Occupational Health Guideline for 
Benzoyl Peroxide

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: \((C_6H_5(CO)O)_2\)
- Synonyms: Dibenzoyl peroxide
- Appearance and odor: Colorless, odorless solid.

PERMISSIBLE EXPOSURE LIMIT (PEL)
The current OSHA standard for benzoyl peroxide is 5 
milligrams of benzoyl peroxide per cubic meter of air 
\((mg/m^3)\) averaged over an eight-hour work shift. 
NIOSH has recommended that the permissible exposure 
limit be changed to 5 mg/m³ averaged over a work 
shift of up to 10 hours per day, 40 hours per week. The 
NIOSH Criteria Document for Benzoyl Peroxide 
should be consulted for more detailed information.

HEALTH HAZARD INFORMATION
- Routes of exposure
Benzoyl peroxide can affect the body if it is inhaled or if 
it comes in contact with the eyes or skin. It can also 
 affect the body if it is swallowed.
- Effects of overexposure
1. Short-term Exposure: Benzoyl peroxide causes irritation 
of the eyes, nose, throat, and skin.
2. Long-term Exposure: Repeated exposure may cause 
an allergic skin rash.
3. 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 
benzoyl peroxide.
- Recommended medical surveillance
The following medical procedures should be made 
available to each employee who is exposed to benzoyl 
peroxide 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. Exami-
     nation of the skin and respiratory system should be 
     stressed.
   - Skin disease: Benzoyl peroxide is a primary skin 
     irritant and a skin sensitizer. Persons with pre-existing 
     skin disorders may be more susceptible to the effects of 
     this agent.
   - Chronic respiratory disease: In persons with im-
     paired pulmonary function, especially those with ob-
    structive airway diseases, the breathing of benzoyl 
     peroxide might cause exacerbation of symptoms due to 
     its irritant properties.
2. Periodic Medical Examination: The aforementioned 
   medical examinations should be repeated at least every 
   3 years. Emphasis should be placed on informing the 
   employee to report any symptoms associated with 
benzoyl peroxide toxicity.
- Summary of toxicology
Benzoyl peroxide dust causes primary irritation of skin 
and mucous membranes and sensitization dermatitis. 
Application to the face as a lotion for acne treatment in 
two individuals caused facial erythema and edema; 
patch tests with benzoyl peroxide were positive. In 
contact with the eyes it may produce irritation, and if 
allowed to remain on the skin it may produce inflamma-
tion. Workers exposed to 12.2 mg/m³ experienced 
pronounced irritation of the nose and throat. When 
repeatedly applied to the skin of mice, it was not 
carcinogenic.

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

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CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  1. Molecular weight: 242
  2. Boiling point (760 mm Hg): Not applicable
  3. Specific gravity (water = 1): 1.33
  4. Vapor density (air = 1 at boiling point of benzoyl peroxide): Not applicable
  5. Melting point: 103°C (217°F) (decomposes)
  6. Vapor pressure at 20°C (68°F): Much less than 1 mm Hg
  7. Solubility in water, g/100 g water at 20°C (68°F): Less than 1
  8. Evaporation rate (butyl acetate = 1): Not applicable

- **Reactivity**
  1. Conditions contributing to instability: Benzoyl peroxide decomposes when heated above 75°C (167°F) and will explode when subjected to shock and friction.
  2. Incompatibilities: Benzoyl peroxide is a powerful oxidizer and contact with wood, paper, and other combustible substances may cause fires and explosions. Contact with oxidizable materials such as lithium aluminum hydride may also cause fires and explosions. In the dry state, benzoyl peroxide is highly flammable. At elevated temperatures it can be unstable and is spontaneously explosive.
  3. Hazardous decomposition products: Toxic gases and vapors (such as benzoic acid smoke and carbon monoxide) may be released in a fire involving benzoyl peroxide.
  4. Special precautions: Benzoyl peroxide will attack some forms of plastics, rubber, and coatings; fires and explosions may result.

- **Flammability**
  1. Flash point: Not applicable
  2. Autoignition temperature: 103°C (217°F) (ignites and/or explodes)
  3. Flammable limits in air, % by volume: Not available
  4. Extinguishing agents: Water

- **Warning properties**
  According to Grant, "the dust irritates the eyes, respiratory mucous membranes, and skin. Applied experimentally to animal eyes, it produces superficial opacities in the cornea and inflammation of the conjunctiva, according to one investigator, but according to another no injury results from single application of a 93% pure powder or a 50% paste in dimethyl phthalate to rabbit eyes."

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**

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 respirator 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 personal protective clothing necessary to prevent repeated or prolonged skin contact with benzoyl peroxide or liquids containing benzoyl peroxide.

- Employees using or handling pure benzoyl peroxide should be provided with and required to wear fire-resistant clothing treated with an antistatic agent.

- Non-impervious clothing which becomes contaminated with benzoyl peroxide should be removed promptly and not reworn until the benzoyl peroxide is removed from the clothing.

- If employees' clothing may have become contaminated with solid benzoyl peroxide, employees should change into uncontaminated clothing before leaving the work premises.

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

- Employees should be provided with and required to use dust- and splash-proof safety goggles where benzoyl peroxide or liquids containing benzoyl peroxide may contact the eyes.

**SANITATION**

- Skin that becomes contaminated with benzoyl peroxide should be promptly washed or showered with soap or mild detergent and water to remove any benzoyl peroxide.
- Eating and smoking should not be permitted in areas where solid benzoyl peroxide is handled, processed, or stored.
- Employees who handle benzoyl peroxide or liquids containing benzoyl peroxide 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 benzoyl peroxide may occur and control methods which may be effective in each case:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use as free radical initiator for polymerization of many vinyl monomers in manufacture of a variety of plastics; use in manufacture of polyester resins as initiator for polymerization of unsaturated polyesters; room temperature curing agent for polyester resins, for auto-repair kits, optical and dental castings, and other molding applications</td>
<td>Local exhaust ventilation; personal protective equipment</td>
</tr>
</tbody>
</table>

**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 benzoyl peroxide or liquids containing benzoyl peroxide get into the eyes, wash eyes immediately with large amounts of water; lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

- **Skin Exposure**
  
  If benzoyl peroxide or liquids containing benzoyl peroxide get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If benzoyl peroxide or liquids containing benzoyl peroxide penetrate through the clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.

- **Swallowing**
  
  When benzoyl peroxide or liquids containing benzoyl peroxide have 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.

**SPILL AND DISPOSAL PROCEDURES**

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

- If benzoyl peroxide is spilled, the following steps should be taken:
  1. Ventilate area of spill.
  2. Submerge in excess of water. Treat small portions of the slurry at a time with about ten times its weight of 10% sodium hydroxide solution. This slurry can then be disposed in a secured sanitary landfill.
  3. Do not use spark generating or cellulosic materials (paper, wood, etc.) for sweeping or handling spilled benzoyl peroxide.
  4. Or, for liquids containing benzoyl peroxide, add vermiculite or perlite to spill in at least equal weight to the spill. Drain off water and burn carefully in a suitable unconfined (open) combustion chamber equipped with an appropriate effluent gas cleaning device.

- Waste disposal method:
  See above.

REFERENCES

# RESPIRATORY PROTECTION FOR BENZOYL PEROXIDE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Minimum Respiratory Protection* Required Above 5 mg/m³</th>
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<tbody>
<tr>
<td>Particulate Concentration</td>
<td>Any dust and mist respirator containing non-oxidizable sorbents, except single-use respirators.***</td>
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<tr>
<td>25 mg/m³ or less**</td>
<td>Any dust and mist respirator containing non-oxidizable sorbents, except single-use or quarter-mask respirator.***</td>
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<td></td>
<td>Any fume or high efficiency particulate respirator containing non-oxidizable sorbents.***</td>
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<td></td>
<td>Any supplied-air respirator.</td>
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<tr>
<td></td>
<td>Any self-contained breathing apparatus.</td>
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<tr>
<td>50 mg/m³ or less**</td>
<td>A high efficiency particulate filter respirator with a full facepiece containing non-oxidizable sorbents.***</td>
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<tr>
<td></td>
<td>Any supplied-air respirator with a full facepiece, helmet, or hood.</td>
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<tr>
<td></td>
<td>Any self-contained breathing apparatus with a full facepiece.</td>
</tr>
<tr>
<td>250 mg/m³ or less</td>
<td>A powered air-purifying respirator with a full facepiece, helmet, or hood and high efficiency particulate filter containing non-oxidizable sorbents.***</td>
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<td></td>
<td>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.</td>
</tr>
<tr>
<td>1000 mg/m³ or less</td>
<td>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>Greater than 1000 mg/m³ or entry and escape from unknown concentrations</td>
<td>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</td>
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<tr>
<td>Fire Fighting</td>
<td>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</td>
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<tr>
<td>Escape</td>
<td>Any dust and mist respirator containing non-oxidizable sorbents, except single-use respirator.***</td>
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<tr>
<td></td>
<td>Any escape self-contained breathing apparatus.</td>
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</table>

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

**If eye irritation occurs, full-facepiece respiratory protective equipment should be used.

***Benzoyl peroxide is a strong oxidizer and should not come in contact with oxidizable materials. Some cartridges and canisters may contain activated charcoal and should not be used to provide protection against benzoyl peroxide. Only non-oxidizable sorbents are recommended.