

OHS Registration #: _____

Expiration Date: _____

**STANDARD OPERATING PROCEDURE/APPROVAL FORM
FOR CARCINOGENS AND HIGHLY TOXIC MATERIALS**

Instructions: Please complete this form to request approval to use and possess highly toxic or carcinogenic material from the University Chemical Hygiene Committee as required by Chapter 12 of the University Chemical Hygiene Plan and University Policy 7-37.

Submit a separate form for each chemical. Copies of the current guidelines and Chemical Hygiene Plan are available at the DOHS web site: <http://www.udel.edu/OHS/>. For questions, please contact the University Chemical Hygiene Officer at 831-2103.

Section I – Information

1. Principal Investigator(s): _____
2. E-Mail Address: _____
3. Department: _____
4. Address: _____
5. Phone Number: _____
6. Fax Number: _____
7. Lab(s) to be Used: _____
8. Chemical: Paraoxon (Aryl Diethylphosphate, Diethyl-p-nitrophenyl phosphate)

Section II – Use and Storage

A. Purchasing

All purchases of this material must have approval from the Principal Investigator (PI) or authorized personnel before ordering. The user is responsible to ensure that a current Material Safety Data Sheet (MSDS) is obtained unless a current one is already available within the laboratory. Quantities of this material will be limited to _____, and/or the smallest amount necessary to complete the experiment.

B. Authorized personnel

Please select the general categories of personnel who could obtain approval to use this material:

1. Principal Investigator
2. Graduate Students
3. Undergraduates
4. Technical Staff
5. Post Doctoral Employees
6. Other (Describe): _____

Please list the specific personnel and their approval level (Attach an addendum to this form for additional personnel):

NOTE: The Principal Investigator must be aware of all purchases of this material. The Principal Investigator must assure the there is not an exceedance of the quantity limits.

1. _____	<input type="checkbox"/> Purchase	<input type="checkbox"/> Use the Material
2. _____	<input type="checkbox"/> Purchase	<input type="checkbox"/> Use the Material
3. _____	<input type="checkbox"/> Purchase	<input type="checkbox"/> Use the Material
4. _____	<input type="checkbox"/> Purchase	<input type="checkbox"/> Use the Material
5. _____	<input type="checkbox"/> Purchase	<input type="checkbox"/> Use the Material

The Principal Investigator will update this section when any personnel changes occur. If changes occur, document the changes (include the record of training of additional personnel) in the laboratories files and submit an addendum to the University Chemical Hygiene Officer with all training documentation.

C. Storage

Materials will be stored according to compatibility and label recommendations in a designated area.

1. Please list compounds that this chemical is incompatible with: Avoid reaction with oxidizing agents. Avoid strong acids. A number of phosphate and thiophosphate esters are of limited thermal stability and undergo highly exothermic self-accelerating decomposition reactions which may be catalyzed by impurities. The potential hazards can be reduced by appropriate thermal control measures. Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result. BREThERICK L.: Handbook of Reactive Chemical Hazards. Avoid direct sunlight and heat.
2. Please list special storage requirements (I.E.: Refrigerated, Inert Atmosphere, Desiccated, etc.): Observe manufacturer's storing and handling recommendations. Store in original containers. DO NOT store above 50 deg. C. Keep containers securely sealed. No smoking, naked lights, heat or ignition sources. Store in a well-ventilated area. Store in a cool area and away from sunlight. Store away from incompatible materials. Isolate from NON-pesticides. Store away from foodstuff containers. Protect containers against physical damage. Check regularly for spills and leaks.
3. Please list specific storage area (This Area Must be Marked and Labeled): _____

Storage areas will be inspected by laboratory personnel on a regular basis. Personnel will check for safety concerns such as improper storage, leaking/damaged container(s), damaged labels, quantities in excess of approved limits, theft/disappearance of material, etc. The inspector will also determine if an inventory reduction is possible. The Principal Investigator will designate one individual to complete this inspection.

4. Please select an inspection frequency:

- Weekly Biweekly
 Bimonthly Monthly

D. Use location:

Materials shall be used only in the following designated areas.

Check all that apply:

1. Demarcated Area in Lab (Describe): _____
2. Fume Hood
3. Glove Box

4. Other (Describe): _____

Section III – Personnel Safety and Protection

A. Training requirements:

All users must demonstrate competency and familiarity regarding the safe handling and use of this material prior to purchase. The Principal Investigator is responsible for maintaining the training records for each user of this material. Training should include the following:

1. Review of current MSDS
2. Review of the OSHA Lab Standard
3. Review of the Chemical Hygiene Plan
4. Special training provided by the department/supervisor (Right to Know)
5. Review of the departmental safety manual if applicable
6. Safety meetings and seminars
7. One-on-One hands-on training with the Principal Investigator or other knowledgeable laboratory personnel.

B. Personal Protective Equipment:

All personnel are required to wear the following personal protective equipment whenever handling this material:

1. Proper Laboratory Attire (Pants or dresses/shorts below the knees, sleeved shirt, close-toe shoes)
2. Safety Glasses
3. Lab Coat

Personnel may be required to wear other Personal Protective Equipment when working with this material. The Principal Investigator should contact the University Chemical Hygiene Officer to discuss the selection of chemical protective clothing (aprons, suits and gloves) and respirators. Please check all that apply:

1. <input type="checkbox"/> Chemical Safety Splash Goggles	2. <input type="checkbox"/> Face Shield
3. <input checked="" type="checkbox"/> Chemical Protective Gloves (Describe): <u>Butyl Rubber (preferred) or Viton</u>	
4. <input type="checkbox"/> Chemical Protective Clothing (Describe): _____	
5. <input type="checkbox"/> Chemical Protective Splash Apron (Describe): _____	
6. <input type="checkbox"/> Respirator (Type): _____	
7. <input type="checkbox"/> Other (Describe): _____	

C. Safe Work Practices

The following safe work practices should be employed when using this material:

1. Wear all required personal protective equipment
2. Cover open wounds
3. Wash hands thoroughly when work with the material is completed
4. No mouth pipetting
5. Use of sharps, such as glass Pasteur pipettes, needles, razor blades, etc. should be avoided or minimized
6. Must not work alone in the laboratory
7. Please list any other safe work practices: Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. Avoid all personal contact, including inhalation. Wear personal protective equipment when handling. Avoid smoking, naked lights, heat or ignition sources. Use in a well-ventilated area. Avoid contact with incompatible materials. When handling, DO NOT eat, drink or smoke. DO NOT spray directly on humans, exposed food or food utensils. Keep containers securely sealed when not in use. Avoid physical damage to containers. Wash hands with soap and water after handling. Launder contaminated clothing before re-use. Work clothes should be laundered separately: NOT at home.

D. Personnel Decontamination

For most exposures, decontamination should occur as follows:

1. Small Skin Exposures –
 - a. Wash contaminated skin in sink with tepid water for 15 minutes
 - b. Have buddy locate the MSDS
 - c. Wash with soap and water
 - d. Contact Occupational Health and Safety at 831-8475 for further direction
2. Eye Exposure –
 - a. Locate the emergency eye wash
 - b. Turn eye wash on and open eyelids with fingers
 - c. Rinse eyes for 15 minutes
 - d. Have buddy contact 911 for the Newark Campus, 911 for all others and locate the MSDS
 - e. Notify OHS
3. Large Body Area Exposure –
 - a. Locate the emergency safety shower
 - b. Stand under shower and turn it on
 - c. Rinse whole body while removing all contaminated clothing
 - d. Have buddy contact 911 for the Newark Campus, 911 for all others and locate the MSDS
 - e. Rinse body for 15 minutes
 - f. Notify OHS

Please list any special decontamination procedures: _____

E. Exposure Symptoms and Treatment

Please list the emergency procedures to be followed in the event of an exposure. These will be found in the MSDS for the compounds:

1. Skin/eye contact:

- a. Symptoms: EYE: There is some evidence to suggest that this material can cause eye irritation and damage in some persons. Direct eye contact can produce tears, eyelid twitches, pupil contraction, loss of focus, and blurred or dimmed vision. Dilation of the pupils occasionally occurs. SKIN: Skin contact with the material may produce severely toxic effects; systemic effects may result following absorption and these may be fatal. The material is not thought to be a skin irritant (as classified using animal models). Temporary discomfort, however, may result from prolonged dermal exposures. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting. Open cuts, abraded or irritated skin should not be exposed to this material. Toxic effects may result from skin absorption. There may be sweating and muscle twitches at site of contact. Reaction may be
- b. First Aid: Rinse with water in a emergency eye wash or safety shower while removing contaminated clothing for 15 minutes. Seek emergency medical care by dialing 911.

2. Ingestion:

- a. Symptoms: Severely toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 5 gram may be fatal or may produce serious damage to the health of the individual. Ingestion may produce nausea, vomiting, depressed appetite, abdominal cramps, and diarrhea.
- b. First Aid: • If swallowed do NOT induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. Contact 911 immediately.

3. Inhalation

- a. Symptoms: The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress. Poisoning due to cholinesterase inhibitors causes symptoms such as increased blood flow to the nose, watery discharge, chest discomfort, shortness of breath and wheezing. Other symptoms include increased production of tears, nausea and vomiting, diarrhea, stomach pain, involuntary passing of urine and stools, chest pain, breathing difficulty, low blood pressure, irregular heartbeat, loss of reflexes, twitching, visual disturbances, altered pupil size, convulsions, lung congestion, coma and heart failure. Nervous system effects include inco-ordination, slurred speech, tremors of the tongue and eyelids, and paralysis of the limbs and muscles of breathing, which can cause death, although death is also seen due to cardiac arrest.
- b. First Aid: Move to fresh air. Seek emergency medical care by dialing 911. Provide CPR if necessary.

4. Injection

- a. Symptoms: May be fatal
- b. First Aid: Seek emergency medical care by dialing 911.

The ChemWatch MSDS, which is available at <http://www.udel.edu/OHS/> oftentimes, has treatment information for Emergency Room Personnel and Doctors to follow. Please list any information that can be provided to assist with the treatment:

NOTES TO PHYSICIAN

Hydrolysed rapidly by plasma and tissue esterases to alkyl phosphates (diethylphosphoric acid and di- and monoethyl phosphoric acid). These products are rapidly excreted in the urine.

- Most organophosphate compounds are rapidly well absorbed from the skin, conjunctiva, gastrointestinal tract and lungs.
 - They are detoxified by Cytochrome P450-mediated monooxygenases in the liver but some metabolites are more toxic than parent compounds.
 - Metabolites are usually detected 12-48 hours postexposure.
 - Organophosphates phosphorylate acetylcholinesterase with resultant accumulation of large amounts of acetylcholine causing initial stimulation, then exhaustion of cholinergic synapse.
 - gamma-aminobutyric acid (GABA)-ergic and dopaminergic pathways provide compensatory inhibition.
 - The clinical manifestation of organophosphate toxicity results from muscarinic, nicotinic and CNS symptoms.
 - A garlic-like odor emanating from the patient or involved container may aid the diagnosis.
 - Immediate life-threatening symptoms usually are respiratory problems.
 - Frequent suction and, if necessary, endotracheal intubation and assisted ventilation may be necessary to maintain adequate oxygenation.
 - Theophylline compounds, to treat bronchospasm, should be used cautiously as they may lower the seizure threshold.
 - Excessive secretions and bronchospasm should respond to adequate doses of atropine.
 - Diazepam is the drug of choice for convulsions.
 - Usual methods of decontamination, (activated charcoal and cathartics) should be used when patients present 4-6 hours postexposure.
 - The administration of atropine, as an antidote, does not require confirmation by acetylcholinesterase levels. Severely poisoned patients develop marked resistance to the usual doses of atropine. [Atropine should not be given to a cyanosed patient - ICI] NOTE: Hypoxia must be corrected before atropine is given. For adult: 2 mg repeatedly SC or IV until atropinization is achieved and maintained (atropinization is characterised by decreased bronchial secretions, heart rate >100 bpm, dry mouth, dilated pupils).
 - Pralidoxime (2-PAM, Protopam) is a specific antidote when given within 24 hours and perhaps up to 36-48 hours postexposure. Although it ameliorates muscle weakness, fasciculations and alterations of consciousness, it does not relieve bronchospasm or bronchorrhea and must be given concurrently with atropine. NOTE: Pralidoxime should be given as an adjunct to, NOT a replacement for atropine and should be given in every case where atropine therapy is deemed necessary. Traditional dose: 1 g (or 2 g in severe cases) by slow IV injection over 5-10 minutes. 1-2 g, 4 hourly (maximum dose 12 g in 24 hours) until clinical and analytical recovery is achieved and maintained.
 - Avoid parasympathomimetic agents. Phenothiazines and antihistamines may potentiate organophosphate activity. [Ellenhorn and Barceloux: Medical Toxicology]
- NOTE: Acute pancreatitis in organophosphate intoxication may be more common than reported. The possible pathogenesis of pancreatic insult are excessive cholinergic stimulation of the pancreas and ductular hypertension. Early recognition and appropriate therapy for acute pancreatitis may lead to an improved prognosis.

Cheng-Tin Hsiao, et al; Clinical Toxicology 34(3), 343-347 (1996)

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
<u>1. Cholinesterase activity in red cells</u>	<u>70% of individual's baseline</u>	<u>Discretionary</u>	<u>NS</u>

B: Background levels occur in specimens collected from subjects NOT exposed

NS:Non-specific determinant; Also observed after exposure to other materials

SQ:Semi-quantitative determinant; Interpretation may be ambiguous. Should be used as a screening test or confirmatory test.

Some jurisdictions require that health surveillance be conducted on occupationally exposed workers. Such surveillance should emphasise

- demography, occupational and medical history and health advice
 - physical examination
 - baseline estimation of red cell and plasma cholinesterase activity levels by the Ellman method.
- Estimation of red cell and plasma cholinesterase activity towards the end of the working day

F. Spills

The laboratory should be prepared to clean up minor spills (25 ml/25 g or less) of highly toxic/carcinogenic materials should they occur in a properly operating fume hood. Chemical spill clean up guidance can be found at <http://www.udel.edu/OHS/chemspillkit/chemspillkit.html>. Laboratory personnel cleaning up a spill will wear all personal protective equipment listed above and manage all cleanup debris according to the waste disposal section. Notify OHS of any spills, even if the lab staff handled the clean-up.

Please list the following:

1. Location of Spill Cleanup Materials for a small spill: _____
2. Any special measures/cleanup material required to cleanup a spill: Clean up all spills immediately. Environmental hazard - contain spillage. Avoid breathing vapours and contact with skin and eyes. Wear protective clothing, impervious gloves and safety glasses. Contain and absorb spill with sand, earth, inert material or vermiculite. Place spilled material in clean, dry, sealable, labelled container. Wash spill area with detergent and water.

If a spill is large or occurs outside of a fume hood, the laboratory occupants should immediately vacate the laboratory, close all doors and contact Occupational Health & Safety at 831-8475 during working hours or 911 after hours. If the laboratory personnel determine that the spill is not contained to the lab or could cause harm to people outside the laboratory, they should pull the building fire alarm and go to the Emergency Gathering Point to await the University Police and Emergency Responders. The responsible/knowledgeable person should provide the University Police and the Emergency Responders with the following:

1. Common Name of the Material Involved
2. A copy of a MSDS, if possible
3. Any pertinent information related to the emergency, such as location in the lab, other hazards in the lab, etc.

G. Emergency Phone Numbers:

Below are a list of emergency numbers to contact in the event of an emergency:

1. Police, Fire or Medical Emergency, call – 911 on the Newark Campus, 9-911 for all others
2. Occupational Health & Safety – X8475

Please provide a list of other emergency phone numbers, such as after hour contacts for laboratory personnel or any other important phone number, to be used in the event of an emergency: _____

H. Other Special precautions

Please list any other special precautions or procedures not listed in the above sections. Please be as specific as possible:

CHRONIC HEALTH EFFECTS

Principal routes of exposure are by accidental skin and eye contact and by inhalation of vapours especially at higher temperatures.

Repeated or prolonged exposures to cholinesterase inhibitors produce symptoms similar to acute effects. In addition workers exposed repeatedly to these substances may exhibit impaired memory and loss of concentration, severe depression and acute psychosis, irritability, confusion, apathy, emotional liability, speech difficulties, headache, spatial disorientation, delayed reaction times, sleepwalking, drowsiness or insomnia. An influenza-like condition with nausea, weakness, anorexia and malaise has been described. There is a growing body of evidence from epidemiological studies and from experimental laboratory studies that short-term exposure to some cholinesterase-inhibiting insecticides may produce behavioral or neuro-chemical changes lasting for days or months, presumably outlasting the cholinesterase inhibition. Although the number of adverse effects following humans poisonings subside, there are still effects in some workers months after cholinesterase activity returns to normal. These long-lasting effects include blurred vision, headache, weakness, and anorexia. The neurochemistry of animals exposed to chlorpyrifos or fenthion is reported to be altered permanently after a single exposure. These effects may be more severe in developing animals where both acetyl- and butyrylcholinesterase may play an integral part in the development of the nervous system. Padilla S., The Neurotoxicity of Cholinesterase-Inhibiting Insecticides: Past and Present Evidence Demonstrating Persistent Effects. Inhalation Toxicology 7:903-907, 1995.

Section VI – Waste Disposal

The authorized person using this material is responsible for the safe collection, preparation and proper disposal of waste unless otherwise stated below. Waste shall be disposed of as soon as possible and in accordance with all laboratory and University procedures. All personal must obtain chemical waste disposal training via DOHS.

Specific instructions:

Collect solid waste material in a 7mil polyethylene bag and label with an orange chemical waste label. Collect liquid waste in a "Justrite" container provided by DOHS. Label with a hazardous waste label. Use proper laboratory ventilation such as a fume hood to manage both liquid and solid wastes. Contact DOHS for removal. Do not put in the normal trash or pour any solutions down the drain.

Section V – Signature and Verification

Your signature below indicates that you have completed this form accurately to the best of your knowledge, you acknowledge all requirements and restrictions of this form and that you accept responsibility for the safe use of the material.

1. Prepared By: _____

Date: _____

Signature: _____

2. Principal Investigator: _____

Date: _____

Signature: _____

Section VI – Approval Process

A. University Chemical Hygiene Officer Approval

The Principal Investigator should have this form completed as accurately as possible. Please e-mail or fax this form to the University Chemical Hygiene Officer at eich@udel.edu or 831-1528. The Chemical Hygiene Officer will review and verify the form and make any necessary changes or updates.

1. University CHO: _____ Date: _____

Signature: _____

B. Conditional Approval to Purchase and Use

This form will then be e-mailed or faxed to a member of the University Chemical Hygiene Committee (CHC), usually from the same department as the requesting PI. The Committee Member will meet with the Principal Investigator or designee and discuss the form and the use of the material. If the Committee Member finds the procedure acceptable, they can offer a conditional approval for purchase and use of this material.

2. CHC Member: _____ Date: _____

Signature: _____

C. Full Approval

A signed copy of the form will be sent, via campus mail, to the University Chemical Hygiene Officer, who will bring it up at the next Chemical Hygiene Committee Meeting for full approval. All approvals will be good for two years. The complete, signed approval form will kept on file with Occupational Health & Safety and a copy will be sent to the Principal Investigator to keep on file.

3. Acceptance: _____ Date: _____

CHC Chair: _____

Signature: _____

D. Approval Expiration

The approval for use and purchase of this material will expire should any of the approved information change, with the exception of Section II, B and C, Authorized Personnel and Storage Location, or two years after CHC approval. If, at the end of two years, the procedure is substantially the same, the Principal Investigator can complete a renewal form and send it to the University CHO, who can approve the renewal for an additional two years.

CHECKLIST FOR POSSESSION AND USE OF CARCINOGENS AND HIGHLY TOXIC MATERIALS

The checklist is provided to assist a researcher with the approval process for possession and use of carcinogens and highly toxic materials. This form may be kept on file in the laboratory with the SOP to serve as documentation. The complete procedure can be found in the University Chemical Hygiene Plan in Chapter 12.

Date and Initial	
_____	1. Complete a Standard Operating Procedure/Approval Form For Carcinogens and Highly Toxic Materials and submit this form to OHS for review
_____	2. Review and make OHS's changes and recommendations
_____	3. Meet with a member of the University Chemical Hygiene Committee to review the approval form and the use of the material.
_____	4. Submit (via campus mail) the completed and signed form back to the University Chemical Hygiene Officer for conditional approval to purchase and use the material. The University Chemical Hygiene Committee will review this form at the next scheduled meeting for full approval.
_____	5. Complete a Job Hazard Analysis (JHA) for each experiment in which this compound is used. These JHAs must be kept on file in the laboratory and updated every 5 years or when a process changes.
_____	6. Provide and document training for every worker who will use the material. Training shall include hands-on instruction as well as review of the JHA, SOP and the University Chemical Hygiene Plan; specifically Chapter 12.
_____	7. Conduct a trial run with OHS present.
_____	8. Have OHS present the first time a process using this material occurs.