Human Health Hazard Assessment

Dinonyl Phthalate (DNP)
(CAS No. 84-76-4)

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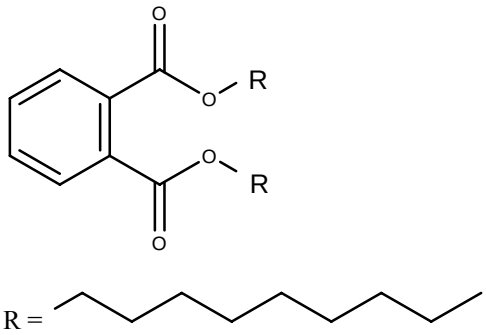
INTRODUCTION

This review of dinonyl phthalate (DNP) is a health hazard assessment only. For this assessment, no international assessment report was available. The review was prepared using Hazardous Substances Data Bank (HSDB) and literature surveys conducted up to September 2006.

Hazard information from this assessment is published also in the form of a hazard compendium providing a comparative analysis of key toxicity endpoints for 25 phthalates (NCNAS, 2007).

1. IDENTITY

1.1 Identification of the Substance

CAS Number:	84-76-4
Chemical Name:	1,2-Benzenedicarboxylic acid, dinonyl ester
Common Name:	Dinonyl phthalate (DNP)
Molecular Formula:	$C_{26}H_{42}O_4$
Structural Formula:	
	R =
Molecular Weight:	418.60
Synonyms:	Di-n-nonyl phthalate; Dinonyl o-phthalate; Phthalic acid, dinonyl ester; Ditrimethylhexyl phthalate
Purity/Impurities/Additives:	Purity: 98% w/w Impurity: not available Additives: not available

1.2 Physicochemical Properties

Table 1: Summary of physicochemical properties

Property	***Value***
Physical state	Colourless oily liquid
Melting point	No data
Boiling point	413ºC
Density	972 kg/m^3 (20ºC)
Vapour pressure	0.133 kPa (205ºC)
Water solubility	Insoluble
Partition coefficient n-octanol/water (log Kow)	>2.12
Henry's law constant	Not available
Flash point	No available

Source: HSDB (2006)

2. USES

There is no published information on the use of DNP.

DNP has a linear backbone length of C9 and hence is expected to belong to the High Molecular Weight Phthalate Esters (HMWPEs) Category as defined by the Phthalate Esters Panel HPV Testing Group (2001) and OECD (2004). The HMWPE group includes chemically similar substances produced from alcohols having backbone carbon lengths of ≥ C7. According to the European Council for Plasticisers and Intermediates, estimated production of HMWPEs is approximately 60-100 ktonnes per year in Europe (OECD, 2004). This is likely to represent about one third of world production.

HMWPEs are used primarily as industrial chemicals associated with polymers, mainly as additives to impart flexibility in polyvinyl chloride (PVC) resins, but are also used as synthetic base stocks for lubricating oils (OECD, 2004). Polymer applications can be divided into PVC-related uses and uses involving other non-PVC polymers. PVC-containing phthalate esters applications can include wire and cable insulation, furniture and automobile upholstery, flooring, wall coverings, coil coatings, pool liners, roofing membranes, and coated fabrics. Polymer-containing phthalate ester applications that are non-PVC based include thermoplastics, rubbers and selected paints and adhesives.

In Australia, DNP is imported for distribution to various institutions and laboratories for analytical, pharmaceutical and biotechnological research.

3. HUMAN HEALTH HAZARD

3.1 Toxicokinetics

No data.

3.2 Acute Toxicity

Oral

Study	***Species***	***Results (LD50/LC50)***	***References***
Oral	Rat	>2000 mg/kg bw	Patty, 1963
	Mouse, Rat, & Guinea pig	18000-21500 mg/kg bw	Timofievskaya et al., 1980*

Source: HSDB (2006)

Intraperitoneal (ip)

The LD50 in male TCR mice following a single intraperitoneal (ip) dose of DNP was >100000 mg/kg bw (Lawrence et al., 1975).

Conclusion

DNP has low acute oral and intraperitoneal toxicity in laboratory animals. No acute toxicity data from dermal or inhalation exposure or human studies were available for DNP.

3.3 Irritation

Skin Irritation

Skin irritation was not observed after intradermal injection of undiluted DNP in mice but details of the test conditions were not available (Lawrence et al., 1975).

Conclusion

Data are insufficient to determine skin irritation effects of DNP.

Eye Irritation

Eye irritation was not observed after instillation of undiluted DNP in rabbits but details of the test conditions were not available (Lawrence et al., 1975).

Conclusion

Data are insufficient to determine eye irritation effects of DNP.

Respiratory Irritation

No data.

3.4 Sensitisation

No data.

3.5 Repeated Dose Toxicity

DNP administered orally, inhalationally or topically to mice in subacute and chronic experiments produced toxicity with demyelination, paralysis, disturbances of central and peripheral nervous systems and cachexia observed. No other details were available (Timofievskaya et al., 1973*).

Rats exposed to saturated vapours of DNP at 28ºC for 6 hr/day for 12 days showed no effect (Patty, 1963).

Conclusion

Only poorly detailed repeat dose studies are available. In one study, inhalation exposure for 12 days showed no effect in rats, while central and peripheral nervous system effects and cachexia were noted following repeat oral, inhalational or topical doses. Overall, data are insufficient to determine effects from repeated exposure to DNP.

3.6 Genetic Toxicity

No data.

3.7 Carcinogenicity

No data.

3.8 Reproductive Toxicity

No data.

4. HAZARD CHARACTERISATION

There is little toxicity information for DNP. For individual health endpoints with missing or incomplete data, information from structurally similar phthalates, where available, was used to extrapolate potential toxicity. Relevant read-across information was obtained from other NICNAS assessment reports for relevant phthalates and the NICNAS Phthalates Hazard Compendium (2007) which contains a comparative analysis of toxicity endpoints across 25 phthalates, including DNP.

DNP has an alkyl carbon backbone of C9 and is considered to be a member of the High Molecular Weight Phthalate Esters (HMWPEs) Category as defined by the Phthalate Esters Panel HPV Testing Group (2001) and OECD (2004). Due to their similar chemical structure, category members are generally similar with respect to physicochemical, biological and toxicological properties or display an expected trend. Thus, read-across for toxicity endpoints is an appropriate approach to characterise selected endpoints for members of this category.

Data are not available on the toxicokinetics of DNP. However, studies on HMWPEs indicate that they are rapidly metabolised in the gastrointestinal tract to the corresponding monoester, absorbed and excreted, primarily in the urine.

DNP has low acute oral and intraperitoneal toxicity. Other toxicological properties of DNP are based on data for the HMWPE Category as a whole, including data on the 7 phthalates reviewed in the NICNAS Phthalate Hazard Compendium (NICNAS, 2007) and other high molecular weight phthalates reviewed by the Phthalate Esters Panel HPV Testing Group (2001) and OECD (2004). DNP is expected to have low acute dermal and inhalation toxicity with minimal or no irritating or sensitising effects. DNP is also unlikely to be genotoxic. For repeat dose toxicity, besides potential central nervous system effects, liver and kidney effects would be expected, particularly at high doses. However the severity of these effects as well as carcinogenic potential for DNP is difficult to predict. DNP is unlikely to affect fertility and development.

5. HUMAN HEALTH HAZARD SUMMARY TABLE

Phthalate	***Acute Toxicity***	***Irritation & Sensitisation***	***Repeated Dose Toxicity***	***Genetic Toxicity***	***Carcinogenicity***	***Fertility***	***Developmental Toxicity***
Dinonyl phthalate (DNP)	Oral Rat: LD50 > 2000 mg/kg/bw Dermal No data Inhalation No data	Skin irritation: Insufficient data Eye irritation: Insufficient data Respiratory irritation: No data Skin sensitisation: No data	Insufficient data	No data	No data	No data	No data

6. REFERENCES

HSDB (2006) Dinonyl phthalate. Hazardous Substances Data Bank. National Library of Medicine, Bethesda, Maryland <http://csi.micromedex.com/fraMain.asp?Mnu=0>, MICROMEDEX, Englewood, Colorado. Accessed 2006 Sep 29.

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Patty F (1963) Industrial Hygiene and Toxicology: Vol II: Toxicology, 2nd ed. New York: Interscience Publishers, p. 1906-1907.

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