# Endrin

| CAS number: | 72-20-8 |
| --- | --- |
| Synonyms: | 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, endo-1,4:5,8-dimethanonaphthalene |
| Chemical formula: | C12H8Cl6O |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **0.1 mg/m3** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Sk.** |
| IDLH: | **2 mg/m3** |
| Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 0.1 mg/m3 is recommended to protect for effects in the liver and central nervous system (CNS) in exposed workers including headache, dizziness, weakness, muscle tremors and convulsions.

## Discussion and conclusions

Endrin was formerly used as an organochlorine insecticide and rodenticide. Its use was discontinued since the late 1980s (ACGIH, 2018) and it is prohibited for use in Australia.

Critical effects include liver toxicity and CNS effects including muscle tremors and convulsions. The ACGIH (2018) base its TLV-TWA recommendations by extrapolation of acute toxicity data from animal studies and note that this concentration does not appear to result in adverse effects in humans.

Given the limited human data available, the current TWA is retained, in line with the recommended TLV-TWA from ACGIH (2018). There are no available data to refute this position and the recommended TWA of 0.1 mg/m3 is considered protective of liver and 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 suggesting potential dermal absorption and adverse systemic effects in animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 0.1 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.1 mg/m3 |
| TLV-TWA recommended to minimise CNS effects including headache, dizziness, weakness, muscle tremors, convulsion, as well as effects on the liver. TLV-TWA based on extrapolations (not clearly presented) from acute toxicity data and oral LD50 values obtained from experimental animal studies due to a lack of human data (including comparison to Aldrin and dieldrin).  Dermal exposure is also significant to the overall toxicity due to lethality observed in animals after dermal application.  Summary of data:  Human data:   * Oral dose between 0.2 and 0.25 mg/kg reported to induce convulsions * 1.0 mg/kg caused repeated seizures, which can manifest within 3 h of exposure * Studies on carcinogenicity unable to identify association between exposure and increased incidence of cancer in a manufacturing setting * 1 case study involved 233 chemical workers in a Dutch manufacturing facility, and it was reported that after 15 yr of observation, there was no evidence of increased cancer incidence in the same group of workers following exposure durations 4-13 yr.   Animal data:   * Oral LD50: 1.37 mg/kg (mice), 3.0 mg/kg (monkeys), 5.3 mg/kg (rats) * LD50: 15–18 mg/kg (female and male rats, dermal) * Acute toxicity generally targets the CNS, manifesting in the form of twitching, convulsions and coma * Rats and mice subjected through inhalation exposure to concentration of 0.36 ppm (15 mg/m3) for 7 h/d, 5 d/wk for 26 wk, showed no signs of intoxication or retardation of growth. However, in an experiment involving 4 rabbits under identical conditions, 2 fatalities reported * Carcinogenic studies on mice and rats concluded no effect on tumour growth * Some studies suggest adverse reproductive/developmental effects, as a single dose of 2.5 mg/kg administered to pregnant hamsters resulted in higher incidence of foetal death, congenital anomalies and growth retardation.   A4 carcinogenicity classification assigned based on lack of evidence in animal or human case studies. |
| DFG 2012 MAK: 0.05 mg/m3 |
| Summary of additional data:  Human data:   * Some studies reported a dose of ~100 mg/kg considered lethal * A plant worker suffered seizures following acute inhalation exposure (quantity unknown), whilst two workers following skin contact did not develop symptoms of intoxication * Several studies examined workers exposed for 12–24 yr showed no signs of toxicity * No increase in chromosomal aberrations observed in a study involving the peripheral lymphocytes of 8 male workers.   Animal data:   * Study reported fatalities in groups of 10 rats following exposure to 2,000 mg/m3 for 1 h * Chronic feeding studies identified NOAELs: mice 0.045 mg/kg/d, 0.05 mg/kg/d rats, dogs 0.025 mg/kg/d; toxicokinetic transfer of NOAEL to a concentration in air using the following: * daily exposure of animals compared to the 5-d work-week exposure (7/5) * species-specific toxicokinetic differences between animal and human: mouse (1:7), rat (1:4) and dog (1:1.4) * oral absorption 90% * human body weight 70 kg * the respiratory volume 10 m3 * assumed 100% absorption in lungs humans * corresponding concentrations 0.06, 0.11 and 0.16 mg/m3 * Based on the rat study derivation divided by 2 and rounded down: MAK value of 0.05 mg/m3 is established. |
| 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 |  | 2002 | * Oral RfD of 0.0003 mg/kg-d based on NOEL of 0.025 mg/kg/d and LOAEL of 0.05 mg/kg/d for mild histological lesions in liver and occasional convulsions in dogs (chronic oral bioassay) |
| US NIOSH |  | 2018 | * TWA: 0.1 mg/m3 [skin] |

### 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 | H (skin) |
| SCOEL | NA |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 3 |
| 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 |
| --- |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Conclusion:** |  |  |  |  |  | |  |  | Adverse effects in human case study: | no |  |  | |  |  | 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? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 380.93 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 15.58 mg/m3; 1 mg/m3 = 0.064 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 |
| --- | --- |
| 1991 | TWA: 0.1 mg/m3 |

## 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). (1998). Endrin – MAK value documentation.

Deutsche Forschungsgemeinschaft (DFG). (2002). Endrin – MAK value documentation.

Deutsche Forschungsgemeinschaft (DFG). (2012). Endrin – MAK value documentation.

International Agency for Research on Cancer (IARC). (1987). Endrin. IARC Monographs on the evaluation of the carcinogenic risk to humans.

US Environmental Protection Authority (US EPA) (1998) Integrated Risk Information System (IRIS) Chemical Assessment Summary – Endrin.

US National Institute for Occupational Safety and Health (NIOSH). (1994). Immediately dangerous to life or health concentrations – Endrin.