# Ethyl benzene

| CAS number: | 100-41-4 |
| --- | --- |
| Synonyms: | Ethylbenzol, phenylethane |
| Chemical formula: | C8H10 |

Workplace exposure standard (amended)

| TWA: | **20 ppm (87 mg/m3)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **800 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 20 ppm (87 mg/m3) is recommended to protect for irritation of the eyes, nose and upper respiratory tract, kidney damage and potential hearing loss in exposed workers.

A STEL is not recommended based on the consideration that the recommended TWA would be protective of effects from short term excursions.

## Discussion and conclusions

Ethyl benzene is primarily used as a solvent, as an intermediate in the production of styrene and in the plastics and rubber industries.

Critical effects of exposure include irritation, kidney damage and cochlear impairment. Exposure at 1,000 ppm for five minutes resulted in eye irritation with profuse lacrimation in a study in humans. A NOAEC of 100 ppm for a single eight hour exposure is identified in a study with volunteers, with irritation demonstrated at concentrations greater than 200 ppm. Epidemiological studies with exposure to solvents including ethyl benzene for ten years reported relative risks of 2.6 and 2.8 for hearing loss. Hearing loss is suggested following exposure at 400 ppm in sub-chronic inhalation studies in rats. Female rats showed damage to the liver and kidneys after chronic oral dosing at 408 mg/kg/day; with no effects seen at 136 mg/kg/day (ACGIH, 2018). An oral dose of 136 mg/kg/day is equivalent to a human inhalation concentration of approximately 380 ppm (952 mg/m3) over an eight hour working day.

The TWA of 20 ppm derived by ACGIH (2018) is recommended and is considered protective of irritant effects and for organ damage and hearing loss (cochlear impairment) in workers. The recommended TWA is sufficiently low to protect for effects from short-term exposure marginally above this concentration and as such a STEL is not recommended.

## 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.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 100 ppm (434 mg/m3); STEL: 125 ppm (543 mg/m3) | |
|  |
| ACGIH 2011 TLV-TWA: 20 ppm (87 mg/m3) |
| TLV-TWA recommended to minimise the potential risk of irritation, organ damage and hearing loss (cochlear impairment).  Summary of data:  Human data:   * 1,000 ppm for 5 min resulted in eye irritation with profuse lacrimation; rapid tolerance * No adverse effects identified in volunteers exposed for 8 h to 4 separate concentrations ranging from 23–85 ppm; no further information * NOAEC of 100 ppm single 8 h exposure in volunteers; inhalation metabolism study; respiratory tract irritation, conjunctivitis and drowsiness at >200 ppm for 8 h * Recognised to cause ototoxicity; more pronounced effect when in combination with noise * Epidemiological studies in workers with exposure to solvents including ethyl benzene for at least 10 yr reported relative risks of 2.6 and 2.8 for hearing loss * Low rate of skin penetration.   Animal data:   * Eye and nose irritation and acute depressant effects (ataxia) on CNS of guinea pigs at 2,000 ppm for 6.5 h * Female rats dosed at 408 mg/kg/d for 5 d/wk, 6 mo resulted in damage to the liver and kidneys; no effects seen at 13.6 or 136 mg/kg/d * Rats exposed at 400 ppm for 8 h for 5 d (consecutive) may have developed hearing loss; hearing effect not definite * Chronic inhalation at 750 ppm associated with a significant increase in renal tubular adenoma and carcinoma in rats and alveolar/bronchiolar adenoma and carcinoma in mice * LD50: 1,540 mg/kg (rats, dermal).   The derivation of the TWA was not provided in the report. It appears that it was based on the NOAEL of 135 mg/kg/d and a composite factor around 20.  No indication of mutagenicity in several assays. |
| DFG NA NA |
| No report. |
| SCOEL 1995 TWA: 100 ppm (442 mg/m3); STEL: 200 ppm (884 mg/m3) |
| Summary of additional data:   * Critical effect is irritation of the eye, nose and throat * Limited information in humans as exposure generally occurs in combination with other solvents * 200 ppm (884 mg/m3) reported to be irritative * Well-absorbed through the lungs and skin. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2013 | * Not considered genotoxic in the absence of pronounced toxicity * Low acute dermal toxicity; LD50:17,800 mg/kg (rabbits). |
| US EPA |  | 1987 | * NOAEL: 100 ppm (434 mg/m3); rat and rabbit developmental inhalation studies; 6 to 7 h/d, 7 d/wk during GD 1–19 and   1–24; human equivalent of 100 ppm. |

### 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 | — |
| HCIS | — |
| NICNAS | — |
| EU Annex | NA |
| ECHA | — |
| ACGIH | Carcinogenicity – A3 |
| DFG | NA |
| SCOEL | 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%: | |  |  |  |  | |  |  | |  | **a skin notation is not warranted** | | |

### IDLH

| Is there a suitable IDLH value available? | Yes, based on LEL |
| --- | --- |

## Additional information

| Molecular weight: | 106.17 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.3 mg/m3; 1 mg/m3 = 0.23 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 (ECHA) (2019) Ethyl benzene – REACH assessment.

EU Scientific Committee on Occupational Exposure Limits (SCOEL) (1995) Recommendation from the Scientific Committee on Occupational Exposure Limits for Ethylbenzene. SCOEL/SUM/28.

International Agency for Research on Cancer (IARC) (2000) Ethylbenzene. IARC Monographs on the evaluation of the carcinogenic risk to humans.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2013) Benzene, ethyl: Human health tier II assessment – IMAP report.

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