# Disulfoton

| CAS number: | 298-04-4 |
| --- | --- |
| Synonyms: | Disyston, O,O-Diethyl-S-ethylmercaptoethyl dithiophosphate, Di-Syston, dithiosystox, phosphorodithioc acid O,O-Diethyl-S-(ethylthio)ethyl) ester, thiodementon |
| Chemical formula: | C8H19O2PS3 |
| Structural formula: | — |

 Workplace exposure standard (amended)

| TWA: | **0.02 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 0.02 mg/m3 is recommended to protect for cholinesterase inhibition in exposed workers.

## Discussion and conclusions

Disulfoton is an organophosphate insecticide used on cotton, tobacco, sugar beet, corn, peanuts, wheat, potatoes and cereal grains. In humans disulfoton is absorbed through the skin and dermal exposure can cause systemic inhibition of cholinesterase. Combined inhalation and dermal exposure of workers at 0.6 mg/m3 resulted in minimal inhibition of RBC cholinesterase (ACGIH, 2018). A NOAEC of 0.16 mg/m3 was reported in a 13-week inhalation study in rats. A NOAEL of 0.025 mg/kg/d was reported a two-year feeding bioassay in dogs (ACGIH, 2018; HCOTN, 2003) which is equivalent to an inhalational exposure of 0.2 mg/m3 (ACGIH, 2018).

The recommended TWA of 0.02 mg/m3 is adopted from the HCOTN (2003) based on the NOAEC of 0.16 mg/m3 and divided by an uncertainty factor of 9 to account for inter- and intra-species variation and rounding up. The recommended TWA is supported by the NOAEL in dogs and considered protective for cholinesterase inhibition in exposed workers.

## 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 sensitiser or respiratory sensitiser according to the GHS.

A skin notation is recommended based on evidence suggesting dermal absorption and adverse systemic effects in humans.

# Appendix

### Primary sources with reports

| Source Year set Standard  |
| --- |
| SWA 1991 TWA: 0.1 mg/m3 |
|  |
| ACGIH 2002 TLV-TWA: 0.05 mg/m3 |
| TLV-TWA recommended to minimise the potential for effects on cholinesterase in exposed workers.Summary of data:Human data:* Human exposure observations; combined inhalation and dermal; minimal inhibition of RBC cholinesterase (23%) seen when airborne level was 0.6 mg/m3; 90 wk exposure
* No measurable decreases in plasma or RBC cholinesterase activity in 5 volunteers dosed orally with 0.75 mg/kg for 30 consecutive days; only dose tested
* A farmer who had worn contaminated gloves for several days developed weakness, fatigue and cyanosis
* Case studies of poisoning by ingestion, one fatal.

Animal data:* LC50: 15–60 mg/m3, (4 h, rats)
* LD50: 6–20 mg/kg (rats, dermal)
* Significant RBC cholinesterase inhibition at concentrations 0.1–1.4 mg/m3; 2 x 21 d inhalation studies in rats
* Repeat-dose feeding studies; brain and RBC cholinesterase activity unaffected at following dose:
* 0.5 mg/kg/d mice
* 0.04 mg/kg/d rat
* 0.025 mg/kg/d dog
* Did not produce tumours in lifetime feeding studies in rats and mice.

The lowest NOAEL in animals (dogs) of 0.025 mg/kg in was extrapolated to an equivalent inhalational NOAEC of ≈0.2 mg/m3 by assuming 100% absorption, 70 kg worker inhaling 10 m3air in 8 h shift; inhalation. Therefore a TLV-TWA of 0.05 mg/m3 should be sufficiently protective.Insufficient data to recommend a sensitiser notation or STEL. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2003 TWA: 0.02 mg/m3 |
| Summary of additional data:* Previous TWA 0.1 mg/m3
* Considered very toxic after respiratory, dermal and oral exposure
* NOAEL:
* 0.025 mg/kg bw for dogs; 2 yr oral study
* 0.4 mg/kg bw for rabbits; 3 wk dermal
* 0.16 mg/m3 for rats;13 wk inhalation
* <0.04 mg/kg bw for rats; 2 yr oral
* Derives TWA from NOAEL of 0.16 mg/m3 and application of an assessment factor of 9 to account for intra- and interspecies variation; rounded to preferred numeral.
 |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US EPA |  | 1987 | * LEL 0.04 mg/kg/d; 2 yr, rat, oral
* 2 yr feeding, dog; NOEL 0.025 mg/kg/d; LEL 0.05 mg/kg/d
 |

### 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 | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4, Skin |
| DFG | NA |
| SCOEL | NA |
| HCOTN | Skin |
| 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: | yes | 4.00 |   |
| Dermal LD50 ≤1000 mg/kg: | yes | 3.00 |   |
| Dermal repeat-dose NOAEL ≤200 mg/kg: |   |   |   |
| Dermal LD50/Inhalation LD50 <10: |   |   |   |
| *In vivo* dermal absorption rate >10%: |   |   |   |
| Estimated dermal exposure at WES >10%: |   |   |   |
|   |   | 3 | **a skin notation is warranted** |

 |

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| Molecular weight: | 274.38 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa:  | 1 ppm = 11.22 mg/m3; 1 mg/m3 = 0.089 ppm |
| This chemical is used as a pesticide: |[x]
| 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: | [x]  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*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Health Council of the Netherlands (HCOTN) (2003) Disulfoton. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/071.

US Environmental Protection Authority (US EPA) (1987) Integrated Risk Information System (IRIS) Chemical Assessment Summary – Disulfoton.