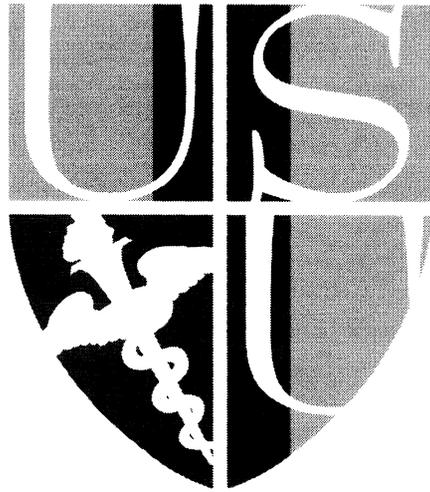


**USUHS
INSTRUCTION
6407**





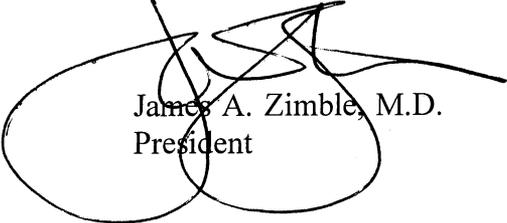
USUHS



DIRECTIVE SYSTEM TRANSMITTAL

NUMBER USUHS I-6407 Ch-1 (EHS)	DATE MAY 4 1999
ATTACHMENTS None	
<p style="text-align: center;">INSTRUCTIONS FOR RECIPIENTS</p> <p>The following changes to USUHS Instruction 6407, "Implementation of Chemical Hygiene Plan," dated December 1, 1995 have been authorized.</p> <p>Pen Changes</p> <ol style="list-style-type: none"> 1. Enclosure 1, REFERENCES page, reference (f), change title and date to: ""Research and Clinical Investigation," dated September 30, 1997" 2. Enclosure 1, REFERENCES page, reference (i), replace with: "DoD Instruction 4715.4, "Pollution Prevention," dated June 18, 1996" 3. Enclosure 2, page i, 4th line, change the word "Properitoneal" to "Pre-operational" 4. Enclosure 2, Attachment 1, REFERENCES page, reference (d), change title and date to: ""Research and Clinical Investigation," dated September 30, 1997" 5. Enclosure 2, Attachment 1, REFERENCES page, reference (e), change date to: "January 1997" 6. Enclosure 2, Attachment 3, page 1, 2nd column, 7th line, change the words "four times" to "monthly" 	

WHEN PRESCRIBED ACTION HAS BEEN TAKEN, THIS TRANSMITTAL SHOULD BE FILED WITH THE BASIC DOCUMENT

Number	Date	USUHS DIRECTIVES SYSTEM TRANSMITTAL
INSTRUCTIONS FOR RECIPIENTS (Continued)		
<p>7. Enclosure 2, Attachment 3, page 5, at paragraph 4.d.(5)(a), last line, after the word network, change the ";" to a "." and add the following sentence, "Hot links to internet sources of MSDSs can be found on the EHS home page;"</p>		
<p><u>Effective Date</u></p>		
<p>These changes are effective immediately.</p>		
 James A. Zimble, M.D. President		



UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES



SUBJECT: Implementation of Chemical Hygiene Plan

Instruction 6407

DEC 0 1 1995

(EHS)

ABSTRACT

This Instruction is issued to comply with the Occupational Safety and Health Administration regulation, "Occupational Exposure to Hazardous Chemicals in Laboratories." That regulation requires a written chemical hygiene plan to ensure safe use of hazardous chemicals and to ensure personnel are informed of the hazards associated with the chemicals and the methods by which they are used.

A. Purpose. This Instruction implements Occupational Safety and Health (OSHA) laboratory regulation, 29 CFR 1910.1450^a, hazard communication standard, 29 CFR 1910.1200^b, and portions of DoD Instruction 6050.5^c. This Instruction assigns responsibilities and provides information to help protect Uniformed Services University of the Health Sciences (USUHS) personnel, visitors, and the surrounding community from hazards associated with potentially dangerous chemicals.

B. References. See Enclosure 1.

C. Scope and Applicability. This Instruction is applicable to all USUHS personnel planning for, or engaging in the use of hazardous chemicals in the laboratory as defined in 29 CFR 1910.1450^a. It is intended to complement existing Federal and State regulations and other USUHS safety-related instructions.

D. Policy.

1. Implementation of this Chemical Hygiene Plan (CHP) and the safe use and management of hazardous chemicals will be an integral part of every laboratory activity at USUHS.

2. This CHP shall be readily available to employees, employee representatives, and, upon request, to the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

3. Laboratory procedures involving work with hazardous chemicals will be identified and addressed in research protocols through the use of USUHS Form No. 6007, "Use of Biohazards, Controlled Substances, and Dangerous Materials."

4. Employees shall be provided information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Such information and training shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. In addition, annual refresher training of employees shall be provided.

5. The primary responsibility for recognizing, controlling, and correcting hazards within a work area rests with the Principal Investigator (PI). If not available, the PI may find it necessary to designate a qualified employee to act in his/her behalf. This designee must be a senior

laboratory member, appointed in writing and the letter sent to the Department of Environmental Health and Occupational Safety (EHS) by the PI.

6. EHS periodically monitors work practices and areas to assist the University in maintaining safe facilities and procedures. The monitoring by EHS does not alleviate the responsibilities of individual workers, laboratory supervisors, or PIs.

E. Responsibility.

1. President, USUHS shall implement the CHP and enforce hazard control procedures for the University.

2. Dean, School of Medicine (DEN) shall:

a. Provide oversight of the CHP on behalf of the President, USUHS; and

b. Appoint members to the USUHS Biohazards, Controlled Substances, and Dangerous Materials (BCD) Committee to review hazardous chemical control practices.

3. USUHS, BCD Committee shall:

a. Assist in monitoring the overall hazardous chemical control program;

- b. Serve in an advisory capacity for policy matters relating to hazardous chemicals;
- c. Review and approve all research/teaching protocols, including those using hazardous chemicals, prior to their commencing;
- d. Provide technical advice pertaining to hazardous chemicals;
- e. Regularly inform the DEN of the status of hazardous chemical control and chemical hygiene at USUHS;
- f. Identify where new chemical hazards may exist; and
- g. Review policies for chemical risk assessment, provide comments to the Director, EHS, and suggest recommendations for reducing chemical hazards.

Note: Guidelines for the management of "controlled substances" are contained in USUHS Instruction 6404^d and information concerning the management of biohazards and other dangerous materials can be found in USUHS Instruction 6401^e.

- 4. Department Chairs shall:
 - a. Assure the safety of all personnel assigned to or working on projects under their direction;
 - b. Maintain adequate precautions for protecting the surrounding community from

substances that employees under their supervision are investigating or using; and

- c. Ensure that employees and procedures conducted under their department auspices comply with University policies and other governing regulations and standards.

5. Director, EHS shall:

- a. Develop and implement guidance for handling and managing hazardous chemicals;
- b. Review the CHP annually, implementing instructions, revise it as necessary, and issue announcements to reflect current regulatory requirements;
- c. Review research protocols and standard operating procedures for all operations using hazardous chemicals;
- d. If necessary, conduct preoperational surveys of new operations using hazardous chemicals;
- e. Ensure that Health and Safety Surveys are conducted at least annually in all laboratories where hazardous chemicals are used;
- f. Review plans and specifications for all laboratory construction, renovation, or modification to ensure appropriate safety, health, and environmental protection design criteria are incorporated;

- g. Investigate all reported accidents that involve hazardous chemicals;
- h. Provide guidance on waste handling and disposal;
- i. Conduct inspections of all laboratories where chemical waste is generated or stored;
- j. Maintain, make available, and disseminate as needed Material Safety Data Sheets (MSDS) for all chemicals used, stored, or manufactured at the USUHS;
- k. Maintain copies of chemical inventories for all the laboratories at the USUHS;
- l. Evaluate potential for chemical exposures and conduct air samplings of laboratory operations where there is a reasonable probability that employee exposure exceeds the action level for a chemical (see 29 CFR 1910.1450^a);
- m. Conduct or arrange for preplacement, preassignment, and periodic job-related medical surveillance for military and civilian (non-HMJF) employees potentially exposed to hazardous chemicals (see USUHS Instruction 3200^f) as required by regulations or deemed necessary;
- n. Organize or coordinate training programs (lectures, demonstrations, programmed instruction, briefings, training guides and videos, computer based training,

etc.) on the safe use and management of hazardous chemicals and maintain records of those trained;

- o. Provide or coordinate consultative evaluations or specialized surveys, including certification compliance of engineering controls, when applicable or as set forth in governing regulations and professionally recognized guidance;

- p. Notify affected employees of the results of any sampling within 15 working days of receipt of the results. Notification will be in writing, either addressed specifically to the individuals or by posting results in an appropriate location that is accessible to the affected employees;

- q. Maintain records of hazardous chemicals being brought into the USUHS;

- r. Have authority to stop any procedure, operation, or material acquisition if deemed unsafe;

- s. Provide guidance and disseminate information to department chairs on related hazardous chemical regulations and requirements; and

- t. Assemble, publish, and maintain a list of hazardous chemicals for use as a guide in determining which chemicals are to be considered and treated as hazardous chemicals in accordance with this CHP.

6. Director, Research Administration (REA) shall:

- a. Forward to the Chair, BCD Committee, for review those research/clinical investigation proposals that include the handling or use of chemicals;

- b. Provide potential researchers with information of the approval process of the BCD Committee; and

- c. Provide EHS with read-only access to the grant administration database for the purpose of monitoring grant activity and hazardous chemical usage.

7. PIs (or appointed designees) shall:

- a. Submit research/clinical investigation proposals involving chemicals to the Director, REA, who will coordinate the routing to the BCD Committee;

- b. Maintain a current chemical inventory and submit it to EHS at the time of the Annual Health and Safety Survey, or upon request. The chemical inventory will, as a minimum, include any chemical identified in the EHS-published Chemical Hazard Index and those chemicals identified as hazardous as defined by this Instruction;

- c. Develop specific safety guidelines for laboratory employee(s) for the research and chemicals

involved. *Enclosure (2)*, Attachment (3), "Chemical Hygiene Training Guide," should be amended by the PI to meet specific laboratory safety training requirements;

- d. Inform and train laboratory workers regarding hazards and potential hazards of the specific laboratory and its operation. Inform personnel of early signs and symptoms of exposure to chemicals within the laboratory. Inform personnel of the location of this instruction, the CHP, and specific chemical safety procedures relevant to hazardous chemicals involved with the research protocol or operation. Document personnel safety training, retain copies, and provide copies to EHS;

- e. Consider chemical safety practices, facilities, and equipment in design of proposals for new research;

- f. Consult with the Director, EHS on requirements for physical examinations, exposure monitoring, exposure control, and waste disposal;

- g. Advise the Director, EHS of all incidents of dangerous exposure to chemicals;

- h. Maintain records of personnel working with hazardous chemicals and provide this list to EHS upon request;

- i. Select and assign personnel for laboratory duties only after consideration of their capabilities, understanding of safety,

and any recommendations from the Occupational Physician concerning the possible increase in risk to the individual from exposure to chemicals;

j. Ensure that a research protocol or standard operating procedure is prepared and approved by EHS for laboratory operations using hazardous chemicals. Have alterations/modifications to protocol procedures approved before initiating changes;

k. Ensure that laboratory personnel receive job-related medical surveillance as directed by the Occupational Medicine Division, EHS;

l. Ensure that personnel have received hazard communication training prior to beginning work in the laboratory;

m. Ensure that personnel are provided and have received adequate training in the use of protective clothing and equipment necessary to conduct routine operations and for use during potential emergencies;

n. Perform routine (recommended daily) inspections of laboratory operations involving hazardous chemicals to ensure compliance with the research protocol, USUHS procedures, the

CHP, applicable regulations, and accepted safe practices;

o. Ensure hazardous waste generators and handlers receive training in the management of hazardous waste;

p. Control and limit access to laboratories and chemical storage areas;

q. Determine the specific type of engineering controls (ventilation such as chemical/biological hoods, etc.) required for use in specific investigations. EHS, through the Bioenvironmental Engineering Division, will provide consultation on types of engineering controls and recommended applications, as well as the evaluation of their effectiveness;

r. Prepare and keep current Disaster Control/Emergency Response Information forms for the work spaces under their control and provide copies to EHS;

s. Inform laboratory employees of accident and emergency response procedures relative to specific operations;

t. Determine if additional laboratory safety training is necessary, and if so, coordinate additional training with EHS; and

u. Coordinate with EHS prior to bringing chemicals into the University through means other than routine procurement. This is to ensure proper storage, handling, control, and disposal of hazardous chemicals.

8. Operations, Service, or Laboratory Director shall be the primary person responsible for a space or procedure involving hazardous chemicals when a PI or designee of a PI is not available.

9. Laboratory Workers shall:
a. Plan and conduct laboratory operations using hazardous chemicals and biological agents in accordance with the provisions of this Instruction, an approved research protocol, and if applicable, an approved standard operating procedure;

b. Review with their supervisor all procedures that involve the use or handling of hazardous chemicals;

c. Comply with medical screening procedures which are deemed necessary by the department chair in coordination with EHS;

d. Report, upon confirmation, their pregnancy or other significant medical conditions (i.e., respiratory problems) to the PI and EHS, so that chemical exposures can be evaluated. This action cannot be mandated, however, it is strongly encouraged for the health and safety of the employee;

e. Use protective clothing and equipment necessary to conduct the operation in a safe manner;

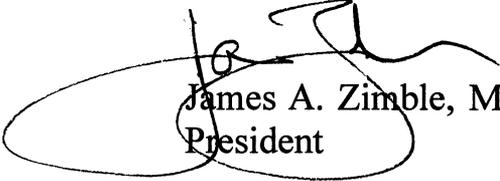
f. Report hazardous conditions, chemical spills, exposures or abnormal circumstances associated with a hazardous chemical to their supervisor, or, if left uncorrected by the supervisor, to EHS; and

g. Manage waste in accordance with applicable environmental regulations and USUHS policies.

F. Chemical Hygiene Plan Program Elements.

The CHP Program Elements are described in detail in this Instruction. Refer also to USUHS Safety Manual 6053-M^g, USUHS Waste Disposal Guide^h, and USUHS Instructions 4210ⁱ and 6002^j.

G. Effective Date. This Instruction is effective immediately.



James A. Zimble, M.D.
President

Enclosures:

1. References
2. USUHS 6407-M

REFERENCES

- (a) Title 29, Code of Federal Regulations, Part 1910.1450, "Occupational Exposures to Hazardous Chemicals in Laboratories; Final Rule," January 31, 1990
- (b) Title 29, Code of Federal Regulations, Part 1910.1200, "Hazard Communication," August 24, 1987
- (c) DoD Instruction 6050.5, "DoD Hazard Communication Program," dated October 29, 1990
- (d) USUHS Instruction 6404, "Management of Controlled Substances, Alcohol and Alcoholic Liquors, Syringes, and Hypodermic Needles, Precursor/ Essential Chemicals, and Anabolic Steroids," dated June 28, 1991
- (e) USUHS Instruction 6401, "Biohazards, and Dangerous Materials Guide," dated May 15, 1987
- (f) USUHS Instruction 3200, "USUHS-Sponsored Research and Clinical Investigation: Submission, Review, and Funding," dated July 5, 1988
- (g) USUHS No. 6053-M, "USUHS Safety Manual," dated March 15, 1988
- (h) USUHS Waste Disposal Guide, May 1990
- (i) USUHS Instruction 4210, "Hazardous Material Pollution Prevention," dated July 11, 1995
- (j) USUHS Instruction 6002, "USUHS Occupational Safety and Health Program," dated September 10, 1990



USUHS CHEMICAL HYGIENE PLAN

**Uniformed Services University
of the Health Sciences**

Bethesda, Maryland

DECEMBER 1995

**USUHS Chemical Hygiene Plan
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- 1 References
- 2 Explanation of Terms
- 3 Chemical Hygiene Training Guide
- 4 Water Reactive Chemicals
- 5 Shock Sensitive Chemicals

USUHS CHEMICAL HYGIENE PLAN

1. Policy.

a. The Chemical Hygiene Plan^a (CHP) establishes the minimum requirements for the safe use of hazardous chemicals in the laboratory. Chemical exposure shall be minimized through the use of engineering and administrative controls, work practices, and protective clothing and equipment.

b. Laboratory personnel shall not be exposed to airborne concentrations which exceed the more stringent of either the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) for a specific compound or mixture. The most current editions of 29 CFR 1910.1000^b and Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices^c will be used for PELs and TLVs values.

c. Acutely toxic compounds, carcinogens, and reproductive toxins shall be handled using the special procedures found in paragraph 18.

d. Employees will be made aware of the CHP and its location. This CHP shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary of Labor for

the Occupational Safety and Health, U.S. Department of Labor, or designee.

e. Employees shall be notified of area and "personal" monitoring results within 15 working days of receipt of results. Notification of results will be made in writing, either individually or by posting results in an appropriate location that is accessible to employees.

f. Laboratory procedures involving work with hazardous chemicals will be identified and addressed in research protocols using USUHS Form No. 6007, "Use of Biohazards, Controlled Substances, and Dangerous Materials." Laboratory work involving hazardous chemicals not covered by a research protocol will have an approved standard operating procedure detailing the procedures for handling hazardous chemicals.

g. Employees shall be provided information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Such information and training shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assign-

ments involving new exposure situations. In addition, annual refresher training of employees shall be provided. Refer to paragraph 9 for additional information and training.

2. Program Administration.

a. Research protocols shall be prepared for and include each laboratory operation using hazardous chemicals in accordance with USUHS Instruction 3200^d.

According to USUHS Instruction 3200^d the protocol proposal shall be forwarded to EHS for review and comment prior to approval. EHS shall evaluate the use and management of hazardous chemicals identified for use in the protocol.

b. If necessary, a pre-operational survey shall be conducted by representatives from EHS to identify health, safety, and environmental compliance issues before a new operation begins. The protocol shall not be approved until the pre-operational survey is completed and operations are approved.

c. Annual Health and Safety Surveys shall be conducted in each laboratory.

3. Procurement.

a. Purchase requests for chemicals identified by EHS will be coordinated with the Chemical

Hygiene Officer (CHO) prior to purchase. Purchase requests for new (not previously purchased) chemicals for USUHS will be coordinated with the CHO prior to ordering.

Chemicals identified by the CHO will be flagged for CHO approval before purchasing. The College and University Financial System (CUFS) may be used to coordinate chemical purchases and CHO approval.

b. Requesters should review health and safety data on chemicals before purchasing to determine special requirements for handling, storage, and disposal.

(1) MSDSs for chemicals used at the USUHS are available through EHS (Room G040).

Laboratory personnel can view or obtain copies of MSDSs at any time during normal duty hours by calling EHS (295-3305/3323). In addition, EHS has subscribed network version CD-ROM MSDS for university users. This can be available through the Learning Resource Center (LRC) Network. If circumstances warrant, an EHS person is also available on a 24-hour basis through USUHS Security (295-3038).

(2) Other sources of chemical data and health effects information include DoD Instruction 6050.5-LR^e and "Dangerous Properties of Industrial Materials,"^f and are

available for review in Room G040, and through the USUHS LRC network.

c. Personnel shall inspect containers upon receipt to ensure they are intact and not leaking. All containers shall be labelled in accordance with 29 CFR 1910.1200^g. Damaged or unlabelled containers shall not be accepted.

d. The Director, EHS will be consulted and approval received before chemicals, of any kind, are brought into the University through means other than the routine procurement procedures.

4. Chemical Storage.

a. Central Storerooms.

(1) New facilities shall be provided with central storerooms designed and constructed in accordance with NFPA Standard 30^h. Hoods, gas cabinets, or ventilated storage rooms should be provided when acutely toxic gases are stored in the laboratory.

(2) Requirements for central storage at existing facilities shall be evaluated by EHS on a case-by-case basis.

b. General. Chemical storage inside the laboratory shall be limited to those chemicals necessary to complete daily laboratory requirements. Central storerooms shall be used when they are available.

Chemicals should not be permanently kept on the bench. Open shelves should be designed with restraining devices or lips to prevent containers from creeping or tipping over.

(1) Chemicals should be stored according to the compatibility categories. A separate cabinet should be used for each storage group. Chemicals stored in trays, desiccators, or secondary containers (large enough to contain the spill from the original container) may be stored with chemicals from another group when they are located on the bottom of the cabinet.

(2) Chemicals within a given storage group may be incompatible with other chemicals in that group. Laboratory personnel shall determine intra-category incompatibility and minimize incompatible storage when possible. Spill trays should be used to reduce spreading in the event of spills or leaks.

(3) Chemicals shall be inspected by laboratory personnel at least semi-annually to determine their condition. Corroded or leaking containers should be replaced and turned in, along with outdated or excess chemicals.

(4) Cabinets shall be labelled with storage code and compatibility category.

c. Inventories.

(1) Chemical inventories shall be available for each individual room where chemicals are stored or used. The inventory shall be maintained by the principal investigator or other responsible party and list the chemical name, quantity stored, and typical use rate. Chemical inventories shall be provided to EHS during Annual Health and Safety Surveys.

(2) Principal investigators or their representative shall update the inventory at least semi-annually. Copies shall be provided to EHS upon request.

(3) Copies of chemical inventories are maintained by EHS and are accessible in the event of an emergency.

(4) The chemical inventory will, as a minimum, consist of chemicals identified in the Chemical Hazard Index published by EHS, or any chemical identified as hazardous or toxic per Attachment 2 of this Enclosure.

(5) Inventories should include chemicals used in the specific laboratory or work space but stored elsewhere.

d. Flammable and Combustible Liquids.

(1) The quantity of flammable and combustible liquids stored in a laboratory room shall not exceed

10 gallons or one month's supply, whichever is less. The quantity of liquids stored in an approved inside storage room shall be in accordance with NFPA Standard 30^h.

(2) Flammable and combustible liquids shall be stored in glass, metal, or plastic containers which meet the requirements of NFPA Standard 30^h. Class I liquids shall be stored in approved safety cans when the container quantity exceeds 2 gallons. Combustible liquids shall be stored in approved safety cans when the container quantity exceeds 5 gallons per NFPA Standard 45ⁱ.

(3) Flammable and combustible liquids shall be stored in approved cabinets designed in accordance with NFPA Standard 30^h. Cabinets should not be located adjacent to an exit or in a stairwell. Cabinets shall not be vented without approval from EHS.

(4) The transfer of Class I liquids to smaller containers from bulk containers not exceeding 5 gallons shall be conducted in a chemical hood or in an approved inside storage room. The transfer of Class I liquids from bulk containers exceeding 5 gallons shall be conducted in an approved inside storage room or outdoors per NFPA Standard 45ⁱ.

(5) Class I liquids shall not be transferred between metal

containers unless the containers are electrically bonded.

(6) Refrigerators and freezers used to store flammable liquids shall be explosion-proof or "laboratory safe" in accordance with NFPA Standard 45ⁱ.

e. Water Reactive Chemicals.

(1) Water reactive chemicals shall be segregated from other chemical storage. These chemicals should be stored in approved cabinets designed in accordance with NFPA Standard 30^h. If approved cabinets are not available, these chemicals, with their original containers, should be packed tightly in a metal can during storage. Some of the common water reactive chemicals are listed in Attachment 4 of this Enclosure. Consult EHS for more information.

(2) Water reactive chemicals shall not be stored with flammable or combustible liquids. Cabinets used for storage of water reactive chemicals shall be posted "CAUTION - WATER REACTIVE CHEMICAL."

f. Shock Sensitive Chemicals.

(1) Unless the manufacturer has added an inhibitor, unopened containers of shock sensitive chemicals should be turned-in after 12 months of storage. Once opened, shock sensitive chemicals should be turned in after 6 months of storage.

(2) Shock sensitive chemicals shall be prominently noted on the inventory. A list of shock-sensitive chemicals is included as Attachment 5 of this Enclosure. Consult EHS for further information.

g. Toxic Chemicals.

(1) Toxic chemicals should be segregated from other chemicals and stored in a closed cabinet. The cabinet shall be posted "TOXIC CHEMICALS." Flammable toxic chemicals shall be stored in accordance with paragraph d.

(2) Toxic chemicals should be stored in a well-ventilated area. The storage of unopened containers presents no unusual hazard. Once opened, containers should be sealed with parafilm or tape.

h. Compressed Gases.

(1) General Requirements.

(a) Only personnel trained in the handling, transporting, storage, and use of compressed gases shall perform these operations.

(b) Gas cylinders shall be labelled or tagged to show their contents.

(c) Gas cylinders shall be secured by the use of clamps, chains, or straps while in storage or use.

(d) When gas cylinders are not in use, hand valves shall be tightly closed and the valve protector cap shall be in place.

Enclosure 2

(e) Compressed gas from cylinders shall be reduced through the use of a regulator specifically designed for that purpose.

(f) Reduction valves, gauges, and fittings used for oxygen shall not be used for other gases. Likewise valves, gauges, and fittings used for other gases shall not be used for oxygen.

(2) Storage Requirements.

(a) Gas cylinders stored outdoors shall be located in a secured area. Gas cylinders shall not be stored near sources of ignition, heat, or open flames.

(b) Gas cylinders shall not be stored in the laboratory room. Requirements for cylinder use shall be kept to a minimum. Manifold systems should be used when feasible.

(c) Gas cylinder storage areas shall be posted with the names of the gases in storage. Areas where hydrogen or other flammable gases are stored shall be posted, "DANGER - FLAMMABLE GAS, NO SMOKING OR OPEN FLAMES WITHIN 50 FEET."

(d) Gas cylinders shall be segregated by their classification (i.e., flammable, toxic, or oxidizer). Oxidizers shall be separated from flammable gases as much as possible. Storage of these gases in

close proximity must be approved by EHS.

(e) Full and empty gas cylinders shall be stored in separate locations of the storage area. Empty gas cylinders shall be appropriately marked.

(f) Empty gas cylinders shall be returned to the manufacturer for refilling. Non-refillable cylinders shall be disposed of in accordance with USUHS Instruction 6002^j.

(3) Acutely Toxic Gases.

(a) Acutely toxic gases used in the laboratory shall be stored in a chemical hood or gas cabinet. Administrative controls, such as reducing gas mixture concentrations and cylinder size, shall be used to minimize risk. Flow-limiting orifices shall be required on a case-by-case basis. If appropriate storage is not available, EHS will provide storage for acutely toxic gases.

(b) Outdoor storage facilities should be located at least 75 feet from buildings. A gas cabinet should be provided to handle leaking cylinders.

i. Distribution.

(1) Toxic, flammable, or corrosive chemicals should be placed in a carrying bucket or other unbreakable container when being moved between rooms or through the laboratory corridors.

(2) Wheeled carts should be used to move larger quantities of chemicals which cannot be hand carried. Wheels shall be designed to travel over uneven surfaces without tipping or stopping suddenly. Carts with open shelves should be designed with a restraining device or lip to prevent containers from creeping or tipping over.

(3) Freight elevators should be used to move chemicals between floors when available. Passenger elevators shall not be used when personnel are on-board, however, these may be placed out-of-service temporarily to move chemicals.

(4) Compressed gas cylinders shall be moved using a suitable hand truck. The gas cylinder shall be strapped in place with the valve protector cap installed. Only one cylinder shall be moved at a time. Acutely toxic gases should be moved during off-duty hours. Approved escape respirators shall be readily available in the event of an emergency.

5. Engineering Controls.

a. General Practice. Engineering controls including hoods, glove boxes, inhalation chambers, gas cabinets, local exhaust ventilation, and the practice of substituting less toxic chemicals, should be used to

minimize exposure to all hazardous chemicals in the laboratory.

b. Laboratory operations which involve chemicals with a PEL or TLV of 100 ppm or less (gas or vapor) or 0.1 mg/m³ or less (aerosol) shall be planned and conducted using appropriate engineering controls. High risk operations shall be conducted inside primary containment including chemical hoods or glove boxes. Low risk operations, where the potential for generation of gas, vapor, or aerosol contamination is remote, may be conducted on the open bench.

c. Design/Performance Criteria.

(1) Chemical Hoods.

(a) Hoods shall have an average face velocity of 90 to 120 feet per minute (fpm) with the sash in the fully open position. Existing hoods designed and operating at 120 to 180 fpm may be used as long as adequate performance is documented. Sash stops should be installed when the face velocity requirement cannot be met with the sash in the fully open position. Individual velocity readings should be within 20 percent of the average face velocity to ensure uniform airflow.

(b) Hood performance shall be evaluated quarterly and after any repair or modification to the

ventilation system. Interconnected systems shall be evaluated together to determine the overall system performance. Procedures used to evaluate hood performance shall be approved by the CHO.

(c) Hoods used for highly toxic compounds, carcinogens, or reproductive toxins should be equipped with an audible and visual alarm which is activated when the centerline face velocity drops below 90 fpm. All hoods should be equipped with a manometer or magnehelic gauge so that laboratory personnel can monitor static pressure to determine when preventive maintenance is necessary.

(d) Prior to each day's operation, personnel will check the operation of the hood. If the hood does not appear to be operating properly, discontinue laboratory work, and notify EHS immediately.

(2) Glove boxes.

(a) Glove boxes shall be maintained at a negative pressure of at least 0.25 inches water gauge. A manometer or magnehelic gauge shall be installed to monitor differential pressure.

(b) Glove boxes shall have an inward velocity of at least 90 fpm through all open ports or doors. Total makeup air volume shall be adequate to prevent

explosive concentrations of gas, vapor, or dust inside the enclosure.

(c) Glove box performance shall be evaluated semi-annually, and after any repair or modification to the ventilation system.

(3) Inhalation Chambers. The design and performance criteria for inhalation chambers shall be the same as that for glove boxes.

(4) Gas cabinets.

(a) Gas cabinets shall be ventilated at a minimum rate of 80 cubic feet per minute (cfm) per square foot of cabinet space (cross-sectional area) or 125 cfm per cylinder. An inward velocity of at least 200 fpm shall be maintained through the access door.

(b) A manometer or magnehelic gauge shall be installed to monitor differential pressure.

(c) Cabinet performance shall be evaluated annually and after any repair or modification to the ventilation system.

(5) Local Exhaust Ventilation. Design/performance criteria for local exhaust ventilation should be in accordance with the ACGIH Industrial Ventilation Manual^k (latest edition). System performance shall be evaluated annually and after any repair or modification.

(6) Air Balance.

(a) Laboratories shall be maintained under negative pressure with respect to corridors and administrative areas. This requirement shall be monitored during hood performance evaluations. Exhaust air from chemical fume hoods shall not be recirculated.

(b) Adequate conditioned make-up air shall be provided to ensure a safe environment and operation of the ventilation system.

(7) Biological Safety Cabinets. Laminar-flow devices such as biological safety cabinets, laminar flow hoods, and clean benches which are designed for the containment or isolation of biological (infectious) materials are not suitable for work involving hazardous chemicals. Such devices will not be used as substitutes for properly-functioning chemical fume hoods.

d. Preventive Maintenance. Laboratory ventilation systems should be provided routine maintenance.

e. Filtration and Vacuum Systems. House vacuums should be provided with in-line filters or traps (available from the Self-Service Store) to prevent mechanical contamination. Vacuum pumps should be vented into a hood or exhaust ventilation system.

6. Administrative & Work Practice Controls.

a. General. High risk laboratory operations shall not be left unattended or conducted after normal duty hours without prior approval from EHS.

b. Signs and Labels.

(1) Entrances to laboratories and chemical storage rooms shall be clearly posted with the following information: principal investigators and alternate names and telephone numbers for both work and home. Personnel should avoid posting items on the door which may confuse or obscure important health or safety information.

(2) Locations of eyewash/safety showers, first aid kits, and fire extinguishers should be posted.

(3) Posting requirements for biological agents and radioactive materials are covered in other USUHS Instructions.

c. Handling Chemicals.

(1) Working quantities of hazardous chemicals outside of storage during an operation shall be as small as practical. Containers shall be closed when not in use.

(2) Care should be taken to minimize aerosol formation during complex manipulations. Electrostatic powders and other solid materials shall be handled in solution

whenever feasible. Glove boxes or glove bags inside a chemical hood may be required on a case-by-case basis.

(3) Mouth pipeting is prohibited. Do not use mouth suction for pipetting or starting a siphon.

d. Laboratory Glassware.

(1) Handling and storage procedures should be developed to minimize damage to glassware. Glassware should be inspected before each use. Damaged items shall be repaired or discarded in containers labeled "Glass Only."

(2) Glassware used for pressure or vacuum service shall be designed specifically for that purpose. Damaged or repaired glassware should not be used for pressure or vacuum operations. Pressure or vacuum operations shall be adequately shielded.

e. Chemical Hoods. The following work practices shall be used to ensure adequate hood performance:

(1) Work with the hood sash lowered to at least the point where the calibration check point marks a line. This will allow for the optimum air flow rates to best control contaminants. **Do not place your head inside the hood;**

(2) Keep all apparatus and containers at least 8 inches behind the face of the hood to minimize spillage from the hood;

(3) Keep the slot in front of the lower hood baffle free from obstructions. Elevate all necessary apparatus and equipment;

(4) Minimize the storage of chemicals or hazardous waste inside the hood. Use approved cabinet or satellite storage locations;

(5) Minimize pedestrian traffic past the open face of the hood. This may cause spillage of contaminants; and

(6) Keep laboratory doors closed during laboratory procedures involving hazardous chemicals.

f. Disaster Control/Emergency Response Information.

(1) Disaster Control/Emergency Response Information forms (USUHS Form 6057) shall be completed by all principal investigators or responsible official for all laboratory work spaces.

(2) Copies of completed Disaster Control/Emergency Response Information forms shall be provided to EHS within thirty days of beginning work in a new laboratory, when significant changes occur to laboratory procedures that invalidate previous information, or when requested by EHS.

7. Protective Clothing and Equipment.

a. Eye Protection. Eye protection shall meet the requirements of ANSI Standard Z87.1¹.

(1) Eye protection suitable for the operation being conducted shall be worn in all laboratories where hazardous chemicals are being handled. Safety glasses shall be considered the minimum eye protection to be used in the laboratory. Chemical goggles shall be worn during operations where a splash hazard exists or where corrosives are used.

(2) Face shields shall be worn when additional eye/face protection is necessary against splash or projectiles. Face shields shall be used in combination with approved eye protection.

(3) Contact lenses shall not be worn in the laboratory.

(4) Visitors shall comply with the above requirements.

b. Gloves. Gloves shall be worn to minimize potential skin contact with hazardous chemicals.

(1) Glove selection should be based on the potential and severity of liquid contamination as well as their suitability for the operation performed. For operations with the potential for prolonged or severe liquid contamination, selection shall

be based on the available permeation and degradation data for the specific chemical. Contact the CHO for guidance.

(2) Nonstandard butyl rubber gloves can be used for operations where the potential for liquid contamination is minimal. If a high degree of manual dexterity is required and the potential for liquid contamination is remote, disposable-surgical-latex gloves may be used.

(3) Insulated gloves shall be used to prevent contact with hot or cold surfaces. Asbestos-containing gloves shall not be used.

(4) The following glove discipline shall be followed:

(a) All gloves shall be visually inspected for cuts, tears, and degradation before each use. A leak test shall be performed (when and wherever appropriate) to identify pinholes. Damaged or leaking gloves shall not be used;

(b) Gloves, other than disposable type, shall be decontaminated as soon as practical after contamination during an operation. Disposable type gloves shall be removed without decontamination and disposed of appropriately; **reuse is prohibited**;

(c) Gloves shall not be removed from the working area of a hood once used unless they are to be disposed of; and

(d) Personnel should become proficient at doffing gloves to prevent cross contamination. Employees shall wash their hands with soap and water after gloves have been removed.

c. Clothing.

(1) Lab coats or smocks shall be worn over street clothes inside all laboratories where hazardous chemicals are handled or stored. These shall not be worn for extended periods of time in non-laboratory areas except when transporting hazardous waste. Personnel shall remove and launder or dispose of these garments once contamination has occurred.

(2) **Laboratory personnel shall wear closed-toe shoes.** The use of sandals is prohibited. Steel-toe or conductive shoes shall be worn when determined necessary by the principal investigator or EHS.

(3) Chemical protective clothing including aprons, boots, or one-piece suits shall be worn when there is a high risk of chemical contamination. Equipment shall be inspected for cuts, tears, and degradation before each use. Decontamination and doffing procedures shall be developed for individual protocols.

d. Respiratory Protection. Selection and use of respirators shall be in accordance with USUHS

Instruction 6401^m. Military masks shall not be used to provide protection against non-surety chemicals unless they have been tested and found effective. For these cases, the military mask may be used for escape purposes only.

e. Eyewash/Safety Showers. Design and installation of new equipment shall comply with ANSI Standard Z358.1ⁿ.

(1) For new construction, an eyewash and safety shower shall be installed in each laboratory where hazardous chemicals are handled or stored. The adequacy of equipment in existing laboratories shall be determined by EHS.

(2) Equipment shall be inspected by the user periodically to determine if it is functional. Eyewashes shall be inspected by laboratory workers at least monthly. Safety showers shall be inspected at least annually by EHS.

(3) Signs should be used to post the location of each eyewash and safety shower in the laboratory.

(4) Equipment shall be accessible at all times. Personnel shall not store equipment, apparatus, or containers in front of an eyewash or safety shower.

8. Air Monitoring.

a. Air monitoring shall be conducted by EHS when there is a

reasonable probability that employee exposure exceeds the action level for a chemical (see 29 CFR 1910.1450^o).

b. If the initial determination indicates employees are exposed above the action level, or in its absence one-half of the PEL for an OSHA-regulated substance, periodic monitoring shall be conducted in accordance with respected references and the best available guidance.

c. The requirement for periodic air monitoring may be terminated when conditions are found to be safe and below levels which require periodic monitoring in accordance with the particular standard.

9. Information and Training.

a. Laboratory personnel shall be provided with information and training to ensure they are apprised of chemical hazards in the laboratory. At a minimum, the following health and safety information shall be provided (see 29 CFR 1910.1450^o):

- (1) Contents of the OSHA Laboratory Standard and its appendices;
- (2) Location and availability of this CHP;
- (3) PELs for OSHA-regulated substances;
- (4) Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory;

(5) Location and availability of reference material including MSDSs;

(6) Details of this CHP;

(7) Methods and observations that may be used to detect the presence of hazardous chemicals;

(8) Physical and health hazards of chemicals used in the laboratory; and

(9) Measures personnel can take to protect themselves from these hazards including use of engineering controls, work practices, and personal protective equipment.

b. Experimental Agents. Health hazard information for experimental agents developed at USUHS shall be made available to personnel.

c. Hazardous Waste. Personnel handling hazardous wastes shall be trained in the environmental requirements for its management. At a minimum, training shall include the following:

(1) Resource Conservation and Recovery Act (RCRA) including authority, regulatory framework, and general requirements; and

(2) Site-specific information including facility operation, emergency equipment and procedures, inspection procedures, hazardous material pollution prevention, waste minimization, chemical reissue program, and hazardous waste turn-in procedures.

10. Hazard Communication. The hazard communication program shall be conducted in accordance with the USUHS Hazard Communication Program and DoD Instruction 6050.5^P. Some basic information on the University's Hazard Communication program is outlined here.

a. New employees receive an initial briefing on the University's Hazard Communication program during their initial Safety orientation class provided by EHS.

b. A copy of the Hazard Communication Rule is available for review at EHS in Room A2020.

c. EHS is the office of primary responsibility for maintaining MSDSs and these are available for review at any time by contacting EHS at 295-3305/3323.

d. An inventory of hazardous chemicals for work areas are available from the responsible PI or from EHS in Room G040.

e. Labels must be maintained on all containers.

f. A refresher briefing on hazard communication is presented by EHS to those employees available in the work place at the time of the annual health and safety survey.

11. Personal Hygiene.

a. Food, drink, smoking materials, or cosmetics shall not be carried into or stored in the laboratory.

Personnel shall not eat, drink, smoke, chew gum, or apply cosmetics in the laboratory.

b. Personnel shall wash their hands after handling hazardous chemicals. Personnel shall shower after abnormal circumstances which result in chemical contamination to the neck, arms, legs, or body.

c. Personnel shall restrain long hair and loose clothing to minimize the risk of chemical contamination.

d. **Mouth pipeting is prohibited.**

12. First Aid.

a. Laboratory personnel and supervisors should report all laboratory injuries and illnesses to EHS. The patient shall be seen by a qualified medical physician for treatment and the incident documented.

b. For severe injury or illness dial 777, report the injury and location of the emergency, and await ambulance transportation. Render the appropriate first aid while awaiting transport. If only minor first aid is required, and there is no chemical contamination, personnel may be transported to a medical emergency room in a private vehicle.

c. The following general first aid procedures should be followed in the event of chemical contamination or acute exposure.

(1) Eye contact. Immediately flush eyes with water for at least 15 minutes. Hold eyelids apart to ensure adequate irrigation. Seek prompt medical attention.

(2) Skin contact. Immediately flush the affected area with water and remove contaminated clothing. Wash the area with hand soap or mild detergent to remove any residual contamination. Seek prompt medical attention.

(3) Ingestion. Drink large amounts of water to dilute the chemical. Seek prompt medical attention.

(4) Inhalation. Move employee away from toxic atmosphere and expose to fresh air. Begin artificial respiration if breathing has stopped. Use CPR if the heart has stopped.

13. Medical Surveillance.

a. Medical examinations and consultation shall be performed by or under the direct supervision of a licensed physician.

b. Preplacement, preassignment, and periodic job-related medical surveillance shall be provided to all military and civilian employees potentially exposed to hazardous chemicals as required by USUHS Instruction 6002¹.

c. Additional medical attention shall be provided to employees under the following circumstances:

(1) When an employee develops signs or symptoms associated with occupational exposure to a hazardous chemical; or

(2) When air sampling reveals exposure levels above the action level, or in its absence the PEL for an OSHA regulated substance. Medical surveillance shall comply with the requirements of that particular standard.

d. Medical consultation shall be provided whenever an abnormal event such as a spill, leak, or explosion takes place in the laboratory. Its purpose shall be to determine whether subsequent medical examination is necessary.

e. For medical examinations and consultation required under paragraph c, the examining physician shall provide a written opinion which includes the following:

(1) Any recommendations for further medical follow-up;

(2) Results of the medical examination and diagnostic tests;

(3) Any medical condition which may be revealed in the course of the examination that places the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

(4) A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination.

f. Pregnancy Surveillance. The pregnancy surveillance program shall meet the requirements found in USUHS Instruction 6401^m and EHS SOP 24-051, "Pregnant Worker's Workplace Evaluation."

(1) Female employees of child-bearing age shall be informed about reproductive hazards in the laboratory. The pregnant employee and her unborn child shall not be endangered by the work assignment.

(2) Pregnant employees are strongly encouraged to notify their principal investigator and EHS as soon as the pregnancy is known. The principal investigator shall notify EHS of pregnancies among their staff and report any known or suspected hazards to the pregnancy.

(3) EHS will, when notified of a pregnancy, conduct a pregnancy evaluation to assess hazards to the pregnancy.

14. Chemical Waste Disposal.

a. Laboratory wastes shall be handled and disposed of in accordance with applicable federal^q, state^r, and local environmental regulations

and policies. Information on USUHS waste disposal is available in the USUHS Waste Disposal Guide^s.

b. All chemicals in the laboratory shall be labeled properly to ensure their identities are retained from initial receipts. When chemicals are combined and become part of a laboratory waste mixture, a record of all chemicals in the mixture shall be maintained.

c. Personnel shall minimize the generation of hazardous waste whenever feasible. Common methods of waste minimization include substitution of less hazardous chemicals, process changes, purchasing only necessary quantities, recycling, or reuse.

d. Containers holding hazardous waste shall be labelled with a USUHS Form No. 6301, "Hazardous Waste Disposal Label," and listed on an, "Internal Hazardous Waste Disposal Manifest," form, NNMC Form No. 6280.

e. Disposal procedures for hazardous waste are established by EHS. Researchers are encouraged to consult EHS to establish disposal procedures.

f. Non-hazardous chemical waste shall be disposed of in accordance with the USUHS Waste Disposal Guide^s.

15. Chemical Spills.

a. General.

(1) The spill of any quantity of a hazardous chemical which results in a release to the environment (i.e., air, land, or water) or exposure to personnel shall be immediately reported to EHS (295-3305). Laboratory personnel may take action to stop or contain a spill if it can be done without endangering themselves or other personnel. When a spill causes a health hazard, all potentially affected laboratories shall be evacuated immediately.

(2) Personnel shall use appropriate protective equipment and clothing to minimize chemical exposure during spill clean-up. Specific requirements shall be available through EHS.

(3) Laboratories shall have supplies and equipment to handle small spills. These include absorbents, neutralizers, mops, buckets, dust pans, paper towels, sponges, and waste containers.

(4) Spill trays shall be used for all complex operations where there is a reasonable probability that a spill could occur.

(5) Laboratory spills shall be reported to the EHS (295-3305). All waste shall be handled in accordance with the USUHS Waste Disposal Guide^h.

b. Liquid Spills.

(1) Spills should be confined using trays, absorbents, or paper towels whenever feasible.

(2) Neutralize inorganic acids with an appropriate chemical or use an absorbent mixture (i.e., soda ash or diatomaceous earth). Other liquids should be absorbed with a nonreactive material, such as sand or vermiculite, and placed in suitable containers.

(3) Flammable liquids. Turn off or remove all ignition or heat sources. Continuously ventilate the area. Absorb the liquid with a non-reactive material and place in a suitable container.

c. Solid Spills. Low toxicity materials should be swept into a dust pan and placed in a suitable container. Wet methods or HEPA filtered vacuum shall be used to clean up toxic chemicals; **dry sweeping is prohibited.**

16. Emergencies.

a. Disaster Control/Emergency Response Information. It is the responsibility of the principal investigator, or other workplace supervisor, to complete a Disaster Control/Emergency Response (DC/ER) Information Form (USUHS Form No. 6057) for each of their work spaces where chemicals are

used or stored. Copies of these forms should be provided to EHS and maintained in the main Security office.

b. Each principal investigator will write an emergency plan for each laboratory under his/her control and maintain copies in USUHS Instruction 6053-M^t for that laboratory. The emergency plan will include, but not be limited to, the following elements:

(1) Emergency Alarm System. Laboratories should have a system available to alert personnel in the event of an emergency that may require evacuation. Personnel shall be familiar with the location and operation of the alarm system;

(2) Evacuation Procedures. Primary and alternate routes shall be established as necessary, and communicated to personnel. Outside assembly areas shall be designated;

(3) Shutdown Procedures. Instructions should be prepared for shutting down equipment or apparatus in the event of an emergency;

(4) Return Procedures. Procedures shall be developed to ensure personnel do not re-enter the laboratory before the emergency is over; and

(5) Drills. Drills incorporating all elements of the emergency plan should be conducted

periodically to test the emergency plan.

c. Fires.

(1) Laboratory personnel shall not attempt to extinguish large fires. The following steps should be taken:

(a) Confine the fire by closing the hood sash or laboratory doors and fire doors as appropriate;

(b) Immediately evacuate the fire area and dial 777 to contact the Base Fire Department; and

(c) Implement the Laboratory Emergency Plan.

(2) If feasible, small fires at the initial stage may be extinguished by designated laboratory personnel trained in the use of portable fire extinguishers. At least two personnel shall be available when the fire is extinguished. The following steps should be taken:

(a) Alert other personnel and have them dial 777 to notify the fire department;

(b) Extinguish the fire directing the discharge at the base of the flames; and

(c) If the fire cannot be controlled, evacuate the area and implement the guidance in paragraph (b) above.

d. Ventilation Failure.

(1) Operations shall be terminated in a safe manner in the event of a low flow condition or

complete ventilation failure.

Personnel shall:

(a) Close the hand valve on all compressed gas cylinders;

(b) Turn off laboratory air, vacuum, and propane gas systems to equipment and apparatus;

(c) Close containers of volatile chemicals;

(d) Close the chemical hood sash;

(e) Evacuate the laboratory room; and

(f) Report the incident to EHS (295-3305).

(2) Personnel shall not re-enter the laboratory until ventilation has been restored for at least 30 minutes or until directed to do so by EHS.

(3) In cases where the operation could not be terminated and there is a reasonable probability that the laboratory atmosphere is unsafe, air monitoring may be necessary before re-entry. The CHO shall be contacted for guidance (295-3305).

17. Housekeeping.

a. Laboratories shall be kept clean and free from obstructions. Personnel shall clean up work areas at the end of each day's operations. Chemical spills shall be cleaned up immediately to minimize contamination.

b. Hazardous waste shall be stored in appropriately marked closed containers and turned-in to EHS for disposal. Non-hazardous solid and liquid waste shall be stored in appropriate receptacles or containers.

c. Equipment, apparatus, and chemical inventories shall be properly stored. Excess equipment and chemicals shall be turned in to minimize clutter in the laboratory.

d. Floors shall be cleaned routinely to minimize resuspension of dust and toxic contaminants. Wet methods or HEPA filtered vacuum shall be used for the clean up of toxic chemicals.

e. Stairways and halls shall not be used as storage areas. Access to exits and emergency equipment shall not be blocked.

18. Special Procedures for Handling Acutely Toxic Compounds, Carcinogens or Reproductive Toxins.

a. General. In addition to the hygiene practices covered in the previous paragraphs, the following special procedures are to be used for laboratory operations involving acutely toxic compounds, carcinogens, or reproductive toxins. Information on chemical carcinogens is available through EHS.

b. Storage and Distribution.

(1) Acutely toxic compounds, carcinogens, and reproductive toxins should be segregated from other chemicals and stored in a well ventilated area. When available, ventilated cabinets shall be used for storage.

(2) Cabinets shall be posted, "DANGER - CHEMICAL CARCINOGEN," "CAUTION - CANCER SUSPECT AGENT," or "CAUTION - TOXIC AGENTS," as appropriate.

(3) Storage of unopened containers presents no special hazard. Once opened, containers of volatile chemicals shall be closed and sealed with parafilm or tape, or overpacked in an unbreakable, sealed container.

(4) Acutely toxic compressed gases shall be stored in a chemical hood or gas cabinet. Time outside of storage shall be kept to the minimum required to do the work. EHS has storage available for acutely toxic compressed gases.

(5) Acutely toxic compounds, carcinogens, or reproductive toxins shall be placed in an unbreakable secondary container prior to transport through the laboratory. The secondary container should contain absorbent material to cushion the primary container and absorb the contents in the event of a spill. Secondary containers shall be appropriately labelled.

c. Engineering Controls.

(1) Laboratory operations which involve acutely toxic compounds, carcinogens, or reproductive toxins shall be planned and conducted using appropriate engineering controls. High risk operations shall be conducted inside primary containment including chemical hoods, glove boxes, or inhalation chambers. Low risk operations, where the potential for generation of gas, vapor, dust or aerosol contamination is remote, may be conducted on the open bench.

(2) Effluent from test equipment or apparatus shall be filtered or scrubbed before discharge into primary containment. House vacuums shall be provided with in-line filters or traps to prevent contamination. Vacuum pumps shall be vented into a chemical hood or local ventilation system.

(3) Analytical instrumentation which generates vapor or aerosol contamination shall be vented into a hood or operated using local exhaust ventilation to capture air contaminants.

d. Administrative and Work Practice Controls.

(1) Two Man Rule. High risk operations may require application of the two man rule. Requirements shall be determined by the CHO on a case-by-case basis.

(2) Designated Area.

(a) Laboratory operations shall be conducted in a "designated area" where access to unauthorized personnel is restricted. The area may be the entire room, an area within the room, or the primary containment. Doors leading to the designated area shall remain closed at all times.

(b) Each designated area shall be posted, "DANGER - CHEMICAL CARCINOGEN," "CAUTION - CANCER SUSPECT AGENT," or "CAUTION - TOXIC AGENTS-AUTHORIZED PERSONNEL ONLY," as appropriate.

(3) Working Surfaces.

Working surfaces shall be non-porous and covered with absorbent, plastic-backed paper. Spill trays should be used when complex manipulations are conducted.

e. Decontamination.

Contaminated equipment, apparatus, and glassware shall be decontaminated before removal from the designated area. Working surfaces shall be decontaminated prior to beginning new operations. Acetone, methanol, or water are recommended for solvent washing when chemical decontamination is not feasible.

f. Chemical Spills. Wet methods or HEPA filtered vacuum shall be used. **Dry sweeping shall**

be prohibited. To clean up spills of acutely toxic compounds, carcinogens, or reproductive toxins, personnel shall use appropriate protective clothing and equipment to minimize exposure.

g. Waste Disposal. Acutely toxic compounds, chemical carcinogens or reproductive toxins shall be chemically decontaminated prior to disposal whenever feasible. Specific decontamination procedures shall be provided in the protocol. Decontamination and solvent wash solutions shall be disposed of in accordance with EHS guidance.

h. Animal Work.

(1) Administration of acutely toxic compounds, carcinogens, or reproductive toxins to animals shall be by injection or oral gavage instead of dietary whenever feasible. If dietary administration must be used, cages should be maintained under negative pressure. The diet shall be mixed in a chemical hood or under local ventilation.

(2) Work practice controls, including wet cleaning methods and HEPA filtered vacuums, shall be used to minimize the generation of contaminated aerosols, including those from food, urine, and feces.

(3) Laboratory coats or smocks and gloves shall be worn in all animal handling areas. Additional requirements, including

head and shoe coverings or respiratory protection, shall be determined by the CHO on a case-by-case basis.

19. General Laboratory Safety.

Laboratory equipment and apparatus shall be used in accordance with the USUHS Instruction 6053-M^t. The Director, EHS shall perform an equipment hazard analysis on all equipment developed in-house.

REFERENCES

- (a) USUHS Instruction 6407, "Implementation of the USUHS Chemical Hygiene Plan"
- (b) Title 29 Code of Federal Regulations, Part 1910.1000 Subpart Z (Toxic and Hazardous Substances)
- (c) "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," American Conference of Governmental Industrial Hygienist (ACGIH), most current edition
- (d) USUHS Instruction 3200, "USUHS-Sponsored Research and Clinical Investigation: Submission, Review, and Funding," dated July 5, 1988
- (e) DoD Instruction 6050.5-LR, "Hazardous Materials Information System Hazardous Item Listing," dated November 1993
- (f) "Dangerous Properties of Industrial Materials," Seventh Edition, N.I. Sax and R.J. Lewis, Sr., Van Nostrand Reinhold, 1989
- (g) Title 29, Code of Federal Regulations, Part 1910.1200, "Hazard Communication," dated August 24, 1987
- (h) NFPA Standard 30 (National Fire Protection Association - Flammable and Combustible Liquids Code)
- (i) NFPA Standard 45 (Standard on Fire Protection for Laboratories using Chemicals)
- (j) USUHS Instruction 6002, "USUHS Occupational Safety and Health Program," dated September 10, 1990
- (k) ACGIH Industrial Ventilation - A Manual of Recommended Practice

Enclosure 2
Attachment 1

- (l) ANSI Standard Z87.1 (Practice for Occupational and Educational Eye and Face Protection)
- (m) USUHS Instruction 6401, "Biohazards, and Dangerous Materials Guide," dated May 15, 1987
- (n) ANSI Standard Z358.1 (Emergency Eyewash and Shower Equipment)
- (o) Title 29, Code of Federal Regulations, Part 1910.1450, "Occupational Exposures to Hazardous Chemicals in Laboratories; Final Rule," dated January 31, 1990
- (p) DoD Instruction 6050.5, "DoD Hazard Communication Program," dated October 29, 1990
- (q) Title 40, Code of Federal Regulations, Parts 260-265, "Hazardous Waste Managements Regulations"
- (r) Title 26, Code of Maryland Regulations (COMAR), subtitle 13, "Disposal and Control of Hazardous Substances"
- (s) USUHS Waste Disposal Guide, dated May 1990
- (t) USUHS 6053-M, "USUHS Safety Manual," dated March 15, 1988

EXPLANATION OF TERMS

Acutely toxic. A chemical falling within any of the following toxicity categories: (i) a median lethal dose (LD50) of 50 mg/kg of body weight or less when administered orally to rats; (ii) an LD50 of 200 mg/kg of body weight or less when administered to the skin of rabbits; or (iii) a median lethal concentration (LC50) in air of 200 ppm or less of gas or vapor, or 2 mg/liter or less of mist, fume, or dust when administered by inhalation to rats.

Action level. A concentration designated in Title 29 CFR Part 1910 for a regulated substance which initiates certain required activities such as exposure monitoring and medical surveillance. Also 1/2 of the PEL or TLV for a chemical, whichever is more stringent.

Carcinogen. A neat chemical or mixture which contains at least 0.1 percent of a chemical which meets one of the following criteria: (i) it is regulated by OSHA as a carcinogen; (ii) it is a human carcinogen listed under the category "known to be carcinogens," in the Annual Report on Carcinogens published by the

National Toxicology Program (NTP), latest edition; (iii) it is listed under Group I, "carcinogenic to humans" by the International Agency for Research on Cancer (IARC), latest edition; (iv) it is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP; (v) it is a military- unique compound classified as a carcinogen by USAEHA or OTSG; or (vi) it causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(a) After inhalation exposure of 6-7 hours per day, 5 days per week for a significant portion of a lifetime to doses less than 10 mg/cubic meter;

(b) After repeated skin application of less than 300 mg/kg of body weight per week; or

(c) After oral doses of less than 50 mg/kg of body weight per day.

Chemical Hygiene Officer (CHO). The Chief, Bioenvironmental Engineering is designated as the CHO. The NCOIC, Bioenvironmental Engineering will function as the CHO in the event the Chief is

not available. The Director, EHS has final authority to act in place of the CHO in the event that neither the Chief nor the NCOIC are available.

Chemical Hygiene Plan (CHP). A written program developed and implemented by USUHS/EHS which sets forth policy and procedures capable of protecting employees from the health hazards associated with their work place.

Combustible liquid. Any liquid having a flash point at or above 100 degrees Fahrenheit (F), but below 200 degrees F, except any mixture having components with flash points of 200 degrees F or higher, the total volume of which makes up 99 percent or more of the mixture.

Compressed gas. A gas or mixture of gases having an absolute pressure exceeding 40 psi at 70 degrees F, or a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 degrees F regardless of the pressure at 70 degrees F.

Designated area. An area which may be used for work involving carcinogens, reproductive toxins or acutely toxic chemicals. A designated area may be the entire

laboratory, a controlled area within the laboratory, or engineering controls such as a chemical hood or glove box.

Emergency. Any occurrence such as, but not limited to, equipment failure, container rupture or engineering control failure, which results in the release of a hazardous chemical into the work place.

Employee. An individual employed in a laboratory who may be exposed to hazardous chemicals in the course of his/her employment.

Explosive. A chemical that causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure or high temperature.

Flammable aerosol. An aerosol that, when tested by the method described in Title 16, CFR Part 1500.45, yields flame projection exceeding 18 inches at full valve opening, or a flashback at any degree of valve opening.

Flammable gas. A gas that, at ambient temperature and pressure forms a flammable mixture with air at a concentration of 13 percent by volume or less, or a gas that at ambient temperature and pressure

forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

Flammable liquid. A liquid having a flash point below 100 degrees F, except any mixture having components with flash points of 100 degrees F or higher, the total of which make up 99 percent or more of the total volume of the mixture. Also known as a Class I liquid. These are further divided into (i) Class 1A which includes liquids having flash points below 73 degrees F and boiling points below 100 degrees F; (ii) Class 1B which includes liquids having flash points below 73 degrees F and boiling points at or above 100 degrees F; and (iii) Class 1C which includes liquids having flash points at or above 73 degrees F but below 100 degrees F.

Flash point. The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested using the Tagliabue Closed Tester, the Pensky-Martens Closed Tester or the Setaflash Closed Tester.

Hazardous chemical. A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in an exposed employee. This includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxin, nephrotoxins, neurotoxins, agents which act on the hematopoietic (blood-forming) systems, and agents which can damage the lungs, skin, eyes, or mucous membranes. Hazardous chemicals can further be identified and defined by EHS for the purpose of monitoring and controlling chemicals at the USUHS.

High Risk Operations. Experimental procedures involving the manipulation, handling, or reaction of hazardous chemicals where the potential for release of gas, vapor or aerosol contamination is high. This category includes, but is not limited, to (i) rapid exothermic reactions; (ii) transfer of electrostatic powders; (iii) heating, mixing or transfer of volatile chemicals; (iv) pressurized operations where there is potential for uncontrolled release; and (v) work involving aerosol generation.

Enclosure 2
Attachment 2

Laboratory. A facility or individual room where the "laboratory use" of hazardous chemicals occurs.

Laboratory hood. A type of engineering control enclosed on five sides with a movable sash or fixed partial enclosure on the remaining side designed to draw air from the laboratory into the enclosure to prevent or minimize the escape of contaminants into the laboratory space.

Laboratory scale. Work with substances in which the equipment used for reactions, transfers, and other handling are designed to be easily and safely manipulated by one person.

Laboratory use. The handling or use of chemicals in which: (i) chemical manipulations are done on a "laboratory scale," (ii) multiple procedures or chemicals are used, (iii) procedures are not part of a production process, and (iv) "protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Low Risk Operations. Experimental procedures where the potential for

release of gas, vapor or aerosol contamination is remote.

Medical consultation. A consultation which takes place between an employee and a licensed physician for the purposes of determining what medical exams or procedures are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Oxidizer. A chemical other than a blasting agent or explosive as defined in Title 29 CFR, Part 1910.109 (a), that initiates or promotes combustion in other material, thereby causing fire either by itself or through the release of oxygen or other gases.

Permissible Exposure Limit. An occupational standard promulgated by OSHA as regulatory requirement. The PEL can be an 8-hour time weighted average (TWA), a ceiling value or a 15 minute short term exposure limit (STEL).

Protective laboratory practices and equipment. Those laboratory procedures, engineering/administrative controls, work practices and protective clothing and equipment used to minimize employee exposure to hazardous chemicals.

Enclosure 2
Attachment 2

Reproductive toxin. A chemical which affects the reproductive system and may produce chromosomal damage (mutations) and/or adverse effects on the fetus (teratogenesis). For the purposes of this guidance any chemical with a mutagenic or teratogenic quotation in the Registry of Toxic Effects of Chemical Substances (RTECS) shall be considered a reproductive hazard.

Threshold Limit Value. Airborne concentrations of substances published by the ACGIH to which it is believed workers may be exposed day after day with no adverse effect. The TLVs are advisory in nature, however, USUHS policy uses the TLV as regulatory policy when they are more stringent than the PEL for a specific chemical.

Toxic chemical. A chemical falling within any of the following toxicity categories: (i) an LD50 of more than 50 mg/kg but not more than 500 mg/kg of body weight when administered orally to rats, (ii) an LD50 of more than 200 mg/kg but not more than 1000 mg/kg of body weight when administered to the skin of rabbits, (iii) an LC50 in air of more than 200 ppm but not more than 2000 ppm of gas or vapor, or more than 2 mg/liter but not more than 20 mg/liter of mist, fume or dust when administered by inhalation to rats.

CHEMICAL HYGIENE TRAINING GUIDE

RECORD OF LABORATORY WORKER CHEMICAL HYGIENE TRAINING

Principal investigators (PIs)/supervisors are required by Federal law and USUHS policy to provide employees with information and training to ensure they are apprised of chemical hazards present in their work area. This guide is intended to help PIs/supervisors meet training requirements and is designed to fulfill OSHA documentation requirements. Chemical hygiene training is necessary at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new potential exposure to hazardous chemicals. In addition, annual refresher training of employees is also required.

Note: There are other methods to satisfy the OSHA training requirements. EHS has purchased and has on line a computer program that allows personnel to receive training on an individual basis at any time, Monday through Friday 7:30 am to 4:00 pm, in room A2020.

EHS also have training videos that may be signed out at any time, so PIs/supervisors may conduct training themselves. Finally EHS offers Occupational Safety and Health Classes (HAZCOM & Lab standard) four times throughout the year for any and all USUHS personnel to attend.

INSTRUCTIONS: All items listed in this guide should be reviewed with employees. Additional specific information should be included as appropriate. A copy of the completed signature page is to be sent to EHS after training is complete. Retain original for your record of training.

1. General Principles for Work with Laboratory Chemicals
 - a. Minimize all chemical exposures. Avoid unnecessary contact and exposure.
 - b. Avoid underestimation of risk. Assume mixtures are more toxic than any single component.

c. Prevent escape of chemicals and, if opened or in use, provide adequate ventilation.

d. Follow standard practices for use of hazardous chemicals. (Refer to USUHS Form No. 6007, "Bio-hazards, Controlled Substances, and Dangerous Materials," and if applicable, in-lab Standard Operating Procedures)

e. Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs) are exposures limits designed to protect employee health.

2. Chemical Hygiene Responsibilities

a. President, USUHS shall be ultimately responsible for implementation of the CHP and enforcing hazard control procedures for the USUHS.

b. Dean, School of Medicine/ Executive Vice President shall provide oversight of the CHP on behalf of the President.

c. Chair, Biohazards, Controlled Substances, and Dangerous Materials Committee shall primarily be responsible for chemical hygiene policy within the USUHS and approval authority over hazardous materials used in research protocols.

d. Department Chairs shall be responsible for chemical hygiene within the department.

e. CHO (Chief, Bioenvironmental Engineering Division, Environmental Health and Occupational Safety) shall be responsible for developing chemical hygiene policy and monitoring use, procurement, and disposal of chemicals. Provides consultation on chemical hygiene issues.

f. PIs shall be responsible for chemical hygiene within the laboratory. They shall establish safe procedures, train employees, provide protective equipment, enforce safe practices, and document training. Provide information pertaining to hazardous chemicals in research protocols. Perform regular inspections for chemical hygiene, housekeeping, and operation of emergency equipment.

g. Operations, Activity, Service, or Laboratory Director shall, when a PI is not the primary responsible person for a space or procedure involving hazardous chemicals, have the same responsibilities as a PI.

h. Laboratory Workers shall have responsibility for planning and conducting operations in accordance with the USUHS CHP and other established procedures. They shall practice good personal hygiene and report incidents and unsafe conditions.

3. Laboratory Facilities and Equipment

a. Hazardous chemicals will only be used and stored in appropriate facilities and equipment.

b. Discontinue use of hazardous chemicals immediately upon malfunction of an engineering control and take corrective measures (report to EHS).

c. Laboratory Chemical Fume Hoods (Hoods)

(1) Laboratory personnel must know the differences between chemical fume hoods and biological safety cabinets (BSCs). The BSC should not be used with flammable or toxic chemicals.

(2) Verify hood operation prior to use. Report immediately any malfunctions to EHS.

(3) Check alarm conditions (if any) for the device.

(4) Hoods should not be used in lieu of proper storage areas.

d. Conditions requiring special ventilation (scavenging waste gases, storage areas, unique procedures or chemicals, etc.) should be carefully evaluated and appropriate safeguards established.

e. Laboratory personnel must know limitations of ventilation systems and flammable storage in refrigerators, cold rooms, and warm rooms.

f. If modifications to engineering controls or procedures are needed, notify EHS for reevaluation.

4. CHP

a. USUHS Instruction 6407-M, "USUHS Chemical Hygiene Plan (CHP)"

(1) All laboratory personnel must know the location of CHP within the department or laboratory.

(2) All laboratory personnel must know their rights to access the CHP and be informed of the hazards of the workplace.

(3) Hazardous chemicals, as defined in the CHP, must be approved as part of a research protocol and listed on a USUHS Form 6007, "Biohazards, Controlled Substances, and Dangerous Materials."

b. Procurement, Transport, and Storage of chemicals

(1) The PI must know proper handling, storage, and disposal procedures for chemicals before purchasing and should train his/her employees properly prior to their use.

(2) Limit ordering and purchasing of chemicals to only the quantity needed.

(3) First-time procurement of selected hazardous chemicals may

require prior approval from the CHO.

(4) Consider methods of reducing the quantity of chemicals needed (i.e., sharing chemicals).

(5) Consider requirements for storage, use, hazard control, transport, and disposal of chemicals.

(6) Transport chemicals in external containers (i.e., bucket) and on carts with side rails. Only use freight elevators.

(7) Store chemicals according to reactivity. Limit amounts kept in the laboratory. Storage on open bench tops and in hoods should be limited. Chemicals should not be stored directly on the floor or above shoulder height.

(8) Maintain chemical inventories and routinely update them. Unneeded items should be turned-in to EHS for disposal or reissue.

(9) EHS maintains a list of excess chemicals available at no cost for reissue.

c. Environmental Monitoring

(1) Engineering and work practice controls and procedures can usually control exposures to laboratory chemicals below levels that require extensive environmental monitoring. If warranted, or if

conditions change, additional environmental monitoring may be necessary.

(2) The Bioenvironmental Engineering Division, EHS conducts Annual Health and Safety Surveys of each laboratory. During these evaluations chemical hygiene, to include chemical exposures, are assessed. Copies of Annual Health and Safety Surveys are forwarded to the department chair and are available for review either through the department or EHS (room G040).

(3) Changes in work practices may alter chemical exposures and cause reason for another chemical exposure evaluation. An evaluation should be requested from EHS any time such change occurs.

(4) Laboratory workers suspecting a chemical over-exposure should report the incident to EHS.

(5) Records of environmental monitoring and personnel exposure monitoring results are maintained in casefiles kept by the Bioenvironmental Engineering Division located in Room G040. Individuals can review their personal exposure and workplace environmental monitoring records by contacting EHS.

d. Chemical Hazards

(1) Hazardous chemicals, as defined by Attachment 2 of the CHP, and as determined by EHS will be included as part of the laboratory's chemical inventories.

(2) Attachment 2 of the CHP, the USUHS Waste Disposal Guide^s, and USUHS 6053-M^t define and list the available permissible exposure limits (PEL), and/or threshold limit values (TLV) for chemicals.

(3) Laboratory workers must be informed of the PEL, TLV, toxic effects, exposure symptoms, and disposal procedures for all hazardous chemicals in use in the laboratory.

(4) Physical hazards of chemicals (i.e., explosive, shock sensitive, flammability, reactivity, etc.) must be explained.

(5) Sources of chemical hazard information are:

(a) MSDSs available through EHS (G040) or directly from the manufacturer. In addition, EHS has subscribed to a network version CD-ROM MSDS database for University users. This database is available through the LRC network;

(b) Additional reference material is listed in Attachment 1 of the USUHS CHP; and

(c) Upon request, EHS can assist in locating or explaining chemical hazard information.

e. Protective Measures

Those specific measures employees can take to protect themselves from hazardous chemicals, including: work practices, engineering controls, emergency procedures, and personal protective equipment.

(1) Laboratory procedures involving hazardous chemicals.

(2) Engineering controls necessary for use with hazardous chemicals.

(3) Personal protective equipment availability and requirements for use with hazardous chemicals (goggles, face shields, lab coats, aprons, gloves, respirators, etc.).

(4) Proper use and care of protective equipment.

(5) Location and use of safety shower.

(6) Location and use of eyewash.

(7) Location and use of fire extinguisher.

(8) Location and use of fire alarm, evacuation route, and assembly point.

(9) Location of telephone, emergency numbers, and emergency reporting procedures.

(10) Other safety items as determined by the PI.

f. Medical Surveillance

(1) Laboratory workers requiring medical surveillance will be identified by the PI and have examinations coordinated by EHS (USUHS Instruction 6002^j).

(2) Report all work-related injuries or illnesses to EHS.

(3) Medical emergencies are to be treated immediately and, if appropriate, an ambulance can be requested by dialing 777.

(4) The PI shall know medical surveillance requirements for the laboratory, protocol, or procedure.

g. Signs, Labeling, Restricted Areas, and Other Safety Items

(1) Emergency telephone numbers for fire, medical, and chemical emergency.

(2) Laboratory entrance door posting with the name and emergency telephone number of the PI and an alternate point of contact for the laboratory. Avoid posting of

items on the door which may confuse or obscure important safety information.

(3) Label containers with the name of contents (including daily stock and waste containers).

(4) Special procedures for handling acutely toxic compounds, carcinogens, and reproductive toxins.

(a) Store separately in specially labeled cabinet. Reseal and overpack containers once opened.

(b) Follow mandatory requirements for use of engineering controls and the two man rule for high risk operations.

(c) Work must be performed in designated areas with restricted access, doors closed, and the area specially posted.

(d) Procedures for decontamination, chemical spills, and waste disposal will be especially strict, documented, and approved by EHS.

(5) All employees should know the location of emergency equipment, first aid supplies, and emergency exits.

(6) Follow appropriate procedures for the use of food storage and preparation equipment (food/lab usage of refrigerators and microwave ovens).

(7) Policy of no food, drink, smoking, or application of cosmetics in laboratories should be strictly followed.

(8) Mouth suction for pipetting or starting a siphon is prohibited.

(9) All hazardous operations, determined by the PI, are to be performed during a time when at least two personnel are present at the laboratory. The PI should inform and remind employees on the policy of working alone in the laboratory.

h. Spills and Accidents

(1) In the event of a chemical spill, release, or other accident, follow spill and accident procedures (USUHS 6053-M^t, Section VIII. E. Hazardous Material Spills).

(2) Know evacuation procedures and assembly area.

(3) Know and follow spill control practices, prevention, containment, cleanup, and reporting procedures.

i. Waste Disposal

Laboratory personnel shall be informed and trained on waste disposal procedures. They must understand:

(1) How waste is collected, segregated, labeled, stored, treated,

manifested, and turn-in procedures (USUHS Waste Disposal Guide^s);

(2) Legal liability for improper waste management;

(3) USUHS chemical reissue program for unopened excess chemicals;

(4) Frequency of waste disposal; and

(5) Waste disposal assistance available through EHS.

j. USUHS Hazardous Material Pollution Prevention Policies

(1) Consider environmental impact of chemicals and possibilities for substituting less hazardous chemicals.

(2) Order and stock quantities of chemicals so as to avoid storage, disposal, and expiration problems.

(3) Consider opportunities for sharing little-used reagents and other chemicals with other researchers.

k. Consultation Services: EHS is available for consultation on safety, fire protection, chemical hygiene, radiation protection, occupational medicine, and waste management issues.

5. Attached is a suggested format for training employees on specific chemicals.

6. Certification of Training. We the undersigned, certify that chemical hygiene training was accomplished in accordance with USUHS policies and procedures (Sign and Send Copy to EHS).

Signature of Worker

Signature of Principal Investigator

Printed Name of Worker

Printed Name of Principal Investigator

Date: _____

SUGGESTED HAZARDOUS CHEMICAL TRAINING FORMAT

CHEMICAL NAME:

SYNONYMS:

PERMISSIBLE EXPOSURE LIMIT:

RECOMMENDED EXPOSURE LIMITS:

SIGNS AND SYMPTOMS OF EXPOSURE:

DETECTION METHODS:

PHYSICAL HAZARDS:

HEALTH HAZARDS:

REQUIREMENTS FOR

HANDLING:

STORAGE:

DISPOSAL:

ENGINEERING CONTROLS:

PERSONAL PROTECTIVE EQUIPMENT:

EMERGENCY PROCEDURES:

WATER REACTIVE CHEMICALS

acetic anhydride	benzene diazonium chloride
acetyl bromide	benzene phosphorus dichloride
acetyl chloride	benzol chloride
alkyl aluminum chloride	benzyl silane
allyl trichlorosilane	beryllium hydride
aluminum aminoborohydride	beryllium tetrahydroborate
aluminum borohydride	bismuth pentafluoride
aluminum bromide	borane
aluminum chloride	boron bromdiiodide
aluminum diethyl monochloride	boron dibromoiodide
aluminum fluoride	boron phosphide
aluminum hypophosphide	boron tribromide
aluminum phosphide	boron trichloride
antimony chloride	boron trifluoride
antimony fluoride	boron triiodide
antimony tribromide	bromine monofluoride
antimony trichloride	bromine pentafluoride
antimony trifluoride	bromine trifluoride
antimony triiodide	bromodiethylaluminum
antimony trivinyl	butyl lithium
arsenic bromide	butyl trichlorosilane
arsenic chloride	cadmium acetylide
arsenic iodide	cadmium amide
arsenic tribromide	calcium carbide
arsenic trichloride	calcium hydride
arsenic triiodide	calcium oxide
barium	calcium phosphide
barium carbide	cesium amide
barium hydride	cesium hydride
barium monoxide	cesium phosphide
barium oxide	chlorine monofluoride
barium sulfide	chlorine pentafluoride

Enclosure 2
Attachment 4

chlorine trifluoride	methyl isocyanate
chloroacetyl chloride	methyl magnesium bromide
chloro chromic anhydride	methyl magnesium chloride
chlorodiisobutyl aluminum	methyl magnesium iodide
chlorophenol isocyanate	methyl trichlorosilane
chromyl chloride	nack (sodium-potassium alloy)
copper acetylde	nickel antimonide
cyclohexenyl trichlorosilane	nonyl trichlorosilane
cyclohexyl trichlorosilane	octadecyl trichlorosilane
diethylaluminum chloride	octyl trichlorosilane
decahydronaphthalene	oxygen difluoride
diphenylmethane diisocyanate	phenyl trichlorosilane
disulfuryl chloride	phosponium iodide
dodecyl trichlorosilane	phosphoric anhydride
ethyl dichloroarsine	phosphoric sulfide
ethyl dichlorosilane	phosphorus (red)
ethyl trichlorosilane	phosphorus oxybromide
fluorine	phosphorus oxychloride
fluorine monoxide	phosphorus pentachloride
gold acetylde	phosphorus pentasulfide
hexadecyl trichlorosilane	phosphorus pentoxide
hexahydride diborane	phosphorus sesquisulfide
hexyl trichlorosilane	phosphorus tribromide
hydrogen bromide	phosphorus trichloride
iodine monochloride	phosphorus trisulfide
lithium	phosphoryl bromide
lithium aluminum hydride	phosphoryl chloride
lithium amide	polyphenyl polymethylisocyanate
lithium ferrosilicon	potassium
lithium hydride	potassium hydride
lithium peroxide	potassium oxide
lithium silicon	propyl trichlorosilane
methyl aluminum sesquibromide	pyrosulfuryl chloride
methyl aluminum sesquichloride	silicochloroform
methyl dichlorosilane	silicon tetrachloride
methylene diisocyanate	silver acetylde

Enclosure 2
Attachment 4

slaked lime	thiophosphoryl chloride
sodium	tin tetrachloride
sodium aluminum hydride	titanic chloride
sodium amide	titanium tetrachloride
sodium hydroxide	toulene diisocyanate
sodium methylate	tri-n-butylaluminum
sodium methoxide	trichloroborane
sodium monoxide	trichlorosilane
sodium oxide	triethyl aluminum
sodium peroxide	triethyl antimony
sodium potassium alloy	triethyl arsine
stannic chloride	triethyl stibine
sulfonyl chloride	triisobutyl aluminum
sulfonyl fluoride	trimethyl aluminum
sulfur chloride	trimethyl arsine
sulfuric acid	trimethylstibine
sulfuric anhydride	tri-n-butylborane
sulfur monochloride	tripropyl stibine
sulfur oxychloride	trisilyl arsine
sulfur pentafluoride	trivinyl stibine
sulfur trioxide	vanadium trichloride
sulfuryl chloride	vinyl trichlorosilane
sulfuryl fluoride	zinc acetylide
tetraphosphorus trisulfide	zinc dioxide
thionyl chloride	zinc ethyl
thiocarbonyl chloride	zinc peroxide
thiophosgene	

SHOCK SENSITIVE CHEMICALS

acetylides (heavy metal)	guanyl tetrazene
aluminum ophorite	guanyl nitrosamino
amatol	guanylidene
ammonal	hydrazine
ammonium nitrate	heavy metal azides
ammonium perchlorate	hexanite
ammonium picrate	hexanitrodiphenylamine
ammonium salt lattice	hexanitrostilbene
butyl tetryl	hexogen
calcium nitrate	hyrazinium nitrate
copper acetylide	hyrazoic acid
cyanuric triazide	lead azide
cyclotrimethylene trinitramine	lead mannite
cyclotetramethylene	lead mononitroresorcinate
trinitramine	lead picrate
dinitroethyleneurea	lead salts
dinitoglycerine	lead styphnate
dinitrophenol	magnesium ophorite
dinitrophenolates	mannitol hexanitate
dinitrophenyl hydrazine	mercury oxalate
dinitrotoluene	mercury tartrate
dipicryl sulfone	mononitrotoluene
dipicrylamine	nitrated carbohydrate
erythritol tetranitrate	nitrated glucoside
fulminate of mercury	nitrated polyhedric alcohol
fulminate of silver	nitrogen trichloride
fulminating gold	nitrogen triiodide
fulminating mercury	nitroglycerin
fulminating silver	nitroglycide
gelatinized nitrocellulose	nitroglycol
germane	nitroguanidine
guanyl nitrosamino	nitroparaffins

Enclosure 2
Attachment 5

nitronium perchlorate	sodium dinitro-ortho-cresolate
nitrourea	sodium picramate
organic amine nitrates	syphnic acid
organic nitramines	tetrazene
organic peroxides	tetranitrocarbazole
picramic acid	tetrytol
picramide	trimonite
picratol	trinitroanisole
picric acid	trinitrobenzene
picryl chloride	trinitrobenzoic acid
picryl fluoride	trinitrocresol
polynitro aliphatic compounds	trinitro-meta-cresol
potassium nitroaminotetrazole	trinitronaphthalene
silver acetylde	trinitrophenetol
silver azide	trinitrophloroglucinol
silver styphnate	trinitroresorcinol
silver tetrazene	tritonol
sodatol	urea nitrate
sodium amatol	

NOTE: No attempt has been made to list all shock sensitive chemicals. Laboratory personnel shall review health and safety data including MSDSs to determine whether compounds are shock sensitive.