

Occupational Health Guideline for Dimethylaniline

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $C_6H_5N(CH_3)_2$
- Synonyms: N,N-dimethylaniline
- Appearance and odor: Straw to brown-colored liquid with a characteristic amine-like odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for dimethylaniline is 5 parts of dimethylaniline per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 25 milligrams of dimethylaniline per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

- **Routes of exposure**
Dimethylaniline can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. It may enter the body through the skin.
- **Effects of overexposure**
Exposure to dimethylaniline may affect the ability of the blood to carry oxygen. The earliest effect may be a bluish color of the skin, especially the lips. If the lack of oxygen becomes severe, a person may have drowsiness, headache, nausea, and vomiting. If oxygen lack is very severe, it may cause unconsciousness and even death.
- **Reporting signs and symptoms**
A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to dimethylaniline.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to dimethylaniline at potentially hazardous levels:

1. **Initial Medical Examination:**

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the blood, kidneys, liver, and cardiovascular system should be stressed.

—A complete blood count: Dimethylaniline has been shown to cause methemoglobinemia. A complete blood count should be performed, including a red cell count, a white cell count, a differential count of a stained smear, as well as hemoglobin and hematocrit.

2. **Periodic Medical Examination:** The aforementioned medical examinations should be repeated on an annual basis.

- **Summary of toxicology**

Dimethylaniline absorption, whether from inhalation of the vapor or by skin absorption of the liquid, causes anoxia due to the formation of methemoglobin. In dogs, the repeated subcutaneous injection of 1.5 g caused vomiting, weakness, cyanosis, methemoglobinemia, and hyperglobulinemia. It is said to be less toxic than aniline as regards methemoglobin formation but more of a central nervous system depressant. The liquid caused moderate injury in the eye of a rabbit.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
 1. Molecular weight: 121
 2. Boiling point (760 mm Hg): 192.8 C (379 F)
 3. Specific gravity (water = 1): 0.96
 4. Vapor density (air = 1 at boiling point of dimethylaniline): 4.2
 5. Melting point: 2.5 C (36 F)
 6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
 7. Solubility in water, g/100 g water at 20 C (68 F):

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

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Occupational Safety and Health Administration

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8. Evaporation rate (butyl acetate = 1): Data not available

• **Reactivity**

1. Conditions contributing to instability: Heat

2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions. Contact with strong acids may cause violent spattering.

3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and carbon monoxide) may be released in a fire involving dimethylaniline.

4. Special precautions: Liquid dimethylaniline will attack some forms of plastics, rubber, and coatings.

• **Flammability**

1. Flash point: 62.8 C (145 F) (closed cup)

2. Autoignition temperature: 371 C (700 F)

3. Flammable limits in air, % by volume: Lower: 1.0 (calculated at flash point)

4. Extinguishant: Foam, dry chemical, carbon dioxide

• **Warning properties**

1. Odor Threshold: No quantitative information is available concerning the odor threshold of dimethylaniline.

2. Eye Irritation Level: Dimethylaniline vapor is not known to be an eye irritant. Grant reports that "in only one instance has it been involved in an ocular disturbance," and in this instance, it is not known if the disturbance should be attributed to the inhalation of phenol, which was also present, or dimethylaniline.

3. Evaluation of Warning Properties: Since no quantitative information is available relating the warning properties of dimethylaniline to air concentrations, it is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Sampling and analyses may be performed by collection of dimethylaniline vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure dimethylaniline may be used. An analytical method for dimethylaniline is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing

Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with liquid dimethylaniline, where skin contact may occur.

• Clothing contaminated with dimethylaniline should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of dimethylaniline from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the dimethylaniline, the person performing the operation should be informed of dimethylaniline's hazardous properties.

• Where exposure of an employee's body to liquid dimethylaniline may occur, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

• Non-impervious clothing which becomes contaminated with dimethylaniline should be removed immediately and not reworn until the dimethylaniline is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where liquid dimethylaniline may contact the eyes.

SANITATION

• Skin that becomes contaminated with dimethylaniline should be immediately washed or showered with soap or mild detergent and water to remove any dimethylaniline.

- Eating and smoking should not be permitted in areas where liquid dimethylaniline is handled, processed, or stored.
- Employees who handle liquid dimethylaniline should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to dimethylaniline may occur and control methods which may be effective in each case:

Operation	Controls
Use in synthesis of dye and dye intermediates; synthesis of explosives; pharmaceuticals; polyester resin systems; and intermediates for vanillin	Process enclosure; local exhaust ventilation; personal protective equipment
Use in absorption of sulfur dioxide	Process enclosure; local exhaust ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If liquid dimethylaniline gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If liquid dimethylaniline gets on the skin, immediately wash the contaminated skin using soap or mild detergent and water. If liquid dimethylaniline soaks through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Get medical attention immediately.

• Breathing

If a person breathes in large amounts of dimethylaniline, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When liquid dimethylaniline has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If liquid dimethylaniline is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.

2. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

- Waste disposal methods:

Dimethylaniline may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.

2. By atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

ADDITIONAL INFORMATION

To find additional information on dimethylaniline, look up dimethylaniline in the following documents:

- Medical Surveillance for Chemical Hazards
- Respiratory Protection for Chemical Hazards
- Personal Protection and Sanitation for Chemical Hazards

These documents are available through the NIOSH Division of Technical Services, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

REFERENCES

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RESPIRATORY PROTECTION FOR DIMETHYLANILINE

Condition	Minimum Respiratory Protection* Required Above 5 ppm
Vapor Concentration 50 ppm or less	Any supplied-air respirator. Any self-contained breathing apparatus.
100 ppm or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 100 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.