# Methomyl

| CAS number: | 16752-77-5 |
| --- | --- |
| Synonyms: | Lannate (dupont 1179), methavin, s-methyl-n[(methylcarbamoyl)oxyl]-thioacetimidate, nudrin, Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-methyl ester |
| Chemical formula: | C5H10N2O2S |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **0.2 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 0.2 mg/m3 is recommended to protect for cholinergic effects and potential reproductive toxicity in exposed workers.

## Discussion and conclusions

Methomyl is used as a broad-spectrum pesticide for field and fruit crops.

Critical effects of exposure are acetylcholine inhibition, which causes cholinergic effects such as headaches, lachrymation, gastrointestinal distress and tachycardia. Damage to testes is reported before cholinergic effects in some animal studies.

Human inhalational exposure data are limited. Several cases of poisonings following oral intake are reported and indicate severe cholinergic toxicity at relatively low doses (ACGIH, 2018). Chronic animal feeding studies indicate a NOAEL of 3 mg/kg/day for cholinergic effects and kidney damage in rats and dogs (ACGIH, 2018). A LOAEL of 0.5 mg/kg/day for testes damage and hormone level disturbance is reported in rats, which is the most sensitive endpoint in the available database (ACGIH, 2018). There is insufficient evidence of mutagenic activity and it is not considered human carcinogen because carcinogenic effects are not affirmed in chronic carcinogenicity studies with animals (ACGIH, 2018).

Dermal absorption causes cholinergic effects in humans and animals. A NOAEL of 5 mg/kg/day for these effects is reported in a repeat dermal application study with rabbits and warrants a skin notation.

A TWA of 0.2 mg/m3 is recommended as assigned by ACGIH (2018) and is expected to be protective of cholinergic 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 for dermal absorption and adverse systemic effects in humans and animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 2.5 mg/m3 | |
|  |
| ACGIH 2014 TLV-TWA: 0.2 mg/m3 |
| TLV-TWA intended to protect for cholinergic effects, headaches, sweating, salivation, lachrymation, gastrointestinal distress and tachycardia. Not classified as a human carcinogen based on lack of evidence for carcinogenicity in chronic feeding study with animals. A skin notation is warranted based on systemic cholinergic effects following dermal exposure in animals and humans.  Summary of data:  TLV-TWA based on weight of evidence of several oral dose/feeding studies with rats and dogs. A NOAEL of ≈3 mg/kg/d for histopathological changes to kidney and spleen, acetylcholine inhibition, and chronic anaemia is reported in dogs and rats, and a LOAEL of 0.5 mg/kg for adverse reproductive effects is reported in rats. An air concentration that delivers an effective oral dose at this LOAEL ≡3.5 mg/m3 assuming 100% absorption in a 70 kg individual with a respiratory volume of 10 m3 over an 8 h shift. The TLV-TWA is set at 0.2 mg/m3 due to the severity of the toxic endpoints.  Human data:   * Lethal oral dose estimated at 12–55 mg/kg from reports of accidental or intentional poisoning; typical cholinergic effects observed in all cases:   + seizure >1 h of dermal exposure to clothes soaked in mixture of methomyl and endosulfan * 11 workers from packaging plant (n=102) hospitalised with cholinergic symptoms including blurred vision, vomiting and fatigue (exposure concentration/duration not specified).   Animal data:   * LC50: 258–300 mg/m3 (rats, 4 h); pulmonary irritation and typical cholinergic symptoms such as tremors, irregular breathing, lachrymation and red discharge around eyes reported * Oral LD50: 17–48 mg/kg (rats), 30 mg/kg (rabbits), 20 mg/kg (dogs), 40 mg/kg (monkeys); typical cholinergic effects reported as with acute inhalation * Eliminated almost entirely within 24 h in urine and exhaled CO2 following metabolism * LOAEL: 0.5 mg/kg/d for testicular lesions and decreased spermatogenesis in reproductive repeat oral dose study (male rats, 65 d):   + NOAEL: 5 mg/kg for changes in reproductive and histopathological parameters, and teratogenicity in multigenerational study (rabbits, duration not specified) * Cholinergic effects and some mortality reported at 200 mg/kg/d in repeat dermal application study (rabbits, 15 d):   + NOAEL: 5 mg/kg/d (males), 50 mg/kg/d (females) reported in similar 21 d study * Several key chronic feeding studies are presented and used in the TLV-TWA derivation:   + NOAEL: 3 mg/kg/d for kidney damage and decreased haemoglobin levels; RBC and brain cholinesterase inhibition at 24 mg/kg/d (rats, 2 yr)   + LOAEL: 10 mg/kg/d for changes in RBC and haemoglobin levels (mice, 2 yr)   + NOAEL: 3 mg/kg/d for adverse histopathological changes to kidneys and spleen (dogs, 2 yr)   + no evidence for carcinogenicity reported in these chronic studies * Negligible irritation and no sensitisation when applied as 60% paste, or 5% solution in water or propylene glycol (guinea pigs) * Equivocal mutagenicity results *in vitro*; positive results *in vivo* in a micronucleus assay.   Insufficient data to recommend a TLV-STEL or sensitiser 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 |
| --- | --- | --- | --- |
| NICNAS |  | 2018 | * Tier I: used in agriculture, excluded from assessment. |
| US EPA |  | 1987 | * Chronic feeding study with NOAEL of 3 mg/kg/d for histopathological kidney and spleen changes (dogs, 2 yr) used principally to derive oral reference dose (RfD) (also cited by ACGIH, 2018 and used in TLV-TWA derivation) * Carcinogenicity assessment not available. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | No |
| **The chemical is not a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | — |
| 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: | yes | 4.00 |  | | Dermal LD50 ≤1000 mg/kg: | no |  |  | | Dermal repeat-dose NOAEL ≤200 mg/kg: | yes | 3.00 |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  | | Estimated dermal exposure at WES >10%: | yes | 2.00 |  | |  |  | 2.5 | **a skin notation is warranted** | |

### IDLH

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

## Additional information

| Molecular weight: | 162.21 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number 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.

European Chemicals Agency Regulation (ECHA) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2018) Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester: Human health tier I assessment – IMAP report.

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