# n-Butyl glycidyl ether (bge)

| CAS number: | 2426-08-6 |
| --- | --- |
| Synonyms: | BGE, 1-butoxy-2,3-epoxypropane,  3-butoxy-1,2-epoxypropane,  (butoxymethyl)-oxirane, butyl 2,3-epoxypropyl ether, 2,3-epoxypropyl butyl ether, oxirane |
| Chemical formula: | C7H14O2 |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **3 ppm (16 mg/m3)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Carc. 2, Sk., DSEN** |
| IDLH: | **250 ppm** |
| Sampling and analysis: | There is uncertainty regarding quantification of the recommended value with available sampling and/or analysis techniques. |

## Recommendation and basis for workplace exposure standard

A TWA of 3 ppm (16 mg/m3) is recommended to protect for adverse effects on the male reproductive system in exposed workers. The TWA is also protective of potential adverse respiratory effects reported in animals.

## Discussion and conclusions

n-Butyl glycidyl ether (BGE) is used as a reactive diluent in epoxy resins, which are used in a range of industrial, construction and domestic uses.

There are limited data in humans other than reports of skin sensitisation and irritation effects. A NOAEL of 38 ppm for testicular atrophy is reported in rats from a 10‑week inhalation study (ACGIH, 2014). A NOAEC of 100 ppm is reported in mice, rats and rabbits for rhinitis, lethargy and gait changes and 25 ppm in rabbits for lung collapse (NICNAS, 2015). Positive results in male rat germ cell mutagenicity are reported following application of BGE to the skin.

The TWA is derived by applying an interspecies factor of 10 to the reported NOAEL of 38 ppm in rats and then rounding down this figure to 3 ppm. The TWA is expected to protect for the respiratory effects reported for short-term inhalational exposures (NICNAS, 2015).

## Recommendation for notations

Classified as a category 2 carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Classified as a skin sensitiser and not classified as a respiratory sensitiser according to the GHS.

A skin notation is recommended based on reports of rapid dermal uptake and associated systemic effects in animals.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 25 ppm (133 mg/m3) | |
|  |
| ACGIH 2014 TLV-TWA: 3 ppm (16 mg/m3) |
| TLV-TWA recommended to minimise risk of male reproductive effects in exposed workers.  Summary of data:  Human data:   * Human data relevant for skin sensitisation and irritation * Patch testing in volunteer subjects across a range of concentrations produced positive sensitisation results with rates of sensitisation between 10–79%.   Animal data:   * NOAEL of 38 ppm for testicular atrophy in rats (inhalation; 7 h/d, 5 d/wk for 10 wk) * 5/10 rats died before exposure 50 at 300 ppm * LC50: >3,500 ppm in (rats, 4 h) * LC50: 670 ppm (rats, 8 h) * LD50: 2,520 mg/kg (rabbits, dermal) * Positive germ cell mutagenicity results from application to the skin (male rats).   Insufficient data to recommend respiratory sensitiser or carcinogen notations.  Insufficient data to recommend a STEL. |
| DFG 1992 Not assigned |
| Previous MAK withdrawn due to lack of long-term exposure studies.  Summary of additional data:   * Reported toxic concentration taken up readily through the skin in animals * Carcinogenicity studies not yet available * chemical structures and results of mutagenicity tests suggest carcinogenic potential. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2008 Not assigned |
| * Review of carcinogenicity and genotoxicity * Mutagenic and genotoxic in bacterial and mammalian cell systems. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | 2015 | * Available respiratory irritation studies reported respiratory effects that support the ‘irritating to the respiratory system’ classification * Classified as hazardous/harmful by inhalation * 4 h LC50: >3,500 ppm (mice) * 4 h LC50: 1,030 ppm (rats) * Inhalation effects: delirium, depression, dyspnoea, lacrimation, nasal discharge and aerophagia * Irritating to eyes * Skin sensitiser based on human case studies * NOAEC of 100 ppm in mice, rats and rabbits for rhinitis, lethargy and gait changes (6 h/d; 5 d/wk for 2 wk) * NOAEC of 25 ppm in mice, rats and rabbits for atelectasis in rabbits (6 hr/d; 5 d/wk for 13 wk; cited from NTP, 2004) * Systemic long-term effects – reproductive toxicity, carcinogenicity and mutagenicity * Systemic acute effects (acute toxicity) and local effects (skin sensitisation, skin and respiratory irritation, and possibly serious eye damage). |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Yes |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Insufficient data |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** | |

## Notations

| Source | Notations |
| --- | --- |
| SWA | NA |
| HCIS | Carcinogenicity – category 2, Skin sensitisation – category 1 |
| NICNAS | Carc. Cat 3 |
| EU Annex | Carc 2, Skin sensitisation - category 1 |
| ECHA | NA |
| ACGIH | Skin, DSEN |
| DFG | H (skin) |
| SCOEL | NA |
| HCOTN | — |
| 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 |
| --- |
| Skin notation recommended based on reports of rapid dermal uptake and systemic effects in animals. |

### IDLH

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

## Additional information

| Molecular weight: | 130.21 |
| --- | --- |
| 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) (1992) n-Butyl glycidyl ether – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2008) n-Butyl glycidyl ether. Evaluation of the carcinogenicity and genotoxicity. The Hague: Health Council of the Netherlands; publication no. 2008/07OSH.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (2015) Aliphatic and allyl glycidyl ethers: Human health tier II assessment – IMAP report.

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 National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – n-Butyl glycidyl ether.