# Diazinon

| CAS number: | 333-41-5 |
| --- | --- |
| Synonyms: | Basudin, Diazitol, O,O-Diethyl O-(2-isopropyl-6-methyl-4pyrimidinyl) phosphorothioate, Dipofene, Neocidol, Nucidol, phosphorothioic acid, O,O-diethyl O-(2-isoprpyl-6-methyl-4-pyrimidinyl) ester, spectracide |
| Chemical formula: | C12H21N2O3PS |

Workplace exposure standard (amended)

| TWA: | **0.01 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 0.01 mg/m3 is recommended to protect for cholinergic symptoms including the reduction of cholinesterase enzymes in exposed workers.

## Discussion and conclusions

Extensive human and experimental animal studies have been conducted for diazinon due to its ubiquitous use as an insecticide.

The critical effect is cholinergic symptoms including the reduction of cholinesterase enzymes. Workers exposed to approximately 0.01 mg/m3 over an eight hour workday demonstrated slight plasma effects but no different red blood cell (RBC) acetylcholinesterase (AChE) activity than a control group. A NOAEL of 0.01 mg/kg/day is reported from feeding studies in rats and dogs (equivalent air concentration of 0.07 mg/m3). A two year feeding study in monkeys reported a NOAEL of 0.05 mg/kg/day (ACGIH, 2018). A NOAEC of 0.46 mg/m3 in rats in a three week inhalation study (DFG, 2015).

The TWA of 0.01 mg/m3 is recommended based on minimal to no effects on workers. The recommended TWA is considered to protect for inhibition of cholinesterase 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 data from several human and animal studies that indicate adverse effects following dermal contact.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA 0.1 mg/m3 | |
|  |
| ACGIH 2003 TLV-TWA: 0.01 mg/m3 |
| TLV-TWA recommended to protect workers from cholinergic symptoms and other harmful effects.  Elevated exposure results in reduced level of ChE enzymes, which can be followed by respiratory paralysis, coma and ultimately death if exposure levels rise.  A skin notation assigned due to cholinergic poisoning observed in humans upon dermal application. No SEN or carcinogenicity notations assigned.  Summary of data:  Human data:   * Fatality from cardiac arrest following inhalation exposure to an insecticide containing diazinon and malathion * A prominent symptom of inhalation exposure includes reduced serum ChE activities; in some cases, cholinergic toxicity (symptoms including headache, blurred vision, nausea, etc.) also observed * Case involving 2 female gardeners reported cholinergic signs (cyanosis, frothing at mouth, nausea) following dermal exposure * concluded potential for skin absorption, but exposure estimates not available * Workers exposed to ~0.01 mg/m3 for 8-h; slight inhibition of plasma ChE; RBC ChE activities did not differ from controls; duration not reported * A group of 99 workers exposed to ≈0.02 mg/kg/d for 8 h/d for 39 d during an insecticide application program reported slight impairments in neurological function * converting these values to inhalation exposure results ≈0.1–0.5 mg/m3 * Multiple observational studies reported that following inhalation exposure for pest control operators at 8 h average concentrations of 6, 7.5 or 31 µg/m3, depressed plasma hE activities were reported, but RBC AChE activities remained unchanged.   Animal data:   * LD50: 100–500 mg/kg (rats, oral) * LD50: >1000 mg/kg (rats, dermal) * 4 h LC50: 3,500 mg/m3 (rats), 1,600 mg/m3 (mice) and 55,500 mg/m3 (guinea pigs) * No erythema or oedema observed following skin application on guinea pigs and concluded not a sensitiser * Inhalation exposure (rats), for 6 h/d, 7 d/wk for a 3-wk duration at concentrations of 0.1, 1.0, 10 or 100 mg/m3 reported no signs of OP toxicity in any of the rats under any of the exposure scenarios except: * decreased serum ChE activity to all levels at the end of the 3 wk study * inhibition of RBC ChE as concentration changed from 0.1 to 1.0 mg/m3 * NOAEL of ~0.01 mg/kg/d based on 4-6 wk feeding studies in rats and 12-13 wk studies in dogs; cholinergic toxicity was not observed * NOAEL of 0.05 mg/kg/d in monkeys; 2 yr feeding study * Limited data available on carcinogenicity through inhalation * Genotoxicity studies are conflicting, with some reporting positive test results for gene mutations and chromosomal aberrations, and other studies negative results. |
| DFG 2015 MAK: 0.1 mg/m3 |
| Summary of additional data:  MAK is recommended based on the inhibition of the AChE at the cholinergic synapses which is measured as AChE activity in erythrocytes and brain.  Human data:   * One observational study involved 18 male Japanese insecticide sprayers, 5 of which mainly used diazinon * exposed workers showed increased levels of 8‑hydroxydeoxyguanosine in contrast to the control * Patch tests conducted with 294 patients and a 1% solution showed no irritating effects  48–72 h after application * Dermal response test involving 56 volunteers using technical grade determined sensitisation in 6 of the volunteers after repeated applications to the forearm for several days * A study of 493 males determined that subjects with increased levels of metabolites in their system had a higher likelihood of exhibiting a reduction in their sperm parameters (i.e., morphology, volume, etc.) * Genotoxicity and carcinogenicity studies were deemed insufficient and inconclusive.   Animal data:   * LC50: 2,330 mg/m3 (rats, whole-body 4-h) (aerosol) * LD50: 1,000 mg/kg (rats, oral), higher LD50 values with purity of 96% or above * LD50: 2,000 mg/kg (rats and rabbits, dermal) * A 3 wk study in rats subjected to whole-body exposure determined a NOAEC for brain AChE of 0.46 mg/m3; this value confirmed by other studies using slightly different exposure scenarios * NOAEL of 1 mg/kg (dermal) involving 10 rabbits subjected to varying doses for 3 wk; cholinesterase activities decreased in all parts of the body following dermal exposure * No skin irritation reported in a rabbit study in which animals were exposed (semi-occlusive) for 4 h to 0.5 mL undiluted dimethoate * No evidence of carcinogenic or mutagenic effects were found in bacterial or mammalian cells. |
| 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 |
| --- | --- | --- | --- |
| IARC |  | 2017 | * Limited evidence of carcinogenicity in humans exists; however, some positive correlation has been observed for lung cancer, leukaemia and NHL * Classified as “probably carcinogenic to humans” (Group 2A). |

### 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 | Skin |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4, Skin |
| DFG | H (skin) |
| SCOEL | NA |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 2A |
| US NIOSH | — |

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: | *No* |  |  |  | | Dermal LD50/Inhalation LD50 <10: | *Yes* |  |  |  | | *In vivo* dermal absorption rate >10%: | *No data* |  |  |  | | Estimated dermal exposure at WES >10%: | *No data* |  |  |  | |  |  | 3 | **A skin notation is warranted** | | |

### IDLH

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

## Additional information

| Molecular weight: | 304.35 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 12.45 mg/m3; 1 mg/m3 = 0.08 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.

Deutsche Forschungsgemeinschaft (DFG) (2015) Diazinon – MAK value documentation.

International Agency for Research on Cancer (IARC) (2017) Diazinon. IARC Monographs on the evaluation of the carcinogenic risk to humans.