
CHEMICAL

HYGIENE

PLAN

UNIVERSITY OF HAWAII AT MANOA

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I. PREFACE

The University of Hawaii has a fundamental obligation to safeguard the health, safety, and welfare of its students, personnel, and the visiting public whenever they participate in an official University activity. It is the policy of the University to provide for and maintain, through implementation of safety and health programs, conditions and practices that provide safe and healthful campus environments.

In keeping with this commitment, this Chemical Hygiene Plan was developed as part of the UH Laboratory Safety Program.

The Chemical Hygiene Plan (CHP) is designed to protect laboratory personnel from potential hazards associated with the use of chemicals. It is for your reference while working with or around chemicals in laboratories at the University of Hawaii. Compliance is mandatory for all employees working in campus laboratories due to requirements of the Hawaii Occupational Safety and Health (HIOSH) division of the Department of Labor and Industrial Relations' standard on "Hazardous Chemicals In Laboratories". While these regulations pertain specifically to employees, provisions of the CHP apply to students and visitors depending on their activities when specified by supervisors.



Peter Englert
Chancellor
University of Hawaii at Manoa
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INTRODUCTION

The objective of this CHP is to provide uniform requirements for safe use and disposal of potentially hazardous substances in University laboratories. A variety of hazardous chemicals are used in small quantities in research and teaching laboratories creating a unique environment with a number of risks. These chemicals may cause injury or damage because they are toxic, flammable, corrosive, or reactive with water and other materials. How these substances are handled will determine the degree of risk. General standard operating procedures are outlined, including work with select carcinogens, reproductive toxins, and substance with a high degree of acute toxicity. Specific standard operating procedures must be developed by each lab for operations posing a special hazard, for example, heating phosphoric acid, working with pyrophorics, conducting electrophoresis, distillations, extractions, etc.

Maintaining a safe and healthy environment in the laboratory is ultimately the responsibility of the Supervisor or Principal Investigator. However, each individual is expected to conduct all operations and procedures involving chemicals in a safe and prudent manner.

II. PROGRAM ADMINISTRATION

A. WORKPLACE SAFETY COMMITTEE

1. Establish policies that will ensure that the University of Hawaii is in compliance with all federal, state, and local regulations, statutes, procedures, and principles relating to environmental and occupational safety, including in particular (1) the fire code, (2) the electrical code, and (3) the regulations relating to the purchase, storage, use, and disposal of hazardous chemicals. This task includes the review and maintenance of the UH Chemical Hygiene Plan (CHP).
2. Establish close-out procedures for hazardous chemical users that will minimize the hazardous waste burden to UH.
3. Review laboratory safety audit reports. In cases where problems have been noted by the Environmental Health and Safety Office (EHSO) and the responsible parties have been notified by the EHSO, initiate corrective actions if the problems have not been resolved within a reasonable amount of time.
4. Evaluate and approve the use of particularly hazardous substances such as select carcinogens, reproductive toxins, and highly acute toxins. Prepare a list of such substances to facilitate oversight and control/regulation of their use.
5. The EHSO will evaluate laboratory accidents and chemical spills and will ask the WSC to initiate corrective action if needed to prevent the reoccurrence of such incidents.
6. In cases where correction of a workplace safety problem requires the expenditure of money, authorize, with the approval of the Executive Vice Chancellor, the funds needed to correct the problem.
7. Where necessary, intervene in EHSO inspection and enforcement actions (see Appendix XIII).

B. DEAN/DIRECTOR/DEPARTMENT CHAIR

1. Have the primary responsibility of establishing and maintaining a safe and healthy environment for their employees, students and visitors.
2. Ensure that laboratories and other chemical storage sites within the department comply with all CHP requirements.
3. Take corrective action in cases where an inspection by the EHSO has indicated that a hazard exists in the workplace that has not been corrected in a timely manner, including (but not limited to) electrical hazards, fire safety hazards and chemical hazards. The WSC will stipulate the nature of the corrective action. The hazardous

condition will be judged to have been corrected only when an inspection by the EHSO indicates that the condition has been corrected.

4. Ensure that Principal Investigators follow the closeout procedures (see Appendix XII) and take measures to enforce them when necessary.
5. Assign responsibility for shared labs/facilities to one person.

C. ENVIRONMENTAL HEALTH AND SAFETY OFFICE

1. Provide technical assistance to the WSC, principal investigators, supervisors and employees.
2. Appoint a Chemical Hygiene Officer (CHO).
3. Conduct laboratory surveys, including air monitoring if required. The CHO must inform the WSC about any deficiencies that are not corrected in a timely manner.
4. Maintain all relevant records such as training, air monitoring results and laboratory surveys.
5. Assist principal investigators and supervisors in complying with the CHP.
6. Provide chemical safety training for all Manoa employees as required by the CHP.

D. PRINCIPAL INVESTIGATOR/SUPERVISOR

1. Have direct and overall responsibility for safety and chemical hygiene in the laboratory/workplace. This includes following the policies and procedures of the CHP and correcting deficiencies found during EHSO audits in a timely manner.
2. Ensure that employees are informed of and follow the rules and procedures of the CHP.
3. Inform personnel about their workplace hazards. This information must include written Standard Operating Procedures (SOP's) that detail operations the employees will conduct. These SOP's should include safety precautions that employees must follow.
4. Provide personal protective equipment (gloves, lab coats, goggles, etc.) for employees and ensure that they are used.
5. Conduct and document the appropriate chemical hygiene training, including emergency procedures, for all workers.
6. Periodically survey the workplace to ensure safe working conditions. These surveys should include inspection of all emergency equipment such as eyewashes, safety showers and spill kits. All defective equipment must be immediately reported to the appropriate department.

7. Review MSDS and other sources for information about special first aid requirements for chemicals, e.g., hydrogen fluoride and cyanogen bromide, and prepare accordingly.
8. Restrict access to areas where an inspection by the EHSO indicates that a hazardous condition exists.
9. Follow the closeout procedures when departing from the University (see Appendix XII).
10. Keep lab equipment and chemicals secure against theft or tampering. Keep the laboratory doors closed and locked when no one is present.

E. LABORATORY WORKERS

1. Know the hazardous properties of the chemicals they use so that proper safety precautions can be determined and followed.
2. Plan and conduct each operation in accordance with the general safety procedures specified in the CHP, as well as whatever additional specific procedures are required by the principal investigator/supervisor.
3. Develop and maintain good personal chemical hygiene practices.
4. Immediately report improperly functioning safety equipment such as fume hoods directly to the principal investigator/supervisor.
5. Promptly complete required safety training sessions.
6. Immediately report any occupational injury or illness to your principal investigator/supervisor.
7. Know the location and operation of emergency equipment such as eyewashes, safety showers, etc.
8. Be aware of emergency reporting and evacuation procedures.
9. Immediately inform the principal investigator/supervisor about any unsafe workplace conditions.

II. EMPLOYEE INFORMATION AND TRAINING

PI's shall ensure that information and training are 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. PI's may contact the CHO for assistance in providing training.

A. Information

All laboratory personnel shall be informed of:

1. requirements of the HIOSH Standard, "Hazardous Chemicals in Laboratories" (Appendix III);
2. the contents and availability of this Chemical Hygiene Plan;
3. permissible exposure limits (PELs) for HIOSH regulated substances (Appendix IV) or recommended exposure limits where there is no applicable HIOSH standard;
4. signs and symptoms associated with exposures to hazardous chemicals used in their laboratory;
5. the location of reference materials (including electronic) on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets (MSDS's).

B. Training

Employee training shall include:

1. the physical and health hazards associated with chemicals stored and used in their work area;
2. the contents of this Chemical Hygiene Plan;
3. methods and observations that may be used to detect the presence or release of a hazardous chemical (e.g., exposure monitoring conducted by the CHO, visual appearance or odor of hazardous chemicals when being released, etc.).

III. PRIOR APPROVAL CIRCUMSTANCES

Employees must obtain prior approval to proceed with a laboratory task from the CHO or appropriate EHSO personnel when:

- A. Radioactive materials will be used. Contact the EHSO Radiation Safety Program.
- B. Recombinant DNA or any biological commodities will be used. Contact the EHSO Biological Safety Program.
- C. It is likely that exposure limit concentrations could be exceeded or that other harm could occur. Contact the CHO.
- D. Certain hazardous chemicals will be used which require prior approval from the EHSO Hazardous Material Management Program before purchase. Refer to Appendix V for a list of these chemicals.

Employees must stop working and contact EHSO to gain approval for continuing to work when:

- A. There is failure or suspected failure of any equipment used in the process, especially of safeguards such as chemical fume hoods.
- B. A member of the laboratory staff becomes ill and you know or suspect the illness is related to the work environment in the laboratory.

IV. STANDARD OPERATING PROCEDURES

A. General Rules

- 1. For chemicals they are working with, all employees should know:
 - a. the chemical's hazards, as determined from a MSDS and other appropriate references;
 - b. appropriate safeguards for using that chemical, including personal protective equipment;
 - c. how to properly store the chemical when it is not in use;
 - d. proper chemical waste disposal procedures (Appendix V);
 - e. proper personal hygiene practices;
 - f. proper methods of transporting chemicals outside the laboratory;
 - g. appropriate procedures for emergencies, including first aid, evacuation routes, and spill cleanup procedures.

2. Employees should avoid working alone. Arrangements should be made between individuals working in separate laboratories outside of regular working hours to crosscheck each other periodically. Alternatively, Campus Security may be asked to check on the employee. Experiments known to be hazardous should not be undertaken by an employee who is alone in the laboratory.
3. In the event of a power outage, the procedures in listed in Appendix VI should be followed.
4. Individuals who are not properly trained in laboratory safety and the University CHP (e.g. employees' children, guests, etc.) shall not be allowed in University laboratories unless closely supervised and monitored.
5. No animals, other than those approved for laboratory experimentation by the UH Institutional Animal Care and Use Committee (IACUC), shall be allowed in laboratories.

B. Personal Hygiene

1. Wash promptly whenever a chemical has contacted your skin.
2. Avoid inhalation of chemicals. Do not "sniff" to test chemicals.
3. Do not use mouth suction to pipet anything. Pipetting aids must be used at all times.
4. Do not bring food (including gum and candy), beverages, tobacco, or cosmetic products into chemical storage or use areas. Eating, drinking, and applying cosmetics is allowed in designated areas only. Smoking is prohibited in all University facilities.
5. Wash well with soap and water before leaving the laboratory. Avoid the use of solvents for washing skin. Solvents remove the natural protective oils from skin and can cause irritation and inflammation. In some cases, washing with solvent may facilitate absorption of toxic chemicals.

C. Protective Clothing and Equipment

1. Carefully inspect all protective equipment prior to use. Do not use defective equipment.
2. When the potential for a splash hazard is present (e.g. chemistry laboratories), eye protection in the form of chemical-resistant goggles shall be worn at all times in the laboratory. Ordinary prescription glasses and/or standard safety glasses are not considered effective eye protection since they lack necessary shielding. Chemical-resistant goggles should be worn over the glasses for employees who wear corrective lenses.

3. Consult with an optometrist prior to wearing contacts in the laboratory. Chemical-resistant goggles must be worn over contacts at all times.
4. When working with corrosive, toxic, allergenic, or sensitizing chemicals, rough or sharp-edged objects, very hot or very cold materials, gloves made of material known to be protective for the hazard shall be worn.

No one glove can protect against all hazards. Cloth gloves, while not appropriate for use around liquids, can protect against light abrasive materials and moderate temperature changes. Synthetic or rubber gloves protect against corrosives, solvents, and poisons. Leather gloves, often used for tasks like welding, protect against sparks, heat, & rough abrasives.

Consult the manufacturer's performance chart or contact the Chemical Hygiene Officer to determine the proper choice of glove material. Appendix X has a glove selection chart that can be used to inform glove choices.

5. Low-heeled shoes with fully covered uppers shall be worn at all times in the laboratory. Shoes or sandals with open toes shall not be worn.
6. Long pants and garments with long sleeves must be worn when working with or around chemicals.
7. Long hair should be held in place behind the head.
8. Caution should be taken when wearing loose clothing not to inadvertently allow cuffs, sleeves, or other materials to knock over or absorb chemicals.
9. A full-body-length rubber, plastic, or neoprene apron appropriate for the material being handled should be worn if there is risk of splash or spill.
10. A proper respirator must be worn whenever exposure by inhalation is likely to exceed the action level or PEL and a fume hood is not accessible. Procedures specified in the UHM Respiratory Protection Program must be followed. Employees must be medically qualified, trained, and fit-tested prior to using a respirator. Contact the CHO before doing any work requiring a respirator.
11. Remove all PPE before leaving the laboratory.

D. Housekeeping

Housekeeping is directly related to safety and must be given importance of equal value to other procedures. Lack of good housekeeping reduces work efficiency and may result in accidents. Laboratory personnel must adhere to the following:

1. All work areas, especially laboratory benchtops, should be kept clear of clutter.

2. Access to emergency equipment, showers, eyewashes, fire extinguisher, exits and circuit breakers shall never be blocked or obstructed.
3. All aisles, corridors, stairs, and stairwells shall be kept clear of chemicals, equipment, supplies, boxes, and debris.
4. Each laboratory must have a puncture resistant container (e.g., cardboard box) lined with plastic specifically designated for glassware disposal.
5. Food and drink for human consumption shall not be kept in the same refrigerator used to store chemicals and laboratory samples. Eating and office areas must be clearly separated from laboratory and chemical storage areas.

E. Chemical Management

1. Chemical containers should be regularly monitored for proper labeling and container integrity. Labels which are fading, falling off, or deteriorating must be promptly replaced. If abbreviations are used, they should be kept to a minimum and clearly identify the contents of the container as well as hazards associated with use; e.g., HgCl₂/poison, HCl/corrosive, MeOH/flammable, H₂O₂/corrosive-oxidizer, nonhazardous buffer, etc. Improperly or unlabeled chemicals make hazard identification and disposal difficult, and may create a health hazard.
2. Segregate all chemicals in storage according to hazard class. The main hazard classes are flammable/combustible, oxidizer, acid, and base. See Appendix XI for more detailed chemical storage guidelines.
3. All chemicals should be placed in their proper storage areas at the end of each workday. Chemicals shall not be stored on desks, laboratory benchtops, floors, or in aisles.
4. Secondary containers (flasks, beakers, reaction vessels, etc.) should be labeled unless they are under the immediate control of the user. At the end of each workday, all unlabeled containers are to be labeled as to their contents or the contents must be disposed of as waste.
5. Chemical wastes must be clearly labeled including hazard identification, and stored according to hazard class. Refer to the Hazardous Material Management Plan in Appendix V for requirements.
6. Maintain an inventory of all chemicals in the laboratory, including all containers of chemicals in use or in storage, but excluding working solutions, synthetic intermediates, biological samples, chemical extracts, and waste. The chemical inventory should be kept in the laboratory's Chemical Hygiene Plan binder and updated annually. The inventory should include, at a minimum, the chemical name, the amount, the storage location, and the hazard class (see Appendix XI for guidelines). Appendix XIV contains a sample inventory form that may be used.

F. Flammable Materials

Precautions for safe handling of flammable materials include the following:

1. Storage and handling of flammable and combustible substances shall be conducted in accordance with the requirements in Appendix VII.
2. Flammable substances shall be handled only in areas free of ignition sources.
3. Flammable substances should never be heated by using an open flame. Preferred heat sources include steam baths, water baths, oil baths, heating mantles, and hot air baths.
4. Class I liquids (see Appendix VII) shall not be transferred from one vessel to another in any exit passage way.
5. Transfer of flammable liquids shall be conducted in a laboratory fume hood or an approved flammable liquid storage room.
6. Empty containers (no pourable liquid remaining) shall be treated in the following manner:
 - a. For water soluble solvents: triple rinse, deface the label, and dispose empty container appropriately.
 - b. For non-water soluble solvents: allow to evaporate to dryness in a hood, deface the label, and dispose empty container appropriately.

G. Reactive Chemicals

A reactive chemical is one that:

1. Fits the HIOSH definition of "unstable" in 12-204-2 (Appendix III):

"Unstable (reactive) means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature, or
2. Is ranked by the National Fire Protection Association (NFPA) as 3 or 4 for reactivity, or
3. Is identified by the Department of Transportation (DOT) as:
 - a. an oxidizer, or
 - b. an organic peroxide, or
 - c. a class A, B, or C explosive.

4. Violently reacts with exposure to water or air.

Handle reactive chemicals with all proper safety precautions. This includes designating a separate storage area, monitoring periodically for degradation, and using appropriate personal protection.

H. Corrosive Chemicals

1. Materials are classified as corrosive if they:
 - a. are capable of rapidly eroding building materials or metals, or
 - b. burn, irritate or destructively attack organic tissues such as skin, eyes, lungs and stomach.

Examples of commonly used chemicals that have corrosive properties are:

glacial acetic acid	hydrofluoric acid	hydrochloric acid
fluorine	nitric acid	bromine
sulfuric acid	chlorine	sodium hydroxide

Safe handling procedures will vary with each operation and the type and concentration of the corrosive chemical. Refer to the MSDS for specific safe handling procedures.

2. The following general guidelines should be followed for procedures involving acids and bases:
 - a. Never pour water into acid. Slowly add the acid to the water and stir.
 - b. Open bottles or carboys slowly and carefully, wearing protective equipment to guard hands, face, and body.
 - c. Suitable facilities, such as a safety shower and eyewash, shall be located within 50 feet or 10 seconds of the work area for quick drenching or flushing of the eyes and body. PI's shall ensure eyewash stations are flushed once every quarter.
 - d. Procedures requiring the use of concentrated acids and bases should be conducted in a fume hood.
 - e. Never mix acid wastes with other materials such as solvents, metal-contaminated solutions, etc. Noncontaminated acid wastes can be easily disposed by neutralization. Never dispose of acids or bases in the sanitary sewer system (i.e., down the drain) until neutralized (pH 5.5-8.5). Neutralization should be conducted in a fume hood, then the solution poured slowly down the drain with copious amounts of water; i.e., leave the water running for approximately 5 minutes.

- f. When disposable containers are completely emptied of their contents, flush them thoroughly with water before throwing them away.
- g. Contact EHSO Hazardous Material Management Program (see Appendix V) for assistance with disposal of large quantities (more than 2 gallons or 1 pound) of acids and bases.

I. Compressed Gas Cylinders

Use of compressed gases in the laboratory requires anticipating chemical, physical, and health hazards. Cylinders that are knocked over or dropped can be very dangerous. If a valve is knocked off, the cylinder can become a lethal projectile. Accidental releases may result in an oxygen deficient atmosphere or adverse health effects. In short, improper handling and use can cause structural damage, severe injury, and possibly death.

The following guidelines will help ensure safe handling, use, and storage of compressed gas cylinders.

RECEIVING AND STORAGE

1. Be sure to arrange a return agreement with suppliers prior to purchase since disposal of compressed gas cylinders is difficult and very expensive. Retain all documentation such as purchase orders to facilitate return of cylinders to the manufacturer.
2. Cylinders should not be accepted unless the cylinder contents are clearly labeled. Color code only should not be accepted, since it does not constitute adequate labeling.
3. Do not accept cylinders which are damaged or do not have a valve protection cap.
4. All gas cylinders in use shall be secured in an upright position in racks, holders, or clamping devices. When cylinders are grouped together, they should be individually secured and conspicuously labeled on the neck area.
5. Oxygen cylinders shall be separate from combustible materials (e.g. oils, greases, fuels, acetylene, etc.) a minimum distance of 20 ft or by a noncombustible barrier at least five feet high having a fire resistant rating of at least 1/2 hour. Systems and components used for other gases and must never be used for oxygen or interconnected with oxygen.
6. Cylinders should have current hydrostatic test date (normally less than 5 years old for steel and 3 years old for aluminum) engraved on the cylinder. Cylinders should be returned to the supplier for servicing prior to the expiration date.

7. Do not place cylinders near heat, sparks, or flames or where they might become part of an electrical circuit.
8. Do not store cylinders in exit corridors or hallways.

HANDLING AND USE

1. Only Compressed Gas Association fittings and components are permitted for use with gas cylinders. Only use regulators approved for the type of gas in the cylinder. Do not use adapters to interchange regulators. Never lubricate any fitting or component of a gas cylinder.
2. Before opening the cylinder valve, be sure that the T-valve is backed out and turns loosely. Open cylinder valves slowly and be sure that the T-valve is not facing anyone, including yourself. Never force a gas cylinder valve. If the valve cannot be opened by the wheel or small wrench provided, the cylinder should be returned.
3. No attempt shall be made to transfer gases from one cylinder to another, to refill cylinders, or to mix gases in a cylinder in the laboratory.
4. All cylinders are to be considered full unless properly identified as empty by the user. Empty cylinders must be returned to the supplier and not accumulated.
5. Compressed gases must not be used to clean your skin or clothing.
6. Never heat cylinders to raise internal pressure.
7. Do not use copper (>65%) connectors or tubing with acetylene. Acetylene can form explosive compounds with copper, silver, and mercury.
8. Always leave at least 30 psig minimum pressure in all "empty" cylinders. Do not leave an empty cylinder attached to a pressurized system.

V. CONTROL MEASURES

A. Ventilation

1. Laboratory ventilation is normally designed to provide eight air changes per hour. This flow is not necessarily sufficient to prevent accumulation of chemical vapors. Laboratory work shall be conducted in a fume hood, glove box, or similar device when:
 - a. Procedures call for work with toxic substances which are volatile; i.e., evaporate at normal temperature and pressure, or
 - b. There is a possibility the action level or PEL (see Appendix III) will be exceeded.
2. The protection provided by the laboratory fume hoods is dependent upon two important factors:
 - a. proper use of the hood, and
 - b. maintenance of adequate airflow through the hood.
3. The way the hood is used will determine the degree of protection it will provide. Each employee is responsible for implementing the following work practices when using a hood.
 - a. Continually monitor air being drawn into the hood by attaching a kim wipe or light-weight strip of paper to the bottom of the sash.
 - b. Operate the hood at the proper sash position; i.e., maximum 12 inch sash height for hoods with vertical sliding (up and down) sashes and the sashes closed as much as possible for hoods with horizontal sliding (left and right) sashes. This helps to ensure optimum protection when conducting operations in the hood. A small sash opening maximizes air velocity through the hood face and may provide additional protection from unexpected splashes or chemical reactions.
 - c. Avoid using the hood for storage of bottles and equipment, especially along the back wall. Any apparatus that must be housed within the hood should fit completely inside the hood. Elevate the apparatus on blocks (at least 2 inches off the benchtop) to allow air to flow freely around and beneath.
 - d. Manipulations within the hood should be performed at least 6 inches inside the face of the hood or as far towards the back of the hood as possible. This minimizes the possibility of contaminants escaping from the hood.

- e. Fully close the hood sash and turn off the fan (if possible) when the hood is not in use. The fan should remain on if volatile materials are being temporarily (i.e., for the duration of a current project) stored in the hood.
 - f. Things which cause air turbulence across the face of the hood such as fans, window air conditioning units, or excessive movement should be avoided.
 - g. Exhaust hoods do not provide adequate protection for all operations involving toxic materials. A higher level of containment should be used for procedures where minor contamination can be serious. If you are in doubt about the level of containment needed for your operation, ask your PI or contact the CHO.
- 4. EHSO conducts annual surveys of fume hoods to ensure adequate airflow is maintained through the hood face. Face velocities should be between 80 and 120 feet per minute (fpm) with the sash lowered to within one foot of the bottom of the hood. Hoods that do not meet these minimum standards are considered "inadequate" and should not be used for protection from toxic or volatile materials. Contact the CHO at x65180 if you suspect the hood is not working properly.
 - 5. At no time shall laboratory fume hood alarms be tampered with or disabled. Upon activation of the alarm, work within the hood should cease and facilities and/or the CHO must be notified.

B. SPILL CLEAN-UP PROCEDURES

The range and quantity of hazardous substances used in laboratories requires preplanning to respond safely to chemical spills. The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits with instructions, adsorbents, reactants, and protective equipment should be available to clean up minor spills. A minor spill is one that does not spread rapidly, does not endanger people or property except by direct contact, does not endanger the environment, and the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel. All other chemical spills are considered major.

In the event of a major spill the following procedures shall be carried out:

- 1. Attend to anyone who may be hurt or contaminated if it can be accomplished without endangering yourself.
- 2. If flammable materials are spilled, de-energize electrical devices if can be done without endangering yourself.
- 3. Call Campus Security at x66911.

In the event of a minor spill the following procedures shall be carried out:

1. Attend to anyone who may have been contaminated or hurt.
2. Ensure that the fume hood(s) is on. Open windows where possible to increase exhaust ventilation and if the spilled material is flammable, turn off all ignition and heat sources.
3. Secure cleanup supplies. Neutralize acids and bases, if possible. Ensure protective apparel is resistant to the spill material.
4. Control the spread of the liquid by containing the spill.
5. Absorb the liquid by adding appropriate absorbent materials from the spill's outer edges toward the center.
6. Collect and contain the cleanup residues by scooping it into a plastic bucket or other appropriate container.
7. Properly dispose of the waste as hazardous waste.
8. Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.
9. Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.

In any event, there should be supplies and equipment on hand to deal with the spill, consistent with the hazards and quantities of the spilled substance. These cleanup supplies should include neutralizing agents (such as sodium carbonate or sodium bisulfate) and absorbants (such as vermiculite and sand). Paper towels and sponges may also be used as absorbent-type cleanup aids, although this should be done cautiously. For example, paper towels used to clean up a spilled oxidizer may later ignite, and appropriate gloves should be worn when wiping up highly toxic material with paper towels. Also, when a spilled flammable solvent is absorbed in vermiculite or sand, the resultant solid is highly flammable and gives off flammable vapors and, thus, must be properly contained or removed to a safe place. If you have questions regarding spill clean up requirements please contact EHSO at x63198.

VI. EXPOSURE MONITORING

Exposure monitoring shall be performed when there is reason to believe that exposures are in excess of the action-level or the PEL. Materials which require monitoring under these conditions are listed in Appendix III. If an employee would like to have an exposure assessment conducted, the CHO should be contacted. Exposure assessments and monitoring may be conducted by the CHO or UH Industrial Hygienist.

Documentation of exposure monitoring shall be kept and maintained as part of each employee's personnel record.

VII. MEDICAL CONSULTATIONS AND EXAMINATIONS

Employees shall be provided an opportunity to receive medical attention, including any related follow-up examinations, at the University's expense, under the following circumstances:

1. An individual develops signs or symptoms associated with exposure to hazardous chemicals in the laboratory.
2. Exposure monitoring reveals an exposure level routinely above the action level or PEL for a HIOSH regulated substance for which there are exposure monitoring and medical surveillance requirements.
3. An accident such as a spill, leak, equipment failure, or explosion results in possible over-exposure to hazardous chemicals.

The PI and department Personnel Offices are responsible for establishing and maintaining an accurate record of any medical consultations and examinations provided to an employee.

VIII. SELECT CARCINOGENS, REPRODUCTIVE TOXINS, HIGHLY ACUTE TOXINS

The procedures described in this section are mandatory when performing laboratory work with greater than 10 mg or 100 mL of any carcinogen, reproductive toxin, or substance that has a high degree of acute toxicity.

A. Definitions

1. Select carcinogens: any substance defined as such in Title 12 Chapter 204-2 (refer to Appendix III page 204-2-4, and Appendix VIII).
2. Reproductive toxin: chemicals which affect reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).
3. Highly Acute Toxin is any substance for which:
 - a. the median oral LD₅₀ is less than or equal to 50 mg/kg when administered orally to albino rats, or
 - b. the median inhalation lethal concentration, LC₅₀, value is less than or equal to 200 ppm by volume of gas or vapor, or 2 mg/liter or less of dust, mist, or fume when administered continuously for one hour or less to albino rats, or
 - c. the median LD₅₀ is less than or equal to 200 mg/kg when administered by continuous contact for 24 hours or less with the bare skin of albino rabbits.
4. Designated area: a hood, glove box, portion of a laboratory, or an entire laboratory room, designated as the only area where work shall be conducted with quantities of select carcinogens, reproductive toxins, or highly acute toxins in excess of the limits specified above.

B. Designated Area

Access to designated areas shall be restricted. Only trained employees will be allowed to work with chemicals in the designated area. All such persons will:

1. Use the smallest amount of chemical that is consistent with the requirement of the work to be done.
2. Always use these chemicals in a hood with adequate air flow (face velocity between 80 and 120 feet per minute with the sash one foot from the floor of the hood) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance.
3. Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.

4. Contact the Chemical Hygiene Officer at x 65180 for more information about reproductive toxins. A partial list of reproductive toxins is listed in Appendix IX.
5. Decontaminate designated areas before normal work is resumed there. This includes contaminated equipment.
6. Remove any protective apparel, place it in an appropriately labeled container, thoroughly wash hands, forearms, face, and neck on leaving a designated area.
7. Prepare wastes for disposal in accordance with the UHM Hazardous Material Management Program (Appendix V).
8. Do not wear jewelry when working in designated areas since decontamination of jewelry may be difficult or impossible.