# 2,3-Pentanedione (Acetyl propionyl)

| CAS number: | 600-14-6 |
| --- | --- |
| Synonyms: | — |
| Chemical formula: | C5H8O2 |
| Structural formula: | — |

Workplace exposure standard (new)

| TWA: | **0.02 ppm (0.083 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 0.02 ppm (0.083 mg/m3) is recommended to protect for lung effects and inflammation in the upper respiratory tract of exposed workers.

## Discussion and conclusions

2,3-Pentanedione is used as an artificial flavouring for food and beverages, imparting a butter and caramel flavour. It is also used a solvent in paints, inks and lacquers.

Critical effects of exposure are inflammation, necrosis, ulceration and fibrosis in the lung and inflammation, exudates and metaplasia in the nasal cavity in rats and mice.

A NOAEC of 49 ppm in rats and a LOAEC of 49 ppm in mice for lung effects including fibrosis reported in a 12-day inhalation study in rats and mice. Occurrence of fibrosis after two weeks of inhalation is considered a severe effect. A human equivalent NOAEC of 0.2 ppm was derived from both the reported NOAEC and LOEAC in rats and mice, respectively. 2,3-pentanedione is structurally similar to diacetyl (assigned a MAK of 0.02 ppm by DFG, 2017). Diacetyl is responsible for *bronchiolitis obliterans* in popcorn workers. Considering the evidence in rats and mice and based on the analogy to diacetyl, the DFG (2017) adopted a MAK of 0.02 ppm for 2,3-pentanedione in 2017.

A TWA of 0.02 ppm (0.083 mg/m3) by DFG (2017) is recommended to be adopted. This TWA is cited to be protective of adverse, cumulative lung effects and inflammation effects in the nose.

## 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. However, a prioritised review is recommended as DFG (2017) recommend a skin notation based on structural analogy to diacetyl which is known to have systemic effects in humans and the limited information available.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA NA NA | |
|  |
| ACGIH NA NA |
| No report. |
| DFG 2017 MAK: 0.02 ppm (0.083 mg/m3) |
| MAK recommended to protect for irritant effects and inflammatory processes in the nasal cavity and lungs as demonstrated in animals.  Derivation of MAK based on evidence from rat and mice studies and the structural analogy to diacetyl (MAK 0.02 ppm; irreversible cumulative effects in the lungs).  Skin contact may contribute significantly to systemic toxicity.  Summary of data:   * No human data.   Animal data:   * LD50: 2,500 mg/kg (rabbits, dermal) * 12-d inhalation study in rats and mice, 0, 49, 97, 202 ppm; inflammation and exudates in the nasal cavity, metaplasia in the respiratory epithelium and minimal effects on the olfactory epithelium: * NOAEC of 49 ppm in rats for lung effects including fibrosis; lung effects start at 97 ppm * LOAEC of 49 ppm in mice for lung effects * LOAEC of 49 ppm in rats and mice for inflammation, exudate and metaplasia in the nasal cavity and minimal effects on the olfactory epithelium, which increased in a concentration-dependent manner * NOAEC of 49 ppm in rat ≡NOAEC of 0.2 ppm for humans; based on adjustments for: * worker’s respiratory volume being 32x higher than that of a rat * 1:6 to adjust 12-d to 90-d data. * LOAEC of 49 ppm in mouse for lung effects equivalent to a NAEC of 0.2 ppm for humans; based on adjustments: * LOAEC/3 = 16 ppm NAEC * 1:6 to adjust for 12 d to 90 d data * 1:12 for tidal volume of mice (no further details). * Considering the above data, due to the structural similarity to diacetyl (responsible for bronchiolitis obliterans in popcorn workers) the MAK of 0.02 ppm was adopted by analogy. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

NIL.

### 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 | NA |
| DFG | H (skin), Sh (dermal sensitiser) |
| 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: |  |  |  | | Dermal LD50/Inhalation LD50 <10: |  |  |  | | *In vivo* dermal absorption rate >10%: |  |  |  | | Estimated dermal exposure at WES >10%: |  |  |  | |  |  |  | **a skin notation is not warranted** | |

### IDLH

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

## Additional information

| Molecular weight: | 100.12 |
| --- | --- |
| 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

Deutsche Forschungsgemeinschaft (DFG) (2016) 2,3-Pentandion – MAK value documentation.