# p-dichlorobenzene

| CAS number: | 106-46-7 |
| --- | --- |
| Synonyms: | Di-chloricide, 1,4-dichlorobenzene, paracide, paramoth, parazene, PDB, santochlor, p-chlorophenyl chloride, paradichlorobenzene, |
| Chemical formula: | C6H4Cl2 |

Workplace exposure standard (amended)

| TWA: | **2 ppm (12 mg/m3)** |
| --- | --- |
| STEL: | **10 ppm (60 mg/m3)** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **150 ppm** |
| **Sampling and analysis**: The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 2 ppm (12 mg/m3) is recommended to protect for eye irritation and possible liver damage in exposed workers.

A STEL of 10 ppm (60 mg/m3) is recommended to protect for irritation in the nasal epithelium in exposed workers.

Given the conflicting data about dermal absorption and whether a skin notation should be assigned, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

*p*-Dichlorobenzene (*p*DCB) is used as an insecticide and a fumigant for control of mildew, moulds and moths (moth-balls).

Eye irritation is reported in workers following exposure at 17 ppm. Injury to the liver and kidneys is reported in humans also with no exposure concentration information provided (ACGIH, 2018). A NOAEC of 20 ppm is reported in rats for effects in the nasal epithelium, with exposure at 25 ppm reported to be associated with renal toxicity. A LOAEL of 10 mg/kg/day in dogs is reported in a one year feeding study for effects in the blood and lung inflammation (DFG, 2003; SCOEL 2014). Carcinogenicity is reported in various animal species, but it is not considered to be a non-threshold based genotoxic as the mechanism of action for carcinogenicity is not fully understood (DFG 2003).

A threshold exposure concentration is derived from the systemic toxicity studies. SCOEL (2014) uses the LOAEL in dogs to extrapolate equivalent eight hour concentration of 3.6 ppm in humans and a TWA of 2 ppm (rounded). The recommended TWA of 2 ppm is considered to protect for irritation and liver effects in exposed workers. The NOAEC of 20 ppm for effects at the nasal epithelium is used as the basis for the STEL.

## Recommendation for notations

Classified as a category 2 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.

There are insufficient data to recommend a skin notation. However, further review is recommended as there is evidence of dermal absorption in humans and conflicting assessments between agencies.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 2001 TWA; 25 ppm (150 mg/m3); STEL: 50 ppm (300 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 10 ppm (60 mg/m3) |
| TLV-TWA recommended to minimise the potential for eye irritation.  Summary of data:  Human data:   * Severe eye irritation in workers reported at 17–500 ppm * Injury to the liver and kidney reported; liver effects dominate chronic exposure * CNS depression reported at concentrations irritating to eyes and nose * 8 workers in moth-proof manufacturing developed various neural disorders following 1‑7 mo exposure (no further information). * 58 workers involved with processing of *p*DCB for 8 mo–25 yr showed no evidence of organic damage or haematological alterations.   Animal data:   * Renal toxicity observed in rats at 150 mg/m3 (25 ppm) * LD50: >5,000 mg/kg in (rabbits, dermal) * Rabbits exposed 8 h/d, 62 exposures in 83 d at 770–800 ppm demonstrated tremors, weakness, oedema of the cornea, opacity of the lens and death * Kidney and liver tumours reported in a variety of animals from exposure conditions not characteristic of a working environment.   No evidence of mutagenicity.  Insufficient evidence to recommend skin or SEN notation or a STEL. |
| DFG 2003 Not assigned |
| Previous MAK of 50 ppm withdrawn due to carcinogenic effects in animals.  Summary of additional data:   * In a long-term study, mice exposed to ≥20 ppm developed liver adenomas, bronchiolar and alveolar carcinomas and malignant lymphomas, rats developed C cell adenomas in the thyroid gland and leukaemia * Skin notation assigned based on analogy with o-dichlorobenzene. |
| SCOEL 2014 TWA: 2 ppm (12 mg/m3); STEL: 10 ppm (60 mg/m3) |
| Summary of additional data:   * LOAEL of 10 mg/kg (≡11 ppm concentration) oral study in dogs; non-significant increase in thrombocytes, foci of chronic inflammation in the lung * Based on LOAEL, 5 ppm is used as starting point for derivation of OEL; allometric scaling factor of 1.4 applied to extrapolate from dogs to humans (3.6 ppm); rounded to obtain a TWA of 2 ppm * NOAEC of 20 ppm for effects in nasal epithelium identified long-term inhalation study in rats; basis for STEL * LD50: >2,000 mg/kg (rats, dermal) * Skin notation recommended based on absorptions of up to 318 mg for a 1 h exposure of the hands and forearms (2,000 cm²). |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2000 | * NOAEL by inhalation for the rat (both sexes) was 75 ppm (451 mg/m3) for hepatoxicity. |
| US EPA |  | 1994 | * NOAEL 50 ppm in rats (human equivalent 75 mg/m3) increased liver weight. |

### 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 | NA |
| HCIS | Carcinogenicity – category 2 |
| NICNAS | NA |
| EU Annex | Carcinogenicity – category 2 |
| ECHA | NA |
| ACGIH | Carcinogenicity – A3 |
| DFG | Carcinogenicity – 2, H (skin) |
| SCOEL | Carcinogenicity – D, Skin |
| HCOTN | NA |
| IARC | Carcinogenicity – Group 2B |
| 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: | no |  |  |  | | Dermal repeat-dose NOAEL ≤200 mg/kg: |  |  |  |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  |  | | Estimated dermal exposure at WES >10%: | yes | 2.00 |  |  | |  |  | 2 | **insufficient data to assign a skin notation** | | |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 147.01 |
| --- | --- |
| 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.

Deutsche Forschungsgemeinschaft (DFG) (2003) 1,4-Dichlorobenzene – MAK value documentation.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (2014) Recommendation from the Scientific Committee on Occupational Exposure Limits for 1,4-Dichlorobenzene. SCOEL/SUM/65.

International Agency for Research on Cancer (IARC) (1999) Volume 73, Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2016) Benzene, 1,4-dichloro-: Priority Existing Chemical Assessment Report No. 13.

Tenth Adaptation to Technical Progress Commission Regulation (EU) No 2017/776 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (the CLP Regulation).

US Environmental Protection Authority (US EPA) (1994) Integrated Risk Information System (IRIS) Chemical Assessment Summary – 1,4-Dichlorobenzene.

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