

Safety Data Sheet

N-Nitrosodi-n-butylamine

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-butylamine (DBN) 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.

B. Chemical and Physical Data

1. Chemical Abstract No.: 924-16-3

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Fire, Explosion, and Reactivity Hazard Data

1. 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 and 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 DBN.

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

1. Chemical inactivation: Validated methods have been reported (Castegnaro et al., 1982).
2. Decontamination: Turn off equipment that could be affected by DBN 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 DBN before disposal. For details, see Castegnaro et al. (1982). No waste streams containing DBN shall be disposed of in sinks or general refuse. Surplus DBN or chemical waste streams contaminated with DBN 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 DBN 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 DBN shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with DBN

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 DMN 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:** DBN is absorbed by the gastrointestinal tract after ingestion and by parenteral injection. No human data.
2. **Distribution:** After ingestion or injection, DBN is distributed to the liver and then to the kidneys, bladder, respiratory tract, and mammary glands.
3. **Metabolism and excretion:** DBN is extensively metabolized in the liver of rodents. The main metabolites, identified as excretion products in the urine, retain the nitroso and one butyl group intact. The second butyl group is oxidized first to the 4-hydroxybutyl group (which is excreted as conjugation product) and further to the 3-carboxypropyl-, 3-carboxy-2-hydroxypropyl-, 2-carboxyethyl and carboxymethyl groups (Blattmann and Preussmann, 1974). Intra-peritoneal administration of DBN to rats induces the formation of 7-butylguanine in liver RNA. This implies activation of DBN to an active carcinogen, possibly a reactive carbonium ion, in analogy with other N-nitroso-dialkylamines.

4. Toxic effects: The acute LD50 of DBN is 1,200 mg/kg in the rat (oral, subcutaneous) and 561 mg/kg in the hamster (subcutaneous). Target organs for toxicity in rodents are mainly urinary bladder (hemorrhage through the mucosa, necrosis, and papillomas), larynx, trachea, and bronchi (papillomas).
5. Carcinogenic effects: Parenteral and oral administration of DBN to rodents has produced liver carcinomas and carcinomas of the nasal cavities (hamster), lungs, and urinary bladder.
6. Mutagenic and teratogenic effects: DBN is mutagenic in E. coli following metabolic activation. There are no data on 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.

References

Blattmann, L., and R. Preussmann. 1974. Biotransformation of carcinogenic dialkyl nitrosamines. *Z Krebsforsch Klin Onkol* 81:75-78.

Castegnaro, M., G. Eisenbrand, G. Ellen, L. Keefer, D. Klein, E.B. Sansone, D. Spincer, G. Telling, K. Webb, eds. 1982. *Laboratory Decontamination and Destruction of Carcinogens in Laboratory Wastes: Some N-Nitrosamines*, IARC Scientific Publications No. 43. World Health Organization, Geneva, Switzerland.

Eisenbrand, G. 1972. Determination of volatile nitrosamines at low levels in food by acid catalyzed denitrosation and formation of derivatives from the resulting amines. Pages 64-70 in *N-Nitroso Compounds Analysis and Formation*, IARC Scientific Publications No. 3. World Health Organization, Geneva, Switzerland.

Fine, D.H., D.P. Rounbehler, E. Sawicki, and K. Krost. 1977. Determination of dimethylnitrosamine in air and water by thermal energy analysis: Validation of analytical procedures. *Environ Sci Technol* 11:577-580.

Issenberg, P., and H. Sornson. 1976. A monitoring method for volatile nitrosamine levels in laboratory atmospheres. Pages 97-108 in *Environmental N-Nitroso Compounds Analysis and Formation*, IARC Scientific Publications No. 14. World Health Organization, Geneva, Switzerland.

- Magee, P.N., R. Montesano, and R. Preussmann. 1976. N-Nitroso compounds and related carcinogens. Pages 493-525 in C. Searle, ed. Chemical Carcinogens, A.C.S. Monograph 173. American Chemical Society, Washington, DC.
- Mirvish, S.S., P. Issenberg, and H.C. Sornson. 1976. Air-water and ether-water distribution of N-nitroso compounds: Implications for laboratory safety, analytic methodology, and carcinogenicity for the rat esophagus, nose, and liver. J Natl Cancer Inst 56: 1125-1129.
- Pellizzari, E.D., J.E. Bunch, R.E. Berkley, and J. McRae. 1976. Collection and analysis of trace organic vapor pollutants in ambient atmospheres: The performance of a Tenax GC cartridge sampler for hazardous vapors. Analyt Letters 9:45-63.
- Pensabene, J.E., W. Fiddler, C.J. Dooley, R.C. Doerr, and A.E. Wasserman. 1972. Spectral and gas chromatographic characteristics of some N-nitrosamines. J Agric Food Chem 20:274.
- Rainey, W.T., W.H. Christie, and W. Lijinsky. 1978. Mass spectrometry of N-nitrosamines. Biomed Mass Spectrom 5:395-408.
- Telling, G.M. 1972. A gas-liquid chromatographic procedure for the detection of volatile N-nitrosamines at the ten parts per billion level in foodstuffs after conversion to their corresponding nitramines. J Chromatogr 73:79-87.
- Walker, E.A., M. Castegnaro, L. Garren, and B. Pignatelli. 1978. Limitations to the protective effect of rubber gloves for handling nitrosamines. Pages 535-543 in Environmental Aspects of N-Nitroso Compounds, IARC Scientific Publications No. 19. World Health Organization, Geneva, Switzerland.