M-PHTHALODINITRILE

CAS number: 626-17-5

Synonyms: 1,3-Benzenedicarbonitrile, 1,3-dicyanobenzene, IPN, isophthalonitrile

Chemical formula: $C_8H_4N_2$

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 liver damage in exposed workers.

Discussion and conclusions

m-Phthalodinitrile is used as an intermediate in the manufacture of polyurethane paints and varnishes, plastics and synthetic fibres. It is also used as a firming agent in epoxy resins and in some agricultural chemicals.

Critical effect of exposure are hepatic (liver) damage. No human toxicological data are available. A NOAEL of 5 mg/kg/day was identified in a 28-day rat feeding study with liver effects reported at 10 mg/kg/day. A NOAEL of 5 mg/kg/day for hepatic effects is reported in a 99-day feeding study in rats. This is reported as an equivalent workday concentration of 35 mg/m^3 based on generic factors (ACGIH, 2018). Rhinorrhoea and diarrhoea in reported from a sub-chronic rat inhalation study, which is indicative of autonomic nervous system stimulation at 1,250 mg/m^3 (ACGIH, 2018). However, the concentration at which these nervous system effects manifest is too high to be a critical effect.

The current TWA of 5 mg/m^3 as derived by ACGIH (2018) and HCOTN (2001) is recommended to be retained. Based on the absence of liver damage at 5 mg/kg/day (approximately 35 mg/m^3 human workday equivalent) in animals, this TWA is expected to be protective of liver damage and possible autonomic nervous system as reported in animals.

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	***2009***	***TLV-TWA: 5 mg/m^3***

TLV-TWA recommended to protect against potential hepatic toxicity and autonomic nervous system stimulation.

Summary of data:

OEL based on NOAEL of 5 mg/kg/d for hepatic effects; equivalent to 35 mg/m^3 (assuming 70 kg worker with respiratory volume of 10 m^3) and autonomic nervous system stimulation at 1,250 mg/m^3; no specific derivation provided.

No human data.

Animal data:

- Rhinorrhoea (runny nose) in rats exposed at ≤8,970 mg/m^3 for 1 h
- No deaths or evidence of erythema or oedema in rabbits when 2,000 mg/kg applied topically for 24 h
- Male and female rats exposed at 190 mg/m^3 or 1,500 mg/m^3 for 6 h/d, 5 d/wk for 2 wk:
  - at 190 mg/m^3 half the rats exhibited alopecia; no further information
  - at 1,500 mg/m^3 alopecia, rhinorrhoea and diarrhoea were evident
  - rhinorrhoea and diarrhoea are indications of autonomic nervous system stimulation
- Sub-chronic mouse feeding study; 259, 399 and 501 mg/kg/d in males, 305, 466 and 617 mg/kg/d in females for 34 d; increased liver weights, centrilobular hepatocytomegaly, increased activity and aggressiveness and reduced food consumption at all doses
- A 28-day rat feeding study; 0, 5,10, 25 or 50 mg/kg/d:
  - decreased food consumption and body weight gain at 25 and 50 mg/kg/d in males and at 10 mg/kg/d and higher in females
  - significant increases in serum ALT, a liver function marker, seen in males fed 10 and 50 mg/kg/d and in females fed 10 mg/kg/d and higher
  - increases in centrilobular hepatocytomegaly seen at 50 mg/kg/d in both males and females and at 25 mg/kg/d in males only
  - NOAEL of 5 mg/kg/d; equivalent to 35 mg/m^3 (assuming 70 kg worker with respiratory volume of 10 m^3)
- 90-day feeding study; males fed 0, 20, 200 and 400 mg/kg/d; females 0, 20, 200 and 360 mg/kg/d:
  - all dietary levels produced increased liver weights and centrilobular hepatocytomegaly, few or no faeces and increased aggression
  - LOAEL reported as 20 mg/kg/d (≡140 mg/m^3)
- 99-day feeding study in rats; 0, 1, 5 or 25 mg/kg/d in feed:
  - NOAEL of 5 mg/kg/d for males based on increased liver weights measured in rats fed 25 mg/kg/d (LOAEL)
  - NOAEL for female rats of 5 mg/kg/d; demonstrated increases in GGT and liver weights observed; centrilobular hepatocytomegaly and increases in urine volume at 25 mg/kg/d.

Source	Year set	Standard
DFG	***NA***	***NA***
No report.		
SCOEL	***NA***	***NA***
No report.		
OARS/AIHA	***NA***	***NA***
No report.		
HCOTN	***2001***	***TWA: 5 mg/m^3***
Administrative OEL; toxicological database insufficient to recommend a health-based OEL. Summary of additional data: • Not irritating to skin or eye of rabbits • No additional data.		

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	NA
ACGIH	—
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

Calculation
Insufficient data to assign a skin notation.

IDLH

Is there a suitable IDLH value available?	No

Additional information

Molecular weight:	128.13
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:	☐
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) (2001) m-Phthalodinitrile. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/027.