



TETRYL

CAS number: 479-45-8

Synonyms: N-methyl-N,2,4,6-tetranitroaniline, nitramine, tetralite, 2,4,6-trinitrophenylmethylnitramine

Chemical formula: $C_7H_5N_5O_8$

Workplace exposure standard (interim)

TWA: 1.5 mg/m³

STEL: —

Peak limitation: —

Notations: —

IDLH: 750 mg/m³

Sampling and analysis: The recommended value is quantifiable through available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 1.5 mg/m³ is recommended to protect for irritation of the skin, mucous membrane and respiratory tract and liver and kidney effects in exposed workers.

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

Discussion and conclusions

Tetryl is used as an explosive in detonators and primers and may also be employed as an explosive charge.

Critical effects of exposure are skin, mucous membrane and upper respiratory tract irritation, contact dermatitis and possible respiratory and skin sensitisation. Liver and kidney effects are also reported.

There are case reports of workers experiencing irritation of the mucous membranes of the upper respiratory tract, resulting in sore throats, nosebleeds and coughing of varying degrees of severity presumably associated with exposure to tetryl. Irritation of the skin and upper respiratory passages and liver damage is reported in a study of 11 workers at a munition factory exposed for between one and four years at 0.88 to 17.7 mg/m³ (ACGIH, 2018; DFG, 1995). No cases of systemic poisoning are reported in a study of several thousand workers over a 10-year period with airborne concentrations not exceeding 1.5 mg/m³ (DFG, 1995). Tetryl workers are reported to have left operations due to severe asthma-like bouts of coughing that were particularly troublesome at night. No further information was provided (ACGIH, 2018; DFG, 1995). DFG (1995) noted that it is structurally like trinitrotoluene, for which there is adequate evidence of a carcinogenic effect; however, no further evidence was identified.

Limited data are available to derive a health-based TWA. Given this, the TWA of 1.5 mg/m³ is recommended to be retained in the interim. Noting the lack of data and the consideration of

carcinogenic potential noted by the DFG (1995), it is recommended that an investigation of additional data sources is undertaken at the next scheduled review.

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 review of the sensitiser classifications is recommended as human case reports suggest tetryl is a skin and possible respiratory sensitiser.

There are insufficient data to recommend a skin notation. A further literature review is recommended given evidence of contact dermatitis in humans and structural similarity to trinitrotoluene which is readily absorbed through the skin.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1991	TWA: 1.5 mg/m³
ACGIH	2001	TLV-TWA: 1.5 mg/m³
TLV-TWA recommended to reduce the potential for skin, mucous membrane and upper respiratory tract irritation, contact dermatitis and possible respiratory and skin sensitisation. Summary of data: - No specific derivation of TLV is provided - Not considered a major industrial hazard except during high production operations and concomitant high exposures such as those encountered during wartime munitions operations. Human data: - No studies with exposure data presented - Highly irritating to skin and mucous membranes and may cause severe URT irritation with coughing and epistaxis; no further information - CNS effects reported in workers included irritability, headache, malaise, nausea and insomnia - Major effects noted in a report on accidental exposure of 11 people of yellow pigmentation of the skin, liver damage, dermatitis, dermal and possible respiratory sensitisation and upper respiratory irritation; no further specific information is provided; cited by DFG (1995) - Case report of workers experiencing irritation of the mucous membranes of the URT noteworthy, resulting in sore throats, nosebleeds and coughing of varying degrees of severity presumably associated with exposure; no further specific information provided - Workers left operations due to severe asthma-like bouts of coughing which were particularly troublesome at night; no further specific information is provided - No X-ray evidence of lung damage reported in a study of a plant employing 4,000 people: - the size of tetryl particles was 150 µm and reported as being of tremendous importance in explaining the lack of lung damage - In a study of 1,258 workers affected by tetryl, 944 had dermatitis symptoms which generally occurred between the 2nd and 3rd week of exposure: - no exposure data presented; - some reported symptoms suggestive of systemic illness included headache, irritability, malaise, lassitude and sleeplessness - In a review of the use of chemicals in the war industries concluded tetryl was the chief cause of dermatitis: - points of friction, such as the collar line and the wrists, were common sites; no further information. Animal data: - No inhalation studies reported; no sub-chronic or chronic studies reported		

Source	Year set	Standard
- Smallest reported fatal dose was 0.5 g/kg of recrystallised material given to a dog subcutaneously in olive oil as five daily doses of 0.1 g/kg/d: - gross examination showed mild inflammation of the kidney; no further information - A severe acute inflammation at the injection site and with varying degrees of oedema and haemorrhage in the tissues of rabbits and dogs after fatal doses reported; no further information. Insufficient data to recommend a sensitiser, skin or carcinogen notation or a TLV-STEL.		
DFG	1995	Not assigned
No MAK recommended because it is structurally like trinitrotoluene, for which there is adequate evidence of a carcinogenic effect. Summary of additional data: - Basis of retracted MAK of 1.5 mg/m³ was the observation that during a 10 yr period in a factory with several thousand workers no systemic intoxication occurred: - concentrations in the air did not exceed 1.5 mg/m³; no further information - cited by ACGIH (2018) but with no air concentration data - In a munitions factory, 11 persons were exposed for 1–4 yr at 0.88–17.7 mg/m³: - main symptoms included yellow discoloration of the skin and hair, liver damage and irritation of the skin and upper respiratory passages - Found to be mutagenic in several strains of <i>S. typhimurium</i>, with the most marked effect in TA100; no further information - Sensitising effects reported in guinea pigs after inhalation and intradermal and topical application; no further information - Rats receiving 0, 14, 69 and 199 mg/kg/d bw (females) and 0, 13, 62 and 180 mg/kg/d bw (males) in the diet: - food consumption reduced in all groups - Hb significantly reduced in the animals of the medium and high dose groups - male animals of the medium and high dose groups found to have tubular degeneration and droplets in the cytoplasm of renal cells - NOAEL reported a 13.5 mg/kg/d bw for both sexes - No data available for the mechanisms of action, toxicokinetics or metabolism - Due to structural similarity to trinitrotoluene, similar absorption is assumed.		
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? Insufficient data

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	Sen
HCIS	—
NICNAS	NA
EU Annex	NA
ECHA	—
ACGIH	—
DFG	Carcinogenicity – 3B, 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

Insufficient data to assign a skin notation.

IDLH

Is there a suitable IDLH value available? Yes

Additional information

Molecular weight:	173.94
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 7.12 mg/m ³ ; 1 mg/m ³ = 0.14 ppm
This chemical is used as a pesticide:	☐
This chemical is a biological product:	☐



Molecular weight:	173.94
Conversion factors at 25°C and 101.3 kPa:	1 ppm = 7.12 mg/m ³ ; 1 mg/m ³ = 0.14 ppm
This chemical is used as a pesticide:	☐
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.

Deutsche Forschungsgemeinschaft (DFG) (1998) N-Methyl-N,2,4,6-tetranitroaniline – MAK value documentation.

European Chemicals Agency (ECHA) (2019) Tetryl – REACH assessment.

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