# triphenyl phosphate

| CAS number: | 115-86-6 |
| --- | --- |
| Synonyms: | Celluflex TPP, disflamoll TP, phenyl phosphate, phosflex TPP, phosphoric acid, triphenyl ester, TPP |
| Chemical formula: | C18H15O4P |

Workplace exposure standard (retained)

| TWA: | **3 mg/m3** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| 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 3 mg/m3 is recommended to protect for liver changes in exposed workers.

## Discussion and conclusions

Triphenyl phosphate (TPP) is used as a plasticiser in vehicle upholstery, fireproofing agent, component of lubricating oil and hydraulic fluids.

The critical effects of exposure are potential liver changes.

Limited human data are available. A medical evaluation of 32 male workers from a manufacturing plant found no adverse clinical effects from exposure at TWA of 3.5 mg/m3 (ACGIH, 2018). There is equivocal evidence of sensitisation in humans (ACGIH, 2018; DFG, 1991; NICNAS, 2018). Based on animal data, TPP is of very low acute oral and dermal toxicity. A NOEL of 105 mg/kg/day is identified in rats based on increased liver weight (NICNAS, 2018).

Based on no adverse effects in workers exposed at an average concentration of 3.5 mg/m3, a TWA of 3 mg/m3 by ACGIH (2018) is recommended to be retained. The recommended TWA is considered adequately protective of liver changes 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 not recommended based on the available evidence.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 3 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 3 mg/m3 |
| TLV-TWA recommended to minimise the risk of skin and eye irritation and dermatitis.  Summary of data:  TLV-TWA based on absence of effects following medical evaluation of workers exposed to TPP for up to 10 yr at average of 3.5 mg/m3.  Human data:   * No adverse clinical effects (dermatitis, eye or respiratory tract irritation, unexplained illness or neurological disease) in 32 men in manufacturing plant exposed at TWA 3.5 mg/m3 for 2–10 yr (average 7.4 yr): * slight reduction in erythrocyte ChE activity in 6 workers * no difference in plasma ChE activity * *in vitro* cytotoxicity demonstrated in cultured human cells, provides some evidence of *in vitro* immunotoxicity * Allergic or sensitisation reaction to exposure not definitive.   Animal data:   * No fatalities among groups of guinea pigs, rats or mice administered 3,000 mg/kg (in ethanol solution) orally or subcutaneously * Oral LD50: 1,320 ±280 mg/kg (mice); 3,800±260 mg/kg (rats) * Subcutaneous administration of 500 mg/kg fatal to monkeys: * 1,000 mg/kg fatal to rabbits; * 200 mg/kg induced paralysis in cats (fatal between 300–1,000 mg/kg) * Subcutaneous injection of 400, 700 or 1,000 mg/kg in cats; no ataxia at 400 mg/kg. Prostration occurred sometime after dosing at the higher doses * 50% inhibition of plasma ChE activity in mice administered 200 mg/kg and in cockerels administered 1,000 mg/kg (oral or IP) * No skin irritation following topical application in rats and mice * No cumulative toxicity based on 3 mo study in rats dosed at 1,800 mg/kg and 380 mg/kg * Negative results in genotoxicity tests * No difference in incidence of pulmonary adenomas in treated or control mice (single or multiple doses) * Not teratogenic or maternally toxic in male and female rats fed at 0, 2.5, 5, 7.5 or 10 mg/kg (91 d).   Insufficient data to recommend Skin or SEN notations or a TLV-STEL.  Not classifiable as a human carcinogen notation is assigned. |
| DFG 1991 Not assigned |
| Summary of additional data:   * Single dose of 1,000 mg/kg in hens produced no effects * Appears to be poorly absorbed through skin and GIT * Limited human data. No evidence reported for lethal dose of 1,000 mg/kg * Older studies in which neurotoxic changes occurred concluded to be due to impurities in the chemical: * no changes in blood, plasma or RBC ChE activity in later studies in cats * Repeated dose studies in hens confirmed absence of neurotoxic effects * Slight reduction in body weight gain and increased liver weight at the highest dose reported in dietary study in rats fed 0, 754 and 3,632 mg/kg/d (35 d) * Equivocal evidence of sensitisation * Not mutagenic in *S. typhimurium* strains TA98, TA100, TA135 and TA1537 (with or without activation): * weakly positive in micronucleus test in SHE cells * No chronic studies available * Insufficient data in humans and animals to assign MAK: * additional studies, particularly of neurotoxicity *in vivo*, is required. |
| 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 | * LD50: >10,000 mg/kg (rabbits, dermal) * No signs of toxicity caused by whole body exposure in mice at 363 mg/m3 (6 h) or 757 mg/m3 (2–4 h) * Very low incidence of potential skin sensitisation in humans * NOAEL of 1,500 ppm (105 mg/kg/d in males and 117 mg/kg/d in females) in rats based on increased liver weight (90 d duration) * Negative results in *in vitro* genotoxicity studies * Not considered to cause neurotoxicity * No adverse effects following repeated application to intact or abraded rabbit skin at 100 or 1,000 mg/kg/d, 5 d/wk * Single doses of 2,000, 3,000, 5,000, 8,000 or 12,500 mg/kg caused no effects in hens (observed for 2–3 wk) * Recent studies suggest may cause hormonal and/or metabolic changes. |
| OECD |  | 2002 | * Very low acute oral and dermal toxicity * Repeated dose oral studies in rats (up to 4 mo) showed slight body weight reduction and increased liver weight; NOAEL of 161 mg/kg/d identified based on reduced body weight gain * Pure substance did not caused neuropathy in cats or hens: * providing support to presence of impurities causing such effects in older studies. |

### 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 | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4 |
| 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: | no |  |  |
| Dermal repeat-dose NOAEL ≤200 mg/kg: | no | -3.00 |  |
| Dermal LD50/Inhalation LD50 <10: |  |  |  |
| *In vivo* dermal absorption rate >10%: |  |  |  |
| Estimated dermal exposure at WES >10%: |  |  |  |
|  |  | -3 | **a skin notation is not warranted** |

### IDLH

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

## Additional information

| Molecular weight: | 326.28 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 13.3 mg/m3; 1 mg/m3 = 0.07 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) (1991) Triphenyl phosphate – MAK value documentation.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2018) Phosphoric acid, triphenyl ester: Human health tier II assessment – IMAP report.

Organisation for Economic Cooperation and Development (OECD) (2002) SIDS initial assessment profile – Triphenyl Phosphate.