

# Occupational Health Guideline for Dibutylphthalate

## 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:  $C_{16}H_{32}(CO_2C_4H_9)_2$
- Synonyms: DBP; dibutyl 1,2-benzenedicarboxylate
- Appearance and odor: Colorless, oily liquid with a very weak, aromatic odor.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

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

## HEALTH HAZARD INFORMATION

### • Routes of exposure

Dibutylphthalate can affect the body if it is swallowed, comes in contact with the eyes or skin, or is inhaled as a mist or spray.

### • Effects of overexposure

Swallowing dibutylphthalate may cause nausea, dizziness, light sensitivity, and watering and redness of the eyes. Overexposure to hot vapors or mists of dibutylphthalate may cause nose and throat irritation.

### • 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 dibutylphthalate.

### • Recommended medical surveillance

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

### • Summary of toxicology

Extensive experience with dibutylphthalate as an insect repellent has shown that it is relatively non-irritating to the skin, eyes, and mucous membranes. Aerosols from heated dibutylphthalate may cause irritation of the eyes and upper respiratory tract. In one report of a human case, accidental ingestion of ten grams of this compound by a chemical operator produced nausea and dizziness with lacrimation, photophobia, and conjunctivitis, but recovery was prompt and uneventful. Animal experiments to determine dermal and oral toxicity of dibutylphthalate showed that extremely high doses were considered necessary to produce toxic effects. Dibutylphthalate was found to be teratogenic by intraperitoneal injection of doses representing  $\frac{1}{10}$ ,  $\frac{1}{5}$ , 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: 278
2. Boiling point (760 mm Hg): 335 C (635 F)
3. Specific gravity (water = 1): 1.05
4. Vapor density (air = 1 at boiling point of dibutylphthalate): 9.6
5. Melting point: -37 C (-35 F)
6. Vapor pressure at 20 C (68 F): Less than 0.01 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): 0.45
8. Evaporation rate (butyl acetate = 1): Almost zero

### • Reactivity

1. Conditions contributing to instability: None
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, 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 dibutylphthalate.

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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

U.S. DEPARTMENT OF LABOR  
Occupational Safety and Health Administration

4. Special precautions: None

• **Flammability**

1. Flash point: 157 C (315 F) (closed cup)
2. Autoignition temperature: 403 C (757 F)
3. Flammable limits in air, % by volume: Lower: 0.5 (calculated at flash point)
4. Extinguishant: Dry chemical, foam, carbon dioxide

• **Warning properties**

According to Grant, "contact with the surface of human eyes has occurred by accidental droplet splash as well as by experimental application, and this has caused immediate, severe, stinging pain. The pain stimulated profuse tearing, which washed the oily liquid away, and the eyes were not appreciably damaged."

## 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 dibutylphthalate on a filter, followed by extraction with carbon disulfide, and gas chromatographic analysis. An analytical method for dibutylphthalate 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 splash-proof safety goggles where liquid dibutylphthalate may contact the eyes.

## COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Liberation during spray application of polyvinyl acetate surface coatings by spraying, dipping, or crushing	Local exhaust ventilation; personal protective equipment
Liberation during spray application of polyester and epoxy resins	Local exhaust ventilation; personal protective equipment
Liberation during hand and dip applications of polyvinyl acetate, and polyester and epoxy resins	General dilution ventilation
Liberation during molding and forming of cellulose acetate butyrate, acetate, propionate, and polyvinyl acetate	Local exhaust ventilation; personal protective equipment
Liberation during application of polyvinyl acetate adhesives, both solvent and hot-melt types	Local exhaust ventilation; personal protective equipment
Liberation during manufacture of nitrile rubber; during molding of polyester and epoxy articles	General dilution ventilation
Liberation during manufacture of polyvinyl acetate surface coatings	General dilution ventilation
Use during spray application of nitrocellulose lacquer surface coatings, including paper coatings	Local exhaust ventilation

<b>Operation</b>	<b>Controls</b>
Liberation during forming of ethyl cellulose articles; during production of polyvinyl acetate; during production of cellulose acetate butyrate, cellulose acetate propionate, and polyvinyl acetate adhesives	General dilution ventilation
Liberation during brush application of nitrocellulose surface coatings; during manufacture of polyester and epoxy resins; during manufacture of nitrocellulose surface coatings	General dilution ventilation
Liberation during manufacture of explosives and propellants	Local exhaust ventilation

## 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 dibutylphthalate 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 dibutylphthalate saturates the clothing, remove and clean the clothing before wearing it again. Wash any dibutylphthalate 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 dibutylphthalate, 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 dibutylphthalate 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 dibutylphthalate 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:

Dibutylphthalate 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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- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
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## RESPIRATORY PROTECTION FOR DIBUTYLPHTHALATE

Condition	Minimum Respiratory Protection* Required Above 5 mg/m <sup>3</sup>
Particulate Concentration	
250 mg/m <sup>3</sup> 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 <sup>3</sup> 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 <sup>3</sup> 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.