

I. RECOMMENDATIONS FOR A METHYL PARATHION STANDARD

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to methyl parathion in the workplace be controlled by adherence to the following sections. The standard is designed to protect the health and safety of employees for up to a 10-hour workday, 40-hour workweek, over a working lifetime. Compliance with all sections of the standard should prevent adverse effects of methyl parathion on the health and safety of employees. The standard is measurable by techniques that are valid, reproducible, and available to industry and government agencies. Sufficient technology exists to permit compliance with the recommended standard. The criteria and standard will be subject to review and revision as necessary.

"Methyl parathion" is defined as O,O-dimethyl O-p-nitrophenyl phosphorothioate, regardless of production process, alone or in combination with other compounds. "Occupational exposure to methyl parathion" is defined as employment in any area in which methyl parathion or materials containing methyl parathion, alone or in combination with other substances, is produced, packaged, processed, mixed, blended, handled, stored in large quantities, or applied. If employees are occupationally exposed to other chemicals, such as pesticide vehicles, diluents, or emulsifiers, or other pesticides, provisions of any applicable standards for such other chemicals shall also be followed. Adherence to all provisions of the standard is required in workplaces using methyl parathion regardless of the airborne methyl parathion concentration because of serious effects produced by contact with the skin, mucous membranes, and eyes. Since methyl parathion

does not irritate or burn the skin, no warning of skin exposure is likely to occur. However, methyl parathion is readily absorbed through the skin, mucous membranes, and eyes and presents a potentially great danger from these avenues of absorption. It is extremely important to emphasize that available evidence indicates that the greatest danger to employees exposed to methyl parathion is from SKIN CONTACT.

Section 1 - Environmental (Workplace Air)

(a) Concentration

Occupational exposure to methyl parathion shall be controlled so that no employee is exposed to methyl parathion at a concentration greater than 0.2 milligram/cubic meter of air determined as a time-weighted average (TWA) exposure for up to a 10-hour workday in a 40-hour workweek.

(b) Calibration, Sampling, and Analysis

Procedures for the calibration of sampling equipment and the collection and analysis of environmental air samples shall be as provided in Appendices I and II, or by any method shown to be equivalent in accuracy, precision, and sensitivity.

Section 2 - Medical

Medical surveillance (medical and biologic monitoring) shall be made available to workers occupationally exposed to methyl parathion as outlined below. Physicians responsible for workers who may be occupationally exposed to methyl parathion should be familiar with the information contained in Appendix III which describes the diagnosis and treatment of

intoxication by organophosphorus compounds.

(a) Medical Management

(1) Preplacement and periodic medical examinations shall include:

(A) Comprehensive initial or interim medical and work histories.

(B) A physical examination which shall be directed toward, but not limited to, evidence of frequent headache, dizziness, nausea, tightness of the chest, dimness of vision, and difficulty in focusing the eyes. Those workers with a history of glaucoma, cardiovascular disease, hepatic disease, renal disease, or central nervous system abnormalities should be considered for exclusion from assignments requiring exposure to methyl parathion.

(C) Initial medical examinations shall be made available to all workers within 60 days of the promulgation of a standard based on these recommendations.

(D) Periodic examinations shall be made available yearly or at some other interval determined by the responsible physician.

(E) Determination, at the time of the preplacement examination, of a baseline or working baseline erythrocyte cholinesterase activity (See paragraph (b) Biologic Monitoring).

(F) A judgment of the worker's physical ability to use negative or positive pressure respirators as described in 29 CFR 1910.134.

(2) Emergency first-aid services shall be established, under the direction of the responsible physician, to provide care to any

worker acutely intoxicated by methyl parathion (See Appendix III).

(3) Appropriate medical services and surveillance shall be provided to any worker with adverse health effects reasonably assumed or shown to be due to occupational exposure to methyl parathion.

(4) Medical records shall be maintained for all workers occupationally exposed to methyl parathion, and such records shall be kept for at least 5 years after termination of employment.

(5) Pertinent medical information shall be available to the designated medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employee or former employee, and of the employer.

(b) Biologic Monitoring

(1) Definitions

(A) "Preexposure baseline" for erythrocyte cholinesterase activity is defined as the mean of two cholinesterase activity determinations, each of which is derived from a separate sample of blood. The two samples shall be taken at least 1 day apart after a period of at least 60 days without known exposure to any cholinesterase-inhibiting compounds. If the determinations produce values differing by more than 15%, additional determinations on new samples of blood shall be performed until successive tests are within 15% of each other.

(B) "Working baseline" erythrocyte cholinesterase is defined as the mean of two cholinesterase activity determinations, each of which is derived from a separate sample of blood. The two samples shall be taken at least 1 day apart. The cholinesterase activities of the two samples shall differ by no more than 15%. Alternatively, the working

baseline may be the arithmetic mean of normal values as defined in paragraph (b)(1)(C) of this section for the appropriate control population. A working baseline is determined only for an individual whose work history does not permit determination of a preexposure baseline as specified in paragraph (b)(1)(A) of this section.

(C) "Mean of normal values" is defined as the arithmetic mean of erythrocyte cholinesterase activities as determined by the laboratory's experience with repeated analyses on samples from healthy individuals. This mean shall also be consistent with the mean baseline activities presented in Table XII-2 of Appendix IV.

(2) Routine Monitoring

(A) All employees who are to be occupationally exposed to methyl parathion shall have preexposure erythrocyte cholinesterase baselines determined whenever their work histories allow an accurate preexposure determination, as specified in paragraph (b)(1)(A) of this section. Those new employees with work histories precluding preexposure baseline erythrocyte cholinesterase determinations shall have working cholinesterase baseline determinations performed.

(B) Within 60 days after the effective date of this standard, all employees currently exposed to methyl parathion shall have their working baseline erythrocyte cholinesterase activities determined.

(C) Subsequent to the determination of a preexposure or working baseline, all employees occupationally exposed to methyl parathion shall have their erythrocyte cholinesterase activities determined at 4-week intervals, except for those employees in the following occupations who shall be tested at 2-week intervals: mixers, loaders,

ground applicators, aerial applicators, flaggers, personnel who clean or repair equipment or clean up methyl parathion spills, checkers or field workers entering fields still wet from application or otherwise presenting a reasonable potential for adverse exposure, and employees engaged in manufacturing or formulating in other than closed production, mixing, blending, transfer, or packaging systems. This 2-week interval shall be reduced to 1 week for any employee working longer than 12 hours during any workday. This shorter interval shall be maintained until at least one entire workweek has elapsed without a workday exceeding 12 hours.

(D) Unacceptable absorption of methyl parathion indicating a failure of control procedures or work practices is demonstrated when the enzymatic activity of erythrocyte cholinesterase is decreased to between 60 and 70% of the employee's preexposure baseline or working baseline level. The employee shall be advised of this finding, and an industrial hygiene survey shall be conducted in the workplace of the affected employee unless the cause of exposure is known and corrective action has been initiated. This survey shall include an assessment of the dermal exposure potential. Based on the results of this survey, necessary corrective action shall be accomplished.

In addition, an employee whose erythrocyte cholinesterase determination, as required by paragraph (b)(2) of this section or (a)(5) of Section 6, indicates that the employee's erythrocyte cholinesterase activity is decreased to 60% of, or below, preexposure or working baseline, shall be removed from potential exposure to methyl parathion and placed under medical observation. In such cases, an industrial hygiene survey shall be conducted in the workplace of the

affected employee unless the cause of the exposure is known and corrective action has been taken. This survey shall include an assessment of the dermal exposure potential. Based on the results of this survey, necessary corrective action shall be accomplished.

(E) An employee who has been removed from methyl parathion exposure shall be prohibited from returning to work involving exposure to methyl parathion until the erythrocyte cholinesterase activity has returned to at least 75% of the working or preexposure baseline value.

(F) Each employee shall be given, as soon as possible, a copy of the results of said employee's initial, periodic, or special cholinesterase tests and a professional interpretation of the results.

(3) Blood Collection and Analysis

Procedures for collection and analysis of blood samples for erythrocyte cholinesterase activity shall be as provided in Appendix IV, or by any method shown to be at least equivalent in accuracy, precision, and sensitivity to those specified.

Section 3 - Labeling and Posting

(a) Labeling

Containers of methyl parathion shall be labeled with at least the following information:

DANGER!

POISON

CONTAINS METHYL PARATHION

3 HIGH HEALTH HAZARD (INCLUDES SKIN)

2 MODERATELY COMBUSTIBLE

CAN BE FATAL (If Swallowed
(If Inhaled
(If Left on Skin

(Note: The above items do not have to appear on labels for methyl parathion dust formulations.) If methyl parathion is dissolved in a combustible solvent, the label shall include a statement of flammability appropriate to the solvent.

WORK SAFETY RULES:

DO NOT breathe or allow vapor, mist, or dust to get into eyes or on skin or clothing. Do not rub eyes or face with hands or garments.

When possibility of contact exists, wear full-body coveralls or impervious apron, impervious boots and gloves, goggles, and, if required, respirator.

WARNING - Can penetrate leather or canvas shoes and sneakers.

Use fresh clothing daily. Shower with soap and water before leaving work. Do not wear work clothes home.

Wash hands thoroughly with soap and water before eating, chewing gum, smoking, using toilet, or urinating or defecating elsewhere. Store food and tobacco away from work area. Keep unattended containers tightly closed. Protect concentrated methyl parathion from all sources of ignition. Do not warm concentrated methyl parathion containers with open flame. Concentrated methyl parathion may explode when heated beyond 248 F (120 C). Do not smoke while handling methyl parathion.

EMERGENCY INFORMATION:

IF MATERIAL GETS ON SKIN, wash immediately with soap and water and call a physician. (Soap with a pH above 8.0 is more effective than neutral soap.) If clothes become contaminated, remove at once; wash skin with soap and water and call a physician. If sickness occurs during or after handling materials containing methyl parathion, call a physician. NOTE: Symptoms may occur several hours after end of work. If possible, take this label to the physician along with the patient.

IN CASE OF FIRE, use supplied-air respirator. Burning may produce highly poisonous combustion products.

IN CASE OF SPILLS (accidental discharges, leaks, ruptures, or other sources of contamination of equipment, facilities, or ground), place contaminated area or items under continuous surveillance; then decontaminate with strong alkali or other suitable decontaminating materials.

(b) Posting

(1) The following sign shall be posted in a readily visible location at or near all entrances to manufacturing, formulating, and storage areas containing methyl parathion:

POISON AREA
METHYL PARATHION

(If Swallowed
CAN BE FATAL (If Inhaled
(If Left on Skin

DO NOT SMOKE, EAT, OR SLEEP IN THIS AREA.

Use required personal protective equipment and clothing.

IF SKIN contact occurs, wash immediately with alkaline soap and water and call a physician.

IF CLOTHES are contaminated, go to a clean area and remove quickly. Wash skin with soap and water. Put on clean clothes and call a physician.

Warning signs shall be printed both in English and in the predominant language of non-English-reading workers. Employees unable to read posted warnings and labels, and those speaking languages other than English or the predominant non-English language, shall receive periodic training sufficient to ensure their understanding of the contents of the signs specified in this section and to provide a continuing reminder of their contents.

(2) The following sign shall be securely attached in a readily visible location to any vehicle (eg, truck, freight car) used to transport methyl parathion:

DANGER! POISON
CONTAINS METHYL PARATHION
IF LIQUID OR POWDER HAS LEAKED,
DO NOT ENTER

CAN BE FATAL (If Inhaled
(If Swallowed
(If Left on Skin

If skin contact occurs, wash immediately with alkaline soap and water and call a physician.

Section 4 - Personal Protective Equipment and Clothing

(a) Skin Protection

(1) Unless separately provided in this section, an employee who engages in filling containers of, pouring, mixing, formulating, loading, applying, or otherwise handling methyl parathion (including open-system manufacturing processes) shall be provided with, and required to

wear, protective head covering, goggles and face shield, impervious gloves, full-body coveralls, impervious apron or rainsuit, and impervious footwear. Impervious gloves should have reverse gauntlets and coveralls should be of a closely-woven material (siliconized fabric, such as nylon or cotton, is especially protective) and without cuffs. Whenever the word impervious appears in this document, it means highly resistant to the penetration of methyl parathion.

(2) Employees handling sealed, nonleaking containers of methyl parathion shall be provided with, and required to wear, full-body coveralls, or the equivalent, and impervious gloves.

(3) Employees operating open equipment for ground (non-aerial) application of methyl parathion shall be provided with, and required to wear, protective head coverings or face shields, impervious gloves, full-body coveralls or impervious rainsuits, and impervious footwear.

(4) Employees applying methyl parathion from closed-cockpit aircraft shall be provided with impervious gloves. Employees applying methyl parathion by open-cockpit aircraft shall be provided with, and required to wear, full-body coveralls or impervious rainsuits and goggles, and shall be provided with impervious gloves.

(5) Employees acting as flaggers (other than those flagging from enclosures) in the aerial application of methyl parathion shall be provided with, and required to wear, full-body coveralls or impervious rainsuit, protective head and neck covering, impervious footwear, and impervious gloves.

(6) Where toxic residues present a reasonable potential for exposure, employees entering areas treated with methyl parathion shall be provided with, and required to wear, impervious gloves, full-body coveralls or impervious rainsuits, face shields (if foliage is likely to contact the face), and impervious footwear.

(7) Laundry personnel handling clothing contaminated with methyl parathion shall be provided with, and required to wear, impervious gauntlet gloves, impervious footwear, and, in addition to ordinary clothes, impervious aprons.

(8) Employees applying methyl parathion in greenhouses or other enclosures, or entering such enclosures while foliage is still wet from an application or while dust is still airborne, shall be provided with, and required to wear, impervious rainsuits, hoods, neck coverings, impervious gauntlet gloves, and impervious boots.

(9) Employees (such as cleanup personnel) entering areas contaminated with methyl parathion shall be provided with, and required to wear, impervious gloves, full-body coveralls or impervious rainsuits, impervious footwear, impervious aprons, and such other personal protective equipment as may be required for adequate protection against the particular hazards present.

(10) Protective clothing shall not be taken home by employees. The employer shall provide for maintenance and laundering of protective clothing.

(b) Respiratory Protection

(1) Engineering controls shall be used wherever feasible to maintain methyl parathion concentrations below the TWA environmental limit

recommended in Section 1(a). Compliance with the recommended workplace environmental limit may not be achieved by the use of respirators except:

(A) During the installation, testing, maintenance, or repair of required engineering controls.

(B) For operations, such as maintenance or repair activities, causing brief exposures to methyl parathion at concentrations in excess of the workplace environmental limit.

(C) During emergencies.

(2) When a respirator is permitted by paragraph (b)(1) of this section, it shall be selected and used in accordance with the following requirements:

(A) For the purpose of determining the type of respirator to be used, other than supplied-air positive pressure respirators, the employer shall make a determination of the atmospheric concentration of methyl parathion in the workplace initially (and thereafter whenever pertinent working conditions are altered) and shall choose the appropriate respiratory protection specified in Table I-1. The employer shall ensure that no employee is being exposed to methyl parathion in excess of the TWA environmental limit recommended in Section 1(a) because of improper respirator selection, fit, use, or maintenance, or because of changes in working conditions.

(B) Employees experiencing breathing difficulties while wearing respiratory protective devices shall be medically examined to determine their ability to wear such devices. If it is determined that an employee cannot breathe adequately while wearing a respirator, the employee shall be assigned to work which does not require the use of a respirator.

This provision does not relieve the employer of any of the requirements of Section 2(a).

(C) A respiratory protective program meeting the requirements of 29 CFR 1910.134 shall be established and enforced by the employer.

(D) The employer shall provide respirators in accordance with Table I-1 that comply with the provisions of 30 CFR 11 and shall ensure that the appropriate respirator is worn.

(E) Canisters or cartridges shall be discarded and replaced with fresh canisters or cartridges as recommended by the manufacturer, or immediately if the user has difficulty breathing, if the user smells methyl parathion or methyl parathion-containing formulations, diluents, emulsifiers, or solvents while using the respirator, or if a breakthrough indicator (if any) indicates that the absorbent is saturated. Filters shall be changed whenever canisters or cartridges are changed, or after every 4 hours of use, or if breathing becomes difficult, whichever occurs first. Unused canisters or cartridges shall be discarded and replaced when the seals are broken, or on the expiration of the manufacturer's recommended storage life if the seals are unbroken.

(F) The employer shall ensure that respirators are adequately cleaned and maintained, and that employees are instructed on the use of respirators assigned to them and on methods for leakage testing.

(G) Respirators specified for use in higher concentrations of methyl parathion may be used in atmospheres with lower concentrations.

(H) Except in emergencies, respirators other than the cooled supplied-air type shall be used no longer than 15 minutes if ambient temperature exceeds 85 F in the workplace.

(I) Where an emergency develops which could result in overexposure of employees to methyl parathion, the employer shall provide respiratory protection as indicated in Table I-1.

TABLE I-1

RESPIRATOR SELECTION GUIDE

Concentration of Methyl Parathion	Respirator Type
2 mg/cu m or less	(1) Half-mask pesticide respirator (2) Type C supplied-air respirator, demand type (negative pressure), with half-mask facepiece
10 mg/cu m or less	(1) Fullface gas mask (chin style or chest- or back-mounted type) (2) Type C supplied-air respirator, demand type (negative pressure), with full facepiece
200 mg/cu m or less	(1) Type C supplied-air respirator, continuous-flow type, with full facepiece or suit (2) Pressure-demand type respirator with full facepiece and impervious plastic shroud
Emergency (includes entry to vessels, bins, or other containers which are likely to be contaminated with methyl parathion)	(1) Self-contained breathing apparatus, positive pressure type, with full facepiece (2) Combination supplied-air respirator, pressure-demand type, with auxiliary self-contained air supply

(3) For purposes of this section, application of methyl parathion or methyl parathion formulations is a routine operation in which respirators must be used if the recommended TWA environmental limit is exceeded. Engineering controls, such as enclosed filtered-air tractor cabins or cockpits, shall be used where the environmental conditions encountered, alone or in combination with the application method selected, present a reasonable likelihood of the recommended environmental limit being exceeded. Where filtered-air enclosures are used, air levels of methyl parathion shall be regularly monitored to ensure compliance with the recommended environmental limit.

Section 5 - Informing Employees of Hazards from Methyl Parathion

(a) Before beginning work, all new and reassigned employees who may be occupationally exposed to methyl parathion shall be informed of the hazards from methyl parathion, relevant symptoms of overexposure to methyl parathion, appropriate emergency procedures, and the conditions and precautions required for its safe handling.

(b) Within 30 days of the promulgation of a standard based on these recommendations, all employees whose duties currently involve potential exposure to methyl parathion shall be informed as specified in paragraph (a) of this section.

(c) A continuing education program shall be instituted within 30 days after the effective date of the standard. The program shall be designed to ensure that all employees occupationally exposed to methyl parathion understand and remain aware of job hazards as well as emergency, maintenance, and cleanup procedures, and that they know how to correctly

use and maintain respiratory protective equipment and protective clothing. The training shall be repeated at least annually after the employee's initial training.

(d) In addition to the requirements of paragraph (c) above, employees occupationally exposed to methyl parathion shall be kept currently informed through posting as specified in Section 3(b) and shall be instructed as to the availability of biologic monitoring. The information specified in Section 2(b)(2) shall be kept on file and shall be readily accessible to each employee at or near each workplace where exposure to methyl parathion may occur. In addition, employees shall be informed of the results of their biologic monitoring as specified in Section 2(b)(2)(F).

(e) Information as required shall be recorded on the "Material Safety Data Sheet" shown in Appendix V, or on a similar form approved by the Occupational Safety and Health Administration, US Department of Labor.

Section 6 - Work Practices

(a) Emergency Procedures

(1) Each employer shall contact and advise a physician, or other nearby medical service, that an emergency arising from exposure to methyl parathion may occur.

(2) Unless otherwise specified in this paragraph, employees occupationally exposed to methyl parathion shall have readily accessible 25 gallons of water/person or 100 gallons, whichever is greater, plus alkaline soap and towels for use in emergencies. No emergency water supplies are required in agricultural aircraft. Tractors shall have at least 10 gallons

of water stored in closed containers. Mixing vehicles shall have at least 20 gallons of water stored in closed containers.

(3) Facilities for the manufacture, formulation, or fixed mixing of methyl parathion shall have emergency showers.

(4) Whenever methyl parathion contaminates clothing or personal protective equipment other than the outside of impervious clothing, the employee shall move away from the area of exposure; contaminated articles shall be immediately removed; and the employee required to wash with alkaline soap and water.

(5) Before externally contaminated impervious clothing is removed, its surface shall be washed with alkaline soap and water, or other decontaminant of equal or superior effectiveness.

(6) When an employer has reason to suspect that an employee has been overexposed to methyl parathion, or the employee suspects overexposure (eg, is aware of overexposure or has obvious signs or symptoms of poisoning), medical observation shall be instituted until a determination is made by the physician in accordance with Section 2(b)(2) that the employee is capable of returning to work.

(7) Persons responsible for fire protection shall be informed of the significance of the flashpoint and explosion hazard of methyl parathion formulations, of the high toxicity of its vapors and combustion products, and of the necessity for using supplied air respirators while suppressing fires involving methyl parathion formulations.

(b) Engineering Controls

(1) Engineering controls, such as process enclosures, filling equipment with automatic shutoff devices, mechanical metering and transferring devices, and ventilation systems, shall be used to ensure that the recommended workplace environmental limit specified in Section 1(a) is not exceeded, and to minimize skin exposure to methyl parathion.

(2) Control of Unit Operations

Unit operation controls of equivalent or superior effectiveness may be substituted for those specified below.

(A) All fittings, hoses, tubing, pumps, valves, and associated equipment operated at positive pressure shall be sufficient to withstand 2.5 times the maximum pressure encountered and shall be examined at least weekly for leaks and other signs of deterioration.

(B) All hoses, pipes, and tubing used for filling tanks on loading or application vehicles shall be equipped with quick-acting shutoff valves, or other devices at the discharge end, to prevent dripping.

(C) To prevent back-siphoning, the discharge end of hoses used for filling vessels, tanks, or other containers with methyl parathion, or for adding any other liquid if the container already contains some methyl parathion shall be submerged only if the level in the supply source is higher than the highest possible level of liquid in the receiving container.

(D) When positive displacement pumps are used with hoses, pipes, or tubing equipped with shutoff valves at the discharge end, a relief device shall be installed to bypass liquid back to the low-

pressure side of the system to prevent rupture of hoses, pipes, tubing, or pumps.

(E) All application equipment with two or more nozzles shall have the distribution manifold shielded to minimize operator exposure in the event of malfunction.

(F) Opaque tanks used for mixing, loading, or application of methyl parathion shall be equipped with indicators of the level of liquid within the tank.

(G) Loading equipment shall be fitted with an automatic shutoff device to prevent overfilling.

(H) Tank covers shall be constructed to minimize the possibility of contents spilling in the event of rollover or aerial accident.

(3) Ventilation

(A) Ventilation systems shall be designed to remove methyl parathion from the breathing zones of exposed workers and to prevent the accumulation and recirculation of methyl parathion in the workplace.

(B) Exhaust ventilation systems discharging to outside air should conform with applicable local, state, and federal air pollution regulations.

(C) A program of periodic preventive maintenance, cleaning, and inspection shall be established to ensure maximum effectiveness of ventilation systems. This program shall include airflow measurements, inspection of ductwork for leaks, and examination of the collecting elements. These procedures shall be performed before manufacturing or formulating operations begin and at least twice a month

during manufacture or formulation. A written record shall be kept indicating the conditions observed and measures taken.

(c) Storage

(1) All locations in which methyl parathion is stored shall be fenced and locked or shall have access limited by other means. All storage locations shall be posted as specified in Section 3(b).

(2) Provisions for the storage of containers, applicable to methyl parathion or its formulations, are given in 29 CFR 1910.106. Containers of methyl parathion, or of its combustible or flammable formulations, shall be protected from heat, corrosion, mechanical damage, and sources of ignition.

(3) Containers shall be inspected upon receipt, and at least monthly thereafter, for corrosion, leaks, breaks, tears, or other defects.

(4) Partially full and empty methyl parathion containers shall be tightly closed and kept in locked storage areas until disposed of properly, except where direct supervision is maintained continuously.

(5) Methyl parathion shall be stored only in containers which bear the label required in Section 3(a).

(6) No containers which are normally used for storage or preparation of food, feed, or drink shall be used for storage of methyl parathion.

(7) No persons shall be allowed to eat, sleep, or smoke in any area in which methyl parathion is stored.

(8) Outdoor storage facilities shall be located at least 20 feet from any dwelling or populated area and shall be equipped with a sprinkler system where feasible.

(d) Personal Hygiene

(1) The employer shall provide areas where employees can change their street and work clothing. These areas shall have facilities for storing street and spare work clothes free from contamination.

(2) All required personal protective clothing and protective equipment shall be provided by the employer and shall be laundered or cleaned daily. The employer shall ensure that all impervious personal protective clothing is free from cracks, pinholes, or other signs of deterioration.

(3) Personal protective clothing grossly contaminated with methyl parathion shall be decontaminated and laundered separately from other clothing.

(4) The employer shall make extra clothes available at each worksite for use when protective or personal clothing becomes contaminated with methyl parathion.

(5) Employees occupationally exposed to methyl parathion shall be required to wash their hands and face with alkaline soap and water before eating, drinking, smoking, and before urinating or defecating.

(6) Employees occupationally exposed to methyl parathion shall be required to shower at the end of each workday before leaving work. The employer shall provide alkaline soap and clean towels.

(e) Housekeeping, Decontamination, and Waste Disposal

(1) All methyl parathion spills shall be cleaned up as soon as possible. If feasible, continuous surveillance of spills shall be provided until decontamination is completed. Contaminated areas shall be roped off and posted.

(2) All floors that may be contaminated by methyl parathion shall be cleaned with a strong alkaline solution, or with an equivalent or superior decontaminating solution, at least weekly.

(3) Spills of methyl parathion on floors shall be absorbed with absorbing clay. Sweeping compound shall be utilized to facilitate the removal of all visible traces of methyl parathion-contaminated clay.

(4) Equipment or fixtures contaminated with methyl parathion, including operator compartments or control positions on application and loading equipment, shall be washed as soon as possible with a strong alkaline solution, or with an equivalent or superior decontaminating solution.

(5) Drip pans containing absorbent material shall be utilized to facilitate decontamination in locations where leakage is likely to occur.

(6) Unless local, state, or federal regulations provide otherwise, clothing, rags, bags, and fiber drums heavily contaminated with methyl parathion shall be disposed of at a sanitary landfill or shall be incinerated. Adequate precautions shall be taken to prevent inhalation of potentially toxic fumes, combustion products, and vapors produced during disposal.

(7) All empty containers contaminated with methyl parathion that are to be disposed of in a sanitary landfill shall be decontaminated with a strong alkaline solution, or with an equivalent or superior decontaminating solution, and punctured before disposal.

(8) Empty metal drums or containers contaminated with methyl parathion that are to be reclaimed shall be decontaminated with a

strong alkaline solution or with an equivalent or superior decontaminating solution before shipment. The reclaimer shall be informed of the methyl parathion contamination.

(9) Whenever it is necessary for an employee to perform maintenance or repair work on equipment contaminated with methyl parathion, such as a vessel, pump, valve, pipe, nozzle, etc, the employer shall ensure that the equipment has been decontaminated before maintenance or repair is undertaken.

(10) Reusable clothing that has been exposed to, or is actually contaminated with, methyl parathion shall be placed in a plastic bag or container and labeled with a suitable warning.

(f) Other Work Practices

(1) Employees handling methyl parathion concentrates shall work in groups of two or more. In addition, regardless of the concentration of the material, all mixers, loaders, flaggers, and applicators shall maintain periodic communication with a person capable of summoning emergency aid.

(2) Employees exposed to methyl parathion while spraying shall remain upwind from the spray whenever possible.

(3) Aerial applicators shall mix or load pesticides containing methyl parathion only when closed mixing or loading systems are used. This provision shall not prevent an aerial applicator from supervising mixing or loading operations involving open systems.

(4) Only materials free of methyl parathion shall be used when testing mixing, loading, or application equipment for leaks; when

testing for clogged valves, lines, or strainers; or when calibrating equipment.

(5) No dispersal equipment containing methyl parathion shall be turned on outside the area to be treated. Except in an emergency, methyl parathion shall be dumped from application, mixing, or loading vehicles only when proper disposal procedures are followed.

(6) Employees piloting agricultural aircraft shall be prohibited from flying through the drift of an application, starting or continuing an application if wind creates a drift hazard to themselves or others, and spraying or dusting over waterways, canals, buildings, dwellings, vehicles, or persons, including flaggers.

Section 7 - Sanitation

(a) Food Facilities

Storage, preparation, dispensing (including vending machines), or eating of foods or beverages shall be prohibited in areas where methyl parathion is present. Employees may not carry food while working in these areas because of the risk of contamination. The employer shall provide an area free from methyl parathion contamination in which employees may store lunches and other foods, beverages, or tobacco products.

(b) Smoking

Smoking shall be prohibited in areas where methyl parathion is present. Employees may not carry tobacco products while working in these areas because of the risk of contamination.

Section 8 - Monitoring and Recordkeeping

(a) Environmental Monitoring

(1) Each employer involved in the manufacture or formulation of methyl parathion shall monitor environmental air levels of methyl parathion at least monthly, except as specified otherwise by a professional industrial hygienist. The initial monthly environmental air sampling shall be completed within 6 months of the effective date of a standard incorporating these recommendations. If monitoring of an employee's exposure to methyl parathion reveals that the employee is exposed at concentrations in excess of the recommended TWA environmental limit, control measures shall be initiated and the employee shall be notified of that exposure and the control measures being implemented to correct the situation. Monitoring shall continue until two consecutive samplings, at least a week apart, indicate that employee exposure no longer exceeds the TWA environmental limit specified in Section 1(a). Monthly monitoring may then be resumed.

(2) Air samples shall be collected in the breathing zone of employees to permit calculation of TWA values for every methyl parathion exposure area. For each TWA determination, a sufficient number of samples shall be taken to characterize each employee's exposure during each workday. Variations in work and production schedules shall be considered in deciding when samples are to be collected. The number of representative TWA determinations for an operation or process shall be based on the variations in location and job functions of employees in relation to that operation or process.

(b) Recordkeeping Procedures

(1) Sampling records shall be maintained so that exposure information is available for individual employees. These records shall indicate, in addition to the results of air sampling, the type of personal protective device, if any, in use by each employee at the time of sampling. All employees shall be able to obtain information on their individual environmental exposure.

(2) Records shall be maintained and shall include sampling and analytical methods, types of respiratory devices used, and TWA airborne concentrations found. In addition, the following records shall be maintained for each employee occupationally exposed to methyl parathion:

(A) Preexposure baseline erythrocyte cholinesterase activity or working baseline cholinesterase activity, whichever is applicable.

(B) All cholinesterase activities measured during employment.

(C) Medical records compiled during employment (including preplacement examinations) in accordance with Section 2(a).

(3) Records required by this section shall be maintained for 5 years after the worker's employment has ended and 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.

II. INTRODUCTION

This report presents the criteria and recommended standard which were prepared to meet the need for preventing occupational diseases arising from exposure to methyl parathion. 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 of employees from exposure to hazardous chemical and physical agents. Criteria for any recommended standard should enable management and labor to develop better engineering controls resulting in more healthful work practices and should not be used as a final goal.

These criteria for a standard for methyl parathion are part of a continuing series of criteria developed by NIOSH. The proposed standard applies only to the manufacture, formulation, application, or other occupational exposure to methyl parathion 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 acute systemic poisoning by methyl parathion, (2) be measurable by techniques

that are available to industry and to governmental agencies, and (3) be attainable with existing technology.

Because of (1) the widespread agricultural use of methyl parathion, both alone and in combination with other pesticides, (2) the particular exposure hazard presented by its absorption through the skin, and (3) the absence of investigations into the fraction of methyl parathion which is actually converted to methyl paraoxon prior to exposure, the recommended environmental air limit is insufficient by itself to protect most employees occupationally exposed to methyl parathion. Included with the air limit, therefore, are work practices to limit exposure and biologic monitoring, and other medical surveillance, for the detection of significant exposure to anticholinesterase compounds. Exposure must be detected early to prevent acute intoxication by continued exposure to methyl parathion or other anticholinesterase compounds.

While exposure to concentrated methyl parathion presents unequivocal hazards, the hazards to employees from exposure to residues of methyl parathion on crops, foliage, or soil vary with the age of the residue, extent of conversion to methyl paraoxon, wetness of crop surfaces, ambient temperature and humidity, prevalence of rain after application, contact with foliage and soil characteristic of the work activity and of the crop, time spent in the treated area, concentration of applied material, modifications in toxic qualities because of mixed ingredients, and other factors. Since many incidents of systemic poisoning have been reported for workers entering fields in which organophosphorus insecticides, including methyl parathion, have been applied, the reentry interval concept has been developed to protect such workers. Reentry intervals define the time

between application of the insecticide and entry of workers for any activity involving extensive contact with insecticide residues. Discussion of the protection of field workers from the potentially hazardous effects of methyl parathion residues on crops, foliage, or soil through the establishment of safe reentry intervals has been intentionally omitted from the recommended standard, since the US Environmental Protection Agency is presently the regulatory agency responsible for this area.

In the course of developing a recommended standard for occupational exposure to methyl parathion, deficiencies in the available data were recognized in the following areas: (1) epidemiologic studies on the chronic effects, if any, of occupational exposure to methyl parathion and methyl paraoxon and on those effects, if any, due to cholinesterase inhibition; (2) animal studies on the toxic effects of methyl parathion in combination with other chemicals; (3) studies on the permeability of human skin to methyl parathion and methyl paraoxon; (4) human studies on the correlation of cholinesterase inhibition with dermal and respiratory exposure to methyl parathion and methyl paraoxon; (5) development of more precise and uniform sampling methods for methyl parathion; and (6) determination of the fraction of exposure which is due to methyl paraoxon in different occupational settings and under various environmental conditions. To fill these information gaps, a concerted effort is required of those involved with the health and safety of employees exposed to methyl parathion.