Nonane

CAS number: 111-84-2

Synonyms: n-Nonane, nonyl hydride, shellsol 140

Chemical formula: C_9H_{20}

Structural formula: —

Workplace exposure standard (retained)

TWA: **200 ppm (1,050 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 200 ppm (1,050 mg/m^3) is recommended to protect for central nervous system (CNS) depression and potential eye irritation in exposed workers.

Discussion and conclusions

Nonane is used as a fuel additive, solvent and detergent. As a component in fuel, it is present as a mixture with other nonane isomers. Critical effects are CNS depression and eye irritation at higher concentrations.

No suitable human exposure data are currently available, and the toxicological database is limited. A NOAEC of 590 ppm for lachrymation and signs of CNS depression with a corresponding LOAEC of 1,600 ppm is reported in a sub-chronic rat inhalation study (ACGIH, 2018; HCOTN, 2005). Effects at the LOAEL were reported to be mild and transient.

The current TWA of 200 ppm is recommended to be retained to protect for eye irritation and CNS depression in exposed workers, as assigned by ACGIH (2018).

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 warranted based on the available evidence.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	***1991***	***TWA: 200 ppm (1,050 mg/m^3)***
ACGIH	***2012***	***TLV-TWA: 200 ppm (1,048 mg/m^3)***
TLV-TWA intended to protect for CNS impairment. Skin notation not warranted based on low *in vitro* skin absorption. Summary of data: Insufficient data to assess other nonane isomers, only n-nonane considered in agency's evaluation. Nonane isomers are common constituents of petrol fuel and contaminants in indoor- and outdoor air. TLV-TWA based on NOAEL of 590 ppm for coordination loss and tremors from sub-chronic rat inhalation study. Effects at the LOAEL of 1,600 ppm were mild and rats were noted to have higher alveolar ventilation rate compared to humans; TLV-TWA of 200 ppm considered sufficiently protective of the critical effects. Human data: • No studies on the toxicological effects of exposure in humans presented • Odour threshold: 47 ppm • Painters were exposed to 1.2 ppm (average) when using paint diluted mineral turpentine • Refinery and petrol station workers and transport drivers exposed to 0.031 ppm (average). Animal data: • LC_{50}: 3,200 ppm (rats, 4 h), 4,467 ppm (rats, 8 h); exposure progressively caused lachrymation, salivation, ataxia, tremors, seizures, and death • Skin permeation rate *in vitro*: 0.476 µg/cm^2/h (pigs), 0.384 µg/cm^2/h (rats) • Sub-chronic inhalation study with treatment groups 0, 360, 590, 1,600 ppm (rats, 6 h/d, 5 d/wk, 13 wk) reported: ○ NOAEL: 590 ppm for decreased body weight gain, lachrymation, salivation, mild loss of coordination, and slight tremors ○ coordination loss and tremors did not persist beyond 4 d in 1,600 ppm group; 7% decrease in body weight gain after 62 d ○ no significant changes in haematological parameters in 1,600 ppm group • Retention in fatty tissue at 100 ppm reported in repeat inhalation toxicokinetic study (rats, 12 h/d, 3 d): ○ after 12 h recovery, 56% of peak levels remained in fatty tissue, whereas blood and brain levels decreased to 4 and 2% of peak levels, respectively ○ separate study determined $t_{1/2}$ in blood: 8 h, brain: 15 h, fat: 30 h • Non-mutagenic *in vitro* in bacteria with or without metabolic activation. Insufficient data to recommend a TLV-STEL or notations for carcinogenicity or sensitisation.		
DFG	***NA***	***NA***
No report.		
SCOEL	***NA***	***NA***
No report.		

Source	Year set	Standard
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***2005***	***8-hour TWA: 200 ppm (1,050 mg/m^3)***

Summary of additional data:

Current administrative OEL considered too high; health-based recommended OEL (HBROEL) derived from NOAEL for coordination loss and tremors from sub-chronic inhalation study with rats (also cited in ACGIH, 2012). An overall assessment factor of 9 is applied to the NOAEL, which considers the mild or transient effects at the LOAEL, intra- and interspecies differences, and translation from experimental conditions to the workplace; the result is rounded up to obtain the proposed HBROEL of 100 ppm as an 8 h TWA.

Human data:

- No data on occupational exposures available for evaluation.

Animal data:

- Repeat inhalation study at 1,500 ppm over 3 d followed by recovery period of 2 d and second exposure over 4 d (female rats, 6 h/d):
  - no effects after 1 d
  - mild coordination loss, tremors, and slight irritation in eyes and extremities after 2 d
  - after rest period, same effect pattern as previous 3 d exposure after re-exposure for 4 d.

Insufficient data available to assess carcinogenicity.

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	—
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	—
ACGIH	—
DFG	NA
SCOEL	NA

Source	Notations
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	
Adverse effects in human case study:	
Dermal LD_{50} ≤1000 mg/kg:	
Dermal repeat-dose NOAEL ≤200 mg/kg:	
Dermal LD_{50}/Inhalation LD_{50} <10:	
In vivo dermal absorption rate >10%:	
Estimated dermal exposure at WES >10%:	no
	a skin notation is not warranted

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	128.26
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 5.24 mg/m^3; 1 mg/m^3 = 0.191 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* on the ACGIH website.

Health Council of the Netherlands (HCOTN) (2005) Nonane. Health-based Reassessment of Administrative Occupational Exposure Limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/155.