Xavier University of Louisiana

Chemical Hygiene Plan

Effective 02/15/2008

INTRODUCTION

The Federal "Occupational Exposures to Hazardous Chemicals in Laboratories" Standard (29 CFR Part 1910.1450), henceforth referred to as the Laboratory Standard, was developed because the government, after careful review of federal regulations and public objections, felt that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals, and that a different approach than that found in the Occupational Safety and Health Administration's General Industry Standards (29 CFR Part 1910, Subpart Z) was warranted to protect laboratory workers from hazardous and toxic substances. The Laboratory Standard generally supersedes the general industry standards for laboratories meeting specified criteria.

Most laboratories use very small amounts of OSHA regulated toxic substances, and most laboratory work is done by or under the direct supervision of highly trained personnel. OSHA's General Industry Standards did not adequately address the risks associated with the use of multiple hazardous substances to which exposures were intermittent as is typically the case in the laboratory workplace. Instead these standards were designed to control regular exposures to a single substance (such as asbestos, vinyl chloride, benzidine, inorganic arsenic, and lead) used constantly and in large quantities. Often laboratory research including cancer research was obstructed by these tedious and inappropriate industrial regulations. OSHA realized that hazardous situations and potentially significant risks existed in laboratories using a variety of chemicals, and that there was a need for employee protection in the laboratory environment. Thus OSHA developed a separate Laboratory Standard more suitable for the laboratory workplace.

The Laboratory Standard, unlike the general industry standards, is performance based. Although it does not eliminate the requirement to maintain exposures to hazardous chemicals below the applicable permissible exposure levels (PELs), the standard provides greater flexibility in the methods of compliance. With the establishment of the Federal Laboratory Standard, OSHA has given institutions like Xavier a clear responsibility to protect their laboratory workers by formulating and implementing a chemical hygiene plan. The basic purpose of the Laboratory Standard is to develop and implement safety and health practices, procedures, and policies accepted as effective in minimizing laboratory employee exposures to toxic and hazardous chemicals used in their work area. Ultimately, protection of laboratory employees is the major goal. The Laboratory Standard also provides for employee training and information, medical consultation and examinations, hazard identification, respirator use, and recordkeeping. Xavier 's Chemical Hygiene Plan is designed to explain the Laboratory Standard and to implement work practices and procedures which can effectively protect

employees from those risks associated with using hazardous chemicals in their workplace.

OFFICE OF ENVIRONMENTAL HEALTH & SAFETY

Always remember the Office of Environmental Health & Safety is available for advice, consultation, and materials to assist in complying with the Laboratory Standard. Contact at 520-5439. In case of emergency always notify the Office of Environmental Health & Safety or the Xavier University Police for assistance.

THE LABORATORY STANDARD

The Laboratory Standard which became effective on May 1, 1990 requires employers to develop a comprehensive Chemical Hygiene Plan by January 31, 1991 to implement safety and health practices accepted as effective in minimizing laboratory exposures to hazardous and toxic chemicals, thus protecting employees from adverse health effects that may result from work in the laboratory. The Laboratory Standard is applicable to all areas which meet the definitions of "laboratory use" and "laboratory scale" (see exemptions below). It supersedes all other health standards in 29 CFR 1910, Subpart Z, with three exceptions: (1) Only the requirement to limit employee exposure to the permissible exposure limit (PEL) specified in any OSHA health standard applies to laboratories, unless the particular standard states otherwise; (2) Prohibition of eye and skin contact specified by a substance-specific OSHA health standard must be observed; and (3) If the action level (or PEL if no action level is specified) is routinely exceeded for an OSHA-regulated substance with exposure monitoring and medical surveillance requirements, the exposure monitoring and medical surveillance requirements as specified in the relevant standard must be performed.

A "laboratory" is defined as a facility where laboratory use of hazardous chemicals occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a nonproduction basis. The expression "laboratory use" of hazardous chemicals has four components: (1) "laboratory scale," meaning that containers used for reactions, transfers, and other handling of substances are small enough to be easily and safely manipulated by one person; (2) multiple chemicals or chemical procedures are used; (3) procedures are not part of a production process; and (4) protective laboratory practices and equipment are available and in use. The component of laboratory use concerning protective laboratory practices and equipment is intended to mean that a body of knowledge is available, not to imply that such practices are implemented in a particular laboratory.

Other definitions that are important to understanding the Laboratory Standard include:

* **Hazardous chemical** is a chemical for which there is statistical evidence (based on at least one study) that acute or chronic health effects may occur in exposed employees. Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance on defining the scope of health hazards.

* **Chemical hygiene plan** is a written program developed and implemented by the employer that sets forth procedures, equipment, personal protective equipment, and work practices capable of protecting employees from health hazards presented by hazardous chemicals used in a particular work place. A chemical hygiene plan must meet requirements specified in paragraph (e) of the Laboratory Standard.

* **Chemical hygiene officer** is an individual designated by the employer who is qualified by training or experience to provide technical guidance in the development and implementation of the chemical hygiene plan.

* **Employee** is an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments. This includes who may not actually work in a laboratory, but may be required to enter a laboratory where potential exposures could occur. Maintenance and custodial personnel are considered by OSHA to meet the definition of employee. Students are not covered unless they are paid by the institution for duties performed.

* **Designated area** is an area that may be used for work with "select carcinogens," reproductive toxins, or substances with a high degree of acute toxicity. The purpose is to focus attention on the use of particularly hazardous substances to ensure that appropriate measures are taken by employees in or near the vicinity. A designated area may be an entire laboratory, an area of a laboratory, or a device such as a fume hood.

* **Permissible Exposure Limit (PEL)** is an exposure level to a toxic substance which was established by OSHA to protect workers who are exposed to toxic substances over a working lifetime.

WHAT IS EXEMPT?

Any OSHA substance specific standard can require coverage to remain under that standard rather than under the Laboratory Standard. For example, formaldehyde in histology, pathology, and anatomy labs is covered by the Formaldehyde Standard rather than the Laboratory Standard. If a preemption statement is not made, the determination of whether the Laboratory Standard applies is dependent on "laboratory use" and "laboratory scale" criteria and whether permissible exposure limits for that substance are being met.

Many facilities commonly referred to as laboratories are not intended to be covered under the Laboratory Standard, such as quality control laboratories connected with production processes that perform repetitive tasks. If a facility does not meet the definitions of "laboratory use" and "laboratory scale," it must comply with the general industry standards found in Subpart Z rather than the Laboratory Standard. The Laboratory Standard also does not apply to uses of hazardous chemicals which provide no potential for employee exposure, such as medical labs which only use prepackaged test kits. Most labs here at Xavier will meet the criteria for coverage under the Laboratory Standard.

XAVIER 'S CHEMICAL HYGIENE PLAN

Xavier 's written Chemical Hygiene Plan should be implemented for all Xavier laboratories using hazardous chemicals which can pose health hazards to the employees. It consists of a general chemical safety plan with specifics for individual laboratories added by the supervisors. It is available to all persons at Xavier and contains the following elements:

* Standard operating procedures

* Criteria to determine and implement control measures to reduce employee exposure to hazardous chemicals

* Measures to ensure proper performance of fume hoods and other protective equipment

* Provisions for employee information and training

* Circumstances requiring prior approval from the employer

* Provisions for medical consultations and examinations

* Designation of a Chemical Hygiene Officer

* Provisions for work with "select carcinogens," reproductive toxins and substances having a high degree of acute toxicity, including use of designated areas and containment devices, and procedures for removing waste and decontamination.

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The purpose of this booklet is to help the laboratory supervisor understand his/her role as a supervisor in making Xavier 's Chemical Hygiene Plan work. A safe and healthy workplace for Xavier laboratory employees is, to a large part, dependent on the laboratory supervisor. This booklet describes the policies and standard operating procedures set forth in Xavier 's written Chemical Hygiene

Plan, and the supervisor's role in establishing and maintaining a healthy and safe working environment.

CHEMICAL HYGIENE RESPONSIBILITIES

Responsibility for chemical hygiene rests at all levels. The success of this Chemical Hygiene Plan depends to a great extent upon the cooperation of every laboratory supervisor and employee. Employees should be alert to the potential hazards of the materials in their work area, consult the Material Safety Data Sheets and other related literature for information concerning the hazardous chemicals with which they work, and follow the appropriate work practices that have been established by their supervisors and the administration to protect their health and safety. Active participation in this Chemical Hygiene Plan will result in the continued protection of employees from chemically-related illnesses and injuries at Xavier .

Those responsible for chemical hygiene at Xavier include:

1. Administration - The President, Chancellor, Deans, and other administrative officers here at Xavier have ultimate responsibility for chemical hygiene within the University and must provide continuing support.

2. Departmental Chairmen and Department Heads - Departmental chairmen and department heads are responsible for chemical hygiene in their respective departments.

3. Chemical Hygiene Officer - The Office of Environmental Health and Safety has designated a chemical hygiene officer whose duties include:

a) Working with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices;

b) Giving guidance in the procurement, use, and disposal of chemicals used in the laboratory;

c) Performing periodic laboratory inspections and certifications of chemical and radiation fume hoods;

d) Helping project directors develop precautions and adequate facilities;

e) Knowing the current legal requirements concerning regulated substances; and

f) Seeking ways to improve the chemical hygiene program.

4. Faculty/Laboratory Supervisors - Laboratory supervisors have the overall responsibility for chemical hygiene in the laboratory including responsibility to:

a) Compose and implement individual chemical hygiene rules specific for their laboratory;

b) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided and documented;

c) Provide and document regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment;

d) Know the current legal requirements concerning regulated substances;

e) Determine the required levels of protective apparel and equipment; and

f) Ensure that facilities and training for use of any material being ordered are adequate.

5. Laboratory Worker - The laboratory worker is responsible for:

a) Planning and conducting each operation in accordance with Xavier 's chemical hygiene procedures; and

b) Developing good personal chemical hygiene habits.

INFORMATION AND TRAINING

The aim of Xavier 's information and training program for the Laboratory Standard is to assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs. Here at Xavier, the supervisor plays a key role in composing and implementing the Chemical Hygiene Plan. As in the Hazard Communication Standard, the supervisor receives information and training and in turn communicates this information to his workers. The supervisor uses the information on specific chemicals found in his laboratory to compose rules and safe procedures for his employees to follow. The supervisor is the actual instructor making sure that the workers know about the hazards they face in their specific work area and how to do their particular jobs safely.

The Laboratory Standard requires that Xavier provide employees information and training at the time of their initial assignment and prior to assignments involving new hazardous chemicals or new exposure situations. Training should be a regular, continuing activity.

SPECIFIC TRAINING GUIDELINES

The laboratory supervisor should train the employee in the following categories:

1. The methods and observations that may be used to detect the presence of hazardous chemicals in the work area. This should include how to recognize a chemical by appearance or smell. It should also cover any steps Xavier may take to detect the presence of hazardous chemicals, such as air monitoring systems.

2. The signs and symptoms associated with exposures to hazardous chemicals used in the lab. An employee should be aware if his health is being affected by exposure to a hazardous material so that proper medical attention can be obtained. Symptoms such as headaches, nausea, skin rashes, eye irritations, dizziness, etc. can have many different causes, but they may be warning signs of a particular chemical exposure. This early warning system could be the key to preventing serious health problems. Consult the Material Safety Data Sheet for signs and symptoms of exposure.

3. The concept of OSHA's permissible exposure limits and the importance of eliminating unnecessary exposures to hazardous substances. OSHA has established safe exposure levels (PELs) for certain chemicals to which employees may be exposed for a working lifetime. The permissible exposure level of a particular chemical can be found on the Material Safety Data Sheet for that chemical. Employee exposures should not exceed these limits. If it is felt that the recommended limits are being exceeded, ENVIRONMENTAL HEALTH AND SAFETY should be contacted for monitoring and advice.

4. The physical and health hazards associated with the chemicals in the work area. Health hazards of various chemicals used in the laboratory should be emphasized and the route of exposure explained. Physical hazards would include the toxic, corrosive, flammable, reactive, and radioactive properties associated with different chemicals. Not only is this information required for the Laboratory Standard, but it is almost identical to the requirements of the Hazard Communication Standard. The Material Safety Data Sheet and the chemical label are two good places to look for this information.

5. Appropriate protection measures including available protective apparel and equipment and proper emergency procedures. Once employees understand the hazards, they should take steps to protect themselves. This part of the training should be detailed and customized to the individual work area. Employees should be informed regarding engineering controls (hoods, etc.), work procedures, protective clothing and equipment, respirators if applicable, and emergency procedures. Protective apparel and equipment needed for a particular chemical can be found on the Material Safety Data Sheet.

6. The details of the Laboratory Standard and Xavier 's Chemical Hygiene Plan. The written program Xavier has developed along with the supervisor's individualized operating procedures should be reviewed with emphasis placed on protecting the laboratory worker from health and other hazards associated with the laboratory.

7. Availability of reference material on hazards, safe handling, storage, and disposal of hazardous chemicals. This should include, but not be limited to, Material Safety Data Sheets. Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources.

Receiving and stockroom/storeroom supervisors should train their personnel regarding the possible hazards of the chemicals they are handling, and give instruction on proper protective apparel and handling techniques. Personnel in these areas should be aware of the relevant regulations imposed by the Laboratory Standard.

All training should be documented for content as well as attendance (see training record form) with a copy being sent to ENVIRONMENTAL HEALTH AND SAFETY and the safety committee having jurisdiction over the laboratory. Specific tasks and standard operating procedures should be discussed. Although training requirements seem extensive and time consuming, they are well worth it in the long run.

The Office of Environmental Health & Safety will be happy to assist with training aides or speakers on special topics (if available). Please call at 988-5486 to discuss training materials and questions you may have.

THE LABORATORY FACILITY

The design and maintenance of a laboratory facility is very important. Proper ventilation is needed, as well as other safety items such as emergency showers and eyewashes. The work conducted in a laboratory and its scale must be appropriate for the physical facilities available and for the quality of the ventilation. Chemical-hygiene-related equipment (hoods, glove boxes, incinerator, etc.) should undergo continuing appraisal and be modified if inadequate. The laboratory supervisor should communicate and work closely with Environmental Health & Safety as well as with maintenance or physical plant personnel to create a safe chemical environment for the laboratory projects to be performed.

The laboratory facility should be designed with the following features:

* An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air.

* Adequate, well-ventilated stockrooms/storerooms.

* Laboratory hoods and sinks.

* Other safety equipment including eyewash fountains and safety showers.

* Proper fire code and life safety code requirements such as automatic sprinklers and fire alarm systems

In addition, requirements for proper ventilation include:

1. General laboratory ventilation - This system should provide a source of air for breathing and for input to local ventilation devices. It should not be relied on for protection from toxic substances released into the laboratory. It should ensure that the laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day. The general ventilation should direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building.

2. Hoods - A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals. It is recommended that each hood have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. If this is not available, work with substances of unknown toxicity should be avoided or other types of local ventilation devices should be provided. Airflow into and within the hood should not be excessively turbulent. Hood face velocity should be adequate (typically 100 lfm for chemical fume hoods, 125 lfm for radiation fume hoods). Environmental Health & Safety will provide annual certification of all chemical and radiation fume hoods as well as biological safety cabinets and should be contacted if there is a problem with a particular hood.

3. Other local ventilation devices - Ventilated storage cabinets, canopy hoods, etc. should be provided as needed. Each canopy hood should have a separate exhaust duct. Environmental Health & Safety must be contacted before the purchase and installation of such equipment.

4. Special ventilation areas - Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system. Cold rooms and warm rooms should have provisions for rapid escape in the event of electrical failure. Environmental Health & Safety must be contacted before the purchase and installation of such equipment.

5. Modifications - Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate.

6. Performance - A rate of 4-12 room air changes per hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control.

7. Quality - General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas.

8. Evaluation - Quality and quantity of ventilation should be evaluated on installation, regularly monitored, and reevaluated whenever a change in local ventilation devices is made.

HOUSEKEEPING, MAINTENANCE, AND INSPECTIONS

As required by law, supervisors must make inspections of the areas under their jurisdiction once every three months. These inspections are to be documented and retained on file for at least one year.

Eye wash fountains should be inspected at least every three months by the laboratory supervisor and/or safety and representative.. Out-of-service or damaged equipment should be repaired or discarded. Stairways and halls are not storage areas; fire extinguishers are not coat racks. Access to exits, emergency equipment, and utility controls should never be blocked.

A laboratory should be kept neat and orderly. Keep aisles clear and work areas uncluttered. The cleaning of areas where toxic materials are handled, used or stored is the responsibility of those who use the area. The janitorial crew should not be expected to clean areas contaminated with hazardous materials. Proper protective equipment should be worn during cleaning. Floors should be cleaned regularly. Good housekeeping is essential to good laboratory technique.

PROTECTIVE APPAREL AND EQUIPMENT

Protective equipment that should be available to a laboratory should include the following:

* An easily accessible safety shower

* An eyewash fountain

* A fire extinguisher

* Respiratory protection for emergency use, if applicable

* A fire alarm nearby

* A nearby telephone for emergency use

* Protective apparel compatible with the required degree of protection for the substances being handled (eye protection, gloves, aprons, labcoats, etc.)

* Other items designated by the laboratory supervisor

All protective apparel and equipment should be in good working order. If damaged or defective, the supervisor should see that it is fixed or replaced.

CHEMICAL HYGIENE

STANDARD OPERATING PROCEDURES

The Supervisor's Role

The following section is a synopsis of safety precautions that should be observed when working with hazardous and toxic chemicals. The supervisor should act as a role model for his employees making sure that the safety message gets across. These are chemical safety basics that should be followed all the time. For concerns about specific chemicals, the supervisor should consult the material safety data sheets and other reference materials available to him. He then must relay this information to his workers. In other words, the laboratory supervisor should develop and compose laboratory-specific operating procedures based on the materials with which his particular laboratory is working, and ensure that his employees are familiar with these procedures. These standard operating procedures must be updated annually. In effect, the supervisor will be developing his own specific chemical hygiene plan for his laboratory if their lab requires special concerns.

CHEMICAL PROCUREMENT, DISTRIBUTION, AND STORAGE

Before a substance is received, information on proper handling, storage, and disposal techniques should be known and communicated to all those who will be involved. There is no substitute for adequate planning and knowledge. All hazardous properties of the material including any mutagenic, carcinogenic, and/or teratogenic potential should be determined. Large surpluses of chemicals should not be ordered, and less hazardous substances should be substituted if possible. Use only those chemicals for which the facilities and the quality of the available ventilation system is appropriate. No container should be accepted without an adequate identifying label. Material Safety Data Sheets should be

obtained and kept on file for all chemicals used in the laboratory. Copies can be obtained through the Office of Environmental Health & Safety

Stockrooms/storerooms should not be used as preparation or repackaging areas. Stored chemicals should be examined periodically for replacement, deterioration, and container integrity. Toxic substances should be segregated in a well-identified area with local exhaust ventilation. Chemicals which are highly toxic or extremely hazardous should be in unbreakable secondary containers. When chemicals are carried, they should be placed in an outside container or bucket. Freight-only elevators should be used if possible.

Amounts of chemicals stored in a laboratory should be as small as practical. Chemicals should be stored according to their hazard and compatibility class as found on the Material Safety Data Sheet. Flammables should be stored in flammable storage cabinets. Storage on bench tops and in hoods is not advised. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded following proper disposal procedures. Contact Environmental Health & Safety for more information on hazardous waste or inventory procedures.

SIGNS AND LABELS

Prominent signs and labels of the following types should be posted:

* Emergency telephone numbers of emergency personnel, supervisors, and laboratory workers

* Identity labels showing contents of containers and associated hazards

* Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits, and areas where food and beverage consumption and storage are permitted

* Warnings at areas or equipment where special or unusual hazards exist

EXPOSURE & ENVIRONMENTAL MONITORING

Safe habits should be developed and encouraged to minimize unnecessary exposure to chemicals by any route. Avoid underestimation of risk. Do not smell or taste chemicals. Vent apparatus which may discharge toxic fumes (such as vacuum pumps, distillation columns, etc.) into local exhaust devices. Inspect gloves and test glove boxes before use. Do not allow release of toxic substances in cold rooms and warm rooms since these have contained recirculated atmospheres. Under no circumstances should an unprotected person be

knowingly subjected to a hazardous environmental condition above the PELs established by OSHA.

Laboratories must comply with permissible exposure limits in effect for general industry. (This includes any established OSHA exposure limit whether it be a time-weighted average over an 8-hour work day, a ceiling value, or a short term exposure limit.) Regular instrumental monitoring of airborne concentrations of toxic substances is not usually justified or practical in laboratories, but may be appropriate when testing or redesigning hoods or other ventilation devices, or when a highly toxic substance is stored or used regularly. Exposure must be monitored if there is reason to believe that exposures routinely exceed the action level (or PEL if no action level is established for the substance) for a substance regulated by a standard which requires monitoring. If the initial monitoring shows exposure above the action level or PEL for a substance, the employer must immediately comply with the monitoring provisions of the relevant standard. The employer must notify the employee in writing of monitoring results within 15 days of receipt of those results. Contact ENVIRONMENTAL HEALTH AND SAFETY for more information on monitoring or if you feel there is an exposure problem in your laboratory.

If monitoring is done and it is found that the action level or permissible exposure limit (PEL) is routinely exceeded (e.g., 3 times per week), then monitoring and medical provisions of the relevant industrial standard must be done until the exposure level is brought to or below that prescribed by the particular standard, or until the substance is no longer used in the same procedure. Engineering controls, personal protective equipment, and good hygiene practices should be used to control exposures. If exposure monitoring discloses a level below the action level or PEL, then no further monitoring is required and the Laboratory Standard is in effect.

SPILLS AND ACCIDENTS

Chemical accidents and spills can be dangerous and destructive, possibly causing bodily harm and/or property damage. If a chemical should get into the eyes, promptly flush the eyes with water for a prolonged period (15 minutes) and seek medical attention. If a chemical should get on the skin, remove any contaminated clothing and flush the affected area with water. If symptoms persist after washing, seek medical attention. If a chemical is ingested, consult the material safety data sheet and/or seek medical advice. Be sure to contact Environmental Health & Safety for assistance and advice in cleaning up the spilled material.

Spills should be cleaned up promptly using appropriate protective apparel and equipment. In the event of a chemical spill at Xavier :

1. Alert all personnel in the immediate area and your supervisor. Notify Environmental Health & Safety or University Police and provide them with information including: name and type of material, known hazards, amount spilled, actual location of spill, name of caller and telephone number, and department with responsibility over area where spill occurred. ;

2. If possible, without endangering yourself or others, confine the spill in a safe and cautious manner to help prevent further contamination (i.e., close doors, pull down sash of hood, etc.).

3. Do not reenter spill area without proper personal protective equipment, or as directed by Environmental Health & Safety.

4. Isolate area until clean up is complete.

5. Avoid contact with any spilled material.

6. Avoid breathing vapors.

7. If the spill is small and the hazards of the material are known, put on the proper protective equipment and absorb the spilled material with towels, spill pillows, or other absorbents as directed by Environmental Health & Safety. Do not use sand, newspaper, or other materials which have poor absorbent properties. Place the absorbed materials in a container, seal, and save for disposal by Environmental Health & Safety. If spill is too large, proceed to the next step.

8. Evacuate the area and close all exits to the area.

9. If needed, Environmental Health & Safety personnel will respond to contain, remove, and dispose of the spilled material. Personnel from the responsible department are required to provide support to Environmental Health & Safety personnel in the uncontaminated area.

10. Radioactive spills should be cleaned up in accordance with the Radiation Safety Manual.

GENERAL SAFETY RULES

1. Any chemical whose composition is unknown shall be assumed to be hazardous and should be handled accordingly.

2. Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present. Do not store food or beverages in refrigerators used for the storage of biological agents or hazardous chemicals.

Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations.

3. Handle and store laboratory glassware with care to avoid damage. Do not use damaged glassware. Do not remove rubber stoppers or rubber tubing by forcing. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur. Clean and decontaminate contaminated glassware. Use equipment only for its designed purpose.

4. All supplies of syringes and needles should be kept in a secure location to prevent theft. These should be disposed of in labeled, rigid, puncture resistant containers designed for that purpose and not in the regular trash. Contact Environmental Health & Safety for more information on proper disposal of sharps.

5. Wash hands and areas of exposed skin well with soap and hot water before leaving the laboratory.

6. Avoid practical jokes or other behavior which might confuse, startle, or distract another worker.

7. Do not use mouth suction for pipetting or starting a siphon. Suction bulbs or other mechanical devices should be used. Do not leave pipettes sticking out of bottles, flasks, or beakers, as this invites danger of tipping over.

8. Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored. Do not obstruct exits and aisles. Clean up the work area on completion of an operation or at the end of each day.

9. Clothing should be worn which protects as much of the body as possible. Confine long hair and loose clothing. Wear shoes at all times in the laboratory. Sandals are not recommended. It is recommended that laboratory coats be either worn in the laboratory or worn over the uniform when out of the laboratory and removed when working. (This is to reduce the spread of microorganisms from the laboratory to other areas.) Lab coats should be removed if contaminated. Safety screens and shields should be used when there is a potential for explosion or apparatus implosion. Wear appropriate eye protection where chemicals are stored or handled. Wear appropriate gloves when the potential for contact with toxic materials exists. Gloves should be inspected before use and replaced periodically. They should be appropriately resistant to the type of chemical being used.

10. Respiratory protection may be needed when effective engineering controls are not feasible, during emergencies, for certain maintenance operations, or

while controls are being instituted. All personnel requiring respiratory protection should be properly trained in the procedures for use. Contact Environmental Health & Safety for more information and review Xavier 's Policy and Procedure Manual on provisions for respiratory protection.

11. Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation. If an operation will be left unattended, provide for containment of toxic substances in the event of a utility service failure (such as cooling water). Heat materials which liberate flammable vapors only in steam heated ovens. Avoid working alone in a laboratory, particularly if the procedures being conducted are hazardous. Unauthorized experiments and unauthorized use of laboratory equipment are prohibited at all times.

12. Do not operate centrifuges unless covers are closed being sure to keep dangling items such as neckties or ribbons out of the way. Do not centrifuge uncovered tubes of specimens or flammable liquids. Centrifugation creates a vacuum and volatilizes liquids into vapors and aerosols. Use caps or parafilm. Do not leave the tops of centrifuges in the open position.

13. Do not operate autoclaves unless trained in their proper operation. Do not open the autoclave door until both temperature and pressure are back to normal as indicated by the gauges. Be sure all supply system valves are in the OFF position before opening. Beware of steam which will permeate gloves. Loosen caps of any containers to allow equalization of pressures inside containers thus preventing explosions, boil overs, and implosions. Cellulose nitrate tubes may explode and should not be autoclaved.

14. Before any equipment is sent for repair, it should be thoroughly cleaned and decontaminated.

15. Be alert to unsafe conditions and see that they are corrected when detected.

USE OF HOOD

Use the hood for operations which might result in release of toxic chemical vapors or dust. Hoods should also be used when working with flammable or noxious materials. As a rule of thumb, use a hood or other local ventilation device when working with any appreciable volatile substance with a threshold limit value of less than 50 ppm. (This information can be found on the Material Safety Data Sheet.) Confirm adequate hood performance before

use. Keep materials stored in hoods to a minimum and do not allow them to block vents or airflow. Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general

laboratory ventilation will be maintained when it is "off". The Environmental Health & Safety and/ contactor will inspect hoods annually to check that they are operating properly. Fume hoods should be thoroughly decontaminated after use and exhaust ventilation filters replaced as necessary for safe operation of the hood.

WASTE DISPOSAL

The aim of Xavier 's hazardous waste disposal program is to assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals. Indiscriminate disposal by pouring waste chemicals down the drain or into the trash is unacceptable. Also hoods should not be used as a means for disposal of volatile chemicals. Each waste container should be properly labeled as to its contents. Arrangements should be made with the Office of Environmental Health & Safety for pick up or delivery to the hazardous waste storage areas on the various campuses for all chemicals that are no longer needed.

Much of the hazardous waste that is collected by Environmental Health & Safety can be treated or recycled. Waste acids and bases may be neutralized to a pH of between 5.5 and 10.0 and released into the sanitary sewer with copious amounts of water. Some laboratories have reduced their waste generation by the redistillation and reuse of solvents. Large volumes of waste are shipped offsite for disposal. The majority of Xavier 's waste is destroyed by high temperature incineration, neutralization, or offsite recycling. Very little waste is landfilled due to regulatory restrictions and environmental concerns. Waste is disposed of according to EPA and the Louisiana Department of Environmental Quality (DEQ) regulations. Radioactive waste is handled by the methods allowed by Radiation Safety Regulations.

All infectious waste is to be sterilized prior to disposal or packaged properly for immediate incineration. No untreated infectious waste is to be discarded into solid waste (normal trash) containers for disposal. Again contact Environmental Health & Safety for information on proper disposal of infectious waste.

PRIOR APPROVAL

For any experiment or project that requires the use of high risk substances such as explosives, "select carcinogens,"

reproductive toxins, or substances having a high degree of acute toxicity, a protocol sheet describing the project and procedures that will be followed should be submitted to Environmental Health & Safety. Environmental Health & Safety will review the protocol and distribute the information for review and comment to

the Committee having jurisdiction over the laboratory. In this manner all safety questions and concerns should be addressed.

WORKING WITH ALLERGENS AND EMBRYOTOXINS

When working with allergens (such as diazaomethane, isocyanates, bichromates, etc.) or substances of unknown allergenic activity, wear suitable gloves to prevent hand contact with these substances. If you are a woman of childbearing age, embryotoxic substances such as organomercurials, lead compounds, formamide, etc. should be handled only in a hood whose satisfactory performance has been confirmed. The "designated" area for use of such substances should be conspicuously labeled with restricted access and warning signs stating the hazard. Protective apparel (especially gloves) to prevent skin contact should be used. The supervisor should review the use of each of these materials and any procedural change that is made. Records should be kept of the amount of material on hand, the amount and date used, and the names of the workers involved. These records should be kept for an employee's entire length of employment plus 30 years. Emergency plans should also be developed.

Allergens and embryotoxins should be stored, properly labeled, in an adequately ventilated area in an unbreakable secondary container. The supervisor should be notified of all incidents of exposure or spills. A qualified physician should be consulted when appropriate (see medical program outlined below).

WORK WITH CHEMICALS OF MODERATE CHRONIC OR HIGH ACUTE TOXICITY

When substances such as diisopropylfluorophosphate, hydrofluoric acid, hydrogen cyanide, etc. are used in significant quantities, exposure to these toxic substances by any route should be minimized using all reasonable precautions. Use and store these substances only in designated areas posting special warning signs. Store breakable containers of these substances in chemically resistant trays. Also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper. Always use a hood (whose satisfactory performance has been confirmed) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance. Trap released vapors to prevent their discharge with the hood exhaust.

Always avoid skin contact of these substances by using gloves, long sleeves, and other protective apparel as appropriate. Always wash hands and arms immediately after working with these materials. Maintain records of the amounts of these materials on hand, amounts used, and the names of workers involved. These records should be kept for an employee's entire length of employment

plus 30 years. Be prepared for accidents or spills and have an emergency plan of action. Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity. If a major spill occurs outside the hood, evacuate the area and contact ENVIRONMENTAL HEALTH AND SAFETY. Assure that cleanup personnel wear suitable protective apparel and equipment.

Contaminated waste should be stored in closed, suitably labeled, impervious containers. Contaminated clothing or shoes should be thoroughly decontaminated or incinerated.

WORK WITH CHEMICALS OF HIGH CHRONIC TOXICITY

All rules listed above should be observed and the following supplemental rules added for work with substances of known high chronic toxicity in quantities above a few milligrams to a few grams, depending on the substance. Examples of chemicals in this category include such things as dimethylmercury and nickel carbonyl, benzo-a-pyrene, N-nitrosodiethylamine, other human carcinogens or substances with high carcinogenic potency in animals. A plan for the use and disposal of these materials should be prepared and approved by the laboratory supervisor.

All transfers and work with substances of high chronic toxicity should be conducted in a "designated area" such as a restricted access hood, a glove box, or a portion of a laboratory designated for the use of highly toxic substances. The "designated area" should be conspicuously marked with warning and restricted access signs. All people with access to the "designated area" should be aware of the substances being used there and take the necessary precautions. Any vacuum pumps used should be protected against contamination by scrubbers or HEPA filters and vented into the hood. Vacuum pumps or other contaminated equipment, including glassware, must be decontaminated in the hood before removal from the designated area. The designated area should then be decontaminated before normal work is resumed. On leaving a designated area, protective apparel should be removed and placed in an appropriate labeled container. Then the hands, forearms, face, and neck should be washed thoroughly.

Substances with high chronic toxicity should be stored in a ventilated, limited access area in appropriately labeled unbreakable, chemically resistant, secondary containers. Accurate records should be kept of the amounts of these substances stored and used, the dates of use, and the names of the users. If using toxicologically significant quantities of such substances on a regular basis, contact Environmental Health & Safety to arrange a consultation with a qualified physician concerning the desirability of regular medical surveillance (see medical program below). Contingency plans, equipment, and materials to minimize exposures of people and property should be readily available in case of an

accident or spill. Waste should be chemically decontaminated whenever possible. Containers of contaminated waste including washings from contaminated flasks should be transferred from the controlled area in a secondary container under the supervision of authorized personnel.

Negative pressure glove boxes should have a ventilation rate of at least two volume changes/hour and a pressure of at least 0.5 inches of water to be suitable for work with substances of high chronic toxicity. Positive pressure glove boxes should be thoroughly checked for leaks before each use. In both cases, exit gases should be trapped or filtered through a HEPA filter and then released into the hood.

ANIMAL WORK WITH CHEMICALS OF HIGH CHRONIC TOXICITY

For large scale studies of animal work with chemicals of high chronic toxicity, special facilities with restricted access are preferable. Whenever possible, the toxic substance should be administered by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters. Procedures should be devised to minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood). When working in the animal room, wear plastic or rubber gloves, a fully buttoned laboratory coat or jumpsuit, and other apparel and equipment that may be needed such as shoe and head coverings, respirators, etc. Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to non-toxic products. Otherwise package the waste appropriately for burial in an EPA-approved site. Contact Environmental Health & Safety for details or questions on disposal procedures.

RECORDKEEPING

The Office of Environmental Health and Safety will keep records of any exposure monitoring or medical consultations and/or examinations in accordance with the Laboratory Standard. In addition training records, inventory records, inspections, and material safety data sheets should be kept on file both in Environmental Health & Safety and in the laboratory.

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The laboratory supervisor is responsible for his own safety and that of his workers. Under the Laboratory Standard, the supervisor should make sure that his workers receive proper operating procedures to follow and are trained to work with the specific chemical and toxic hazards present in the laboratory. Periodic inspections and daily observations should be done to ensure that employees are using their training and

protecting themselves from harm. Safe practices are important in minimizing exposures and potential risks. Safety should be an integral part of every laboratory procedure and operation.

Chemical Synthesis/Right-to-know

When a chemical substance is developed in a laboratory and the composition of the substance which is produced exclusively for the laboratory's use is known, the laboratory supervisor shall determine if the substance is a hazardous chemical. If so, he shall provide training as required in this document. If the chemical produced is a by-product whose composition is not known, the supervisor shall assume that the substance is hazardous and shall follow the provisions of this Chemical Hygiene Plan. If the chemical substance is produced for another user outside of the laboratory, the supervisor shall comply with the Hazard Communication Standard including the requirements for preparation of Material Safety Data Sheets and labeling.

Exposure Monitoring Policy

a. Regular instrumental monitoring is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices or when a highly toxic substance is stored or used regularly. Contact Environmental Health & Safety for advice in these type situations.

b. For laboratory uses of OSHA regulated substances, employee exposures must not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z. Environmental Health & Safety will measure an employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely (e.g., 3 times/week) exceed the action level (or in the absence of an action level, the PEL).

c. If the initial monitoring prescribed above discloses employee exposure over the action level (or in the absence of an action level, the PEL), Environmental Health & Safety will immediately comply with the exposure monitoring provisions of the relevant standard. Environmental Health & Safety will work with Maintenance or Physical Plant as well as with the laboratory worker to institute control measures (engineering controls, the use of personal protective equipment and hygiene practices, etc.) to reduce exposures, including a total shut-down of the operation if deemed appropriate.

d. Monitoring may be terminated in accordance with the relevant standard.

e. Environmental Health & Safety will notify the employee in writing of any monitoring results within 15 days after the receipt of the results. This may be

done either individually or by posting the results in an appropriate location that is accessible to employees.

f. Environmental Health & Safety shall establish and maintain for each employee an accurate record of any measurements taken to monitor exposures. These records shall be kept, transferred, and made available in accordance with 29 CFR 1910.20.

Supplemental Information

and Guidelines

INCOMPATIBLE CHEMICAL LIST
from
PRUDENT PRACTICES FOR HANDLING CHEMICALS IN LABORATORIES

Examples of Incompatible Chemicals

CHEMICAL	IS INCOMPATIBLE WITH
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids

Bromine	See Chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic and inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	Everything
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrohydrous)
CHEMICAL	IS INCOMPATIBLE WITH
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines

Oxalic Acid	Silver, mercury
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartartic acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals such as sodium, lithium)
Tellurides	Reducin agents