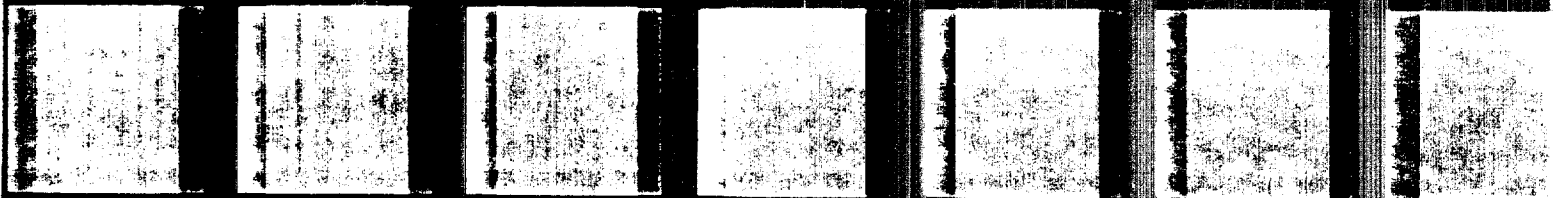
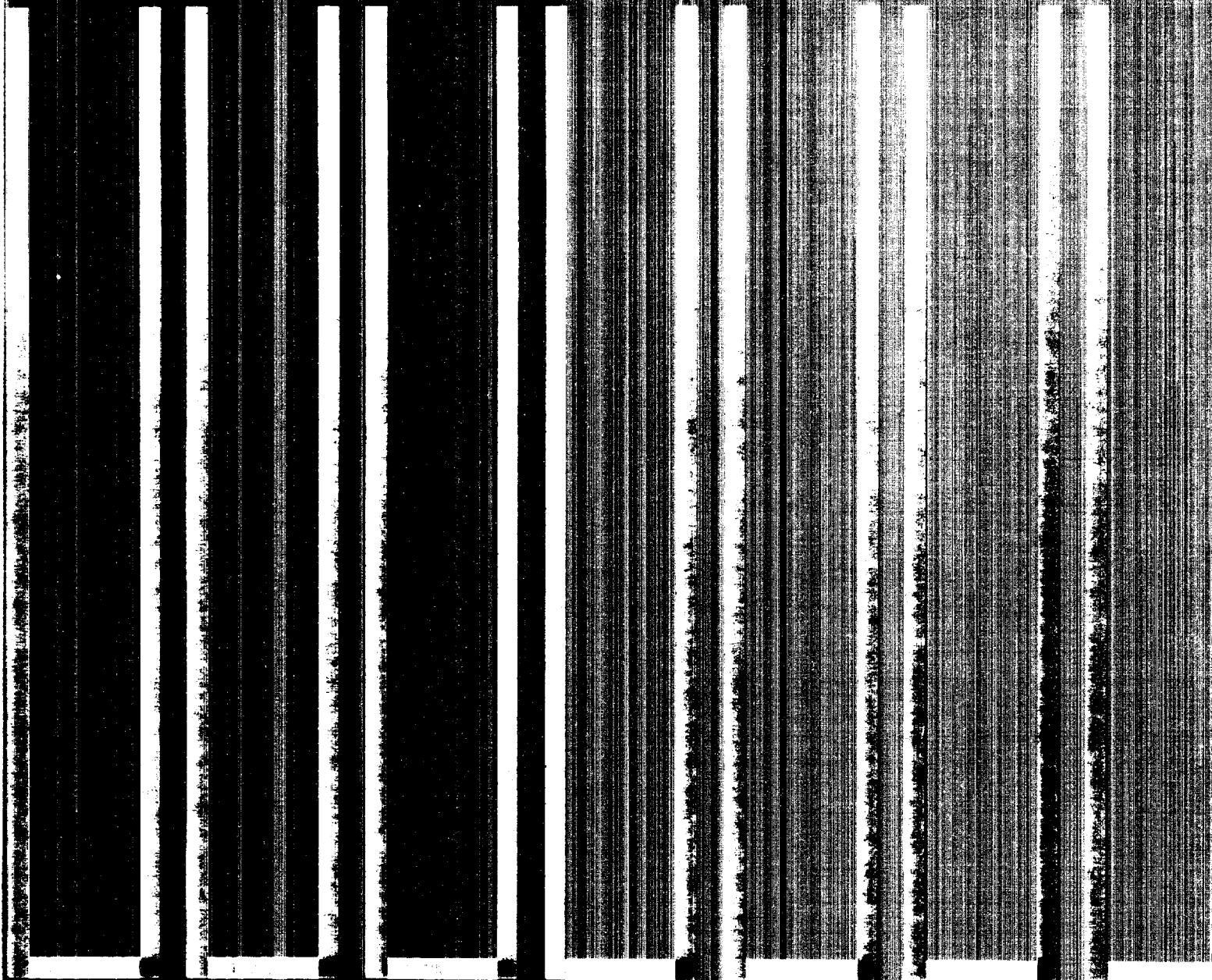


NIOSH

**Criteria for a recommended standard
occupational exposure to
BENZOYL PEROXIDE**



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service — Center for Disease Control
National Institute for Occupational Safety and Health

criteria for a recommended standard....

**OCCUPATIONAL EXPOSURE
TO
BENZOYL PEROXIDE**



**U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
June 1977**

DHEW (NIOSH) Publication No. 77-166

PREFACE

The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the health and safety of workers exposed to an ever-increasing number of potential hazards at their workplace. The National Institute for Occupational Safety and Health has projected a formal system of research, with priorities determined on the basis of specified indices, to provide relevant data from which valid criteria for effective standards can be derived. Recommended standards for occupational exposure, which are the result of this work, are based on the health effects of exposure. The Secretary of Labor will weigh these recommendations along with other considerations such as feasibility and means of implementation in developing regulatory standards.

It is intended to present successive reports as research and epidemiologic studies are completed and as sampling and analytical methods are developed. Criteria and standards will be reviewed periodically to ensure continuing protection of the worker.

I am pleased to acknowledge the contributions to this report on benzoyl peroxide by members of the NIOSH staff, by the Review Consultants on Benzoyl Peroxide, by the ad hoc committees of the American Medical Association and the American Conference of Governmental Industrial Hygienists, and by Robert B. O'Connor, M.D., NIOSH consultant in

occupational medicine. The NIOSH recommendations for standards are not necessarily a consensus of all the consultants and professional societies that reviewed this criteria document on benzoyl peroxide. A list of Review Consultants appears on page vi.



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The Division of Criteria Documentation and Standards Development, National Institute for Occupational Safety and Health, had primary responsibility for development of the criteria and recommended standard for benzoyl peroxide. The division review staff for this document consisted of Keith H. Jacobson, Ph.D. (Chairman), Douglas L. Smith, Ph.D., Frank L. Mitchell, D.O., with Thomas L. Anania (Division of Surveillance, Hazard Evaluations, and Field Studies), Thomas F. Bloom (Division of Technical Services), and Charles C. Hassett, Ph.D. Stanford Research Institute (SRI) developed the basic information for consideration by NIOSH staff and consultants under contract No. CDC-99-74-31. C. Ilana Howarth served as criteria manager.

The views expressed and conclusions reached in this document, together with the recommendations for a standard, are those of NIOSH, after review of the evidence and consideration of the comments of reviewers; these views and conclusions are not necessarily those of the consultants, other federal agencies, professional societies, or the contractor.

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CRITERIA DOCUMENT:
RECOMMENDATIONS FOR AN OCCUPATIONAL
EXPOSURE STANDARD FOR BENZOYL PEROXIDE

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I. RECOMMENDATIONS FOR A BENZOYL PEROXIDE STANDARD

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to benzoyl peroxide in the workplace be controlled by adherence to the following sections. The standard is designed to protect the health and provide for the safety of employees for up to a 10-hour work shift, 40-hour workweek, over a working lifetime. Compliance with all sections of the standard should prevent adverse effects of benzoyl peroxide on the health and safety of employees. Sufficient technology exists to permit compliance with the recommended standard. Although the workplace environmental limit is considered to be a safe level based on current information, it should be regarded as the upper boundary of exposure and every effort should be made to maintain the exposure as low as is technically feasible. The criteria and standard will be subject to review and revision as necessary.

These criteria and the recommended standard apply to employees exposed to any form of the diacyl organic peroxide $(C_6H_5CO)_2O_2$, which is referred to as "benzoyl peroxide" throughout this document. Synonyms for benzoyl peroxide include benzoyl superoxide and dibenzoyl peroxide.

Pure benzoyl peroxide is a granular solid, greater than 95% benzoyl peroxide by weight, usually containing less than 5% water. Wet benzoyl peroxide, also a granular solid, contains 66-85% benzoyl peroxide by weight and 34-15% water. Pastes consist of approximately 50% benzoyl peroxide and 50% of a plasticizer or other diluent. Flour bleach usually contains 32% benzoyl peroxide and 68% cornstarch.

An action level is defined as equal to the environmental limit. Occupational exposure to benzoyl peroxide is defined as any work involving handling, storage, use, or manufacture of benzoyl peroxide at a concentration above the action level. Exposure at lower concentrations will not require adherence to the following sections, except for Sections 2(a,c), 3(a), 4(a), 5, 6(b,c,d,e), 7, and 8(a,d).

The major concerns from occupational exposure to benzoyl peroxide are the hazards arising from its instability, flammability, and explosive properties. In addition, benzoyl peroxide may cause local irritation of the eyes and skin.

Section 1 - Environmental (Workplace Air)

(a) Concentration

Exposure to benzoyl peroxide shall be controlled so that employees are not exposed at a concentration greater than 5 milligrams per cubic meter (mg/cu m) of air, determined as a time-weighted average (TWA) concentration for up to a 10-hour work shift in a 40-hour workweek.

(b) Sampling and Analysis

Sampling and analysis of airborne benzoyl peroxide shall be performed by the methods described in Appendices I and II or by other methods at least equivalent in precision and sensitivity.

Section 2 - Medical

Medical surveillance shall be made available to employees as outlined below.

(a) Preplacement medical examinations shall include at least:

(1) Comprehensive medical and work histories with emphasis on skin conditions.

(2) A complete physical examination giving special attention to the skin for evidence of dermatitis.

(b) Periodic examinations shall be made available at a frequency to be determined by the responsible physician, but at least every 3 years. These examinations shall include at least:

(1) Interim medical and work histories.

(2) A physical examination as described for the preplacement examination.

(c) During examinations, applicants or employees having medical conditions that could be directly or indirectly aggravated by exposure to benzoyl peroxide or formulations containing benzoyl peroxide shall be counseled on the increased risk of impairment to their health from working with these substances.

(d) Initial medical examinations shall be made available to all employees within 6 months of the promulgation of a standard based on these recommendations.

(e) Pertinent medical records shall be maintained for all employees occupationally exposed to benzoyl peroxide. Such records shall be kept for at least 30 years after termination of employment. These records shall be made available to the designated medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employer, and of the employee or former employee.

Section 3 - Labeling and Posting

All labels and warning signs shall be printed both in English and in the predominant language of non-English-reading workers. Illiterate workers and workers reading languages other than those used on labels and posted signs shall receive information regarding hazardous areas and shall be informed of the instructions printed on labels and signs.

(a) Containers

All containers of benzoyl peroxide shall have a label containing the following information, in addition to such other information as may be required by other statutes, regulations, or ordinances or believed needed by the employer:

BENZOYL PEROXIDE
(TRADE NAME)*

DANGER! FLAMMABLE
ORGANIC PEROXIDE

EXPLOSION OR FIRE MAY RESULT FROM HEAT,
SHOCK, OR CONTACT WITH SOME MATERIALS

Store in a cool place in closed original container.
Protect from direct sunlight.
Keep away from heat, sparks, and open flame.
Prevent contamination with readily oxidizable materials and polymerization accelerators.
Avoid contact with skin and eyes.

First Aid: In case of eye contact, flush eyes thoroughly with copious amounts of water. Consult a physician.

*State % of benzoyl peroxide in product.

(1) In addition to the above information, labels for containers of pure benzoyl peroxide shall add the following: Do not add to

hot materials; do not grind or subject to friction or shock--explosive decomposition may result.

(2) Labels for containers of pastes containing benzoyl peroxide shall add the following: Do not freeze.

(3) Labels for containers of wet benzoyl peroxide shall add the following: Keep container tightly closed to prevent drying out.

(b) Work Areas

Areas where benzoyl peroxide is used, manufactured, or stored shall be posted with a sign reading:

BENZOYL PEROXIDE
(TRADE NAME)

NO SMOKING

KEEP AWAY FROM SOURCES OF
IGNITION AND OPEN FLAMES

MAY BE IRRITATING TO SKIN AND EYES

EXPLOSION OR FIRE MAY RESULT FROM CONTACT WITH SOME
MATERIALS, HEAT, OR SHOCK

Do not allow product to dry out.
Avoid breathing dust.
Avoid contact with skin and eyes.
Provide adequate ventilation.

Section 4 - Personal Protective Clothing and Equipment

(a) Protective Clothing and Equipment

(1) The employer shall provide chemical safety goggles, glasses, or face shields (8-inch minimum) with goggles and shall ensure that employees wear them during any operation in which benzoyl peroxide may enter the eyes. The applicable regulation is 29 CFR 1910.133.

(2) The employer shall provide fire-resistant clothing treated with an antistatic agent to employees using or handling pure benzoyl peroxide. Additional protective clothing shall be worn when needed. The employer shall ensure that precautions are taken to protect personnel who launder clothing contaminated with pure benzoyl peroxide.

(3) Protective gloves and aprons shall be worn during operations where pure benzoyl peroxide is handled and may contact the skin.

(4) Measures, such as the wearing of conductive shoes, designed to dissipate static electricity should be required by the employer when large amounts of pure benzoyl peroxide are handled.

(5) The employer shall ensure that all personal protective devices, including conductive shoes, and conductive flooring are inspected regularly, cleaned, and maintained in working condition.

(b) Respiratory Protection

Engineering controls shall be used when needed to maintain airborne benzoyl peroxide concentrations at or below the recommended environmental limit. Compliance with the permissible exposure limit by the use of respirators is permitted only during installation and testing of engineering controls, during performance of nonroutine maintenance or repair, when working in confined spaces, or during emergencies. When use of a respirator is permitted, it shall be selected and used in accordance with the following requirements:

(1) To determine the type of respirator to be used, the employer shall measure, when possible, the concentrations of airborne benzoyl peroxide in the workplace initially and thereafter whenever control, process, operation, worksite, or climatic changes occur that are

likely to increase the concentration of airborne benzoyl peroxide. This provision does not apply when only atmosphere-supplying positive pressure respirators are used.

(2) The employer shall ensure that no employee is exposed to benzoyl peroxide above the recommended limit because of improper respirator selection, fit, use, or maintenance.

(3) A respiratory protection program meeting the requirements of 29 CFR 1910.134 which incorporates the American National Standard Practices for Respiratory Protection, Z88.2-1969, shall be established and enforced by the employer.

(4) The employer shall provide respirators in accordance with Table I-1 and shall ensure that the employees properly use the respirators provided when wearing respirators is required. The respiratory protective devices provided in conformance with Table I-1 shall be those approved by NIOSH and the Mining Enforcement and Safety Administration (MESA) as specified under the provisions of 30 CFR 11.

(5) Respirators specified for use in higher concentrations of airborne benzoyl peroxide may be used in atmospheres with lower concentrations.

(6) When an emergency involving benzoyl peroxide requires evacuation, the employees shall leave the area immediately, stopping to put on respirators only if absolutely necessary.

(7) Respirators shall be easily accessible, and employees shall be informed of their location.

TABLE I-1
RESPIRATOR SELECTION GUIDE

Maximum Use Concentration or Condition	Respirator Type Approved under Provisions of 30 CFR 11
25 mg/cu m or less	Dust and mist respirator, except single-use respirator*
50 mg/cu m or less	(1) Dust and mist respirator except single-use or quarter-mask respirator* (2) Fume or high-efficiency particulate respirator* (3) Supplied-air respirator (4) Self-contained breathing apparatus
250 mg/cu m or less	(1) High-efficiency particulate filter respirator with full facepiece* (2) Supplied-air respirator with full facepiece, helmet, or hood (3) Self-contained breathing apparatus with full facepiece
1,000 mg/cu m or less	Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure mode or with full facepiece, helmet, or hood operated in continuous-flow mode
Greater than 1,000 mg/cu m or entry into area of unknown concentration	(1) Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode (2) Combination respirator which includes a Type C supplied-air respirator with 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

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

Section 5 - Informing Employees of Hazards from Benzoyl Peroxide

(a) The employer shall ensure that each employee working in areas where benzoyl peroxide is used, handled, manufactured, or stored is informed at the beginning of employment, and at least annually thereafter, of the presence of benzoyl peroxide in the workplace, including the trade-name substances, if any, that contain benzoyl peroxide, the hazards, relevant symptoms, appropriate emergency procedures, and proper conditions and precautions for the safe use of benzoyl peroxide.

(b) The employer shall institute a continuing education program, conducted by persons qualified by experience or training, to ensure that all employees have current knowledge of job hazards, proper maintenance and cleaning methods, and proper respirator use. Employees engaged in maintenance and repair activities shall be included in these training programs. The instructional program shall include a description of the general nature of the medical surveillance procedures and of the advantages to the employee of undergoing these examinations. Each employee shall be advised of pertinent information, including that required for the material safety data sheet prescribed by paragraph (c) of this section, which shall be kept on file and shall be readily accessible to employees at all places of employment where there is occupational exposure to benzoyl peroxide.

(c) Required information shall be recorded on the "Material Safety Data Sheet" shown in Appendix III or on a similar form approved by the Occupational Safety and Health Administration, US Department of Labor.

Section 6 - Work Practices

(a) Control of Airborne Benzoyl Peroxide

Engineering controls, such as process enclosure or local exhaust ventilation, shall be used where needed to maintain benzoyl peroxide concentrations at or within the limit recommended in Section 1(a). All engineering controls shall be sparkproof. Ventilation systems shall be designed to prevent recirculation of benzoyl peroxide into the workplaces. Dead airspaces that would allow accumulation of benzoyl peroxide shall be minimized. Consideration must be given to applicable local, state, and federal air pollution regulations in designing exhaust ventilation systems discharging into outside air so that they do not constitute a hazard to the employees or to the general public. Ventilation systems shall be subject to regular preventive maintenance and cleaning to ensure effectiveness, which shall be verified by airflow measurements taken at least every 3 months.

(b) Storage, Handling, and General Work Practices

(1) Containers of benzoyl peroxide shall be kept tightly closed at all times. Containers shall be handled carefully to minimize accidental breakage or spillage and stored in a cool, well-ventilated area away from heat, combustible substances, acids, and oxidizers. No screw-top or metal containers may be used for pure benzoyl peroxide.

(2) Employers shall ensure that shipping containers of benzoyl peroxide are not reused unless they have been properly cleaned.

(3) Employers shall take precautions to minimize benzoyl peroxide contact with the skin and eyes of employees. Equipment, walls, and floors should be kept clean to limit employee exposure.

(4) Before maintenance work, sources of benzoyl peroxide shall be eliminated to the maximum extent feasible. If concentrations of airborne benzoyl peroxide cannot be maintained at or below the limit recommended in Section 1(a), respiratory protective equipment as described in Section 4 shall be used during such maintenance work.

(5) Sources of ignition, such as smoking materials and open flames, shall be prohibited in areas where benzoyl peroxide is used, handled, manufactured, or stored.

(6) All spills of benzoyl peroxide shall be wetted down and cleaned up immediately.

(7) Spills of pure benzoyl peroxide and solid formulations containing benzoyl peroxide shall be thoroughly wetted down or mixed with water-wetted vermiculite, perlite, sand, clay, or other suitable material before being placed in closed containers made of polyethylene or other suitable material and used exclusively for benzoyl peroxide wastes.

(8) Transportation and use of benzoyl peroxide shall comply with all applicable federal, state, and local regulations.

(c) Waste Disposal

(1) Pure benzoyl peroxide may be burned if local, state, and federal regulations permit. It shall be mixed with an inert material, such as vermiculite, and only 1 pound or less shall be burned at one time. The material shall be placed in a trench and ignited from a distance.

(2) Employers shall ensure that no pure benzoyl peroxide is flushed into sewage systems.

(3) Water slurries of benzoyl peroxide wastes and dry, solid, or powder formulations shall be mixed with 4-10 times their weight

of a 10% aqueous sodium hydroxide solution and neutralized before being flushed into any sewage system.

(d) Vessel Entry

(1) Entry into confined spaces, such as tanks, pits, tank cars, and process vessels which have contained benzoyl peroxide, shall be controlled by a permit system. Permits shall be signed by an authorized employer representative, certifying that preparation of the confined space, precautionary measures, and personal protective equipment are adequate and that prescribed procedures will be followed.

(2) Confined spaces which have contained benzoyl peroxide shall be thoroughly ventilated, cleaned, washed, inspected, and tested for oxygen deficiency and for the presence of benzoyl peroxide and other contaminants before entry.

(3) All efforts shall be made to prevent release of benzoyl peroxide into the confined space while work is in progress.

(4) Confined spaces shall be ventilated while work is in progress to keep concentrations of airborne benzoyl peroxide at or below the recommended environmental limit and to prevent oxygen deficiency.

(5) Individuals entering confined spaces where they may be exposed to benzoyl peroxide shall wear respirators as outlined in Section 4(b) and lifelines tended by another employee outside the space who shall also be equipped with the necessary protective equipment and who has contact with a third party. Communication (visual, voice, signal line, telephones, radio, or other suitable means) with the employee inside the confined or enclosed space shall be maintained by the standby person. The

third employee, equipped to aid the other two if necessary, shall have general surveillance of their activities.

(6) Hatch openings shall be large enough for two people to enter or exit simultaneously.

(e) Emergency Procedures

For all work areas where there is a reasonable potential for emergencies involving benzoyl peroxide, employers shall formulate in advance the procedures specified below and any others appropriate for the specific operation or process and shall instruct employees in their implementation.

(1) The employees shall be trained by periodic drills that simulate emergencies in a work situation. These drills shall involve evacuation procedures with a method of accounting for all personnel present in case of fire or explosion, handling of spills and leaks, location of remote controls for sprinkler systems, location and use of emergency water supplies and equipment and shutoff valves, and entry procedures for restricted areas. Procedures and emergency phone numbers for obtaining firefighting assistance, emergency medical care, and transportation of injured personnel shall be included.

(2) Approved eye, skin, and respiratory protective devices as specified in Section 4 shall be used by personnel essential to emergency operations.

(3) Employees not essential to emergency operations shall be evacuated from hazardous areas where benzoyl peroxide inhalation, skin or eye contact, or explosions may occur. The perimeters of these areas shall be delineated, posted, and secured.

(4) Spills of benzoyl peroxide shall be cleaned up immediately.

(5) If benzoyl peroxide or any of its formulations enters the eyes, the eyes shall be flushed immediately with copious amounts of water. Eyewash fountains and safety showers shall be provided. The applicable regulation for them is 29 CFR 1910.151.

(6) Alarms activated by heat or smoke shall be provided in all areas where benzoyl peroxide or its formulations are manufactured, used, or stored.

Section 7 - Sanitation Practices

(a) The employer shall develop and maintain a continuing program for plant sanitation. The applicable regulation covering plant sanitation is 29 CFR 1910.141.

(b) Eating and food preparation and dispensing (including vending machines) shall be prohibited in work areas where benzoyl peroxide is used, manufactured, handled, or stored.

(c) Smoking shall be prohibited in areas where benzoyl peroxide is used, manufactured, handled, or stored.

(d) Employees who handle benzoyl peroxide or equipment contaminated with benzoyl peroxide shall be instructed to wash thoroughly with soap or mild detergent and water before eating or using toilet facilities.

Section 8 - Monitoring and Recordkeeping Requirements

(a) Within 6 months of the promulgation of a standard based on these recommendations, employers shall conduct an industrial hygiene survey at locations where there is benzoyl peroxide in the workplace air to determine if there is exposure to airborne benzoyl peroxide at concentrations greater than the limit recommended in Section 1a. Records of these surveys, including the basis for concluding that concentrations of airborne benzoyl peroxide are at or below the action level, shall be maintained. Surveys shall be repeated at least annually and within 30 days of any change likely to result in increased concentrations of airborne benzoyl peroxide.

(b) If it has been determined that the concentration of benzoyl peroxide exceeds or may exceed the limit recommended in Section 1a, then the employer shall fulfill the following requirements:

(1) A program of personal monitoring shall be instituted to identify and measure, or permit calculation of, the exposure of each employee occupationally exposed to airborne benzoyl peroxide. Source and area monitoring may be used to supplement personal monitoring.

(2) In all personal monitoring, samples representative of the exposure to airborne benzoyl peroxide in the breathing zone of the employee shall be collected.

(3) For each determination of the TWA concentration, a sufficient number of samples shall be taken to characterize employee exposure during each work shift. Variations in the employee's work schedule, location, or duties and changes in production schedules shall be considered in deciding when samples are to be collected.

(4) Each operation in each work area shall be sampled at least once every 6 months or as otherwise indicated by a professional industrial hygienist. If an employee is found to be exposed to benzoyl peroxide at concentrations above the limit recommended in Section 1a, the exposure of that employee shall be measured at least once every week, control measures necessary to reduce the concentration of benzoyl peroxide in the employees' environment to less than or equal to the limit recommended in Section 1a shall be initiated, and the employee shall be notified of the exposure and of the control measures being implemented. Such monitoring shall continue until two consecutive determinations, at least 1 week apart, indicate that the employee's exposure no longer exceeds the recommended environmental limit. At that point, semiannual monitoring may be resumed.

(c) Environmental monitoring records shall be maintained for at least 30 years. These records shall include the name of the employee being monitored, duties performed and job locations within the worksite, dates of measurements, sampling and analytical methods used, the number, duration and results of samples taken, TWA concentrations estimated from these samples, and the type of personal protection used, if any, by the employee. Each employee shall be able to obtain information on his or her own environmental exposures. Environmental records shall be made available to designated representatives of the Secretary of Labor and of the Secretary of Health, Education, and Welfare.

Pertinent medical records shall be retained for 30 years after termination of employment. Records of environmental exposures applicable to an employee should be included in that employee's medical records.

These medical records shall be made available to the designated medical representatives of the Secretary of Labor, of the Secretary of Health, Education, and Welfare, of the employer, and of the employee or former employee.

(d) In the case of employees exposed to benzoyl peroxide at concentrations equal to or less than the action level, records of industrial hygiene surveys, including the basis for concluding that environmental concentrations are equal to or less than the action level, shall be kept until the next survey is conducted. Moreover, for these employees, records of preplacement medical examinations shall be maintained for at least 30 years after termination of employment involving work with benzoyl peroxide.

II. INTRODUCTION

This report presents the criteria and the recommended standard based thereon which were prepared to meet the need for preventing occupational disease or injury arising from workplace exposure to benzoyl peroxide. The criteria document fulfills the responsibility of the Secretary of Health, Education, and Welfare under Section 20(a)(3) of the Occupational Safety and Health Act of 1970 to "...develop criteria dealing with toxic materials and harmful physical agents and substances which will describe...exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience."

The National Institute for Occupational Safety and Health (NIOSH), after a review of data and consultation with others, formalized a system for the development of criteria upon which standards can be established to protect the health and to provide for the safety of employees exposed to hazardous chemical and physical agents. The criteria and recommended standards should enable management and labor to develop better engineering controls resulting in more healthful work environments and should not be used as a final goal.

These criteria for a recommended standard for benzoyl peroxide are part of a continuing series of documents published by NIOSH. The recommended standard applies to workplace exposure to benzoyl peroxide arising from the handling, processing, manufacture, use, or storage of the substance as applicable under the Occupational Safety and Health Act of 1970. The standard was not designed for the population-at-large, and any

extrapolation beyond occupational exposures is not warranted. It is intended to (1) protect against fires, explosions, and consequent injuries, (2) protect against the development of local effects on the eyes, skin, and mucous membranes of the nose and throat, (3) be measurable by techniques that are valid, reproducible, and available to industry and government agencies, and (4) be attainable with existing technology.

The major concerns in occupational exposure to benzoyl peroxide are the hazards arising from its flammability and explosive properties. More information is required regarding the types of conditions and circumstances in which benzoyl peroxide and its formulations can be handled without risk of an explosion. Experiments should be conducted to provide information that can be extrapolated to cover full-scale decompositions, fires, and explosions.

More information on how benzoyl peroxide can be handled without risk of explosion is needed. Experimental, epidemiologic, or other information on toxic effects of benzoyl peroxide and on concentrations at which toxic effects might occur is deficient. The information that is available suggests little toxic action by benzoyl peroxide that is inhaled or ingested or that contacts the skin. No reports were found on investigations that would clearly demonstrate whether short or long-term exposures to benzoyl peroxide cause adverse effects, so no definitive conclusions about the toxicity of the compound can be drawn. While neither tumorigenesis nor serious effects on reproduction would be expected from presently known structure-activity relationships, appropriate research is needed to resolve any doubts.