

## LABORATORY SAFETY

### A. Introduction:

1. This chapter details safety practices and standards at the University of New England designed to protect laboratory employees, while they are working in a laboratory, from harm due to potential exposure to hazardous chemicals. This chapter applies to all laboratories that use hazardous materials and supersedes the Hazard Communication chapter of the Safety Manual.

2. Each college that stores and uses hazardous chemicals in a laboratory setting will identify at least one Chemical Hygiene Officer (CHO) to serve as a focal point for laboratory health and safety activities within the unit and as liaison with Environmental Health and Safety. Colleges that are made up of a number of large laboratory-based departments are urged to assign laboratory safety officers within each department.

### B. Responsibilities:

#### 1. Environmental Health and Safety Department:

a. Works with all Chemical Hygiene Officers and Department Heads to ensure that all labs have safety policies and procedures in place.

b. Works with all Chemical Hygiene Officers and Department Heads to ensure that all students, researchers, staff and faculty are trained in laboratory safety if they will be working in any UNE laboratory.

c. Updates and revises all policies and procedures for laboratory procedures annually or as needed.

2. Dean(s): Create a protocol to define laboratory supervision for students working after hours in their college.

3. Department Chairs: Enforce the protocol set by the Dean regarding supervision for students working in laboratories after hours.

#### 4. Laboratory Faculty:

a. Ensure that laboratory equipment capable of creating a fire or flood is in the off position when leaving the laboratory (this includes all gas nozzles, bunsen burners, and faucets).

b. Laboratory Fume Hood sashes should be in the closed position when the fume hoods are not in use.

c. Follow all laboratory safety rules and regulations set forth by UNE.

d. Attend all required laboratory safety training sessions as needed.

e. Suggest any changes or updates to the laboratory safety plan as needed.

### C. Policies, Practices, and Procedures:

1. General Safety: Generally, it is prudent to avoid working alone in a laboratory. Under normal working conditions, you should make arrangements with individuals working in separate laboratories, or Security personnel, to carry out a personal safety check periodically. Do not undertake experiments known to be hazardous when working alone.

2. Under some conditions, special rules may be necessary. The supervisor of the laboratory has the responsibility for determining whether the work requires special safety precautions, such as having a second person present during a particular operation.

3. Know the materials you are working with (e.g. chemical, biological, radioactive): Refer to the written laboratory protocols and review the Safety Data Sheets (SDS) for chemicals. Consider the toxicity of materials, the health and safety hazards of each procedure, the knowledge and experience of laboratory personnel, and the safety equipment that is available.

4. Know the location of safety equipment and emergency procedures in your area.

5. Always wear appropriate clothing including long pants, closed toed shoes (no skin showing), and personal protective equipment, (e.g. safety glasses, lab coats, gloves) in the laboratory. (The only exception being the Marine Science Center field labs).

6. Remove personal protective equipment and wash areas of exposed skin before leaving the laboratory.

7. Before and After Hours work in laboratories:

For safety reasons, working alone in laboratories before or after hours is not encouraged whether you are faculty, staff, student or a volunteer and should only be done on an as-needed basis. Normal working hours are considered 7:00am to 6:00pm Monday through Friday. If you doing work in a laboratory setting before 7:00am or after 6:00pm on a week day or anytime on weekends, you must follow the Before and After Hours laboratory policy. Laboratory access will be regulated by the Supervisor of the lab area, except when in use by another program or otherwise posted as closed. Laboratory priority is given to scheduled classes and examination preparation. Signs will be posted when classes are in session and when exams are scheduled. All student access will be denied when either of these events occurs.

University of New England identification cards and personal reference numbers (PRNs) allow UNE students and employees access to lab areas with card swipe access. Card access is monitored through the electronic lock outside of the lab door. Each individual entering the lab must swipe his or her ID card each time entry is desired. If a lab does not have card swipe access, than only an authorized key holder with their own set of assigned keys may access the lab before or after hours. That key holder must be present if allowing another individual access. The key holder is responsible for the condition of the lab area and for

the individual that is using the lab space once they grant another individual before or after hours access.

Please follow the guidelines listed here to assure continued before and after hours usage of UNE labs:

- a. Work in labs should only be conducted with prior approval from faculty, staff, or a supervisor.
- b. All individuals working in labs must complete the required laboratory safety training set forth by the Environmental Health and Safety Department on Blackboard.
- c. Protocols for supervision may be established by the Dean's Office in consultation with the Department Chairs. Any protocols set forth by the Dean's office of an individual College must be as stringent or more stringent than the policies set forth in the UNE Safety Manual. Per federal OSHA regulations, supervision is mandatory when working with hazardous materials.
- d. For all laboratory procedures being conducted before hours, after hours or on weekends, the Department of Safety and Security must be notified. To notify Security that you are working outside of business hours in the lab you simply call the Security desk and tell them who you are and where you will be working. UNE Safety and Security reserve the right to ask any individual to vacate a lab space per their instruction. This must be done in a safe and orderly manner.
- e. Do NOT allow any unauthorized persons entry into the lab. The electronic lock records the identification of the person who swiped the lock. Those individuals will be held responsible for the condition of the laboratory, its occupants and its contents. Responsibility for any damages will be split between all who gained entry via the electronic lock. Professional conduct is mandatory at all times. In buildings that do not have card swipe access, but have key entry systems only authorized persons that hold their own personal set of lab keys are allowed in the lab before or after hours, or the key holder must be present to supervise.
- f. Safety requirements dictate that there must be at least TWO individuals in the lab at all times when working with hazardous materials. This is to ensure the safety of the occupants. Please keep your personal safety in mind.
- g. The appropriate level of personal protective equipment must be worn at all times. All EHS lab rules MUST be followed after hours.
- h. At the end of the evening, clean up your workspace and return materials to their rightful location.

Please be considerate of your classmates and instructors as well as the housekeeping staff.

It is everyone's responsibility that the laboratory be maintained in good working order.

- i. If you are asked to leave, please do so quickly and in a reasonable manner. Be sure to clean your work area and leave the lab in good condition for others.
  
- j. Report ALL injuries and accidents immediately to the Department of Safety and Security (x366).  
Accident and Injury Report forms are available through Security and Human Resources. Forms must be submitted to Human Resources within 24 hours of the incident. Human Resources will then forward the report to the EHS office for additional review and recommendations. The Supervisor may be notified to address any additional problems or concerns.

**FAILURE TO COMPLY WITH ANY OF THESE GUIDELINES WILL RESULT IN LOSS OF AFTER-HOURS ACCESS.**

8. When working with toxic and/or hazardous chemicals, use a properly operating fume hood. Fume hoods should be checked for correct flow before beginning work. Do NOT disable fume hood alarms or alter them in any way under any circumstance. If they seem to be malfunctioning, notify lab manager right away and put in a work order with Facilities to have it repaired or replaced.

9. No food, beverage, tobacco, or cosmetic products are allowed in the laboratory or chemical storage areas at any time. Cross contamination between these items and chemicals or samples is an obvious hazard and should be avoided.

10. Keep work areas clean and uncluttered at all times.

11. Do not leave reactions unattended.

12. Never pipette by mouth. Always use a bulb or pump to pipette.

13. Wash promptly whenever a chemical has contacted skin.

14. No sandals or open toed shoes will be allowed in any laboratory. No footwear exposing any skin will be allowed in the laboratory including high heel shoes and "ballet flats". (The only exception being the Marine Science Center).

15. Inhalation is one of the four modes of entry for chemical exposure. Sniff-testing should not be done, unless specified by the lab procedure.

16. It is the responsibility of everyone working in the laboratory to make certain that the laboratory is left clean after work is performed.

17. Children will not be allowed in areas where hazardous materials or biological agents are present (see “Children in laboratories” portion of this chapter).

18. Animals, except for those that are the subject of experimentation, are to be excluded from all laboratory areas.

19. Housekeeping: As in many general safety procedures, the following list of good housekeeping practices indicates common sense activities which should be implemented as a matter of course in the laboratory. These recommendations are designed for accident prevention.

a. The area must be kept neat and clean at all times.

b. Each laboratory employee and student will be responsible for maintaining the cleanliness of his/her area.

c. Reagents and equipment items should be returned to their proper place after use. This also applies to samples in process.

d. Contaminated or dirty glassware should be placed in specific cleaning areas and *not allowed to accumulate*.

e. Reagents, solutions, glassware, or other apparatus will not be stored in hoods. Such storage reduces the available work space and interferes with the proper air flow pattern, thereby reducing the effectiveness of the hood as a safety device.

f. Counter tops should be kept neat and clean. Bench tops and fume hoods should not be used for long-term chemical storage.

g. Stored items, equipment, and glass tubing will not project beyond the front of shelf or counter limits.

h. Stored items or equipment will not block access to the fire extinguisher(s), safety equipment, or other emergency items.

i. Stairways, hallways, passageways/aisles and access to emergency equipment and/or exits must be kept dry and not be obstructed in any fashion, including storage, equipment, phone or other wiring.

j. No combustible material such as paper, wooden boxes, pallets, etc., will be stored under stairwells or in hallways. Hallways will be kept free of boxes and materials so that exits or normal paths of travel will not be blocked.

k. Materials stored near aisles will be restrained to prevent their falling.

l. All containers must be dated and labeled with at least the identity of the contents and the hazards those chemicals present to users (for additional labeling guidelines, refer to Chapter 7 of this Manual).

m. No material will be stored upon or hung from suspended ceilings. No ceiling tiles shall be removed.

20. Electrical: The typical laboratory requires a large quantity of electrical power. This increases the likelihood of electrically-related problems and hazards. One must address both the electrical shock hazard to the facility occupants and the fire hazard potential. The following recommendations are basic to a sound electrical safety program in the laboratory.

- a. All electrical equipment will be properly grounded.
- b. All electrical equipment will be UL listed, grounded, and approved by Facilities Management. (See Chapter 5 on Electrical Protection for more detailed information).
- c. Sufficient room (36 inches) for work must be present in the area of breaker boxes. All the circuit breakers and the fuses will be labeled to indicate whether they are in the on or off position, and what appliance or room area is served. Circuit breakers must be properly rated.
- d. Equipment cords/plugs, appliance cords/plugs, and power strips will be in good condition.
- e. Extension cords will not be used as a substitute for permanent wiring.
- f. Electrical cords or other lines will not be suspended unsupported across rooms or passageways.
- g. Multi-outlet plugs will not be used unless they have a built-in circuit breaker. This causes overloading on electrical wiring, which will cause damage and possible overheating.
- h. All building electrical repairs, splices, and wiring will be performed by the Facilities Management Department.

21. Vacuum Operations: In an evacuated system, the higher pressure is on the outside, rather than the inside, so that a break causes an implosion rather than an explosion. The resulting hazards consist of flying glass, spattered chemicals, and possibly fire. The following is a list of precautions to be taken when conducting vacuum operations.

- a. When working with a vacuum, be aware of implosion hazards.
- b. Apply vacuum only to glassware specifically designed for this purpose, i.e. e., heavy walled filter flasks, desiccators, etc.
- c. Never evacuate scratched, cracked, or etched glassware. Always check for stars or cracks before use.
- d. Vacuum glassware which has been cooled to liquid nitrogen temperature or below should be annealed prior to reuse under vacuum. Rotary evaporator condensers, receiving flasks, and traps should be taped or kept behind safety shields when under a vacuum.
- e. After completion of an operation in which a cold trap has been used, the system should be vented. This venting is important because volatile substances that have been collected

in the trap may vaporize when the coolant has evaporated and cause a pressure buildup that could blow the apparatus apart.

## 22. Handling Glassware:

a. Glass breakage is a common cause of injuries in laboratories.

- i. Only glass in good condition will be used.
- ii. Discard or send for repair all broken, chipped, starred or badly scratched glassware in marked “broken glass” containers only.
- iii. Hand protection should be used when picking up broken glass.
- iv. The following precautions should be taken when working with glass.
  - Clean all glassware before sending for repair.
  - When using glass tubing, all ends should be fire polished.

b. Lubricate tubing with glycerin or water before inserting into rubber stoppers or rubber tubing.

- i. Protect hands with leather gloves when inserting glass tubing.
- ii. Hold elbows close to the body to limit movement when handling tubing.
- iii. Do not store glassware near the edge of shelves.
- iv. Store large or heavier glassware on lower shelves.
- v. Use glassware of the proper size. Allow at least 20% free space. Grasp a three-neck flask by the middle neck, not a side neck.
- vi. Conventional laboratory glassware must never be pressurized.

23. Laboratory Equipment: The following safety equipment should be available for laboratory personnel working with hazardous materials.

a. Drench Showers: Drench showers and other emergency wash systems are used in an emergency to flush chemicals that have accidentally come in contact with laboratory personnel. In order to wash the body properly, clothing should be removed as water is applied. The drench shower can be used to extinguish a clothing fire, but this is not recommended if the shower is more than a couple of feet away.

- i. Three square feet of space is required beneath the shower.
- ii. The area will be kept free of all obstacles.
- iii. EHS inspects drench showers each semester for proper flow and operation.

- iv. A tag or card is hung on the unit, indicating whether the shower is properly functioning or out of service. Facilities Management is then notified if the shower is out of service so that necessary repairs can be made.
  - v. Once repairs are made, Facilities Management notifies EHS and the drench shower is checked for proper flow and operation.
  - iv. Drench hoses and showers should not be altered or removed in any lab space without the approval of the Environmental Health and Safety Department.
- b. Eye and Face Washes:
- i. The best treatment for chemical splashes of the eye and face is immediate flushing with copious amounts of water for 15 minutes.
  - ii. Eye and Face Washes are equipped with a stay-open ball valve.
  - iii. All plumbed eye and face washes should be flushed by laboratory personnel on a weekly basis by allowing the water to flow for 3 minutes, to remove stagnant water from the pipes.
  - iv. Eyewash stations should not be altered or removed in any lab space without the approval of the Environmental Health and Safety Department.
  - v. Plumbed eyewash stations will NOT be used as a drain for any other type of equipment.
  - vi. Bottle eyewashes shall be checked for an expiration date and replaced as needed per the lab staff.
24. Fire Extinguishers: Fire extinguishers have been strategically placed in or just outside laboratories depending on the hazards. ABC type extinguishers are located in laboratory facilities.
25. First Aid Kits: First aid kits should be available in each laboratory.
- a. At a minimum, the kit should contain: Disposable gloves, Band-Aids, Gauze Bandage, Gauze Pads and Ice Packs.
  - b. First Aid kits are initially supplied by EHS and are then maintained and stocked by the laboratory instructor/principle investigator.
26. Laboratory Safety Information: SDS, emergency procedures, safety manuals, and other references should be readily available for all laboratory personnel.
27. Sharps Containers and Glass Only Boxes:
- a. Sharps containers are used for the disposal of hypodermic needles and syringes, razor blades and other sharp items.



- b. When full, sharps containers should be sealed, labeled and disposed of by calling Facilities Management.
- c. Glass-only boxes are used for the disposal of broken glass.
  - i. When full, the boxes should be properly sealed and disposed of by Facilities Management once the lab has put in a Facilities Work Order and replace the box with a new one immediately.
- d. Sharps containers and glass-only boxes can be obtained (depending on the building) from the Chemical Stockroom or departmental offices.

#### D. Personal Protective Equipment:

1. The following personal protective equipment must be available for laboratory personnel working with hazardous materials and provided by the departments. EHS will assist with recommendations on specific types and uses of protective equipment.

##### 2. Eye and Face Protection:

- a. The eye is the most vulnerable of the body surfaces from an injury standpoint. Accidents that cause injury to the eyes rank among the highest laboratory risks.
- b. All persons at UNE, including students and visitors, must wear appropriate eye protection at all times when exposed to eye hazards from flying particles, liquid chemicals, boiling liquids, acids or caustic liquids, hazardous gases or vapors.
- c. The probability of injury to the eyes is increased when the eye is exposed to such laboratory procedures as those that generate liquid droplets, or splashes including pouring, stirring, blending, heating, reacting and compounding of chemicals.
- d. Equipment to protect the eyes and face must be in accordance with the Occupational Health and Safety Administration (OSHA) Personal Protective Equipment Standards for Eye and Face Protection, 29 CFR 1910. 133 including but not limited to American National Standard for Occupational and Education Eye and Face Protection, Z87. 1-1989. Copies of the OSHA regulation and standard are available at EHS.

##### 3. Laboratory Coats and Gloves:

- a. Laboratory coats, long pants, and closed toed shoes should be used when performing laboratory work.
- b. Depending on the type of work, additional personal protective equipment, such as gloves and aprons may be necessary.
- c. Coats, aprons, and gloves will be replaced periodically, removed before leaving the laboratory. Lab coats should be laundered regularly by a vendor service.
- d. Remove laboratory coats immediately on significant contamination and bag them in a labeled bag.

- e. When using chemicals, consult chemical compatibility information that is provided in manufacturer's catalogs or SDS to help you in selecting the proper gloves and other protective clothing.
  - f. More information on specific types and uses of personal protective apparel is available from EHS and Chapter 18 of the Safety Manual.
4. Respiratory Protection: The use of air-purifying respirators for routine laboratory work is not recommended. (For more information on the Respiratory Protection Program, please see Chapter 6 of the Safety Manual.)
- a. Respirators are discouraged because they protect only the wearer and require periodic medical monitoring, specific training, and fit testing before they can be worn effectively.
  - b. Properly operating laboratory fume hoods provide the best overall protection from chemical hazards in the laboratory.

#### E. Ventilation:

1. General room ventilation does not provide adequate protection against hazardous gases, vapors, and aerosols.
2. All work with corrosive, flammable, odoriferous, toxic, or other dangerous materials will be conducted only in a properly operating chemical fume hood.
3. In special situations, vacuum systems and ductless fume hoods are acceptable if approved by EHS.
4. When it is not possible to meet the above requirements EHS must evaluate hazards with faculty member to determine if work can be conducted safely.

#### 5. Fume Hoods:

- a. Fume hoods are checked quarterly by the EHS and annually by an outside vendor.
  - b. The velocity of the air at the face of the hood is measured with the sash at the maximum height recommended for operation and use. The results are posted on a sticker, which is attached to the lower right-hand corner of the sash.
  - c. On most hoods, stickers are placed 16 inches (or lower if necessary to meet the minimum acceptable face velocity) from the bottom of the fume hood.
  - d. Hoods that do not meet the minimum exhaust requirements during the annual or quarterly inspections are posted out of service and Facilities Management is notified about the need for repairs.
  - e. When repairs have been made, EHS will test the fume hood for proper operation.
- f. Procedures for Proper Use of Fume Hoods:

- i. Before using the hood, make sure air is entering the hood and hood is functioning properly. Report any problems.
- ii. Do not block baffle openings or place bulky items in the hood that will prevent air from entering the baffle opening.
- iii. Conduct work at least six inches from the edge of the hood.
- iv. Lower the sash to marked use setting to protect you from dangerous reactions.
- v. Keep hood clean and uncluttered.
- vi. Wipe up spills immediately.
- vii. Be aware that drafts from open windows, open doors, fans, air conditioners, or high traffic walkways may interfere with normal hood exhaust.
- viii. If hood malfunctions or ceases to operate, secure work area and materials, close the sash, and report condition to Facilities Management.
- vix. Do not alter or remove flow alarms on hoods. Report any problems to the lab manager and contact Facilities to address the issue.

#### 6. Biological Safety Cabinets (BSC):

- a. Class II (vertical laminar flow) biological safety cabinets (BSC) provide a partial containment system for the safe handling of pathogenic organisms.
- b. To ensure safety, BSCs must be used correctly with good microbiological techniques and be in proper mechanical working order. Cabinets should be certified for performance upon installation and any time that the cabinet is moved or altered.

#### 7. When to Use Safety Shields or Other Containment Devices:

- a. Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or even explosive release of material.
- b. Reactions carried out at non-ambient pressures (vacuum or high pressure) also require safety shields, as do reactions that are carried out for the first time or are significantly scaled up from normal operating conditions.
- c. Other containment devices, such as glove boxes or vented gas cabinets, may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur.
- d. The presence of biological or radioactive materials may also mandate certain special containment devices.

e. High strength barriers coupled with remote handling devices may be necessary for safe use of extremely shock sensitive or reactive chemicals.

#### F. Emergencies and Accidents:

1. To request emergency assistance on campus (fire, police, or ambulance), dial 911.
2. In all emergencies and accidents, the first consideration is your safety and the safety of those around you.
3. Large Chemical Spills (5 gallons or more):
  - a. Alert all persons nearby.
  - b. Evacuate the room. Upon leaving, close the door to the laboratory.
  - c. Contact EHS as soon as possible, (on weekends, and after 4 p. m. contact Security, for advice and assistance).
    - Be prepared to provide the identity, amount, and location of the spill, as well as your location and a phone number where you can be reached - not your lab phone, since you should not remain in the lab after the spill.
4. Small Chemical Spills:
  - a. Small spills will be cleaned immediately, providing that the person cleaning the spill is familiar with the material and has the proper equipment. There is a small spill kit in each lab contained in a 5-gallon pail that can be utilized for small spills.
  - b. Water spills can create a hazard because of the slip potential and flooding of instruments (particularly on the floor below.)
  - c. All spills need to be reported to EHS in a timely manner and spill kits will need to be restocked.
5. Fire: In case of fire, follow these procedures:
  - a. Close the door to the fire area.
  - b. Activate the building fire alarm system.
  - c. Dial 911 and report exact location of fire.
  - d. Notify Security at 366 as soon as possible.
  - e. Evacuate and stay clear of building.

#### G. Accidents and Injuries:

- a. Serious injuries that require an ambulance must be reported to Emergency Medical Services by dialing 911.

b. All other injuries should be assessed by a medical care provider at the Health Center for students and a physician at our off-site employee healthcare provider for employees. All incidents should be reported as soon as possible to the responsible faculty member, supervisor, Human Resources and EHS. The Students Affairs Office will also be notified if a student is involved.

H. Chemical Exposure Incidents: In the event of a chemical exposure incident, medical personnel should be given the following information:

- a. Identity of chemical(s)
- b. Conditions under which exposures occurred, and signs and symptoms of exposure
- c. When possible an SDS should be provided.
- d. In addition, a written accident investigation report should be forwarded by the head of the laboratory to Human Resources (if employee) or Department of Security (if non-employee).

I. Exposure Monitoring:

- a. Regular environmental or employee exposure monitoring of airborne concentrations is not warranted or practical in laboratories because the chemicals are used for relatively short periods of time and in small quantities.
- b. All procedures are established to minimize possible exposures.
- c. Sampling may be appropriate when highly toxic substances are used regularly.
- d. Students who suspect that they have been overexposed to a toxic chemical should report to the Health Center for medical treatment if it is necessary and subsequently notify EHS of the exposure. Laboratory employees/faculty/staff that may have been overexposed to a toxic chemical should report to the off-site employee healthcare provider designated by Human Resources and notify EHS of the exposure.
- e. An initial exposure assessment will be made and if there is reason to believe that the action level, or PEL if there is no action level, has been exceeded for any chemical for which a substance specific standard has been established, the University must measure the concentration of that chemical in the air.

J. Handling and Disposal of Chemicals:

1. Procurement:

- a. Plan experiments with safety in mind. Substitute less hazardous chemicals in laboratory procedures when possible.
- b. Certain laboratory operations, procedures, or activities may warrant prior approval from a designated supervisor, CHO, or EHS. Check Chapter 17 (Hazardous Material/Chemical Inventory and Control) for special restrictions or contact EHS.

c. Estimate the amount of chemical required for each experiment and order only what is necessary based on current inventories. *Excess chemicals are very expensive to dispose of and can cause a hazard if stored too long.*

d. Request SDS from chemical vendor at the time of purchase:

e. Upon arrival, send one copy of the SDS to EHS.

f. Safety Data Sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, in all cases the required information is provided for each hazardous chemical,

i. SDS' must be readily accessible during each work shift to employees when they are in their work area(s).

ii. Electronic access and other alternatives to maintaining paper copies of the material safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.

iii. In addition, an SDS file is maintained by EHS.

g. Before opening a package containing hazardous substances, inspect the packaging carefully for any signs of breakage or leakage of material. If there are any signs of leakage, place package in chemical fume hood, protect yourself from exposure, and call EHS for assistance.

h. Each department is responsible for determining what additional procedures and storage requirements are required and if available.

## 2. Storage:

a. The quantity of chemicals that need to be stored should be reduced to an absolute minimum.

b. Chemicals should be stored based on their compatibility and not in alphabetical order (See chemical compatibility chart in Appendix S). The following are general guidelines:

- i. Storage areas should be well ventilated (consult with EHS).
- ii. Large containers of reagents should be stored on low shelving, preferably in trays to contain all leaks and spills.
- iii. Inventories of storage areas should be conducted at least annually. Please see Chapter 17 for inventory procedures.
- iv. Chemicals with strong odors should be stored inside cabinets or underneath fume hoods.
- v. Reactive chemicals should be stored in air-tight containers or at very low temperatures.
- vi. Flammables requiring refrigeration should be stored in explosion-safe refrigerators.

3. Labeling: All containers including beakers, vials and flasks must be dated and labeled with the chemical constituents, hazard, and the user's name on the label.

a. Labels on incoming containers must not be removed or defaced.

b. Dating is especially important in the case of compounds which have a specified shelf life, such as those that will form peroxides (e. g. ethyl ether).

c. Identifying unknowns for disposal is extremely costly.

d. All laboratory personnel who are leaving the University are responsible for identifying and properly disposing of the chemical waste in their laboratory.

4. Transportation of Chemicals:

a. Chemicals will not be shipped or transported in a vehicle without prior approval from EHS. Transportation off campus of chemicals is prohibited without the proper knowledge provided by the EHS staff.

b. When transporting chemicals on campus:

i. A secondary containment is a durable container with a properly fitted cover must be used.

ii. Secondary containers should be used when chemicals are carried through corridors, stairways and inside elevators. Both primary and secondary containers should be labeled with the type of material contained inside.

c. If the container is dropped or compromised in any way and there is a leak or spill, contact Security and EHS immediately.

5. Chemical Waste:

a. Most of the waste chemicals resulting from laboratory experiments are considered hazardous and the generation, storage, and disposal of hazardous wastes must be given consideration in every experiment.

b. Each laboratory must follow the procedures specified in Chapter 11 of the Safety Manual.

6. Working with Allergens and Embryotoxins:

a. Allergens (examples: diazomethane, isocyanates, bichromates):

i. Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity.

b. Embryotoxins (examples: organomercurials, lead compounds, formamide):

- i. If you are a woman of childbearing age, handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact.
  - c. Review each use of these materials and review continuing uses annually or whenever a procedural change is made.
- 7. Working with Chemicals of Moderate Chronic or High Acute Toxicity: Examples: diisopropylfluorophosphate, hydrofluoric acid, hydrogen cyanide. These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities:
  - a. Minimize exposure to these toxic substances by any route using all reasonable precautions.
  - b. Location: Use and store these substances only in areas of restricted access with special warning signs.
  - c. Always use a hood (previously evaluated) to confirm adequate performance with a face velocity of at least 80 linear feet per minute 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.
  - d. Personal Protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate). Always wash hands and arms immediately after working with these materials.
  - e. Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.
  - f. Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity.
  - g. 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.
  - h. Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite).
- 8. Work with Chemicals of High Chronic Toxicity: Examples: dimethyl mercury and nickel carbonyl, benzo-a-pyrene, N-nitrosodiethylamine, other human carcinogens or substances with high carcinogenic potency in animals.
  - a. Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity:
  - b. Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances,



for which all people with access are aware of the substances being used and necessary precautions.

c. Prepare a plan for use and disposal of these materials and obtain the approval of the CHO.

d. Protect vacuum pumps against contamination by using scrubbers or HEPA filters and vent them into the hood. Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area.

e. Decontaminate the controlled area before normal work is resumed there.

f. On leaving a controlled area, remove any protective apparel by placing it in an appropriate, labeled container and thoroughly wash hands, forearms, face, and neck.

g. Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder.

h. Medical surveillance:

i. If using toxicologically significant quantities of such a substance on a regular basis (e. g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance.

ii. Keep accurate records of the amounts of these substances stored and used, the dates of use, and names of users.

i. Assure that the controlled area is conspicuously marked with warning and restricted access signs and that all containers of these substances are appropriately labeled with identity and warning labels.

j. Store these chemicals in a ventilated, limited access area in labeled, unbreakable, chemically resistant, primary and secondary containers.

K. Biological Safety:

1. Handling of Human Blood and Body Fluids:

a. Laboratory practices must be followed on the assumption that all human blood, body fluid, and tissues are infectious (universal precautions).

b. The Centers for Disease Control and National Institutes for Health recommend that biosafety level 2 (BSL 2) standards, containment, and facilities be used for activities involving clinical specimens, body fluids and tissues from humans or from laboratory animals infected or inoculated with human material. (Please see the Institutional Biosafety Committee Manual for more information on Biological Safety Issues.)

c. These standards should also be applied to work with human cells in culture, or human serum-derived reagents which may be used as controls.

## 2. Transport of Biological Materials:

- a. Transportation of Biological materials off campus is strictly prohibited without the assistance of the EHS department. Contact EHS if biological materials need to be transported or shipped off campus.
- b. Secondary containers such as sealable plastic containers are required when biological materials are carried to another laboratory or building.
- c. Both primary and secondary containers should be labeled with the type of material contained inside.
- d. If the container is compromised in any way and there is a leak or spill, contact Security and EHS.

## 3. Biohazard Signs and Labels:

- a. A biological hazard sign with the international biological warning symbol should be affixed to the doors of all biosafety level 2 or 3 laboratories. (UNE is not presently configured to handle a biosafety level 3 laboratory.)
- b. In addition, equipment used to store biohazard materials (e. g., incubators, refrigerators, freezers) and receptacles for storage of biohazard waste should be labeled (available from EHS).

## 4. Storage, Treatment, and Disposal of Biohazard Waste:

- a. Biohazard wastes generated during experiments should be placed in covered and labeled containers or in a bag within a secondary container.
- b. Care should be taken to place all needles and syringes and other sharps in puncture-proof containers.
- c. All biohazard waste must be disposed of through a licensed facility (see Chapter 9 of the Safety Manual).
- d. If hazardous chemicals or radioactive materials are also present, please consult EHS before treatment and disposal.

## L. Disposal of Animals:

1. All dead animals (or animal tissues) that have been used for teaching and/or research purposes are to be considered biohazard waste.
2. If the animals or animal tissues have been placed in a formaldehyde solution, they must be separated from the solution before incineration.
3. Radiation Safety: Please see Chapter 14 of the Safety Manual.

M. Chemical Hygiene Plans: UNE is required by 29 CFR 1910 section 1450 of subpart Z (Occupational Exposures to Hazardous Chemicals in Laboratories) to develop a chemical hygiene plan for each laboratory that use hazardous chemicals.

1. The development of a detailed written chemical hygiene plan is necessary to establish continuity, to train personnel, and to help ensure that all employees recognize and comply with work place safety. It is extremely difficult to effectively communicate and enforce requirements without a detailed written chemical hygiene plan.

2. The UNE Laboratory Safety Chapter is intended to serve primarily as a general safety document for compliance with various state and federal environmental and occupational health and safety rules and regulations. It is neither feasible nor technically valid to attempt to provide specific procedures or protocols in a general safety document. However, individual laboratories should be able to develop their own specific chemical hygiene plans by incorporating individual lab functions with the UNE Laboratory Safety Manual.

3. The Content of the Chemical Hygiene Plan: The chemical hygiene plan will include each of the following elements and will indicate the specific measures to be taken to ensure that University employees are protected:

a. Standard operating procedures relevant to all laboratory operations, to be followed by laboratory employees.

b. Statements of the criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals. These measures include engineering controls, use of personal protective equipment, and personal hygiene practices.

c. Criteria to reduce exposure to extremely hazardous chemicals used in the laboratory will be specifically included.

d. A requirement that fume hoods and other protective equipment will function properly and descriptions of the methods to be taken to ensure that such equipment is functioning properly.

e. Circumstances under which a laboratory practice requires prior approval from a supervisor before implementation.

f. Provisions for additional protection for employees when working with particularly hazardous substances, including:

i. Select carcinogens.

ii. Reproductive toxins.

iii. Substances with a high degree of acute toxicity.

g. Use of containment devices such as fume hoods or glove boxes.

h. Procedures for safe removal and disposal of contaminated and hazardous waste.

i. Decontamination procedures.

N. Cell phone use in laboratories:

1. Cell phones may be used in laboratories for educational or emergency purposes only; however certain guidelines must be followed to ensure that the cell phone is not contaminated by chemical or biological agents:

- a. Option 1: If you are wearing gloves in a lab to prevent contamination, remove your gloves before picking up the cell phone, use the phone for whatever task is needed and don a new pair of gloves. This process must be used each time the cell phone is used.
- b. Option 2: If you are going to be using the cell phone while wearing contaminated gloves, the phone must be decontaminated and wiped down with an appropriate cleaning agent while wearing clean, non-contaminated gloves before leaving the laboratory.

2. Cell phones should not be used for personal reasons in the lab and should be stored with your personal items if that are not being used for educational or emergency purposes to prevent contamination.

O. Children in laboratories:

1. The University of New England is committed to introducing minors to interesting and challenging scientific, scholarly, pursuits and fields at a young age. These experiences should be handled in ways that will promote the safety of the minors and that will not impair the normal functions of the University. This policy establishes restrictions relating to and conditions under which certain minors are permitted to be in UNE laboratories and other UNE facilities that could pose risks to minors.

This policy applies to all minors who will visit, tour, observe, or conduct research or a scholarly activity in a UNE laboratory as part of an organized tour program or as an individual observer or volunteer. It does not apply to emancipated minors, minors who are matriculated UNE students or minors who are employed by UNE. It also does not apply to summer camps or events coordinated through UNE's Conference Services Department or Campus Center programs. *This policy is instituted for laboratory facilities only.*

**2. Children of Faculty/Staff and Visiting Children:** For the safety of children visiting the UNE campuses with a faculty or staff member, we cannot allow them to enter any of the lab spaces on campus. This is to reduce the likelihood of a chemical or a biological exposure to any child that visits UNE and to preserve the integrity and accuracy of all research studies.

- a. Any minor under the age of 18 years that is a child, relative, or visitor brought in by a UNE faculty or staff member is not permitted in any laboratory space. All children must be limited to office areas and common areas on campus and must be escorted by a faculty/staff member at all times in these areas.

- b. Any minor under the age of 18 years that is a child, relative, or visitor brought in by a UNE faculty or staff member must be supervised at all time by that faculty or staff member with no exceptions.
- c. If a child brought on campus by a UNE faculty or staff member is found in the laboratory space, they will be asked to relocate to an office area or common area.

Please reference **APPENDIX C CHILDREN ON CAMPUS GUIDELINES** in the UNE Personnel Handbook provided by Human Resources. Guidelines regarding visiting children of faculty/staff are outlined in this section very clearly.

2. **Pets in Laboratory Spaces:** No pets are permitted in any building that contains a laboratory space. There are no exceptions to this policy. If the use of a service dog is required, please notify the Department VP or Dean before the animal is used in the facility as a common courtesy to the occupants of the building.

### 3. **Minors Visiting UNE Laboratories for Educational Purposes**

#### a. **Definitions:**

- i. **Covered Activities** refers to the activities that Covered Minors may perform in certain laboratories. These may include, but are not limited to, Covered Minors observing ongoing research, scholarly or artistic activities, Covered Minors actively participating in research, scholarly or artistic activities, or Covered Minors actively participating in training exercises to learn skills associated with research, scholarly or artistic activities.
- ii. **Covered Minor(s)** refers to person(s) at least 6 years old, but younger than 18 years of age who are not emancipated, matriculated as UNE students or employed by UNE and are on campus for educational purposes.
- iii. **Laboratory** refers to all facilities classified by the University of New England as laboratory spaces, which include the following:
  - Research and teaching laboratories such as chemistry, biology, biomedical sciences, and marine sciences.
  - Animal and plant facilities such as animal holding rooms, surgical suites, greenhouses, etc.
  - Environmental laboratories such as ecology outdoor nature laboratory, marine science field work, etc.
  - Other facilities posing similar risks that are routinely surveyed by EHS such as ceramics and art studios.

- iv. **Lab Tour** refers to when one or more Covered Minor(s) visit a particular laboratory at particular times on one day to observe pre-selected and pre-arranged research, scholarly activities.
- v. **Lab Class** refers to when one or more Covered Minor(s) attend a pre-scheduled class or laboratory program on campus through an organizational program or school system.
- vi. **Lab Supervisor** refers to the UNE staff member or faculty member, including but not limited to a Principal Investigator, who has the ultimate control and responsibility for all activities and matters associated with a particular laboratory. This staff member or faculty member has the responsibility for ensuring that Covered Minors have satisfied all the conditions and requirements in this policy. The Lab Supervisor is responsible for guaranteeing that all appropriate UNE paperwork, requirements, and conditions have been completed *before* a minor is allowed into a Laboratory (consulting with the appropriate university offices, collecting mandatory forms from Covered Minors, etc.).
- vii. **Monitor** refers to the UNE staff member, faculty member or graduate student with the primary responsibility for supervising Covered Minors who are assigned to the Monitor while they are in the Monitor's designated Laboratory. In certain cases, the Monitor and the Lab Supervisor may be the same individual.

**b. Restrictions**

- i. Prohibited Minors: Persons under the age of six (6) are not permitted in any Laboratory.
- ii. Prohibited Laboratories: Covered Minors are not permitted under any circumstances in the following laboratories:
  - Laboratories where radiation or radioactive materials are stored or used,
  - Laboratories with Class IIIB or IV Lasers,
  - Laboratories classified at a level of containment of Biosafety Level 2 (BSL-2) or above,
  - Animal Care Facilities classified at a level of containment of Animal Biosafety Level 2 or above.

- Any facility or location where the use of a respirator is required during normal operations.
- iii. Prohibition on Covered Activities: Covered Minors are prohibited from participating in Covered Activities in laboratories where pyrophoric or highly toxic gases are stored or used; however, they can participate in Lab Tours/Classes of such laboratories, providing that activities involving use of such materials are suspended.

**c. Conditions related to Lab Tours/Classes**

- i. Monitors: Each Covered Minor who takes a Lab Tour/Class must have an identified and responsible Monitor.
- ii. Mandatory Prior Coordination relating to Lab Tours/Classes prior to a Lab Tour/Class, the Monitor must take the following actions:
- Consult with the appropriate Lab Supervisor
    - to establish a date for the tour/class that will not impair on-going research,
    - to select and to arrange for the research, scholarly activities that will occur during the tour/class
    - to receive from the Lab Supervisor any Lab-specific guidelines or protocols that will apply to the Covered Minors during their tour or class, and have all forms filled out in advance
    - If the Covered Minor will be exposed to any chemical or biological agents during their visit to the lab, the parents of the minor must be notified and sign a permission slip in advance.
- iii. Consult with the Lab Supervisor to establish the maximum number of Covered Minors who can be visiting that Laboratory at one time.
- iv. If the Lab Supervisor is a faculty or staff member assigned to a College, notify his/her Department Chair and Dean of a scheduled Lab Tour/Class and submit a list of Covered Minors planning to participate in the Lab Tour/Class at least two days before the tour/class;
- v. If the Lab Supervisor is a staff member who reports to a supervisor outside Academic Affairs, he/she must notify their supervisor and Vice President of a scheduled Lab Tour/Class and submit a list of Covered Minors planning to participate in the Lab Tour/Class at least two days before the tour/class.

- vi. Collect a properly signed UNE Recreational Activities Waiver from each such Covered Minor.

**d. Controls Applicable to the Lab Tour/Class**

- i. The Monitor will confirm the names of all Covered Minors actually participating in the tour/class.
  - While Covered Minors are in the Laboratory, their assigned Monitor will supervise the Covered Minors and will ensure that they are always in compliance with all applicable requirements or conditions included in this policy, in the tour or course materials (if any), in any EHS or other safety training materials or directives, and in any Lab-specific guidelines or protocols.
- ii. The Monitor, coordinating with the Lab Supervisor or his/her designee, will ensure that for the full duration of the Lab Tour/Class all hazardous materials, such as chemicals and biological agents, will remain secured, and all activities that could pose a hazard to the Covered Minors are suspended.
- iii. The Monitor will ensure that the maximum number of Covered Minors allowed to tour/class the selected lab at one time is not exceeded.
- iv. The Monitor will immediately notify UNE Security, the Lab Supervisor and EHS if any of their assigned Covered Minors are injured during a Lab Tour/Class.

**e. Additional Controls relating to Lab Tours and Classes for Minors**

- i. Lab Tours/Classes in animal care facilities in addition to satisfying all the conditions in this section, animal care facility must also meet the following conditions:
  - The Monitor, coordinating with the Lab Supervisor or his/her designee, will ensure that for the duration of the Lab Tour/Class invasive animal procedures and euthanasia will be suspended; and
  - The Monitor will ensure that, immediately before the tour/class, each Covered Minor receives training or instructional materials from animal facility staff as directed by the Lab Supervisor or his/her designee.

**f. Retention of Records associated with Lab Tours and Classes for Minors**

- i. The Monitor will ensure that a UNE Recreational Activities Waiver for each Covered Minor on the Lab Tour/Class and appropriate documentation about the



Lab Tour or Class are retained by the Department responsible for the laboratory.

**g. Conditions relating to Covered Activities**

- i. Mentor: Each Covered Minor who willingly engages in Covered Activities must have an identified and responsible Mentor.
- ii. Mandatory Prior Coordination related to Covered activities: Before any Minor may participate in a Covered Activity, the Mentor must take the following actions:
  - Consult with the appropriate Lab Supervisor to establish dates when a Covered Minor can participate in Covered Activities, to select and to list the research or scholarly activities in which the Covered Minor will participate (itemize the Covered Activities), to select and to appoint a Monitor for each Covered Minor; and provide documentation to the Lab Supervisor, to receive from the Lab Supervisor any laboratory-specific guidelines or protocols that will apply to the Covered Minor while participating in Covered Activities;
  - Consult with EHS to identify and to schedule any mandatory safety training for the Covered Minor and to establish the maximum number of Covered Minors who can participate in Covered Activities in the Laboratory at any one time;
  - Obtain written approval of the Covered Minor's participation in the Covered Activities from the Lab Supervisor and if the Lab Supervisor is faculty or staff appointed within the College, from his/her Department Chair and Dean if the Lab Supervisor is a staff member assigned outside Academic Affairs, from his/her supervisor and Vice President.
  - Collect a properly signed UNE Recreational Activities Waiver from each Covered Minor; and retain them in the Department for which they are employed for the University's records.

**h. Controls applicable to Covered Activities**

- i. Before any Minor may enter the Laboratory to begin participating in a Covered Activity, the Monitor must take the following actions:

- Ensure that all the necessary forms, including the UNE Recreational Activities Waiver are on file for the Covered Minor
  - Ensure that the Covered Minor *has received and understands all safety training* required by EHS and all Lab-specific guidelines and protocols, including but not limited to, the use of personal protective equipment.
  - Anytime the Covered Minor is participating in Covered Activities or is otherwise in the Laboratory, the Monitor, coordinating whenever necessary with the Lab Supervisor or his/her designee and EHS, will ensure that:
    - The Covered Minor is supervised by the Monitor at all times;
    - The Covered Minor participates only in the itemized Covered Activities;
    - The Covered Minor follows all applicable requirements or conditions included in this policy, in the program materials (if any), in any EHS or other safety training materials or directives, and in any Lab-specific guidelines and protocols, including but not limited to, the use of personal protective equipment.
    - The maximum number of Covered Minors allowed to participate in Covered Minors allowed to participate in Covered Activities in that Laboratory at any one time is not exceeded; and
    - The Monitor and Lab Supervisor are immediately notified of misconduct by Covered Minors and of any damages, safety concerns, injuries, or similar incidents relating to a Covered Minor's participation in Covered Activities or presence in the Laboratory.
- i. **Retention of Records associated with Covered Activities:** The Monitor or Lab Supervisor will ensure that a signed UNE Recreational Activities Waiver for each Covered Minor participating in Covered Activities and other appropriate documentation relating to the Covered Minor and to the Covered Activities are retained by the Department Chair under whom the Laboratory is housed.
- j. **Exceptions to the Policy**

- i. When an exception may be authorized: An exception to provision(s) found in this policy may be initiated by a Lab Supervisor and granted as provided below if the following determination is made:
  - The benefits or outreach opportunities associated with a Lab Tour or Covered Activities outweigh any potential risks or disadvantages that may result from deviations to such provision(s).
  - Who must approve an exception: If the Lab Supervisor makes the determination stated then he/she should document the deviations to this policy and the rationale supporting the determination, and then forward the request to their Dean AND the EHS department.

**k. Suspensions of Covered Minor's Privileges**

- i. The Dean, Department VP, Lab Supervisor or EHS may temporarily suspend a Lab Tour or Covered Activities, or a Covered Minor's participation in a Lab Tour/Class or in all or part of the listed Covered Activities if violations, safety deficiencies or other conditions occur.
- ii. The Dean, Department VP, Lab Supervisor or EHS may permanently suspend future Lab Tours/Classes, Covered Activities or a Covered Minor's participation in a Lab tour/class or all or part of the list Covered Activities if violations, safety deficiencies or other conditions occur and are not corrected.
- iii. At any time, the Department VP or EHS may intervene and make the final decisions relating to any suspensions of privileges governed by this policy, and on the management of any disciplinary actions relating to violations of this policy or to misconduct associated with Covered Minors.

**4. Role of the UNE UWSC Laboratory Safety Committee**

- a. UNE's University Wide Safety Committee will review records documenting the number and frequency of minors in labs, and, based on its review, may provide its recommendations related to the policy to the EHS Department.

**5. Administrative Oversight**

- a. The individual Departments maintain administrative oversight and ultimate authority to enforce requirements relating to Lab Tours, Lab Classes, Covered Activities and organized programs associated with such tours and activities. All violations, safety deficiencies or other conditions should also be reported to the Department VP.

**A. Laboratory Safety Training:**

1. Department Heads are responsible for insuring that their employees and students receive proper training. Laboratory Safety, Hazard Communication and PPE training is required before initial assignment to a laboratory.
2. When biohazard or radioactive materials are being used, additional training is required (see Chapter 12).
3. Contact EHS for Laboratory Safety, Fire Safety, PPE, Hazard Communication, Biological Safety, and Radiation Safety Training.

B. Record Keeping:

1. Medical Records: Confidential medical records will be maintained on employees and students receiving medical surveillance and medical care at the Health Center or Human Resources.
2. Safety Data Sheets (SDS): SDS' must be readily accessible during each work shift to employees when they are in their work area(s)
  - a. Electronic access, microfiche, and other alternatives to maintaining paper copies of the material safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.
  - b. SDS' will be maintained by the chemical user of the chemical.
  - c. SDS' for substances no longer utilized at UNE will be maintained for a period of 30 years by EHS.
3. Training Records:
  - a. Records for training conducted by EHS will be maintained in the Department of Human Resources for a minimum of three years; unless otherwise specified.
  - b. Copies of attendance logs will be supplied to HR who will maintain electronic records.