

Occupational Health Guideline for Dimethylphthalate

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: $C_{10}H_{10}O_4$
- Synonyms: DMP
- Appearance and odor: Colorless, oily liquid with a slight ester odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for dimethylphthalate is 5 milligrams of dimethylphthalate per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

• Routes of exposure

Dimethylphthalate can affect the body if it is swallowed, is inhaled, or comes in contact with the eyes.

• Effects of overexposure

Overexposure to hot vapors or mists of dimethylphthalate may cause irritation of the nasal passages and the mouth and throat. Eye contact with liquid dimethylphthalate causes pain. If swallowed, dimethylphthalate may cause irritation of the stomach, dizziness, and unconsciousness.

• 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 dimethylphthalate.

• Recommended medical surveillance

Routine medical examinations should be provided to each employee who is exposed to dimethylphthalate at potentially hazardous levels.

• Summary of toxicology

Extensive experience with dimethylphthalate as an insect repellent has shown that it is relatively non-irritating to the skin, eyes, and mucous membranes. Aerosols from heated dimethylphthalate may cause irritation of the eyes and upper respiratory tract. In one fatal case of suicidal ingestion of a mixture containing dimethylphthalate and ketone peroxides, the principal toxic symptoms were marked esophagitis and gastritis with hemorrhage. Animal experiments to determine dermal and oral toxicity of dimethylphthalate showed that extremely high doses were considered necessary to produce toxic effects. Dimethylphthalate was found to be teratogenic by intraperitoneal injection of doses representing $\frac{1}{10}$, $\frac{1}{6}$, and $\frac{1}{3}$ of the LD50 value into female rats at the 5th, 10th, and 15th day of gestation. This probably is of no significance in industrial exposures.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 194
2. Boiling point (760 mm Hg): 285 C (545 F)
3. Specific gravity (water = 1): 1.2
4. Vapor density (air = 1 at boiling point of dimethylphthalate): 6.7
5. Melting point: 0 to 2 C (32 to 36 F)
6. Vapor pressure at 100.3 C (212 F): 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): 0.04
8. Evaporation rate (methyl acetate = 1): Almost zero

• Reactivity

1. Conditions contributing to instability: None
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalis, and strong acids may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving dimethylphthalate.

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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

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

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

4. Special precautions: None

• **Flammability**

1. Flash point: 146 C (295 F) (closed cup)

2. Autoignition temperature: 556 C (1032 F)

3. Flammable limits in air, % by volume: Lower: 1.2 (calculated at flash point)

4. Extinguishant: Dry chemical, foam, carbon dioxide

• **Warning properties**

According to Grant, contact of dimethylphthalate with the eye "produces considerable pain, but causes either no damage or only slight reversible disturbance of the epithelium." Air concentrations which would produce this effect are not given.

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**

At the time of publication of this guideline, no measurement method for dimethylphthalate had been published by NIOSH.

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 splash-proof safety goggles where liquid dimethylphthalate may contact the eyes.

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Use as a plasticizer in compounding of plastics, primarily cellulose acetate, nitrocellulose, ethylcellulose, cellulose acetate butyrate, polystyrene, polyvinyl acetate, polyvinyl butyral, and polyvinyl chloride	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during manufacture of surface coatings containing plasticized resins and polymers, including furniture lacquers, printing inks, textile and paper coatings, and moisture-proof coatings for cellophane	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during molding, casting, extrusion, or other processing of heated, plasticized resins and polymers in manufacture of plastic articles	Local exhaust ventilation; general dilution ventilation
Use in spray (or dip applications or any method involving heat) of surface coatings containing plasticized resins and polymers, including furniture lacquers, printing inks, textiles and paper coatings, and moisture-proof coatings on cellophane	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a plasticizer in compounding of nitrile and neoprene rubber and chlorinated rubber	Local exhaust ventilation; general dilution ventilation; personal protective equipment

Operation	Controls
Use in spray or other applications of adhesives containing plasticizer, including polyvinyl acetate adhesives for cellulose acetate films, covering cut-out windows in cartons, or laminating cellulose acetate film to paper	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during processing of heated plasticized nitrile, neoprene, and chlorinated rubber into manufactured articles	Local exhaust ventilation; general dilution ventilation
Use during preparation of adhesives containing plasticizer, including polyvinyl acetate adhesives for cellulose film	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during manufacture of insect repellent formulations	Local exhaust ventilation; general dilution 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 dimethylphthalate gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention if any discomfort continues. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If dimethylphthalate saturates the clothing, remove and clean the clothing before wearing it again. Wash any dimethylphthalate from the skin regularly, particularly when there has been much skin contact. If there is skin irritation, get medical attention.

• Breathing

If a person breathes in large amounts of dimethylphthalate, 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 dimethylphthalate has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on

the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

• 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 respiratory protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

• If dimethylphthalate is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. 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.

• Waste disposal methods:

Dimethylphthalate 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.

REFERENCES

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RESPIRATORY PROTECTION FOR DIMETHYLPHthalate

Condition	Minimum Respiratory Protection* Required Above 5 mg/m ³
Particulate Concentration 250 mg/m ³ or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
9300 mg/m ³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 9300 mg/m ³ 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.

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