# Ethion

| CAS number: | 563-12-2 |
| --- | --- |
| Synonyms: | Nialate, diethion,  bis[S-(Diethoxyphosphinothioyl)mercapto]methane,  ethyl methylene phosphorodithioate,  phosphorodithioic acid,  S,S’-methylene O,O,O’O’-tetraethyl ester,  O,O,O,O-tetraethyl-S,S’-methylene di(phosphorodithioate) |
| Chemical formula: | C9H22O4P2S4 |

Workplace exposure standard (amended)

| TWA: | **0.05 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 0.05 mg/m3 is recommended to protect for cholinergic symptoms and other central nervous system (CNS) effects in exposed workers.

## Discussion and conclusions

Ethion is an organophosphate insecticide used on citrus fruits, deciduous fruits, nuts and cotton.

Critical effects of exposure include decreased activity of cholinergic enzymes and CNS effects. Ethion has been cited in numerous poisoning incidents. Oral doses in humans of 0.05 mg/kg/day for 21 days did not report noticeable effects on plasma cholinesterase (ChE) activity and doses of 0.075 mg/kg/day for 21 days reported significant reductions of plasma ChE activity. A NOAEL 0.05 mg/kg/day for inhibition of red blood cell (RBC) ChE inhibition was reported in a one year oral study in dogs (ACGIH, 2018).

The recommended TWA of 0.05 mg/m3 is adopted directly from ACGIH (2018). This TWA is expected to be protective of cholinergic symptoms and other CNS effects 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 of dermal uptake and systemic effects in animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.4 mg/m3 | |
|  |
| ACGIH 2003 TLV-TWA: 0.05 mg/m3 |
| TLV-TWA recommended to prevent the occurrence of cholinergic symptoms and other adverse biologic effects in workers.  Summary of data:  Human data:   * Cited in numerous poisoning incidents * Oral doses of 0.05 mg/kg/d for 21 d did not produce consistent effects on plasma ChE activity * significant reductions in plasma ChE activity reported at 0.075 mg/kg/d for 21 d * TLV-TWA explanation: assuming 100% absorption, a dose of 0.1 mg/kg/d in a 70-kg worker inhaling 10 m3 per 8 h shift ≡0.7 mg/m3.   Animal data:   * NOAEL 0.05 mg/kg/h for RBC ChE inhibition in dogs; 1 yr, oral diet study * equivalent to a daily inhalation exposure of 0.35 mg/m3 * Dermally treated rabbits exhibited inhibited ChE activity in plasma, RBC and brain at doses ranging from 1.0–250 mg/kg/d for 21 d * Dermal LD50: 245 (rats, males); 62 mg/kg (rats, female) * Maternal toxicity (hyperactivity) and developmental toxicity (delayed ossification of pubis) at 2.5 mg/kg/d in rabbits; gavage at GD 6–15.   TLV–TWA is sufficiently low to be protective of short-term exposure peaks.  Inadequate data to assign a sensitisation notation. |
| 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

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| US EPA |  | 1989 | * NOEL of 0.05 mg/kg/d in humans; plasma ChE inhibition; same study as ACGIH (2018). |

### 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 | Skin |
| HCIS | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4, Skin |
| DFG | NA |
| SCOEL | NA |
| 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 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 | **consider assigning a skin notation** | |

### IDLH

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

## Additional information

| Molecular weight: | 384.48 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 15.73 mg/m3; 1 mg/m3 = 0.06 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*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

US Environmental Protection Authority (US EPA) (1989) Integrated Risk Information System (IRIS) Chemical Assessment Summary – Ethion.