THE UNIVERSITY of TEXAS
HEALTH SCIENCE CENTER AT HOUSTON

CHEMICAL HYGIENE PLAN

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PREFACE

The University of Texas Health Science Center at Houston (UTHSC-H) is committed to providing a safe and healthy working and learning environment for all faculty, students, employees, visitors and contract employees. Environmental Health & Safety's mission is to work in conjunction with the UTHSC-H community and ensure that education, research, and health-care related activities take place in conditions that are optimally safe and healthy for students, faculty, staff, visitors, surrounding community, and general public.

The objective of the UTHSC-H Chemical Safety Program is to assist personnel at all levels in fulfilling the commitment to furnish a place of employment and learning that is as free as possible from recognized hazards that cause or are likely to cause harm to UTHSC-H personnel or the surrounding community. It is vital that faculty, staff and students have enough information available to aid them in the safe conduct of their daily work activities relating to hazards throughout their workplace.

The purpose of the manual is to provide employees with general guidelines for implementing a quality and proactive safety program regarding the use of chemical agents. The information contained herein satisfies the requirements for the university to provide a written Chemical Hygiene Plan and Hazard Communication Program. It is not intended to be an exhaustive reference, rather a guide for all UTHSC-H personnel to become familiar with and conduct their operations accordingly. Further advice concerning chemical hazards associated with specific processes and the development of new or unfamiliar activities should be obtained through consultation with your supervisor, the Chemical Safety Committee, or UTHSC-H Chemical Safety Program.

All users of chemicals must be familiar with the requirements set forth in this manual and applicable state and federal regulations and must conduct their operations in accordance with them.

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1.0 INTRODUCTION

The purpose of this Chemical Hygiene Plan is to define work practices and procedures to help protect students, laboratory workers, researchers, and supervisors at The University of Texas Health Science Center at Houston (UTHSC-H) from health hazards associated with the use of hazardous chemicals. The Chemical Hygiene Plan is consistent with the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) standard entitled "Occupational Exposures to Hazardous Chemicals in Laboratories" (Code of Federal Regulations, 29 CFR 1910.1450) and the Texas Hazard Communication Act (Chapter 502 of the Texas Health and Safety Code).

OSHA has defined a hazardous chemical as "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 exposed employees." In addition, OSHA defines a laboratory as "a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis." Finally, laboratory workers are defined in the OSHA Lab Standard under the definition of "employee" as "an individual employed in a laboratory workplace that may be exposed to hazardous chemicals in the course of his or her assignments." An example of a laboratory worker would include researchers in laboratories and principal investigators; the students in the academic laboratory would not be considered laboratory workers according to OSHA, however they are covered by this plan. If there is any confusion about whether a particular workplace is considered a laboratory that utilizes hazardous chemicals, or whether someone is considered a laboratory worker, the Chemical Hygiene Officer will, upon request, make this determination.

Laboratory workers, researchers, supervisors and students conducting laboratory procedures should be familiar with this Chemical Hygiene Plan and together share the responsibility for creating a safe and healthy work environment. In addition to the Plan, the laboratory workers shall be cognizant of and adhere to the Handbook of Operating Procedures (HOOP) Chapter 18 "Safety and Health" and any other sections of the HOOP relevant to their research. The Chemical Safety Program of UTHSCH's Environmental Health & Safety (EHS) has prepared guidelines, which represent prudent health and safety practices in a number of areas. A list of both the policies and the guidelines are found in Appendix 2. Copies of these documents are available upon request from EHS at 713-500-8100.

A written record stating that each laboratory worker has reviewed the Chemical Hygiene Plan and related health and safety policies and guides shall be kept by the laboratory supervisor (see Appendix 5).

This Chemical Hygiene Plan (referred to as the Plan throughout this document) will be reviewed annually by the Chemical Hygiene Officer and/or the Chemical Safety Committee.

2.0 RESPONSIBILITIES

The division of responsibilities regarding general health and safety is outlined in the Handbook of Operating Procedures (HOOP), Chapter 18, "Safety and Health" Parts 18.01 through 18.11. This part of the HOOP discusses responsibilities of Environmental Health and Safety, its programs: Chemical Safety, Biological Safety, Radiation Safety, Fire and Life Safety and Emergency Preparedness, and Environmental Protection. Appropriate sections shall be reviewed by laboratory workers and their supervisors.

Specific to this Chemical Hygiene Plan, the responsibilities of EHS's Chemical Safety Program include the following:

- Provide technical assistance to laboratory supervisors and workers concerning appropriate storage, handling and disposal of hazardous chemicals;
- Provide general and specialized laboratory safety training upon request;
- Conduct exposure assessments and laboratory surveillance upon request and on a routine basis;
- Make routine, as well as special, health and risk appraisals;
- Provide technical assistance concerning personal protective equipment and laboratory safety equipment;
- Facilitate access to manufacturer's Material Safety Data Sheets and other laboratory and chemical safety literature; and,
- Remain current on rules and regulations concerning chemicals used at UTHSC-H.

Deans, Directors, and Heads of Academic and Administrative Units have the primary responsibility for the health and safety of their staff and students. Specific responsibilities regarding the implementation of the Chemical Hygiene Plan include:

- Collaborate with faculty and staff to adapt this model Chemical Hygiene Plan to include lab-specific guidelines and to develop strategies to implement the Plan; and,
- Make budget arrangements for health and safety improvements.

Faculty and staff in charge of supervising laboratories (referred to as laboratory supervisors throughout this document) have the following responsibilities for implementing the Chemical Hygiene Plan:

- Inform and train employees concerning chemical safety as required by this Plan and retain training records and all documentation;
- Implement and enforce rules and standards concerning health and safety for laboratories under supervisor's jurisdiction;
- Ensure compliance of laboratory workers with this Plan;
- Ensure the availability and enforce the use of: appropriate personal protective equipment, Material Safety Data Sheets (MSDSs), and relevant reference materials;
- Remain cognizant of chemicals stored and used in labs and their associated hazards;
- Dispose of chemicals no longer needed by calling the Hazardous Waste Hotline at 713-500-5837;

- Conduct internal inspections of labs for health and safety concerns; and
- Request assistance from the Chemical Safety Program as needed.

Laboratory Employee and Student responsibilities regarding implementation of the Chemical Hygiene Plan are as follows:

- Follow all health and safety policies and procedures;
- Report all hazardous conditions to the supervisor;
- Wear or use prescribed protective equipment;
- Report any job-related injuries or illnesses to the supervisor and seek treatment immediately;
- Refrain from the operation of any equipment or instrumentation without proper instruction and authorization;
- Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely; and,
- Request information and training when unsure how to handle a hazardous chemical or procedure.

3.0 STANDARD OPERATING PROCEDURES

*"Standard operating procedures relevant to safety and health considerations are to be followed when laboratory work involves the use of hazardous chemicals". 2*9 CFR 1910.1450(e)(3)(I)

The Plan represents a minimum set of guidelines for the handling of toxic chemicals on campus. Individual administrative units, laboratories or research groups are required to develop more detailed procedures as their situations warrant. Acceptable lab safety references such as those listed in Appendix 2 of this document may be adopted in whole or may be useful in developing additional procedures. In all situations, individual faculty or staff will be responsible for enforcing adequate safety and hygiene measures in laboratories they supervise. If necessary, additional assistance from Environmental Health and Safety is available.

Some rules or standard operating procedures, which apply to all laboratories at UTHSCH include the following:

3.1 General

Respect and understand the safety and health hazards associated with the chemicals and equipment in your laboratory, and practice the following general safety guidelines at ALL times:

- **No smoking.**
- **Unattended experiments**. Laboratory experiments should be placed in potentially low hazard condition before leaving them unattended.
- **Working alone.** When working with hazardous materials, it is advisable to have a second person present, or at a minimum, maintain surveillance via telephone contact.

- **Housekeeping.** Exits, aisles and safety equipment must be kept clear of any obstructions,

such as equipment, furniture, etc. Hazardous liquid chemicals should be stored below eye level. Work areas and floors should be kept clear of excessive storage.

- **Food, drink, cosmetics.** Eating, drinking and the application of cosmetics are not permitted in areas where hazardous chemicals are used and shall be done only in well-defined designated non-chemical areas. Do not store food in the same refrigerator with chemicals, biohazards or radioactive materials.
- **No horseplay.** Practical jokes or other behavior that might confuse, startle, or distract another worker is not permitted.
- **Equipment.** Use proper equipment that is in good condition. For example, never use chipped or cracked glassware. Shield pressurized or vacuum apparatus and safeguard against bumping or overheating.
- **Waste Minimization.** A laboratory waste minimization program is coordinated by EHS. In general, this plan includes:

    1. An up-to-date chemical inventory.
    2. Use of the chemical redistribution program.
    3. Annual review of experimental protocols and research of new techniques that consider the hazards and quantities of waste produced.
    4. Destruction procedures as the final step in experiments. For example, neutralization of corrosive wastes that do not contain heavy metals should be a standard operating procedure.
    5. Elimination of thermometers and reagents that contain mercury, and chromic acid cleaning solutions. Use of other hazardous materials such as heavy metals and halogenated solvents should also be eliminated or reduced.

For further information, see the directives listed in Appendix 1. Addition technical information on waste minimization is available from the Environmental Protection Program at 713-500-8100.

- **Disposal of chemicals.** In general, to request a pick up of chemicals, call the EHS's Environmental Protection Program's hazardous waste line at 713-500-5837 and leave a message. Disposal of all laboratory waste shall follow the procedures outlined in a guide entitled "Hazardous Waste Disposal Procedures," a copy of which is available from EHS. Additional resource materials relating to waste disposal are available from EHS. A list of these materials is found in Appendix 1.
- **Chemical spills and accident response.** In the event of a chemical spill, please call the Chemical Safety Hotline at 500-5832 or the main EH&S number at 500-8100. For large spills/leaks, incidents involving injury or after hour incidents call 911 and evacuate the area.
- **Mouth pipetting.** Mouth pipetting is not permitted.
- **Mercaptans (thiols, sulfhydryl reagents).** To avoid false reporting of natural gas leaks, the Chemical Safety Program should be contacted at 713-500-5832, when mercaptans will be used in a laboratory in such a manner that persons outside of the laboratory could smell the mercaptan and suspect a natural gas leak in the building. Mercaptans should be used in a chemical fume hood.
- **Perchloric acid.** If perchloric acid is heated above ambient temperature it will give off vapors that can condense and form explosive perchlorates. Hence, when heating perchloric acid above ambient temperature, a perchloric acid fume hood with a wash down system or

a local scrubbing or trapping system must be used. A perchloric acid fume hood is a specialized type of hood that is currently not present at UTHSCH.

3.2 Personal Protection/Hygiene

Personal protection and personal hygiene are two very basic aspects of laboratory safety. Wearing appropriate personal protection and practicing good personal hygiene, as described below, will minimize exposures to hazardous chemicals during routine use and in the event of an accident.

- **Attire.** Wear a lab coat or apron, cover legs and feet (no sandals, open-toed shoes, or shorts), and confine loose clothing and long hair.
- **Gloves.** Gloves are essential when working with hazardous substances. The proper gloves will prevent skin absorption, infection or burns. All glove materials are not equally effective in protection from chemical hazards. ***In many cases, latex examination gloves do not provide adequate protection from hazardous chemicals.*** Consult a chemical resistance chart such as the one found in Appendix 4, consult a glove manufacturer or contact EHS for assistance in appropriate selection.
- **Eye protection.** All personnel including students, staff and visitors in laboratories shall wear safety glasses, goggles, or face shields at all times where potential eye hazards exist. Goggles are recommended when chemical splashes are possible. The wearing of contact lenses in labs is an unsettled issue. *If contact lenses are to be worn, the eyes should be protected by goggles when in the lab.*
- **Face shields.** Full-face shields must be worn when conducting a procedure that may result in a violent reaction. Full-face shields with bottom caps to protect under the chin are preferred due to the tendency to raise the chin when a splash occurs.
- **Glass tubing.** When inserting glass tubing into stoppers, lubricate the tubing and protect hands from being cut in the event the tubing slips and breaks.
- **Personal hygiene.** Hands should be washed frequently throughout the day, before leaving the lab, after contact with any hazardous material, before eating, etc.

3.3 Hazardous Material Handling and Storage

Hazards associated with various chemicals and gases vary widely. Understanding the hazards associated with a compound and minimizing the quantity used and stored in the lab will decrease the chance of injury.

- **Chemical storage (general).** Chemicals must be stored by compatibility, not by alphabetical arrangement. For example, oxidizers should be separated from organics, air/water reactives must be kept dry and cyanides should be stored away from acids. Storage of all laboratory chemicals shall follow the recommendations outlined in appendix 7, Chemical Segregation and Incompatibilities Guidelines.

- **Storage of volatile chemicals.** Volatile toxic substances shall be stored in storage cabinets adequate to the purpose, or in hoods when cabinets are unavailable. If volatile substances

are stored in a hood, other uses of the hood shall be restricted to activities compatible with the chemical and physical properties of the chemicals being stored or used. When volatiles must be stored in a cooled atmosphere, refrigerators or cold rooms designed for this purpose must be used. Refrigerator/freezer units for the storage of flammables are located throughout UTHSCH. Call the Chemical Safety Program at 713-500-5832 for locations.

- **Chemical handling.** Use secondary containment when transporting chemicals by placing the chemical being transported inside a protective container. For example, use polycoated bottles or bottle carriers for transporting chemicals that are in regular glass containers. Close caps securely and avoid storing chemical containers in hard to reach areas. Pour chemicals carefully, and never add water to concentrated acid or base. Metal containers and non-conductive containers (e.g., glass or plastic) holding more than five gallons must be grounded when transferring flammable liquids.
- **Cylinder storage.** Cylinders must be stored in well-ventilated areas with their protective caps screwed on and the cylinder secured (e.g., strapped or chained down) to reduce the chance of the cylinder being knocked over. For assistance in securing gas cylinders, call the Chemical Safety Program at 713-500-5832. Do not store cylinders near heat or high traffic areas. Do not store flammables and oxidizers together. Do not store empty and full cylinders together. Storage of large quantities of cylinders must be done in an approved gas cylinder storage area.
- **Cylinder handling.** Use appropriate handcarts to move cylinders. Cylinders must be secured to the cart during transport. Highly toxic gases should not be moved through the corridors, particularly during business hours. Always consider cylinders as full and handle them with corresponding care.
- **Labels.** Make sure all labels are legible. Label all secondary containers with the chemical name (as it appears on the original label or MSDS) and appropriate hazards. Health hazard warning information should include the target organs that may be affected and any of the following terms that are appropriate: carcinogen, toxic or highly toxic agent, reproductive toxin, irritant, corrosive, sensitizer, hepatotoxin, nephrotoxin, neurotoxin, agents which act on the hematopoietic system, or agents which damage the lungs, skin, eyes, and mucous membranes. Physical hazard warning information should include any of the following terms that are appropriate: combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, unstable (reactive), or water reactive. Date all peroxidizable (i.e. ethyl ether) and other chemicals that may become unstable over time; test and/or dispose of them when appropriate.
- **Containers.** Check the integrity of containers. Ensure that the container used is compatible with the chemical, for example hydrofluoric acid must not be stored in glass and some oxidizers should not be stored in plastic containers.

4.0 CONTROLLING CHEMICAL EXPOSURES

"*Criteria that the employer will use to determine and implement control measures to reduce*

employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous." 29 CFR 1910.1450(e)(ii)

There are three major routes of entry for a chemical to enter the body: inhalation, skin and eye contact, and ingestion. Three types of controls for prevention of these various routes of entry include: engineering controls, personal protective equipment and administrative controls. Each route of entry a chemical can take to enter the body can be controlled in a number of ways, as explained below.

4.1 Inhalation Hazards

Inhalation of chemicals is the most common route of entry a chemical can take to enter the body. To avoid significant inhalation exposures, engineering controls are the best option to eliminate or minimize hazards. For example, substituting a less volatile or a less toxic chemical, or substituting a liquid or solid chemical for a gaseous one are the best means of control. If substitution is not practical, ventilation should be used to lessen the chance of overexposure. The use of well-functioning local exhaust ventilation such as laboratory (fume) hoods, vented glove boxes and other local exhaust systems is often required to minimize exposure to hazardous chemicals. Dilution ventilation may be used to reduce exposure to non-hazardous nuisance odors. For extremely toxic chemicals such as those classified as poison gases by State or Federal Department of Transportation (e.g., arsine, phosgene) the use of closed systems, vented gas cabinets, fail-safe scrubbing, detection or other stricter controls may be required.

Administrative controls can be utilized to reduce the risk of overexposure to hazardous chemicals. Some examples of administrative controls include:

- minimization of exposure time for individual employees;
- restricted access to an area where a hazardous chemical is used;
- allowing a process that emanates nuisance odors to be done only after typical office hours, when most of the staff in the building have gone home; and,
- proper signage on lab doors to indicate special hazards within, a list of lab personnel who should be contacted in the event of an emergency, and appropriate telephone numbers. Door signs are provided by EHS.

Finally, if engineering and administrative controls are not an option, the use of personal protective equipment may be required to reduce inhalation exposures. If respirators are worn by laboratory employees, requirements of the OSHA Respiratory Protection Standard (29 CFR 1910.134) must be met. This standard requires training on the proper use of respirators, medical surveillance to ensure the user is capable of wearing a respirator, and fit testing to ensure that the respirator fits properly. A lab worker or his/her supervisor should contact EHS in the event that respiratory protection is needed to control exposures to hazardous chemicals.

4.2 Skin/Eye Contact Hazards

To reduce the risk of a chemical entering the body via skin and eye contact, engineering controls including substitution and appropriate ventilation, should be used as described above in "Inhalation Hazards." The more obvious means of preventing skin and eye contact is the wearing of personal protective equipment such as eye protection, face shields, gloves, appropriate shoes, lab aprons, lab coats, and other protective equipment appropriate to the hazard. Since the chemical resistivity of the different types of protective equipment varies significantly, the lab supervisor should consult Appendix 4 or other references to ascertain that the protective equipment material is resistant to the chemical being protected against.

Administrative controls to reduce skin/eye contact include: enforcement of policies pertaining to skin and eye protection, and discarding or repairing cracked or broken glassware.

4.3 Ingestion

Ingestion of chemicals is the least common route of entry into the body. A laboratory worker can easily ingest chemicals into the body via contaminated hands if they are not washed prior to eating, smoking or sticking part of the hand, or a writing tool that has been in contaminated hands, into the mouth. Use engineering controls, such as isolating the hazardous substance so that minimal contact is required (e.g., use glove box), to help prevent exposures. Administrative controls such as restricting mouth pipetting, encouraging good personal hygiene, and designating a well-marked non-chemical area where eating, drinking and the application of cosmetics are permitted, is also beneficial in preventing chemical exposures via ingestion. Personal protective equipment, such as gloves, may also be used.

At the request of faculty, staff or students, exposure evaluations may be conducted by the Chemical Safety Program for any suspected overexposure to substances regulated by OSHA and/or with threshold limit values published by the American Conference of Governmental Industrial Hygienists. Records of exposure evaluations will be kept by EHS.

5.0 LABORATORY SURVEILLANCE

Laboratory safety surveys are conducted on a routine basis in all of the biomedical research and clinical laboratories. The focus of the surveys is to ensure compliance with a number of general safety, fire safety, chemical safety, and physical safety compliance issues. The Environmental Health and Safety department takes a proactive approach to compliance problems found in the laboratories and in most cases facilitates the corrective action process. The following outline the criteria in which the laboratory safety surveys are inspected.

General Housekeeping

It is the responsibility of each laboratory worker to ensure that the laboratory is maintained in a clean and orderly fashion. Excessive storage of equipment, supplies, and chemicals can pose various hazards to laboratory employees and other building occupants.

Current emergency information and warning signs posted

All laboratories shall have posted near the telephone or door entrance, the telephone numbers of persons to call in the event of an emergency. In addition to numbers for chemical spill, radiation spill, fire and medical emergency, there should also be included name of responsible person (PI) along with office and home phone.

A list of campus emergency phone numbers can be found on page six of the Environmental Health and Safety Laboratory Safety yellow flip chart. Other important safety information inside the flip chart includes: Texas Department of Health (TDH) Radiation Notice to Employees, TDH Hazard Communication Notice to Employees, obtaining material safety datasheets, hazardous waste disposal procedures, common lab compliance violations and how to correct, infection control, and the UTHSC-H compliance program.

The NFPA 704 diamond shall also be posted outside each active laboratory for use by firefighters and safety personnel during emergency situations. Radioactivity work areas, laboratories and containers of radioactive materials must be posted with appropriate warning signs. [see Radiation safety manual] Areas where human blood or other potentially infectious materials are stored or used must bear the universal biohazard symbol. Researchers working with or storing biosafety level 2 or higher organisms shall utilize the universal biohazard warning. Appropriate locations for biohazard signs include laboratory entrance, incubator, refrigerator, and waste containers.

Emergency postings shall also be placed on the laboratory electrical panel and emergency gas shut off valve. These two emergency cut-offs are utilized in emergency situations and shall never be obstructed with equipment or storage.

No food or drink rule observed

Food and drink brought into areas of chemical or radiological use can easily become contaminated by these hazards. Airborne particulates can settle on exposed food, eating

surfaces or utensils. Even though work surface contamination may not be readily apparent, it can adhere to hands and then be transferred to food items. Upon ingestion these harmful substances will be carried into the body, increasing the opportunity for toxic effects.

Appropriate Personal Protective Equipment available

Chemical resistant gloves should be available and worn during procedures. To choose the best glove for a particular operation one must weigh the ability of the glove material to resist permeation and degradation by the chemicals in use against the dexterity needed to conduct the experimental protocol. There is no single glove material universally resistant to all classes of chemicals; glove selection must be individualized for each experimental protocol. Eye protection should be available and worn during procedures. The eyes are particularly sensitive to chemical or physical insult and should be protected at all times against chemical splashes or sprays, flying particles, UV radiation and other hazards. Protective clothing should be available and worn during procedures (lab coat, apron, etc.) Lab coats not only protect street clothing from being soiled, they also provide an additional layer of splash and burn protection and help protect family members by reducing take-home toxins

All applicable safety binders/manuals available

Safety manuals available include: Chemical Hygiene Plan, Biological Safety Manual, and the Radiation Safety Manual. Every laboratory using hazardous chemicals, radioactive, or biological hazards must have a copy of the respective Laboratory Safety binder/manual in the lab or otherwise readily available. Thoroughly review all applicable safety manuals with laboratory staff. [OSHA 29CFR 1910.1450 (e) (2)]

Occupant's safety concerns solicited

During routine surveys conducted by EH&S, the Safety Specialist is to talk with the laboratory workers and ensure they have no specific safety concerns. If the employee raises concerns, the Safety Specialist will make every effort to address the issue either personally, by way of a Safety Manager, Safety Director, or the University Chemical Safety Committee.

Appropriate records shall be maintained

Laboratory employees and investigators are to keep documentation of all certificates of required training for working in a laboratory. Training requirements will vary depending on the type of research being conducted. Contact EH&S if there are any questions regarding training requirements.

Egress pathways unobstructed

Laboratories shall be maintained in such a manner where there is at least 36 inches of clearance between obstructions to exit from the laboratory into the corridor. The corridors must have a minimum of 48 inches of clearance and shall be maintained free of obstructions to ensure clear egress to the nearest stairwell in the event of an emergency. Many times,

emergency safety equipment i.e. safety showers and eyewashes are also located in the main corridors and this equipment shall be maintained free of any obstruction. Contact Fire and Life Safety and Emergency Preparedness at 500-8100 for further guidance.

Fire extinguisher available and inspected

Fire extinguishers shall be located inside all laboratories or, in some instances, a minimum of 75 feet from the laboratory. Extinguishes are inspected on a quarterly basis and maintained by Fire and Life Safety and Emergency Preparedness. Laboratory workers should routinely inspect for broken seals, damage, and low gauge pressure (depending on type of extinguisher). If problems are identified, repairs are requested by contacting Fire and Life Safety and Emergency Preparedness at 500-8100.

Heat sources separated from combustibles

One of the easiest methods of fire risk reduction is to remove ignition sources from a flammable system (fuel + oxygen + ignition source). Ignition sources include electrical outlets, lighting fixtures, switches, exposed machinery components, as well as open flame. Flammable solvents should be used inside a chemical fume hood so vapors will be prevented from reaching flammable proportions. In the special case of a flammable solvent being heated (as in a distillation) it is important that all ignition sources (electrical outlets, Variac controllers, outlet strips) be located outside of the hood.

Appropriate clearance to ceiling

It is required that there is an 18 inch clearance to the ceiling to comply with NFPA codes for sprinkler systems. Minimizing the "stacking" of combustible material will also decrease the fuel package arrangement of the laboratory and help contain the fire to one laboratory unit in the event of a fire.

Electrical circuit loading and cords

Insufficient or overloading of electrical outlets should be avoided. A sufficient number of outlets will eliminate the need for extension cords. Overloading electrical circuits and extension cords can result in a fire.

A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation. In addition, cords should never be placed on radiators, steam pipes, walls, and windows. Particular attention should be placed on connections behind furniture, since files and bookcases may be pushed tightly against electric outlets, severely bending the cord at the plug.

When the outer jacket of a cord is damaged, the cord may no longer be water-resistant. The insulation can absorb moisture, which may then result in a short circuit or excessive current leakage to ground. If wires are exposed, they may cause a shock to a worker who

contacts them. These cords should be replaced. Electric cords should be examined on a routine basis for fraying and exposed wiring.

Household extension cords and multi-use plugs are prohibited. Check that cords on equipment are in good condition with no fraying. Equipment supplied with a grounded plug requires attachment to a ground source. Removal of the grounding prong interferes with this electrical safety feature and can result in shock or electrocution.

Minimize trip hazards

Laboratories shall be maintained free of trip hazards. This includes items such as power cords on the floor, excessive equipment in the laboratory, and/or damaged flooring.

Compressed gas cylinders secured

Compressed gas cylinders are under great pressures, often exceeding 2000 pounds per square inch or 136 atmospheres. To prevent the accidental and uncontrolled release of energy it is important to protect cylinders from toppling over and rupturing the valve stem. All compressed gas cylinders, including lecture bottles, "empty" cylinders, and cylinders in transit, must be secured in racks, clamping devices, stands, or other protective structure.

Guards for mechanical hazards in place

Some common pieces of lab equipment present physical hazards due to rotating parts, nip points or other mechanical action. Particularly prevalent in the lab are vacuum pumps that have had their belt guards removed. To prevent injury due to entrapment of hair, clothing or other items it is necessary that these areas remain guarded. Any piece of equipment with a detached, disengaged or inoperable guard must be prominently tagged and removed from service.

Electrical Panel not obstructed

Building safety codes prohibit the placement of any items within 30 inches of the electrical panels. In order to maintain accessibility of the electrical panel in case of an emergency, no items should be placed in such a way as to diminish access to the panel.

Proper segregation of chemicals

Storage of chemicals as a general group alphabetically is not recommended as it may place incompatible materials together on a shelf. Instead, separate chemicals into organic and inorganic families and then into related and compatible groups. Suggested chemical storage schemes and compatibility lists of compatibility's can be found in a number of lab safety resources available from EHS. A quick and very general rule of thumb is to separate acids from bases, flammables from oxidizers, and reactives from air or water. Chemicals should never be stored on the floor.

Chemicals properly labeled

Manufacturers are required to label every chemical container with hazard information that includes chemical name, physical and health hazard information, and name of manufacturer. These labels relay valuable information that can assist in hazard evaluation and control, and cannot be removed or defaced from the original container unless the contents have been altered or removed. Secondary containers that will remain in use for a period of time (storage vials, squirt bottles) should bear an abbreviated label that includes chemical name and hazard warning such as flammable, caustic, sensitizer, carcinogen, absorbed through the skin etc.

Flammables properly stored

A number of common solvents have flash points close to or below the temperature at which most refrigerators operate (around 39°F or 4°C). Flammable solvents evaporate rapidly, even at lowered temperatures, so they can quickly reach equilibrium inside the small, well-sealed space of a refrigerator. When this "off-gassing" reaches the lower explosive limit (LEL) sources of ignition inside a conventional refrigerator such as the thermostat, interior light, defroster, compressor, or fan can set off an explosion. Flammable liquids that must be stored at reduced temperature require a specially designed refrigerator, termed a "flammable material storage refrigerator," where ignition sources are isolated from the inside space.

Controlled substances secured

Controlled substances must be secured in accordance with the Texas Legislature Chapter 481 *Texas Controlled Substances Act* which include the following criteria:

Establishing adequate security to prevent unauthorized access to controlled substances and dangerous drugs, including a preliminary security inspection (contact UTPD for assistance)

Not allowing any individual access to controlled substances and dangerous drugs storage areas except those authorized for efficient operations during the course of business activities.

Storing controlled substances and dangerous drugs listed in schedules I, II, III, IV, and V in a securely-locked substantially-constructed cabinet or security cabinet or safe.

Absence of old or potentially explosive chemicals

Out-dated, expired, unknown chemicals should be promptly disposed of by the appropriate means. Many materials, as they age, become unstable, possibly forming explosive byproducts or undergoing rapid and violent decompositions. Other materials simply lose purity as contaminants are introduced or residues form. Chemicals that may no longer be used, that are of questionable purity, or that are past their expiration dates should be removed from the lab by placing a request into the hazardous wasteline at 713-500-5837.

Hazardous liquid chemicals stored below eye level

Every chemical should have assigned to it a definite storage place and should be returned to that place after each use. Do not store materials on top of high cabinets where they will be hard to reach and see.

Air flow in chemical fume hood adequate

Hazardous chemicals that are flammable, volatile, or gases should be manipulated inside a properly functioning chemical fume hood. Optimum height is the sash height at which air flow is maximized without creating turbulence, generally between 60 and 150 linear feet per minute (lfpm). A yellow sticker placed on the hood face indicates the most recently recommended sash height. Hoods can malfunction at any time without warning. It is important to confirm hood operation before each work session. Check the air flow gauge if so equipped. In the absence of a gauge one can tape an inch wide strip of tissue to the lower corner of the sash. Air flow can be visually assessed by noting that the tissue is pulled gently into the hood. Laboratories that have been upgraded during the indoor air quality renovation will have a digital display of the hood flow rate. Variable air volume valves have been calibrated to maintain 100 lfpm. If the flow rate is not within the acceptable range, the correction is to be made by Facility Operations by contacting 713-500-3498.

Chemical fume hood sash closed when not in use?

In order to promote safety and conserve energy, the chemical fume hood sash must be closed when not in use. If a reminder sticker is needed, please contact Chemical Safety at 713-500-5832.

Ventilation negative to hallway

The primary objective in controlling occupational exposures is to prevent contamination of the work atmosphere. This shall be achieved first by use of a chemical fume hood, or other enclosure. The second way in which this achieved is by making sure the ventilation is such that the air pressure in the laboratory is negative with respect to the hallway, thus assuring airflow into the laboratory.

Safety shower/eyewash station available

Emergency shower and eyewash equipment shall be maintained in accordance with the American National Standards Institute (ANSI) code Z358.1 – 1998. If there are any questions or concerns with this equipment please contact Fire and Life Safety at 713-500-8100.

Previous deficiencies adequately resolved

Safety Specialists will review past laboratory inspections and compare to the current inspection. If discrepancies remain that were identified on previous surveys, they will be communicated to the principal investigator. If not resolved, disciplinary actions will be followed as outlined in section 6.0.

Biological agents / rDNA

Biohazards are a concern in laboratories in which microorganisms or material contaminated with them is handled. These hazards are usually present in clinical and infectious disease research laboratories, but may also be present in any laboratory in which bodily fluids or tissues of humans or animal origin are handled. Identify what bioagents are being used, whether the agents are infectious, and whether the research includes the use of recombinant DNA (rDNA). Identify any animals being used in the research. If the research includes the use of rDNA, notify Biological Safety so that they can check their current approval status.

Biological safety cabinet certified within past year

Biosafety cabinet should be certified when installed or moved, and annually thereafter. The biosafety cabinet's (BSC) ability to filter out microscopic particles relies on the seals being intact and the HEPA filter free of micro tears or breaks that can easily occur during moving, instillation or careless handling. To ensure continued proper operation, each BSC should be tested and certified at least annually. [CDC/NIH Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets p. 29; NRC Biosafety in the Laboratory p. 26].

Chemical Waste

Ensure that all chemical waste containers are kept closed and marked "Hazardous Waste" or equivalent.

Label all hazardous waste containers with the word "waste" and list the individual waste chemical constituents on the label. Accumulation start dates should be marked on the container and full containers should be dated and Environmental Protection contacted at 500-5837 for removal and proper disposal.

Biological Waste

All biological waste must be labeled as such. Ensure that waste bags are contained within a separate solid rigid container (secondary containment), such as a trashcan or cardboard box. Metal frames are insufficient and do not constitute secondary containment. Environmental Protection can be contacted for assistance. Contaminated sharps include needles, scalpels, broken capillary tubes, exposed dental wires, and broken glass if contaminated with human blood or other potentially infectious material. These items must be collected in a sharps box or other puncture resistant container that is color coded or labeled with the universal biohazard symbol.

Needles, razors and other sharps should be contained within rigid plastic sharps containers after use. Coffee cans or other metal containers are not allowed due to the incineration process during disposal. If sharps are to be reused, they should be stored between uses in

Styrofoam blocks to reduce the possibility of needlesticks. Sharps containers can be obtained free of charge through the Environmental Protections program.

6.0 RESPONSE TO NON-COMPLIANCE

Discrepancies discovered during routine inspection will be addressed in the following manner.

Step One - Verbal Notification:

If, during a routine evaluation or inspection, a problem involving chemical safety procedures is observed, a verbal recommendation will be provided. If upon receipt of a verbal recommendation, the laboratory staff or the Environmental Health and Safety staff takes immediate steps to correct the problem, then no further response regarding the discrepancy will be requested.

Step Two - Written Notification

Following the survey a written summary of the findings and recommendations including corrections during the survey will be sent to the PI responsible for the laboratory. The PI will then be requested to take corrective action within 30 days. Verbal, e-mail, or written response is requested.

Step Three - Documentation

A list of discrepancies will be maintained by the Environmental Health and Safety Staff and a follow-up will be conducted within 60 days of the inspection to determine if corrective actions had been taken.

Step Four - Follow-up

If the follow-up reveals that the same discrepancy exists, notification of this situation may be sent to both the PI and the Department Chair. A **written response** from the PI shall be sent to EH&S detailing specific steps taken to ensure correction of the discrepancy. Discrepancies may be presented to the Chemical Safety Committee (CSC) at the discretion of the Director of EHS.

Step Five - Chemical Safety Committee Action

If the problem continues, both the PI and the Department Chair will be given a written account of the situation. The entire case history will also be presented to the CSC. Any operation causing a high or unacceptable risk to employees or personnel exposure to any chemical hazard will be suspended immediately by the EHS without regard to the above procedure. In the event of this action, the situation will be promptly reviewed by the Director of EHS and the CSC.

7.0 LABORATORY (FUME) HOODS AND OTHER ENGINEERING CONTROLS

"A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment."

All laboratory (fume) hoods at UTHSC-H should comply with EHS guidelines. Laboratory (fume) hoods and other engineering controls such as vented gas cabinets should be surveyed annually by EHS. Laboratory (fume) hood velocities for all hoods on campus are currently evaluated on an annual basis by EHS at no charge to laboratory personnel. The face velocity of the hoods should fall between 60 and 150 feet per minute (fpm) with the sash positioned at approximately half-open, unless specified otherwise. (In general, laboratory hoods should not be used with the sash fully open.) If the face velocity is between 60 and 150 fpm on the day of the evaluation, the laboratory hood will bear a yellow sticker on the cabinet with an arrow pointing to the appropriate sash position. If the face velocity is less than or equal to 59 fpm or greater than or equal to 151 fpm, the hood will not have a yellow sticker with an arrow indicating sash position. This indicates that the hood is "Restricted" and should not be used for protection from highly toxic substances. Upon finding a hood out of the specified range, EHS will contact Facility Operations for adjustment. Once the hood has been adjusted, a yellow sticker will be attached with an arrow indicating the appropriate sash position and the face velocity in fpm. The fume hood may be equipped with a variable airflow valve that keeps the hood face velocity at a constant 100 fpm. The rate is measured constantly and displayed by a digital readout on the fume hood.

Laboratory personnel should be certain that their hood has a sticker on it and that the date on the sticker is less than a year old. Because the status of a hood can change within one year, continuous air flow indicators are recommended for all fume hoods. New laboratory (fume) hoods should be equipped with air flow monitoring devices which will alert the user if there is a problem with air flow. For older hoods without air flow monitoring devices, a simple visible test to ensure flow into hoods and other ventilating devices is to tape a Kimwipe to the hood and note its movement when the exhaust fan is on.

Protective equipment other than laboratory hoods should be checked periodically by the laboratory supervisor to ensure that the equipment is functioning properly. Any questions or requests for assistance in evaluation of hoods and other protective equipment may be directed to Environmental Health & Safety at 713-500-8100 or Facility Operations at 713-500-3498.

8.0 PRIOR APPROVAL FOR THE AQUISITION AND USE OF HAZARDOUS CHEMICALS

"The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation." 29 CFR 1910.1450(e)(3)(v)

The principal investigator/laboratory supervisor is responsible for obtaining approval for the acquisition and use of toxic chemical agents. Certain materials including toxic chemical agents, radioactive materials, recombinant DNA and certain biological agents require prior approval from

the respective safety committee at various levels. Questions concerning the need for approvals should be directed to EH&S.

The principal investigator/laboratory supervisor is responsible for obtaining approval from the Chemical Safety Committee for the acquisition and use of toxic chemical agents. Forms for Chemical Safety Committee approval for the use of hazardous chemicals may be found in Appendix 7 and online at http://www.uth.tmc.edu/safety. To determine whether a chemical requires approval prior to acquisition and use consult the "Memorandum of Understanding and Agreement for the Use of Chemical Agents." For additional assistance, contact the Chemical Safety Program at 713-500-5832.

9.0 MEDICAL CONSULTATION

"Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section." 29 CFR 1910.1450(e)(3)(vi)

An opportunity to receive medical consultation shall be provided under the following circumstances: if an employee develops any symptoms thought to arise from chemical overexposure; after an event such as a major spill, leak or explosion which may have resulted in an overexposure; or, if an overexposure is identified as the result of an evaluation by the Chemical Hygiene Officer or designee. These suspected or actual exposures requiring medical evaluation can and should be treated as a regular Worker's Compensation claim. A "Supervisor's First Report of Injury" form should be filled out and signed by the supervisor. The injured employee should contact UT Employee Health Services (713-500-3267) for treatment. Following notification of overexposure, arrangements for an appropriate medical examination must be completed before the exposed individual may return to work. Any medical examination required by this Plan shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. Records of any medical examination will be maintained by UT Employee Health Services.

10.0 CHEMICAL HYGIENE OFFICER AND CHEMICAL HYGIENE COMMITTEE

"Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer and, if appropriate, establishment of a Chemical Hygiene Committee." 29 CFR 1910.1450(e)(3)(vii)

The UTHSCH Chemical Safety Committee will serve as the UTHSCH Chemical Hygiene Committee. The Executive Director of Environmental Health & Safety also serves as the Chemical Hygiene Officer for UTHSCH.

Academic units are encouraged to have their own Chemical Safety Officers to help implement this Plan in their units.

11.0 SPECIAL PROVISIONS FOR SELECT CARCINOGENS, REPRODUCTIVE TOXINS ACUTELY TOXIC CHEMICALS, CONTROLLED SUBSTANCES AND NANOSCALE

PARTICLES

"Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

(A) Establishment of a designated area;
(B) Use of containment devices such as fume hoods or glove boxes;
(C) Procedures for safe removal of contaminated waste; and
(D) Decontamination procedures." 29 CFR 1910.1450(e)(3)(viii)

Carcinogens, reproductive toxins, acutely toxic chemicals, controlled substances and nanoscale particles may require approval from the Chemical Safety Committee prior to acquisition and use. A listing of required protocol chemicals can be obtained from Chemical Safety by calling 713-500-5832. In addition to the general safety guidelines mentioned in the first section and throughout the Plan, special precautions are needed when handling these types of chemicals. A minimum set of guidelines that should be followed is listed below. The lab supervisor should ensure that these and other precautions designed to minimize risk of exposure to these substances are taken.

- Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solutions or mixtures.

- Work with genotoxins, reproductive toxins, acutely toxic chemicals and nanoscale particles should be performed within a functioning laboratory (fume) hood, ventilated glove box, sealed system, or other system designed to minimize exposure. (The exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere.) In all cases, work with these types of chemicals shall be done in such a manner that the OSHA permissible exposure limits or similar standards are not exceeded.

- Compressed gas cylinders that contain acutely toxic chemicals such as arsine and nitrogen dioxide should (and may be required to) be kept in ventilated gas cabinets.

- The ventilation efficiency of the designated hood, glove box or gas cabinet, and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances should be evaluated periodically by laboratory personnel at intervals determined by the laboratory supervisor. The interval of evaluating systems may vary from weekly to biannually depending upon the frequency of usage, quantities employed and level of hazard.

- Each laboratory utilizing these substances must designate an area for this purpose and must sign or mark this area with an appropriate hazard warning. The designated area may be an entire laboratory, an area of the laboratory or a device such as a fume hood or glove box. The designated area should be marked with a DANGER, specific agent, AUTHORIZED PERSONNEL ONLY or comparable warning sign.

- All laboratory workers who work in a laboratory that has an area designated for use with genotoxins, reproductive toxins, acutely toxic chemicals and nanoscale partciles must be trained about the deleterious effects of these substances as well as signs and symptoms regarding exposure to these substances, whether or not they actually work with the substance themselves. Training to ensure the safe handling and storage of these substances is required for those who use these materials. This training is the responsibility of the laboratory supervisor and must be done prior to the use of any of these materials.

- Laboratory workers working with these chemicals must have access to appropriate protective equipment and clothing (available at no expense to the workers) and must be trained on how to properly utilize the safety equipment.

- Detection equipment may be required in laboratories where chemicals (especially poisonous gases) with a high degree of acute toxicity are utilized.

- All wastes contaminated with these substances should be collected and disposed of in a timely manner and appropriately as outlined in the EHS waste disposal guide (mentioned previously). For special disposal information, call Environmental Protection at 713-500-8100. If possible and as soon as practical, waste products shall be destroyed by a suitable, generally acceptable chemical procedure to lessen or eliminate their toxicity.

- The designated working area shall be thoroughly and appropriately decontaminated and cleaned at regular intervals determined by the laboratory supervisor. The interval may be as short as one day or as long as six months depending upon the frequency of usage and level of hazard.

- Special precautions to avoid release and exposure to highly toxic chemicals, genotoxins, reproductive toxins and nanoscale particles must be utilized. For instance, volatile substances should be kept cool and contained; gases should have properly functioning valves, check valves, regulators, containment which can withstand pressure buildup, and appropriate piping; and dispersive solids should be kept in closed containers, used in places with minimum air currents, and appropriate contact materials should be used to avoid static charging. Additionally, the shipment of any highly toxic chemicals, genotoxins, reproductive toxins and/or nanoscale particles from UTHSC-H to any other location must be coordinated through the EHS Chemical Safety Program.

- Emergency response planning for releases or spills shall be prepared by the lab supervisor and included in the training of the laboratory workers and others who may be affected in the building. EHS can be contacted for assistance.

- More information on the use of controlled substances in research can be obtained by referring to the Controlled Substances Research Guide, available on the EH&S website.

APPENDIX 1

CHEMICAL WASTE DISPOSAL PROCEDURES

BACKGROUND

In general, all chemicals and their disposal should be treated with a healthy measure of respect. Because of the tremendous number of chemicals available in today's medical research institutional environment, their deleterious effects to personnel, and the "cradle to grave" responsibility under the Resource Conservation Recovery Act (RCRA) and Superfund Amendments and Reauthorization Act (SARA Title III) regulations, it is essential that an institution conduct a chemical waste disposal program that limits both health and monetary liability.

Generally, a hazardous chemical is one that is highly flammable, toxic, corrosive, carcinogenic, explosive, reactive, or is a solvent. **Because of the complexity of rules that govern the disposal of hazardous waste, all hazardous chemical waste is disposed of through the Environmental Protection Program of EH&S.**

DISPOSAL

When disposing of chemical waste, the following procedures should be followed:

1. **Placed waste in the proper container.**

    a. The outside of waste containers must be contamination free, the lid should be securely attached, and the container must be in good condition.

    b. All containers should be maximum one gallon with a minimum two inches of free space on top. Acids, bases, and poisons should be placed in containers no larger than ½ gallon.

    c. All dry waste should be double bagged in 2 mil thick bags.

2. **Label the waste properly with the complete chemical name of the waste.**

3. **Have a completed Hazardous Material Tag attached to it.** Hazardous Material Waste Tags are provided to lab personnel free of charge by contacting the Environmental Protection Program at the number listed below. The tag should have the chemical name(s) and the date when accumulation began and when the container was completely full and ready for pickup.

4. **When ready for collection, lab personnel should leave a message on the waste line (713-500-5837).** Chemical waste is picked up throughout the week..

Empty Containers

Empty containers with a volume of less than five gallons can be disposed of in the regular trash provided the **labels are defaced.** Before containers greater than five gallons can be discarded in the regular trash they must be rinsed a minimum three times, making sure the washings are collected and disposed of as chemical waste.

Broken Glassware/Containers

If a broken container is contaminated with a hazardous chemical residue, call 713-500-5837 for a pickup. Otherwise, broken glassware/containers should be disposed of in a broken glass box. These boxes are available free of charge by calling the number listed above. When filled, the container should be closed, taped, labeled "Housekeeping" and placed near the regular trash for pickup.

Controlled Substances/Expired Drugs/Pharmaceuticals

The DEA (Drug Enforcement Agency) no longer accepts controlled substances. They must be disposed of directly to a contractor who is approved by the DEA to dispose of controlled substances. Approval must be obtained prior to disposal of the substances. Assistance in disposal of controlled substances can be obtained by contacting the Environmental Protection Program at 713-500-8100.

Expired drugs or pharmaceuticals that are not considered controlled substances can be disposed of by calling 713-500-5837.

Sink Disposal

Under no circumstances, should any *hazardous waste* be disposed of by pouring it down the drain (through the sanitary sewer). There are some chemicals, however, that can be disposed of by pouring down the sink. They include **salt solutions, sugar solutions, saline, ringers lactate, amino acid solutions, vitamin solutions, glucose solutions, and urine samples.** Call the Environmental Protection Program at 713-500-8100 for questions regarding waste disposal.

APPENDIX 2
ADDITIONAL POLICIES AND GUIDELINES

THE HANDBOOK OF OPERATING PROCEDURES

Chapter 18

Safety and Health

18.01 Emergency Situation Response Plan
18.02 Suspension of Operations: Adverse Conditions
18.03 Medical Emergencies, Minor Injuries/Illneses
18.04 Reporting Criminal Activity on Campus
18.05 Substance Abuse in the Workplace
18.06 Substance Abuse-Students
18.07 AIDS, HIV, and HBV Infection
18.08 Building Pathways Use
18.09 Radiation Safety
18.10 Hazardous Chemical, Infectious, and Radioactive Waste
18.11 Safe Use of Biological and Chemical Agents
18.12 Minors in the Workplace
18.13 Tuberculosis Infection

Copies of the following guidelines written by Environmental Health & Safety are available by calling 713-500-8100.

INSTITUTIONAL BIOSAFETY MANUAL

1.0 Introduction
2.0 General Information and Procedures
3.0 Engineering and Work Practice Controls
4.0 Requirements for Work with Specific Infectious Agents
5.0 Laboratory Safety Audits
6.0 UT Student and Employee Health Service
7.0 Occupational Health Services for Agent Categories
8.0 Tuberculosis Control Plan
9.0 Animal Exposures
Appendices

MANUAL OF RADIATION SAFETY

1.0 Radiation Safety Committee
2.0 Safety Officer
3.0 The Authorized User

4.0 Individual Responsibility
5.0 Authorization to Obtain and Use Radiation Sources
6.0 Procurement, Accountability and Transfers of Radioactive Materials
7.0 Disposal of Radioactive Waste
8.0 Radiation Protection Program
9.0 Emergency Procedures
Appendix
Permissible Concentration Limits in Air and Water

EHS HEALTH AND SAFETY GUIDES

Chemical Storage Guide
Hazardous Waste Disposal Procedures

EHS VIDEOS

Assessing Risks
Practicing Safe Science
Controlling Your Risks HIV in the Research Lab
Safety in the Lab Set One (Radionuclide and Chemical Hazards, Emergency Response)
Safety in the Lab Set Three (Mammalian Cell Culture Hazards, X-ray Diffraction Hazards,
Assessing Risks on Toxic Chemicals
Mammalian Cell Culture Hazards

Additional videos available by calling 713-500-8100.

APPENDIX 3
REFERENCE MATERIALS

References available from Environmental Health & Safety:

Dangerous Properties of Industrial Materials, 8th ed., Irving Sax and Richard J. Lewis, Sr., Van Nostrand Reinhold Company, 1992.

Handbook of Compressed Gases, 3rd ed., Compressed Gas Association, Arlington, Virginia, 1990.

Handbook of Laboratory Safety, 3rd ed., edited by A. Keith Furr, CRC Press, 1990.

Hawley's Condensed Chemical Dictionary, 11th ed., Irving Sax and Richard J. Lewis, Sr., Van Nostrand Reinhold Company, 1978.

Industrial Ventilation, 20th ed., American Conference of Governmental Industrial Hygienists, 1992.

NIOSH Pocket Guide to Chemical Hazards, DHHS (NIOSH), June 1997, DHHS (NIOSH) Publication No. 97-140.

OSHA Safety and Health Standards, (29 CFR 1910), United States Department of Labor, U.S. Government Printing Office, 1995.

Patty's Industrial Hygiene and Toxicology, 3rd ed., Patty, F.A., Volumes 1,2(A,B,C),and 3(A,B), Wiley-Interscience, 1978.

Prudent Practices for Disposal of Chemicals from Laboratories, National Research Council, National Academy Press, 1983.

Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Research Council, National Academy Press, 1981.

Safety in Academic Chemistry Laboratories, 5th ed., Committee on Chemical Safety, American Chemical Society: Washington, D.C., 1990.

Threshold Limit Values for Chemical Substances and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 1999.

APPENDIX 4
CHEMICAL RESISTANCE CHART

Resistance to Chemicals of Common Glove Materials
(E=Excellent, G=Good, F=Fair, P=Poor)

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CHEMICAL	NATURAL RUBBER	NEOPRENE	NITRILE	VINYL
Acetaldehyde	G	G	E	G
Acetic acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	-	F
Ammonium hydroxide	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
*Benzene	P	F	G	F
*Benzyl chloride	F	P	G	P
Bromine	G	G	-	G
Butane	P	E	-	P
Butyraldehyde	P	G	-	G
Calcium hypochlorite	P	F	G	F
Carbon disulfide	P	P	G	F
*Carbon tetrachloride	P	F	G	F
Chlorine	G	G	-	G
Chloroacetone	F	E	-	P
*Chloroform	P	F	G	P
Chromic acid	P	F	F	E
Cyclohexane	F	E	-	P

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Dibenzyl ether	F	G	-	P
Dibutyl phthalate	F	G	-	P
Diethanolamine	F	E	-	E
Diethyl ether	F	G	E	P
**Dimethyl sulfoxide	-	-	-	-
Ethyl acetate	F	G	G	F
*Ethylene dichloride	P	F	G	P
Ethylene glycol	G	G	E	E
*Ethylene trichloride	P	P	-	P
Fluorine	G	G	-	G
Formaldehyde	G	E	E	E
Formic acid	G	E	E	E
Glycerol	G	G	E	E
Hexane	P	E	-	P
Hydrobromic acid (40%)	G	E	-	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofluoric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	-	G
Methylamine	G	G	E	E
Methyl cellosolve	F	E	-	P
*Methyl chloride	P	E	-	P
Methyl ethyl ketone	F	G	G	P
*Methylene chloride	F	F	G	F
Monoethanolamine	F	E	-	E
Morpholine	F	E	-	E
*Naphthalene	G	G	E	G

Nitric acid (conc)	P	P	P	G
Perchloric acid	F	G	F	E
Phenol	G	E	-	E
Phosphoric acid	G	E	-	E
Potassium hydroxide	G	G	G	E
*Propylene dichloride	P	F	-	P
Sodium hydroxide	G	G	G	E
Sodium hypochlorite	G	P	F	G
Sulfuric acid (conc)	G	G	F	G
*Toluene	P	F	G	F
*Trichloroethylene	P	E	G	F
Tricresyl phosphate	P	E	-	F
Triethanolamine	F	E	E	E
Trinitrotoluene	P	E	-	P

* Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

** No data on the resistance of dimethyl sulfoxide of natural rubber, neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

Appendix 4 taken from "Prudent Practices for Handling Hazardous Chemicals in the Laboratory"

APPENDIX 5
UTHSC-H CHEMICAL HYGIENE PLAN
GENERAL TRAINING CERTIFICATE

Name:_____Date:_____

Building/Room:_____Phone:_____Department_____

I certify that I have read the Chemical Hygiene Plan for the University of Texas-Houston HSC and that I have received the general training related to the Chemical Hygiene Plan, which included the following:

1. Location of the potentially hazardous chemicals in the workplace.

2. Recognition of the chemical labeling and its meaning.

3. Location of the MSDS's in the workplace.

4. Location of the health hazard, physical hazard, environmental protection, and special protection sections of the MSDS and an explanation of their use.

5. Identification of the Chemical Hygiene Officer by name and title.

6. The major components of the laboratory's standard labeling system.

7. The appropriate protective clothing for the area and its proper usage.

8. Emergency procedures in the events of a hazardous chemical spill.

9. The environmental monitoring protocol for the laboratory.

10. Location and safety precautions for potentially hazardous equipment.

11. Physical and health effects of hazardous chemicals associated with task assignments.

12. Methods and observation techniques used to determine the presence or release of hazardous chemicals in the laboratory.

13. How to lessen or prevent exposure to hazardous chemicals through controlled work practices and personal protective equipment.

14. Emergency and first-aid procedures to follow if employees are exposed to hazardous chemicals.

In addition, I understand that I have the responsibility to read the MSDS's for any chemical that I will work with in the laboratory.

_____
Laboratory User Signature

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APPENDIX 6
Chemical Safety Committee Forms

THE UNIVERSITY of TEXAS
HEALTH SCIENCE CENTER AT HOUSTON

Application for the Use of a Highly Toxic Chemical

Section 1 - Applicant Data

Date: **CSC Protocol Number:**

Project Name:

Principal Investigator: **Department:**

Building/Room Number: **Office Phone:**

Section 2 - Identification of Chemical Agent

Chemical Agent(s) :

Use Quantity :

Number of Procedures :

Storage Quantity :

Section 3 - Personnel Involved in Study and experience working with chemical agent

1) **Experience:**

2) **Experience:**

Section 4 - Location where work is to be conducted:

Building/Room Number: **Laboratory Phone Number:**

Section 5 - Experimental Description:

Section 6. Hazard Controls

Personal Protective Equipment:

Engineering Controls:

Section 7. Storage

Section 8. Waste Disposal

Identify method of waste disposal:

Has source substitution been investigated:

Can chemical be neutralized during experiment:

Section 1. Chemical/ Industrial Hygiene Related Information

Chemical Agent(s) :

Description :

Classification :

Toxicology :

Routes of Exposure :

Other Precautions :

Exposure Limits :

Section 2. Non-Routine Operations

Section 3. Identify Occupational Monitoring Required (if any)

Section 4. Waste Disposal Recommendations

Classification:

Identify any mixed waste generated:

Section 5. Fulfillment of UTHHSC Chemical Hygiene Plan Requirements

Hazard Communication Training:

Last Laboratory Safety Survey:

Findings:

Section 6. Assessment Rating

Acceptable Rating _____

Uncertain Rating _____

Unacceptable Rating _____

THE UNIVERSITY of TEXAS
HEALTH SCIENCE CENTER AT HOUSTON

Memorandum of Understanding and Agreement for The Use of Chemical Agents

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Title of Research: **Number:**

PI Name: **Dept:**

Lab Room No(s): **Phone:**

Chemical Name: **CAS #:**

Usage Amount: **Storage Amount:**

The referenced chemical has been determined to require Chemical Safety Committee Protocol Review based on the following: (check one) :

_____ **Chemical is listed on the "Mandatory Protocol Review Chemical List"**

_____ **Chemical has been found to be potential hazardous because of its toxicological, usage and storage quantities**

Attach completed "Application for the Use of Acutely Toxic Chemicals"

I agree to comply with current regulations and university policies pertaining to the use, storage, transfer and shipment of chemical agents. I will also abide by all of the provisions of UTHHSC Chemical Hygiene Plan and the recommendations of the Chemical Safety Committee.

_____ _____

P.I. signature Date

The UTHHSC Environmental Health and Safety Chemical Safety Program has reviewed the above proposal and has verified the classification indicated by the Principal Investigator.

_____ _____

Chemical Safety Representative Date

The Chemical Safety Committee has been provided a summary of this memorandum of understanding and agreement and concurs with the information provided above. The activities described in this protocol will be reviewed annually.

_____ _____

Chair, Chemical Safety Committee Date

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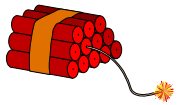
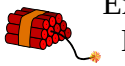
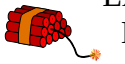
Appendix 7

Chemical Segregation & Incompatibilities Guidelines

Class of Chemical	Examples	Recommended Storage Method	Incompatible Materials	Possible Reaction If Mixed
Corrosive Acids 	*Mineral Acids* – Chromic Acid Hydrogen Chloride Hydrochloric Acid Nitric Acid Perchloric Acid Phosphoric Acid Sulfuric Acid	Separate cabinet or storage area away from potential water sources, i.e. under sink	Flammable Liquids Flammable Solids Bases Oxidizers Poisons	Heat   Gas Generation  Violent Reaction
Corrosive Bases/ Caustics 	Ammonium Hydroxide Sodium Hydroxide Sodium Bicarbonate	Separate cabinet or storage area away from potential water sources, i.e. under sink	Flammable Liquids Flammable Solids Acids Oxidizers Poisons	 Heat  Gas Generation  Violent Reaction
Explosives 	Ammonium Nitrate Nitro Urea Picric Acid Trinitroaniline Trinitrobenzene Trinitrobenzoic Acid Trinitrotoluene Urea Nitrate	Secure location away from other chemicals	Flammable Liquids Oxidizers Poisons Acids Bases	Explosion Hazard 

Flammable Liquids 	Acetone Benzene Diethyl Ether Methanol Ethanol Toluene Glacial Acetic Acid	Grounded flammable storage cabinet of flammable storage refrigerator	Acids Bases Oxidizers Poisons	 Fire Hazard Heat   Violent Reaction
Flammable Solids 	Phosphorus Magnesium	Separate dry cool area	Acids Bases Oxidizers Poisons	Fire Hazard  Heat   Violent Reaction
Oxidizers 	Sodium Hypochlorite Benzoyl Peroxide Potassium Permanganate Potassium Chlorate Potassium Dichromate Peroxides Perchlorates Chlorates Nitrates	Spill tray that is separate from flammable and combustible materials	Reducing Agents Flammables Combustibles Corrosives	Fire Hazard  Toxic Gas Generation 
Poisons 	Cyanides Cadmium Mercury Osmium Acrylamide DMSO	Vented, cool, dry area in unbreakable chemically resistant secondary containers	Flammable Liquids Acids Bases Oxidizers Corrosives	Generation of Toxic & Flammable Gas   Violent Reaction
Water Reactive Chemicals 	Sodium Metal Potassium Metal Lithium Metal Lithium Aluminum Hydride	Dry, cool location away from potential spray from fire sprinklers and other water sources, i.e. under sink	Aqueous Solutions Oxidizers	Heat   Violent Reaction

Flammable Compressed Gases 	Methane Acetylene Propane Hydrogen	Cool, dry area away from oxidizing gases while securely attached to wall or bench	Oxidizing & Toxic Compressed Gases Oxidizing Solids	Fire Hazard   Explosion Hazard
Oxidizing Compressed Gases 	Oxygen Chlorine Bromine	Cool, dry area away from flammable gases while securely attached to wall or bench	Flammable Gases	Fire Hazard   Explosion Hazard
Poisonous Compressed Gases 	Carbon Monoxide Hydrogen Sulfide	Cool, dry area away from flammable gases or liquids while securely attached to wall or bench	Flammable Gases Oxidizing Gases	Release of Toxic Gas   Violent Reaction

Partial Incompatibility Listing

Compound/Class	Avoid Storage Near or Contact With:
Acids	
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene, glycogen, perchloric acid, peroxides, permanganate
Hydrofluoric Acid	Ammonia (aqueous or anhydrous)
Nitric Acid (conc.)	Acetic acid, aniline, chromic acid, acetone, alcohol, or other flammable liquids, hydrocyanic acid, hydrogen sulfide, or other flammable gases, nitratable substances: copper, brass or any heavy metals (or will generate nitrogen dioxide/nitrous fumes) or organic products such as wood and paper
Sulfuric Acid	Light metals (lithium, sodium, potassium), chlorates, perchlorates, permanganates
Bases	
Ammonia	Mercury, chlorine, bromine, iodine, hydrofluoric acid, calcium hypochlorite
Calcium oxide	Water
Alkaline metals	Sodium, potassium, magnesium, calcium, aluminum, carbon dioxide, carbon tetrachloride or other chlorinated hydrocarbons, halogens, water
Bromine	Ammonia, acetylene, butadiene, methane, propane, butane (or other petroleum gases), hydrogen, sodium carbide, turpentine, benzene, finely divided metals
Carbon, activated	Calcium hypochlorite, oxidizing agents
Chlorine	Ammonia, acetylene, butadiene, methane, propane, butane, or other petroleum gases, hydrogen, sodium carbide, turpentine, benzene, finely divided metals
Copper	Acetylene, hydrogen peroxide, nitric acid
Fluorine	Isolate from everything
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, ammonia, fulminic acid (produced in nitric acid ethanol mixtures)
Oxygen	Oils, grease, hydrogen, other flammable gases, liquids, or solids
Phosphorous (white)	Air, oxygen, caustic alkalis as reducing agents (or will generate phosphine)
Potassium	Carbon tetrachloride, carbon dioxide, water
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid (produced in nitric acid-ethanol mixtures), and ammonium compounds

Organics

Acetone	Concentrated nitric acid and sulfuric acid mixtures
Acetylene	Fluorine, chlorine, bromine, copper, silver, mercury
Aniline	Nitric acid, hydrogen peroxide
Flammable Liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Hydrocarbons (propane, butane, etc.)	Fluoride, chlorine, bromine, chromic acid, sodium peroxide
Nitroparaffins	Inorganic bases, amines
Oxalic Acid	Silver, mercury

Oxidizers

Chlorates	Ammonia salts, acids, metal powders, sulfur, finely divided organics, or combustible materials
Chromic Acid (trioxide)	Acetic acid, naphthalene, camphor, glycerol, turpentine, alcohol or flammable liquids
Ammonium Nitrate	Acids, metal powders, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials
Chlorine Dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Cumene Hydroperoxide	Organic or inorganic acids
Hydrogen Peroxide	Copper, chromium, iron, most other metals or salts, alcohols, acetone, or other flammable liquids, aniline, nitromethane, or other organic or combustible materials
Hypochlorites	Acids (will generate chlorine or hypochlorous acid
Nitrates	Sulfuric acid (will generate nitrogen dioxide)
Perchloric Acid	Acetic acid, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides (Organics)	Organic or inorganic acids; also avoid friction and store cold
Potassium Chlorate	Acids, especially sulfuric acid
Potassium Permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Sodium Peroxide	Any oxidizable substance such as methanol, ethanol, glycerol, ethylene glycol, glacial acetic acid, acetic anhydride, benzaldehyde, furfural, methyl acetate, ethyl acetate, carbon disulfide
Alkaline metals	Sodium, potassium, magnesium, calcium, aluminum, carbon dioxide, carbon tetrachloride or other chlorinated hydrocarbons, halogens, water
Calcium oxide	Water

Cyanides	Acids (will generate hydrogen cyanide)
Phosphorous (white)	Air, oxygen, caustic alkalis as reducing agents (will generate phosphine)
Potassium	Carbon tetrachloride, carbon dioxide, water
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium Peroxide	Any oxidizable substance such as methanol, ethanol, glycerol, ethylene glycol, glacial acetic acid, acetic anhydride, benzaldehyde, furfural, methyl acetate, ethyl acetate, carbon disulfide
Sulfides	Acids (will generate hydrogen sulfide)

Reducing Agents

Hydrazine	Hydrogen peroxide, nitric acid, other oxidants
Nitrites	Acids (will generate nitrous fumes)
Sodium Nitrite	Ammonium nitrate and other ammonium salts

Toxics/Poisons

Arsenicals	Reducing agents (will generate arsine)
Azides	Acids (will generate hydrogen azide)
Cyanides	Acids (will generate hydrogen cyanide)
Hydrocyanic Acid	Nitric Acid, alkalis
Hydrogen Sulfide	Fuming nitric acid, oxidizing gases
Selenides	Reducing agents (will generate hydrogen selenide)
Sulfides	Acids (will generate hydrogen sulfide)
Tellurides	Reducing agents (will generate hydrogen telluride)

Date created 03/05

APPENDIX 8

THE UNIVERSTIY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON HAZARD COMMUNICATION PROGRAM

Introduction

To ensure that information about the danger of all hazardous chemicals used at the University of Texas Health Science Center at Houston (UTHSC-H) are known by all affected employees, the following Hazard Communication Program has been established. This program follows the Texas Hazard Communication Act, Chapter 502 of the Health and Safety Code.

This program applies to all work operations at UTHSC-H where employees may be exposed to hazardous chemicals under normal working condition and during emergency situations. This written program is available for review by any interested employee by contacting Environmental Health and Safety.

Under this program, employees are informed of the contents of the Texas Hazard Communication Act, as well as, the hazardous properties, safe handling procedures, and measures that can be taken by employees to protect themselves from chemicals found in the UTHSC-H workplace.

Sec. 502.004 APPLICABILITY OF CHAPTER

(a) Except as provided in Subsection (b), this chapter applies to employers who are not required to comply with the OSHA standard, the Federal Coal Mine Health and Safety Act of 1969 or the Federal Mine Safety and Health Amendments Act of 1977.

The University of Texas Health Science Center at Houston is not directly under the jurisdiction of OSHA but of the Texas State Department of Health. However, the state of Texas plan follows the OSHA plan and provides an equal level of safety and compliance.

(f) This chapter doe not apply to:

(1) any hazardous waste, as that term is defined by the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended, when subject to regulation issued under that Act by the EPA.

(2) a chemical in a laboratory under the direct supervision or guidance of a technically qualified individual if:

(A) labels on incoming containers of chemicals are not removed or defaced;

(B) the employer complies with Sections 502.006 and 502.009 with respect to laboratory employees; and

(C) the laboratory is not used to produce hazardous chemicals in bulk for commercial purposes.

Chemicals in laboratories are under the direct supervision of faculty members/principal investigators

(technically qualified individual), labels on incoming containers of chemical are not to be removed or defaced, UTHSC-H complies with Sections 502.006 and 502.009 with respect to laboratory employees, and no laboratories are used primarily to produce hazardous chemicals in bulk for commercial purposes. The primary function of UTHSC-H laboratories is research.

Sec.502.005 WORKPLACE CHEMICAL LIST

(a) For the purpose of worker right-to-know, an employer shall compile and maintain a workplace chemical list that contains the following information for each hazardous chemical normally present in the workplace or temporary workplace in excess of 55 gallons or 500 pounds or in excess of an amount that the board determines by rule for highly toxic or dangerous chemicals:
(1) the identity used on the MSDS and container label; and
(2) the work area in which hazardous chemical is normally present.
(b) The employer shall update the workplace chemical list as necessary but at least by December 31st of each year. Each workplace chemical list shall be dated and signed by the person responsible for compiling the information.
(c) The workplace chemical list may be prepared for the workplace as a whole or for each work area or temporary workplace and must be readily available to employees and their representatives. All employees shall be made aware of the workplace chemical list before working with or in a work area containing hazardous chemicals.
(d) An employer shall maintain a workplace chemical list for at least 30 years. The employer shall send complete records to the director if the employer ceases to operate.

In accordance with the Texas Community Right-To-Know Act, a Texas Tier II Report is filed by the Environmental Health and Safety annually by March 1st of each year regarding the chemicals maintained in single containers in excess of 55 gallons at UTHHSC. Copies of this report are sent to the Texas Department of Health's State Emergency Response Commission, the local fire department, and the local emergency planning committee. Copies of this report are kept by Environmental Health and Safety's Environmental Protection Program, and may also be found in section five of this Hazard Communication Program binder. At this time, diesel fuel is the only chemical maintained in single containers in excess of 55 gallons. The Tier II report gives the identity of the diesel fuel used on the MSDS and container label and also gives the locations of the underground and above ground diesel storage tanks. This list is updated annually, dated, signed, and copies are kept indefinitely. Employees are made aware of this hazard through training.

Sec.502.006 MATERIAL SAFETY DATA SHEET

(a) A chemical manufacturer or distributor shall provide appropriate data sheets to employers who acquire hazardous chemicals in this state with each initial shipment and with the first shipment after an MSDS is updated. The MSDSs must conform to the most current requirements of the OSHA standard.

(b) An employer shall maintain a legible copy of a current MSDS for each hazardous chemical purchased. If the employer does not have a current MSDS for a hazardous chemical when the chemical is received at the workplace, the employer shall request an MSDS in writing from the manufacturer or distributor in a timely manner or shall otherwise obtain a current MSDS. The manufacturer or distributor shall respond with an appropriate MSDS in a timely manner.

(c) Material Safety Data Sheets shall be readily available, on request, for review by employees or designated representatives at each workplace.

(d) A copy of an MSDS maintained by an employer under this section shall be provided to the director upon request.

Material Safety Data Sheets (MSDSs) are provided by chemical manufacturers and distributors to UTHSC-H with each initial shipment and with the first shipment after an MSDS is updated. Depending on the company, the MSDS may be included inside the package containing the chemical, which goes directly to the principal investigator's laboratory personnel, or may be mailed shortly after shipment to Environmental Health and Safety. Environmental Health and Safety directs any MSDSs received to the principal investigator's laboratory.

MSDSs are readily available for review by employees in several manners at the UTHSC-H. In addition to the paper copies available as described above, employees may access MSDSs via computer 24 hours a day at the institutional website "http://www.uth.tmc.edu/safety/msds.htm." In addition, an employee may directly request an MSDS 24 hours a day from Chemical Safety by calling 500-5832. This phone number is linked to a paging system, which pages the Safety Specialist on call.

Sec.502.007 LABEL

(a) A label on an existing container of a hazardous chemical may not be removed or defaced unless it is illegible, inaccurate, or does not conform to the OSHA standard or other applicable labeling requirement. Primary containers must be relabeled with at least the identity appearing on the MSDS, the pertinent physical and health hazards, including the organs that would be affected, and the manufacturer's name and address. Except as provided by Subsection (b), secondary containers must be relabeled with at least the identity appearing on the MSDS and appropriate hazard warnings.

(b) An employee may not be required to work with a hazardous chemical from an unlabeled container except for a portable container intended for the immediate use of the employee who performs the transfer.

Labels on chemicals received at UTHSC-H are not intentionally removed or defaced. Secondary containers are relabeled with the identity of the chemical and appropriate hazard warnings. As part of the Environmental Health and Safety's routine surveillance program, principal investigators/laboratory personnel are reminded not to label secondary containers using a chemical symbol in place of the chemical name found on the MSDS. In addition, principal investigators/laboratory personnel are encouraged to label all containers with chemicals even if the chemical is intended for immediate use by the employee who performs the transfer.

Sec.502.009 EMPLOYEE EDUCATION PROGRAM

(a) An employer shall provide an education and training program for employees who use or handle hazardous chemicals.

(b) An employer shall develop, implement, and maintain at the workplace a written hazard communication program for the workplace that describes how the criteria specified in this chapter will be met.

(c) An education and training program must include, as appropriate:

(1) information on interpreting labels and MSDSs and the relationship between those two methods of hazard communication;

(2) the location by work area, acute and chronic effects, and safe handling of hazardous chemicals known to be present in the employee's work area and to which the employees may be exposed;

(3) the proper use of protective equipment and first aid treatment to be used with respect to the hazardous chemicals to which the employees may be exposed; and

(4) general safety instructions on the handling, cleanup procedures, and disposal of hazardous chemicals.

(d) Training may be conducted by categories of chemicals. An employer must advise employees that information is available on the specific hazards of individual chemicals through the MSDSs. Protective equipment and first aid treatment may be categories of hazardous chemicals.

(e) An employer shall provide additional instruction to an employee when the potential for exposure to hazardous chemicals in the employee's work area increases significantly or when the employer receives new and significant information concerning the hazards of a chemical in the employee's work area. The addition of new chemicals alone does not necessarily require additional training.

(f) An employer shall provide training to a new or newly assigned employee before the employee works with or in a work area containing a hazardous chemical.

(g) An employer shall keep a written hazard communication program and a record of each training session given to employees, including the date, a roster of the employees who attended, the subjects covered in the training session, and the names of the instructors. Those records shall be maintained for at least five years by the employer. The department shall have access to those records and may interview employees during inspections.

(h) Emergency service organizations shall provide, to their members or employees who may encounter hazardous chemicals during an emergency, information on recognizing, evaluating, and controlling exposure to the chemicals.

All UTHSC-H employees are required to attend an employee orientation prior to beginning their first day of work. During employee orientation, employees view a brief Hazard Communication video. Those employees that work in a laboratory or chemical setting also fill out an Environmental Health and Safety New Employee Orientation form (see section six of this Hazard Communication Program binder) during the orientation. This form lets employees know that training is required and how to obtain it. Employees mark on the form whether they will be working with radiation sources, biological materials, or chemical agents. Environmental Health and Safety contacts the individuals

informing them of available training classes after a copy of the form is forwarded from the Employee Orientation Session.

Employees attending the Basic Laboratory Safety Class (class-room type training) receive initial training in the Hazard Communication Act and the safe use of hazardous chemicals from Environmental Health and Safety. Principal investigators are responsible for additional training on hazards specific to their laboratory. Annual refresher training is offered to review the information presented in the initial training.

The training program emphasizes these items:

- information on interpreting labels and MSDSs and the relationship between those two methods of hazard communication;

- the location by work area, acute and chronic effects, and safe handling of hazardous chemicals known to be present in the employee's work area and to which the employees may be exposed;

- the proper use of protective equipment and first aid treatment to be used with respect to the hazardous chemicals to which the employees may be exposed; and

- general safety instructions on handling, cleanup procedures, and disposal of hazardous chemicals.

Training is conducted by categories of chemicals for employees that use different chemicals. Employees are instructed that information is available on the specific hazards of individual chemicals through their supervisor and MSDSs and are also told how they may access that information 24 hours a day. Protective equipment and first aid treatment information is also given by categories of hazardous chemicals.

Whenever the potential for exposure to hazardous chemicals in the employee's work area increases significantly or when new information concerning the hazards of a chemical is received, additional training will be provided when Environmental Health and Safety is notified of these changes. Principal investigators are primarily responsible for deciding when additional training is required and whether or not to inform Environmental Health and Safety. The addition of new chemicals does not necessarily require additional training.

Training class/session rosters are maintained for the type of training given to the employees, including the date, employees who attended, the subjects covered, and the names of the instructors. Those records are maintained for at least five years by UTHSC-H and have also been used to create a training database. Laboratory and clinic employee training status is assessed annually during routine safety surveys and employees are asked to attend refresher training if necessary.

Environmental Health and Safety's Chemical Safety Program responds to chemical spills and the staff of this program is required to attend an initial 24 hour Hazardous Materials Emergency Response Training in accordance with 29 CFR 1910.120, with an annual 8 hour refresher course.

UTHSC-H has developed, implemented, and maintained a written hazard communication program for the workplace that describes how the criteria in the Texas Hazard Communication Act, Chapter 502, of the Health and Safety Code are being met.

Sec.502.012 REPORTING FATALITIES AND INJURIES

(a) Within 48 hours after the occurrence of an employee accident that directly or indirectly involves chemical exposure, or that involves asphyxiation, and that is fatal to one or more employees, or results in the hospitalization of five or more employees, the employer of any of the employees so injured or killed shall report the accident either orally or in writing to the department.

(b) The report to the department shall relate the circumstances of the accident, the number of fatalities, and the extent of any injuries. If it is necessary to complete the investigation of an incident, the department may require additional reports in writing as necessary.

UTHHSC will report any accidents described in Sec. 502.012 above within 48 hours to the Texas Department of Health. Additional reports will be submitted if necessary.

Sec.502.017 EMPLOYEE NOTICE; RIGHTS OF EMPLOYEES

(a) An employer shall post and maintain adequate notice, at locations where notices are normally posted, informing employees of their rights under this chapter. If the director does not prepare the notice under Section 502.008, the employer shall prepare the notice.

(b) Employees who may be exposed to hazardous chemicals shall be informed of the exposure and shall have access to the workplace chemical list and MSDSs for the hazardous chemicals. Employees, on request, shall be provided a copy of a specific MSDS with any trade secret information deleted. In addition, employees shall receive training concerning the hazards of the chemicals and measures they can take to protect themselves from those hazards. Employees shall be provided with appropriate personal protective equipment. These rights are guaranteed.

The Texas Department of Health's "Notice to Employees" (see section 7 of this Hazard Communication Program binder) is posted at locations where notices are normally posted and in laboratories at UTHHSC. Employees who may be exposed to hazardous chemicals will be informed of the exposure and will have access to the workplace chemical list and MSDSs for the chemicals. Employees have access to training and 24 hour access to specific MSDSs, as described earlier. Principal investigators are primarily responsible for providing personal protective equipment to their employees, but in the event they are unable to, Environmental Health and Safety will make arrangements for this equipment to be provided to employees.