

# Safety Data Sheet

# N-Nitrosodi-n-propylamine

Division of Safety  
National Institutes  
of Health



## WARNING!

THIS COMPOUND IS TOXIC, CARCINOGENIC, AND MUTAGENIC. AVOID FORMATION AND BREATHING OF AEROSOLS OR VAPORS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND COLD WATER. AVOID RUBBING OF SKIN OR INCREASING ITS TEMPERATURE.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, INDUCE VOMITING. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. WASH DOWN AREA. SEE CASTEGNARO ET AL. (1982) FOR DETAILS. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY. MONITOR LABORATORY AIR AND CHECK FOR NITROSAMINE RESIDUES AFTER CLEANUP.

### A. Background

N-Nitrosodi-n-propylamine (DPN) is moderately toxic, carcinogenic, and mutagenic in experimental test systems. Its primary use is for tumor induction in experimental animals and for related research. Use of this compound for other purposes, such as organic synthesis, should be avoided. The volatility of this compound requires use of special precautions and containment procedures to prevent its release into the laboratory and general environment.

### B. Chemical and Physical Data

1. Chemical Abstract No.: 621-64-7

issued 10/82

2. Synonyms:

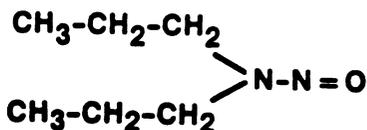
DPN	Di-n-propylnitrosamine
Dipropylnitrosamine	N,N-dipropylnitrosamine
Nitrous dipropylamide	N-Nitroso-N-dipropylamine
Propanamine, N-nitroso-N-propyl-	(9CI)

3. Molecular

formula:  
 $C_6H_{14}N_2O$

weight:  
130.22

structure:



- Density: 0.9163 g/cm<sup>3</sup>.
- Absorption spectroscopy: UV:  $\lambda = 230\text{-}235; 332\text{-}74$ . IR: 1,460 cm<sup>-1</sup> (N=O); 1,067 cm<sup>-1</sup> (N-N) (Magee et al., 1976). For MS data see Pensabene et al. (1972) and Rainey et al. (1978).
- Volatility: 0.4 mm Hg at 20°C (extrapolated). Concentration of DPN in the saturated vapor is approximately 500 ppm or 0.05 per cent (v/v). Air:water distribution coefficient:  $10^5 \cdot K = 25$  at 37°C (Mirvish et al., 1976).
- Solubility: Slightly soluble in water (1% at room temperature). Soluble in alcohol, ether, common organic solvents, and lipids.
- Description, appearance: Pale yellow liquid.
- Boiling point: 206°C.
- Stability: Stable in neutral or alkaline aqueous solution for 14 days. Sensitive to visible and UV light. Nonexplosive.
- Chemical reactivity: Relatively resistant to hydrolysis, but cleaved in strong acid to nitrous acid and dipropylamine.
- Flash point: No data.
- Autoignition temperature: No data.
- Flammable limits: No data.

Fire, Explosion, and Reactivity Hazard Data

- Use dry chemical fire extinguisher, water, or soda-acid. Fire-fighting personnel should wear air-supplied respirators with full-face masks.

2. The explosive range of the vapors is unknown.
3. Decomposed by strong acids, liberating nitrous acid.
4. Absorbed by elastomers. May cause deterioration of these materials.
5. Volatilization during combustion produces hazardous vapors. Combustion products contain nitrogen oxides.

Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving DPN.

Solutions of DPN penetrate various glove materials (Walker et al., 1978). This factor should be taken into account when handling DPN.

1. Chemical inactivation: Validated methods have been reported (Castegnaro et al., 1982).
2. Decontamination: Turn off equipment that could be affected by DPN or the materials used for cleanup. If more than 10 ml has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Consult Castegnaro et al. (1982) for details concerning decontamination of surfaces, glassware, and animal cages.
3. Disposal: It may be possible to decontaminate waste streams containing DPN before disposal. For details, see Castegnaro et al. (1982). No waste streams containing DPN shall be disposed of in sinks or general refuse. Surplus DPN or chemical waste streams contaminated with DPN shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing DPN shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing DPN shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with DPN shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing DPN shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in sealed ampoules or in bottles with caps with polyethylene cone liners inside a sealed secondary container. This should be kept in a solvent storage cabinet, deep freeze, or explosion-safe refrigerator. Avoid exposure to light and moisture.

#### Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: Air samples may be collected using cold traps, impingers (Fine et al., 1977), or solid adsorbents (Issenberg and Sornson, 1976; Pellizzari et al., 1976).
2. Separation and analysis: After extraction and concentration, volatile nitrosamines may be determined by GC using a thermal energy analyzer (TEA) detector or a nitrogen specific detector, such as the thermionic nitrogen detector or Hall electrolytic conductivity detector, or by GC-MS. Electron capture detection of nitramine derivatives (Telling, 1972) or of heptafluorobutyrate derivatives of amines formed by cleavage of nitrosamines with hydrogen bromide in glacial acetic acid (Eisenbrand, 1972) may be appropriate for laboratories not equipped with more selective detectors. GC-TEA and GC-MS are the preferred methods. No acceptable direct field measurement methods are available.

#### Biological Effects (Animal and Human)

1. Absorption: Very limited data. In analogy with other N-nitrosodialkylamines, one may assume that DPN is absorbed by ingestion and parenteral injection.
2. Distribution: Very limited data. After ingestion of DPN by goats, it can be detected for short periods of time in blood and milk.
3. Metabolism and excretion: DPN is degraded in vivo by rat liver to methylating agents probably by beta hydroxylation, although the exact pathway has not been definitively worked out. Intermediate metabolites of DPN may include 2-oxopropyl-n-propylnitrosamine, 2-hydroxypropyl-n-propylnitrosamine, 2,2'-dihydroxy-din-propylnitrosamine, and methyl-n-propylnitrosamine (Krueger, 1973). All four of these metabolites are carcinogenic in experimental animals. The main route of excretion of metabolites of DPN appears to be urine.
4. Toxic effects: The acute LD50 of DPN is 480 mg/kg (oral, rat) and 600 mg/kg (subcutaneous, hamster). Target organs for toxicity in the hamster (the species most thoroughly investigated) are the olfactory epithelium, nasal cavity, liver, and kidney.
5. Carcinogenic effects: Subcutaneous ingestion of high doses of DPN into hamsters results in tumors of the entire respiratory tract (from nasal cavities to lungs), liver, kidney, and pancreas.

Neural neoplasms have been induced in the offspring following administration to pregnant hamsters.

6. Mutagenic and teratogenic effects: DPN is mutagenic to E. coli following metabolic activation by rat liver microsomes; there are no data concerning its teratogenicity.

### Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. Avoid rubbing of skin or increasing its temperature. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.
2. Ingestion: Drink plenty of water. Induce vomiting.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician.

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