo)

Source	Year set	Standard
• RBC and brain ChE inhibition at 3 mg/kg/d, but no other symptoms in chronic feeding study (dogs, 2 yr): o NOAEL of 0.2 mg/kg/d • No effects on development/reproduction at 10 mg/kg/d in oral dose study (rats, GD 6–18) • Non-mutagenic in several *in vitro* studies with bacteria and mammalian cells or *in vivo* in a micronucleus assay and dominant lethal test with mice. Insufficient data to recommend a TLV-STEL or sensitisation notation. Skin notation warranted based on lethal systemic effects from low dermal doses in animals. Not classifiable as a human carcinogen (A4) based on lifetime feeding study with mice and rats.		
DFG	***NA***	***NA***
No report.		
SCOEL	***NA***	***NA***
No report.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***NA***	***NA***
No report.		

Secondary source reports relied upon

NIL.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic? No

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

Notations

Source	Notations
SWA	—
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	Carcinogenicity – A4, Skin
DFG	NA
SCOEL	NA

Source	Notations
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:	
Dermal LD_{50} ≤1000 mg/kg:	yes
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	no
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?	No

Additional information

Molecular weight:	322.5
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 13.19 mg/m^3; 1 mg/m^3 = 0.07 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.