



# 1,3-DINITROBENZENE (DNB)

## PROFILE OF DRINKING WATER CONTAMINANTS FOR EMERGENCY RESPONSE

### GENERAL INFORMATION

1,3-Dinitrobenzene (DNB) is a by-product in the manufacture of trinitrotoluene (TNT) explosives and nitrobenzene. It is used primarily in the production of m-phenylenediamine, a dye intermediate.

Production in the United States takes place mainly at one commercial plant in New Jersey where the 1983 production was reported to be 70,000 to 72,000 pounds. DNB occurs in the waste stream from TNT production and in wastewaters from dinitrobenzene manufacturing. It is also released to the atmosphere.

The environmental fate of DNB is not known, but in general, aromatic nitro compounds are resistant to hydrolysis and probably do not oxidize in water. DNB is not expected to bioaccumulate in aquatic organisms. Preliminary indications are that photolytic degradation may be an important fate while volatilization is not. Microbial degradation occurs in waste streams.

### PHARMACOKINETICS

Inhalation and dermal absorption have been inferred from occupational exposures. Absorption of oral doses of DNB by rats and rabbits is 63-93%. DNB is distributed mainly to liver, fat, kidney, and nerve tissues and excreted primarily in the urine. Metabolism to the nitroanilines is the major metabolic pathway.

### HEALTH EFFECTS

#### Humans

After occupational exposure to DNB dust (concentration unknown), six workers developed cyanosis, anemia, dizziness, and fatigue. Cyanosis and hemolytic jaundice were seen in another worker that was thought to have received dermal exposure of DNB. Formation of methemoglobin and urinary excretion of 2,4-dinitrophenol were observed in the worker.

### HEALTH EFFECTS

#### Experimental Animals

Acute toxicity in rats is associated with respiratory failure, central nervous system disturbances including ataxia, motor dysfunction, and coma, and testicular damage and infertility.

No studies of potential dermal sensitization are available.

Drinking water studies in rats for 8 and 16 weeks showed decreased splenic and testicular weights and decreased spermatogenesis.

Effects reported from a 12-week oral study with rats were reduced spermatogenesis, atrophy of seminiferous tubules, reduced litter size, and ultimately infertility as well as increases in hemosiderin deposition in the spleen.

Although DNB is a potent testicular toxicant, no information on potential reproductive toxicity in females is available, and no multi-generation reproductive or developmental toxicity studies were located.

No lifetime or carcinogenicity studies were found.

DNB is mutagenic in some *Salmonella* strains.

### OTHER CRITERIA, ANALYSES, AND TREATMENT TECHNOLOGIES

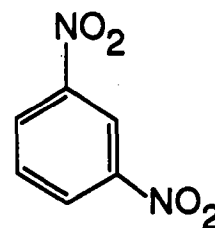
The American Conference of Governmental Industrial Hygienists (ACGIH) 8-hour time-weighted average Threshold Limit Value for exposure to DNB and the Occupational Safety and Health Administration (OSHA) standard for exposure to all dinitrobenzenes are 1 mg/m<sup>3</sup>.

Methods available for the analysis of DNB include gas chromatography, electron capture, tandem mass spectrometry, and spectrophotometric determination.

Treatment technologies for the removal of DNB in wastewater include aerobic or anaerobic microbial degradation, photolysis, and slaking with lime.

## Physical and Chemical Properties

<b>Empirical Formula</b>	C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub>
<b>Synonyms</b>	DNB, 1,3-DNB, m-Dinitrobenzene, m-DNB
<b>CAS Number</b>	99-65-0
<b>Physical State</b>	Colorless to yellow crystalline solid at room temperature
<b>Molecular Weight</b>	168.11
<b>Boiling Point</b>	300-302°C at 770 mm Hg
<b>Melting Point</b>	89.8°C
<b>Specific Gravity</b>	1.571 at 0-4°C
<b>Vapor Pressure</b>	0.0039 mm Hg at 20°C
<b>Solubility</b>	In water: 369 mg/L at 20°C and 500 mg/L at 25°C.



## Health Effects Data and Advisory Values

<b>Genotoxicity</b>	Mixed results (positive and negative) in <i>Salmonella typhimurium</i> strains with and without activation. No effect on <i>Saccharomyces cerevisiae</i> or <i>Escherichia coli</i> . No increase in unscheduled DNA synthesis in cultivated rat hepatocytes.	
<b>Reproductive and Developmental Effects</b>	Nine studies of male reproductive function using single, short-term, or longer-term oral doses show testicular damage and infertility. However, no reproductive or developmental studies evaluating potential reproductive effects in females are available.	
<b>Cancer Classification</b>	EPA Group D, not classifiable as to human carcinogenicity.	
<b>Reference Dose (RfD)</b>	0.0001 mg/kg/day	
<b>Drinking Water Equivalent Level (DWEL)</b>	0.005 mg/L	
<b>Health Advisory Values</b>	One-Day	0.04 mg/L
	Ten-Day	0.04 mg/L
	Longer-Term (child)	0.04 mg/L
	Longer-Term (adult)	0.14 mg/L
	Lifetime	0.001 mg/L

This summary was developed using information from the Drinking Water Health Advisory. For further information contact EPA's Office of Science and Technology at (202) 260-7571.

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