SODIUM BISULFITE

CAS number: 7631-90-5

Synonyms: Sodium hydrogen sulfite, sodium bisulphite

Chemical formula: $NaHSO_3$

Structural formula: —

Workplace exposure standard (retained)

TWA: **5 mg/m^3**

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 5 mg/m^3 is recommended to protect for irritation of the skin, eyes, mucous membrane and respiratory tract in exposed workers.

Discussion and conclusions

Sodium bisulfite is used in the paper, tanning, chemical and food industries. It is also used as an inhibitor of yeast and bacteria in wine making and as a source of sulfur dioxide.

The critical effects of exposure are irritation of the eyes, mucous membrane and respiratory tract.

No inhalation data are available. Ingestion of 4,000 to 5,800 mg/day in a human study caused abdominal pain and emesis, while 1,000 mg/day was well tolerated. There were no changes in neurophysiologic, biochemical, or clinical chemistry parameters reported in healthy volunteers ingesting 10 mg/kg/day (as bisulphite) over 25 days. The acceptable daily intake (ADI) identified by World Health Organization is 0.7 mg/kg/day (sulfite as sulfur dioxide) (ACGIH, 2018). A NOAEL of 108 mg/kg/day for sodium metabisulphite based on local effects, with an equivalent dose of 72 mg sulfur dioxide/kg/day, was identified in a two-year dietary study in rats by HCOTN (2005) and ECHA (2019).

In the absence of suitable inhalation data, the SWA TWA of 5 mg/m^3 by ACGIH (2018) extrapolated from the ADI of 0.7 mg/kg/day is recommended to be retained and is supported by animal data reported by HCOTN (2005) and ECHA (2019). The recommended TWA is considered protective of irritant effects 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.

There are insufficient data to recommend a skin notation.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 5 mg/m^3***
ACGIH	***2001***	***TLV-TWA: 5 mg/m^3***

TLV-TWA recommended to minimise the potential for irritation to skin, eyes, mucous membrane and respiratory tract. TLV-TWA is based on the acceptable daily intake for sulfite identified by WHO.

Summary of data:

Human data:

- Found in all tissues as a result of amino acid catabolism:
  - results in body burden far in excess of any exogenous source
- 4,000–5,800 mg/d reported to cause abdominal pain and emesis:
  - 1,000 mg/d well tolerated
- No change to neurophysiologic, biochemical or clinical chemistry parameters in healthy volunteers ingesting 10 mg/kg/d (as bisulfite) for 25 d
- People with genetic defect in sulfite oxidase are particularly sensitive to bisulfite; at least 1 death reported from bisulfite-induced neurologic degeneration
- No data on bisulfite dust concentrations in air at wineries or manufacturing plants
- Mild eye and respiratory responses following acute exposures (no further information)
- Generally recognised as safe for human consumption:
  - 0.7 mg sulfite (as SO_2)/kg bw identified as maximum ADI by WHO.

Animal data:

- Large doses *via* parenteral administration can produce systemic intoxication and death; no further information
- LD_{50}: ≈2,000 mg/kg (rat, oral); 115 mg/kg (rat, iv)
- IP LD_{50}: 244 mg/kg (dog); 675 mg/kg (mice)
- 50 mmol sodium bisulfite/kg/d (5,203 mg/kg/d) fed to young rats (3 wk duration) caused anaemia, increased spleen weight and increased leukocyte counts
- Rats fed at 0%, 0.1%, 0.25%, 0.5%, 1% and 2% (2 yr):
  - all treated rats: increased body weight gain in first 12 wk (no further details provided)
  - dose level 0.25% or more: reduced survival, decreased body weight, hyperplastic gastric squamous epithelium, focal myocardial fibrosis, renal calcification and bone atrophy at the end of bioassay
  - no treatment-related trend in tumour frequency
  - LOAEL: 0.1%; NOAEL 0.5%
- No gross or pathogenic changes observed in dogs fed 50–1,000 mg/d (1 yr)
- Multigenerational study of rats fed 73, 156, 312, 624 or 1,352 mg/kg/d (2 yr):
  - no changes in fertility or reproduction
  - increased relative kidney weights, and fore- and glandular stomach epithelial hyperplasia in F_2 rats at highest dose
  - NOAEL: 156 mg/kg/d

Source	Year set	Standard
• Sulfites mutagenic in *E. coli*, *B. subtilis*, bacteriophage T4rII, *S. cerevisiae*, and *M. aureus*; in CHO cells; in murine and bovine oocytes; and cultured human lymphocytes • No evidence of *in vivo* clastogenesis or mutagenesis in mice studies • Significant interspecies differences in sulfite clearance; due in part to activity of tissue sulfite oxidase. Insufficient data to recommend Skin or SEN notations, or TLV-STEL.		
DFG	***NA***	***NA***
No report.		
SCOEL	***NA***	***NA***
No report.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***2005***	***TWA: 5 mg/m^3***
Derivation of TWA not provided. Summary of additional data: • 5/36 subjects with bronchial asthma had bronchoconstructive response following oral challenge with the substance • Seizures reported following iv administration with high doses of morphine (sodium bisulfite as preservative) (no further information) • 38% solution not corrosive to clipped back skin of rabbits • Committee did not find adequate data from repeat dose studies; therefore, chronic studies of other sulfite generating substances utilised • NOAEL 20 mg/kg/d, LOAEL 45 mg/kg/d (rats, repeat dose oral studies); 2 yr study cited in ACGIH (2001) with exposures at 0.1% to 2%: o committee concluded studies not suitable not used to assess dose-response relationship for systemic effects • Committee considered 3 generation dietary study of rats fed disodium disulfite (2 yr duration) as key study; NOAEL 250 ppm (72 mg/kg/d, as sulfur dioxide or SO_2) • No evidence of carcinogenic effects, including studies with other sulfite generating substances • Committee considered insufficient toxicological data to justify OEL.		

Secondary source reports relied upon

Source		Year	Additional information
ECHA	✓	2019	• 2 yr rat study, NOAEL of 250 ppm as cited by HCOTN (2005) used as reference for OEL: o Based on read-across concept for sulfites, corrected dose level corresponded to dose of 108 mg/kg/d $Na_2S_2O_5$, equivalent dose of 72 mg/kg/d • Negative response for skin irritation; no skin or respiratory sensitising properties.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?	Insufficient data
Is the chemical carcinogenic with a mutagenic mechanism of action?	No

The chemical is not a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	—
HCIS	—
NICNAS	—
EU Annex	NA
ECHA	—
ACGIH	Carcinogenicity – A4
DFG	NA
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

Insufficient data to assign a skin notation.

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	104.07
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m^3; 1 mg/m^3 = Number ppm
This chemical is used as a pesticide:	☐
This chemical is a biological product:	☐
This chemical is a by-product of a process:	☐

Molecular weight:	104.07
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m^3; 1 mg/m^3 = Number ppm
This chemical is used as a pesticide:	☐
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* on the ACGIH website.

European Chemicals Agency (ECHA) (2019) Sodium bisulphite – REACH assessment.

Health Council of the Netherlands (HCOTN) (2005) Sodium hydrogen sulphite. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/157.