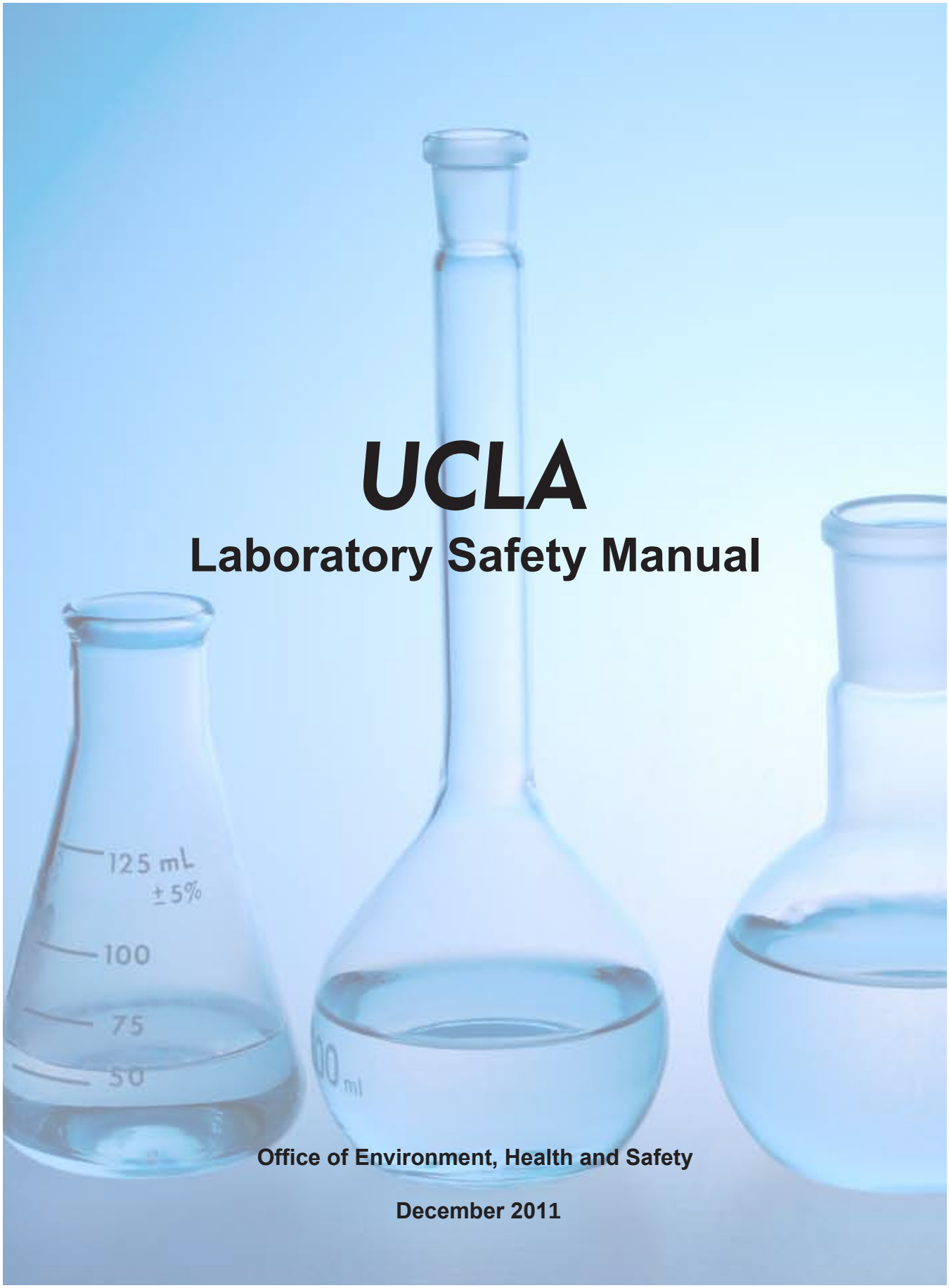
Laboratory Safety Manual

UCLA
ENVIRONMENT,
HEALTH & SAFETY



UCLA

Laboratory Safety Manual

Office of Environment, Health and Safety

December 2011

UCLA Laboratory Safety Manual

Introduction

Laboratory safety is an integral part of laboratory research and is critical to achieving the University's goal expressed in UCLA Policy 811 *(http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=811)* of preventing workplace injuries and illnesses, environmental incidents and property losses or damage. It is also essential in complying with all applicable health, safety and environmental protection laws, regulations and requirements, including the Title 8, California Code of Regulations (CCR) Section 5191 (*http://www.dir.ca.gov/title8/5191.html*).

The risks associated with laboratory research are greatly reduced or eliminated when proper precautions and practices are observed in the laboratory. To better manage and mitigate these risks, UCLA has developed this Laboratory Safety Manual. The manual is intended to be the cornerstone of your safety program and is designed to aid faculty, staff and students in maintaining a safe environment to teach and conduct research.

Each laboratory using hazardous materials is required to have a copy of this manual readily available to all laboratory personnel. Each laboratory worker must be familiar with the contents of the manual and the procedures for obtaining additional safety information needed to perform their duties safely.

Laboratory Safety Manual Sections

This Laboratory Safety Manual is comprised of the following sections[*].

1. Injury and Illness Prevention Plan – Department specific procedures for injury prevention, communication and training requirements
2. Chemical Hygiene Plan
3. Laboratory Specific Standard Operating Procedures
4. Training Records
5. Inspection Records
6. Laboratory Hazard Assessment Tool (LHAT)
7. Resources – Additional laboratory and EH&S resources
8. Notes – Section for additional materials and information related to your specific laboratory

This manual includes information on safe laboratory practices, the use of personal protective equipment, emergency procedures, use and storage of chemicals, and the proper methods of waste disposal. It also covers hazard communication and incident

[*] Each laboratory must provide supplemental laboratory-specific documents, as needed.

response. This information is intended to be a resource and to help laboratory personnel minimize hazards.

In view of the wide variety of chemical products handled in laboratories, it should not be assumed that the precautions and requirements stated in this manual are all-inclusive. Faculty, researchers and students are expected to learn about the hazards of chemical products before handling them. Principal Investigators (PIs) and Laboratory Supervisors should include supplemental information pertinent to their specific areas in this manual.

Laboratory operations that utilize radioactive materials or radiation producing machines, biological hazards, laser operations, or shop activities must to follow additional guidelines outlined in hazard-specific UCLA manuals (e.g., Biosafety Manual, Radiation Safety Manual, Laser Safety Manual, etc.).

1. Injury and Illness Prevention Plan

The development and implementation of laboratory specific Injury and Illness Prevention Plan is a key step in strengthening the safety culture in laboratories. The UCLA Injury and Illness Prevention Plan (IIPP) is a guide that is available to assist PIs/Laboratory Supervisors to develop laboratory specific safety programs for employees. Mandated by California law, an IIPP provides a framework for laboratories to provide their employees with equipment and information necessary to work safely within their specific work environments. It assigns responsibility for safety to specific individuals and outlines procedures to assure compliance with safety procedures. This safety program must address identification, communication, and correction of hazards, as well as accident investigations, training and recordkeeping. A well-integrated IIPP provides the information required to monitor activities and resources to reduce the risk of workplace injury and illness to maintain a safe work environment.

Title 8, of the California Code of Regulations (CCR), requires every California employer to have an effective written IIPP in accord with CCR Section 3203 of the General Industry Safety Orders. The Laboratory Safety Manual includes a brief section providing the purpose and components of the IIPP. Procedures related to “assignment of responsibilities,” “hazard identification,” “hazard mitigation,” “incident reporting,” and “training” are included in the various sections of the Laboratory Safety Manual.

2. Chemical Hygiene Plan

The Chemical Hygiene Plan (CHP) establishes a formal written program for protecting laboratory personnel against adverse health and safety hazards associated with exposure to potentially hazardous chemicals and must be made available to all employees working with hazardous chemicals as required in Title 8, California Code of Regulations (CCR), Section 5191 (Occupational Exposures to Hazardous Chemicals in Laboratories). The CHP describes the proper use, handling practices and procedures to be followed by faculty, staff, students, visiting scholars, and all other personnel working with potentially hazardous chemicals in laboratory settings.

3. Laboratory Specific Standard Operating Procedures

Standard Operating Procedures (SOPs) are written instructions that detail the steps that will be performed during a given experimental procedure and include information about potential hazards and how these hazards will be mitigated. SOPs should be written by laboratory personnel who are most knowledgeable and involved with the experimental process. The development and implementation of SOPs is a core component of promoting a strong safety culture in the laboratory and helps ensure a safe work environment. PIs/Laboratory Supervisors are required to develop and implement laboratory-specific SOPs for certain hazardous chemicals and "particularly hazardous substances" (PHS) that are used in their laboratories. These SOPs must be submitted and reviewed by the Department Safety Committee prior to implementation. For certain hazardous chemicals, PHS, or specialized practices, consideration must be given to whether additional consultation with safety professionals is warranted or required. Circumstances requiring prior approval from the PI/Laboratory Supervisor must also be addressed in laboratory-specific SOPs. The Chemical Hygiene Plan (see Chapter 4 and Appendix D) provides more detailed information on SOPs. SOPs should be kept in the Laboratory Safety Manual under the appropriate tab.

4. Safety Training Records

Effective training is a critical component to facilitating a safe environment and for the prevention of laboratory accidents. All employees must be trained in general safe work practices and be given specific instructions on hazards unique to their job assignment. Meeting safety training requirements is a cooperative effort between departments, Principal Investigators and Laboratory Supervisors, laboratory staff and EH&S.

An effective health and safety training program must include appropriate oversight, proper recordkeeping, instruction on the proper use of PPE (e.g., eye protection, gloves, laboratory coats, respirators, etc.), and extensive outreach. Accurate recordkeeping of training activities demonstrates a commitment to the safety and health of the UCLA community, integrity of research and protection of the environment. EH&S is responsible for maintaining records of training conducted by EH&S staff members. Departments or laboratories are required to document and maintain record of all health and safety training, including safety meetings, one-on-one training, and classroom and online training. Safety training records should be kept in the Laboratory Safety Manual under the appropriate tab, including records of EH&S conducted sessions.

5. Laboratory Inspection Records

EH&S has instituted a laboratory inspection program for all laboratories in the science, engineering and technology areas. Laboratories are currently inspected on an annual basis by EH&S Safety Specialists to ensure compliance with federal, state and university requirements. Most of the standards are contained in Title 8 of the California Code of Regulations (CCR), General Industry Safety Orders (including sections 3380-3385 on Personal Protective Devices), Title 19, State Fire Marshal, and in Title 40 of the Environmental Protection Agency, Code of Federal Regulations. EH&S Safety Specialists conduct inspections, issue reports, conduct re-inspections when deficiencies

are noted, and provide training and coaching on safety and compliance in laboratories. Strong compliance is a critical part of an effective safety program. Laboratory inspection reports should be kept in the Laboratory Safety Manual under the appropriate tab.

6. Laboratory Hazard Assessment Tool

The Laboratory Hazard Assessment Tool (LHAT) helps to categorize laboratories according to risk based on the types of hazards present in the laboratory. The LHAT identifies laboratory activities involving chemical and other types of hazards and specifies the proper PPE that should be used by laboratory personnel to protect themselves against these hazards. Once the appropriate PPE is identified, the laboratory must provide the required PPE to laboratory personnel and conduct and document training for laboratory staff on the proper use of the PPE. Laboratories are required to provide information to EH&S concerning the laboratory location, identify the PI/Laboratory Supervisor and the Laboratory Safety Coordinator, and certify that the assessment and training were completed. The LHAT must be completed at least annually and updated whenever hazards in the laboratory change. The laboratory's most recent LHAT should be kept in the Laboratory Safety Manual under the appropriate tab.

How to Use this Laboratory Safety Manual

Principal Investigators/Laboratory Supervisors

1. Insert your department's Injury and Illness Prevention Plan (IIPP) behind the appropriate tab. Familiarize yourself with your department contacts and any special communication channels.
2. Review the Chemical Hygiene Plan (CHP):
   - Specifically review your responsibilities on pages 1 – 4
   - Review Chapter 7: Training
   - Review Appendices D, J and K. These are resources to help you develop and document laboratory specific Standard Operating Procedures (SOPs) and training
3. Insert your laboratory-specific SOPs behind the appropriate tab.
4. Insert laboratory-specific and all required training documentation behind the appropriate tab.
5. Insert your laboratory's inspection reports behind the appropriate tab.
6. Insert a copy of your current Laboratory Hazard Assessment Tool (LHAT). If it has been over 12 months since your LHAT has been updated, go to *http://lsm.ehs.ucla.edu/Ehsaweb/EHSAWebISAPI.dll/EXEC* to make necessary changes and print a new copy.
7. Review any new information with your laboratory workers.

Laboratory Personnel

1. Review your department's Injury and Illness Prevention Plan. Familiarize yourself with your department contacts, how to report a hazard in your laboratory and how to report injuries.
2. Review the Chemical Hygiene Plan:
   - Specifically your responsibilities listed on pages 1 – 4
   - Review Chapter 2 to refresh your knowledge on how to identify hazardous chemicals
   - Review Chapter 4 to understand how to reduce your potential for exposure to hazardous chemicals (engineering controls, administrative controls and personal protective equipment)
   - Review Chapter 10 with your PI to ensure you know what to do to prepare for and respond to an emergency
3. Review PPE requirements with your PI and ensure you know how to acquire additional or replacement PPE.
4. Review the laboratory-specific SOPs with your PI and document your training. All training, whether formal or on-the-job, should be documented and placed behind the appropriate tab.
5. Ask for clarification if there are any questions related to your laboratory work before you begin a new task.

Questions?

For further information on this Laboratory Safety Manual or on any health and safety related topics, please contact the EH&S Hotline at 310-825-9797.

Chemical Hygiene Plan

UCLA
Chemical Hygiene Plan

Office of Environment, Health and Safety

December 2011

Photograph by Yves Rubin — www.rubinphoto.com

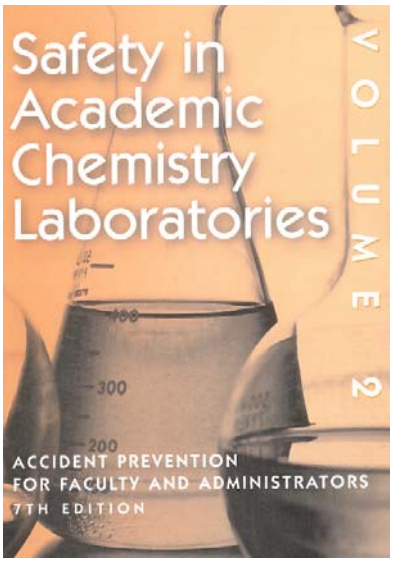
THIS PAGE INTENTIONALLY LEFT BLANK.

Table of Contents

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 1: Introduction

Purpose



UCLA is committed to providing a healthy and safe working environment for the campus community, free from recognized hazards in accordance with UCLA Policy 811 (*http://www.adminpolicies.ucla.edu/pdf/811.pdf*). The Chemical Hygiene Plan (CHP) establishes a formal written program for protecting laboratory personnel against adverse health and safety hazards associated with exposure to potentially hazardous chemicals and must be made available to all employees working with hazardous chemicals. The CHP describes the proper use and handling practices and procedures to be followed by faculty, staff, students, visiting scholars, and all other personnel working with potentially hazardous chemicals in laboratory settings. This plan is based on best practices identified in, among others sources, "Prudent Practices for Handling Hazardous Chemicals in Laboratories," published by the National Research Council, and the American Chemical Society's "Safety in Academic Chemistry Laboratories" (*www.acs.org*), a copy of which has been distributed along with this manual.

Scope

The CHP applies to all laboratories that use, store or handle potentially hazardous chemicals and all personnel who work in these facilities. It does not apply to research involving exclusively radiological or biological materials, as these safety procedures and regulatory requirements are outlined in the Radiation Safety Manual (*www.ehs.ucla.edu/radsafetymanual.pdf*) and Biosafety Manual (*www.ehs.ucla.edu/biosafetymanual.pdf*), respectively. Research involving more than one type of hazard must comply with all applicable regulatory requirements and follow guidance outlined in the relevant safety manuals.

The information presented in the CHP represents best practices and provides a broad overview of the information necessary for the safe operation of laboratories that utilize potentially hazardous chemicals. It is not intended to be all inclusive. Departments, divisions or other work units engaged in work with potentially hazardous chemicals that have unusual characteristics, or are otherwise not sufficiently covered in the written CHP, must customize the document by adding additional sections addressing the hazards and how to mitigate their risks, as appropriate. Such customizations must receive prior approval from the PI/Laboratory Supervisor and/or the UCLA Office of Environment, Health and Safety (EH&S). See *Appendix E: Policy 907 – Safe Handling of Particularly Hazardous Substances* for additional information on substances that may trigger these additions. For information on specific chemical safety topics not covered in the CHP, please contact the **EH&S Hotline at 310-825-9797** or *laboratorysafety@ehs.ucla.edu.*

Regulatory Requirements

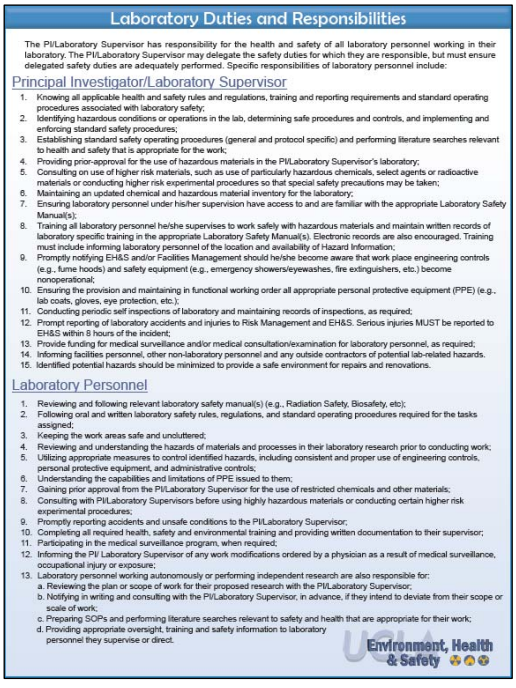
Implementation of the necessary work practices, procedures, and policies outlined in this CHP is required by the following:

- *Title 8, California Code of Regulations (CCR), Section 5191, "Occupational Exposures to Hazardous Chemicals in Laboratories" (http://www.dir.ca.gov/title8/5191.html)*
- *Title 8, CCR, Section 5209, "Carcinogens" (http://www.dir.ca.gov/title8/5209.html)*
- *Title 8, CCR, Section 5154.1, "Ventilation Requirements for Laboratory-Type Hood Operations" (http://www.dir.ca.gov/title8/5154_1.html)*

Other applicable regulations include those promulgated by the U.S. Department of Labor including 29 CFR 1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories" (the "Laboratory Standard"). These regulations require that the CHP be readily available wherever potentially hazardous chemicals are used, handled or stored. EH&S will review and evaluate the effectiveness of this Plan at least annually and update it as necessary.

Rights and Responsibilities

Employees and other personnel who work in laboratories have the right to be informed about the potential health hazards of the chemicals in their work areas and to be properly trained to work safely with these substances. This includes custodial staff and other personnel who work to clean and maintain laboratories. Employees have the right to file a complaint with Cal/OSHA if they feel they are being exposed to unsafe or unhealthy work conditions and cannot be discharged, suspended, or otherwise disciplined by their employer for filing a complaint or exercising these rights. *All personnel working with potentially hazardous chemicals are encouraged to report (anonymously, if preferred) any concerns about unsafe work conditions to the* ***EH&S Hotline at 310-825-9797***.



Laboratory Duties and Responsibilities

The PI/Laboratory Supervisor has responsibility for the health and safety of all laboratory personnel working in their laboratory. The PI/Laboratory Supervisor may delegate the safety duties for which they are responsible, but must ensure delegated safety duties are adequately performed. Specific responsibilities of laboratory personnel include:

Principal Investigator/Laboratory Supervisor

1. Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with laboratory safety;
2. Identifying hazardous conditions or operations in the lab, determining safe procedures and controls, and implementing and enforcing standard safety procedures;
3. Establishing standard safety operating procedures (general and protocol specific) and performing literature searches relevant to health and safety that is appropriate for the work;
4. Providing prior-approval for the use of hazardous materials in the PI/Laboratory Supervisor's laboratory;
5. Consulting on use of higher risk materials, such as use of particularly hazardous chemicals, select agents or radioactive materials or conducting higher risk experimental procedures so that special safety precautions may be taken;
6. Maintaining an updated chemical and hazardous material inventory for the laboratory;
7. Ensuring laboratory personnel under his/her supervision have access to and are familiar with the appropriate Laboratory Safety Manual(s);
8. Training all laboratory personnel he/she supervises to work safely with hazardous materials and maintain written records of laboratory specific training in the appropriate Laboratory Safety Manual(s). Electronic records are also encouraged. Training must include informing laboratory personnel of the location and availability of Hazard Information;
9. Promptly notifying EH&S and/or Facilities Management should he/she become aware that work place engineering controls (e.g., fume hoods) and safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become nonoperational;
10. Ensuring the provision and maintaining in functional working order all appropriate personal protective equipment (PPE) (e.g., lab coats, gloves, eye protection, etc.);
11. Conducting periodic self inspections of laboratory and maintaining records of inspections, as required;
12. Prompt reporting of laboratory accidents and injuries to Risk Management and EH&S. Serious injuries MUST be reported to EH&S within 8 hours of the incident;
13. Provide funding for medical surveillance and/or medical consultation/examination for laboratory personnel, as required;
14. Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential lab-related hazards.
15. Identified potential hazards should be minimized to provide a safe environment for repairs and renovations.

Laboratory Personnel

1. Reviewing and following relevant laboratory safety manual(s) (e.g., Radiation Safety, Biosafety, etc);
2. Following oral and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned;
3. Keeping the work areas safe and uncluttered;
4. Reviewing and understanding the hazards of materials and processes in their laboratory research prior to conducting work;
5. Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment, and administrative controls;
6. Understanding the capabilities and limitations of PPE issued to them;
7. Gaining prior approval from the PI/Laboratory Supervisor for the use of restricted chemicals and other materials;
8. Consulting with PI/Laboratory Supervisors before using highly hazardous materials or conducting certain higher risk experimental procedures;
9. Promptly reporting accidents and unsafe conditions to the PI/Laboratory Supervisor;
10. Completing all required health, safety and environmental training and providing written documentation to their supervisor;
11. Participating in the medical surveillance program, when required;
12. Informing the PI/ Laboratory Supervisor of any work modifications ordered by a physician as a result of medical surveillance, occupational injury or exposure;
13. Laboratory personnel working autonomously or performing independent research are also responsible for:
    a. Reviewing the plan or scope of work for their proposed research with the PI/Laboratory Supervisor;
    b. Notifying in writing and consulting with the PI/Laboratory Supervisor, in advance, if they intend to deviate from their scope or scale of work;
    c. Preparing SOPs and performing literature searches relevant to safety and health that are appropriate for their work;
    d. Providing appropriate oversight, training and safety information to laboratory personnel they supervise or direct.

UCLA Environment, Health & Safety

Responsibilities for the health and safety of the campus community extends to the highest administrative levels of UCLA. The Chancellor and Vice Chancellors are responsible for the implementation of UCLA's Environmental Health and Safety Policy (*http://www.adminpolicies.ucla.edu/pdf/811.pdf*) at all facilities and properties under campus control. Deans and Department Heads are responsible for establishing and maintaining programs in their areas and for providing a safe and healthy work environment.

While the Chancellor, Vice Chancellors, Deans and Department Heads are responsible for the broad implementation and enforcement of UCLA's Environmental Health and Safety Policy, the day to day responsibility for the management of laboratory safety and adherence to safe laboratory practices rests with the PI/Laboratory Supervisor within individual laboratory units and associated departments.

All personnel, including PIs/Laboratory Supervisors, employees, and students, have a duty to fulfill their obligations with respect to maintaining a safe work environment.

All employees and other personnel working with potentially hazardous chemicals have the responsibility to conscientiously participate in training seminars on general laboratory safety and review and be familiar with the contents of the CHP. Those working with chemicals are responsible for staying informed about the chemicals in their work areas, safe work practices and proper personal protective equipment (PPE) required for the safe performance of their job. Failure to comply with these requirements will result in progressive disciplinary action in accordance with University policy, and may result in temporary suspension of laboratory activities until corrective action is implemented.

Specific duties and responsibilities of personnel who work in areas where potentially hazardous chemicals are present have been compiled in the document entitled General Rules for Laboratory Work with Chemicals, found in *Appendix A*.

RESPONSIBILITIES OF PRINCIPAL INVESTIGATOR (PI)/ LABORATORY SUPERVISOR

The PI/Laboratory Supervisor has responsibility for the health and safety of all personnel working in his or her laboratory who handle hazardous chemicals. The PI/Laboratory Supervisor may delegate safety duties, but remains responsible for ensuring that delegated safety duties are adequately performed**.** The PI/Laboratory Supervisor is responsible for:

1. Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with chemical safety for regulated substances;
2. Identifying hazardous conditions or operations in the laboratory or other facility containing hazardous chemicals and determining safe procedures and controls, and implementing and enforcing standard safety procedures;
3. Establishing standard safety operating procedures (general and protocol specific) and performing literature searches relevant to health and safety for laboratory-specific work;
4. Providing prior-approval for the use of hazardous chemicals in the PI/Laboratory Supervisor's laboratory or other facility with hazardous chemicals;
5. Consulting with EH&S and/or Departmental Safety Committee on use of higher risk materials, such as use of particularly hazardous substances, as defined by UCLA Policy 907, or conducting higher risk experimental procedures so that special safety precautions may be taken;
6. Maintaining an updated chemical inventory for the laboratory or facility;
7. Ensuring laboratory or other personnel under his/her supervision have access to and are familiar with the appropriate Safety Manual(s);
8. Training all laboratory or other personnel he/she supervises to work safely with hazardous materials and maintain written records of laboratory-specific or other specialized training in the appropriate Safety Manual(s). Electronic records of training are encouraged. Training must include information of the location and availability of hazard information;
9. Promptly notifying EH&S and/or Facilities Management should he/she become aware that work place engineering controls (e.g., fume hoods) and safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become non-operational;
10. Ensuring the availability of all appropriate personal protective equipment (PPE) (e.g., laboratory coats, gloves, eye protection, etc.) and ensuring the PPE is maintained in working order;

11. Conducting periodic self-inspections of laboratory or facility and maintaining records of inspections, as required;
12. Promptly reporting of accidents and injuries to EH&S. Serious injuries MUST be reported to EH&S immediately to allow for compliance with the CAL/OSHA **8-hour** reporting time frame. Any doubt as to whether an injury is serious should favor reporting;
13. Provide funding for medical surveillance and/or medical consultation and examination for laboratory and other personnel, as required;
14. Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential laboratory-related hazards when they are required to work in the laboratory environment; and
15. Identifying and minimizing potential hazards to provide a safe environment for repairs and renovations.

RESPONSIBILITIES OF ALL PERSONNEL WHO HANDLE POTENTIALLY HAZARDOUS CHEMICALS

All personnel in research or teaching laboratories that use, handle or store potentially hazardous chemicals are responsible for:

1. Reviewing and following requirements of the CHP and all appropriate Safety Manuals and Policies;
2. Following all verbal and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned;
3. Developing good personal chemical hygiene habits, including but not limited to, keeping the work areas safe and uncluttered;
4. Planning, reviewing and understanding the hazards of materials and processes in their laboratory research or other work procedures prior to conducting work;
5. Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment, and administrative controls;
6. Understanding the capabilities and limitations of PPE issued to them;
7. Gaining prior approval from the PI/Laboratory Supervisor for the use of restricted chemicals and other materials;
8. Consulting with PI/Laboratory Supervisor before using these particularly hazardous substances (PHS), explosives and other highly hazardous materials or conducting certain higher risk experimental procedures;
9. Immediately reporting all accidents and unsafe conditions to the PI/Laboratory Supervisor;
10. Completing all required health, safety and environmental training and providing written documentation to their supervisor;
11. Participating in the medical surveillance program, when required;
12. Informing the PI/Laboratory Supervisor of any work modifications ordered by a physician as a result of medical surveillance, occupational injury or exposure; and
13. When working autonomously or performing independent research or work:
    a. Reviewing the plan or scope of work for their proposed research with the PI/Laboratory Supervisor
    b. Notifying in writing and consulting with the PI/Laboratory Supervisor, in advance, if they intend to significantly deviate from previously reviewed procedures (Note: Significant change may include, but is not limited to, change in the objectives, change in PI, change in the duration, quantity, frequency, temperature or location, increase or change in PPE, and reduction or elimination of engineering controls.)

c. Preparing SOPs and performing literature searches relevant to safety and health that are appropriate for their work; and
d. Providing appropriate oversight, training and safety information to laboratory or other personnel they supervise or direct.

RESPONSIBILITIES OF EH&S AND CHEMICAL HYGIENE OFFICER (CHO)

EH&S is responsible for administering and overseeing institutional implementation of the Laboratory Safety Program. The Chemical Hygiene Officer (CHO) has primary responsibility for ensuring the implementation of all components of the CHP. In case of life safety matters or imminent danger to life or health, the Director of EH&S or designee has the authority to order the cessation of the activity until the hazardous condition is abated. EH&S provides technical guidance to personnel at all levels of responsibility on matters pertaining to laboratory use of hazardous materials. The CHO is a member of EH&S and, with support from other EH&S personnel, is responsible for:

1. Informing PIs/Laboratory Supervisors of all health and safety requirements and assisting with the selection of appropriate safety controls, including laboratory and other workplace practices, personal protective equipment, engineering controls, training, etc.;
2. Conducting periodic inspections and immediately taking steps to abate hazards that may pose a risk to life or safety upon discovery of such hazards;
3. Performing hazard assessments, upon request;
4. Maintaining area and personal exposure-monitoring records;
5. Helping to develop and implement appropriate chemical hygiene policies and practices;
6. Having working knowledge of current health and safety rules and regulations, training, reporting requirements and standard operating procedures associated with regulated substances. Such knowledge may be supplemented and developed through research and training materials;
7. Working with Departmental Safety Committee to review existing and developing new SOPs for handling hazardous chemicals;
8. Providing technical guidance and investigation, as appropriate, for laboratory and other types of accidents and injuries;
9. Helping to determine medical surveillance requirements for potentially exposed personnel;
10. Reviewing plans for installation of engineering controls and new facility construction/renovation, as requested;
11. Reviewing and evaluating the effectiveness of the CHP at least annually and updating it as appropriate; and
12. Providing management oversight and assistance with environmental compliance, transport and disposal of hazardous waste.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 2: Chemical Hazard Communication

UCLA has an established Hazard Communication Program that complies with 8 CCR 5194 (*http://www.dir.ca.gov/title8/5194.html*), the Cal/OSHA Hazard Communication Standard. The purpose of UCLA's Hazard Communication Program is to ensure that all employees and, upon request, their personal physicians, have the right to receive information regarding the hazardous substances to which they may have been exposed at work. UCLA is responsible for providing information about the hazardous substances in our workplace, the associated hazards, and the control of these hazards, through a comprehensive hazard communication program that is summarized briefly below. The requirements of the Hazard Communication Program apply to laboratory environments at UCLA due to the potential for large scale experiments and for activities that may occur outside of areas where engineering controls are available. Proper hazard communication involves the active participation of the PI/Laboratory Supervisor, the EH&S Chemical Safety Officer, and the Laboratory/Facility Safety Coordinator, who are each responsible for providing consultation and safety information to employees working with hazardous chemicals.

List of Hazardous Substances

All labs are required to keep an updated copy of their chemical inventory on file, which must be made available to EH&S upon request. For each hazardous substance on their inventory, specific information on any associated health or safety hazards must be made readily available to all laboratory personnel. Compressed gases need to be included in the inventory list.

Hazard Determination

PIs/Laboratory Supervisors are responsible for verifying if any items on their chemical inventory are subject to the requirements of the hazard communication regulation.

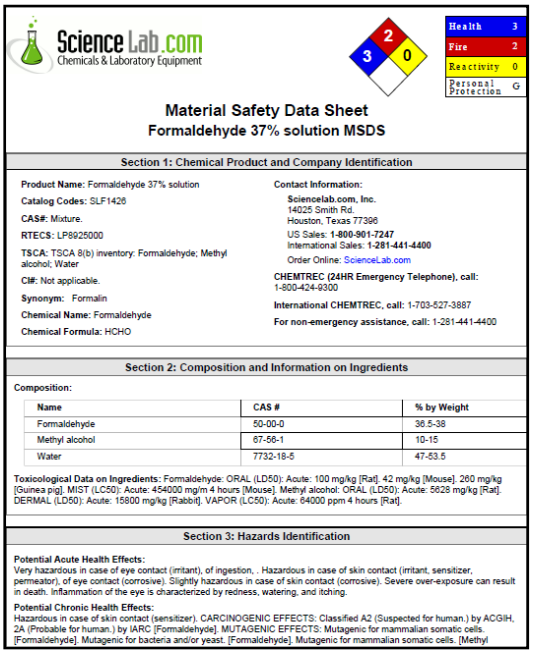
The term "hazardous substance" refers to any chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed individuals. Hazardous substances include, but are not limited to, those chemicals listed in the following:

1. "The Hazardous Substance List", commonly known as the Directors List of Hazardous Substances, 8 CCR 339 (*http://www.dir.ca.gov/title8/339.html*);
2. "Toxic and Hazardous Substances, Air Contaminants", 8 CCR, Section 5155 (*http://www.dir.ca.gov/title8/5155.html*);
3. "Threshold Limit Values for Chemical Substances in the Work Environment", ACGIH, 2004;
4. "Sixth Annual Report on Carcinogens", NTP, 1991;
5. "Monographs", IARC, WHO *(http://www.iarc.fr/en/publications/list/monographs*);
6. MSDSs for reproductive toxins and cancer causing substances (*http://map.ais.ucla.edu/go/1002824*); and
7. "Chemicals Known to the State to Cause Cancer or Reproductive Toxicity" (Proposition 65), 22 CCR 12000.

Inventory items found on the above lists are subject to the requirements outlined below.

MATERIAL SAFETY DATA SHEETS (MSDS)

An MSDS must be available for each hazardous substance in a laboratory's chemical inventory. MSDSs are available from the UC online MSDS library, available on the EH&S website: *http://map.ais.ucla.edu/go/1002824*. PIs/Laboratory Supervisors are responsible for keeping MSDSs current and making them available to all laboratory employees throughout the work day. MSDSs must be in a central location that can be accessed immediately in the event of an emergency. Electronic copies may be kept in a file on a group drive, or hard copies maintained in a central location in the laboratory.



ScienceLab.com
Chemicals & Laboratory Equipment

Health 3
Fire 2
Reactivity 0
Personal Protection G

Material Safety Data Sheet
Formaldehyde 37% solution MSDS

Section 1: Chemical Product and Company Identification

Product Name: Formaldehyde 37% solution
Catalog Codes: SLF1426
CAS#: Mixture.
RTECS: LP8925000
TSCA: TSCA 8(b) inventory: Formaldehyde; Methyl alcohol; Water
CI#: Not applicable.
Synonym: Formalin
Chemical Name: Formaldehyde
Chemical Formula: HCHO

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Formaldehyde	50-00-0	36.5-38
Methyl alcohol	67-56-1	10-15
Water	7732-18-5	47-53.5

Toxicological Data on Ingredients: Formaldehyde: ORAL (LD50): Acute: 100 mg/kg [Rat]. 42 mg/kg [Mouse]. 260 mg/kg [Guinea pig]. MIST (LC50): Acute: 454000 mg/m 4 hours [Mouse]. Methyl alcohol: ORAL (LD50): Acute: 5628 mg/kg [Rat]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 64000 ppm 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (irritant, sensitizer, permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2A (Probable for human.) by IARC [Formaldehyde]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Formaldehyde]. Mutagenic for bacteria and/or yeast. [Formaldehyde]. Mutagenic for mammalian somatic cells. [Methyl

New chemical substances synthesized or produced in a laboratory, and used or shared outside of a laboratory suite, require the preparation of an MSDS for each synthesized substance. The UC-system wide MSDS library has the capability of developing new MSDSs based on the known chemical and physical properties of that substance. Contact the **EH&S Hotline at 310-825-9797** for more information on preparing new MSDSs.

A sample MSDS and information on its contents is available in *Appendix B*.

LABELS AND OTHER FORMS OF WARNING

Labeling requirements for all hazardous substances are summarized as follows:

- All containers of hazardous materials must be labeled with the identity of the hazardous substance
- The label must contain all applicable hazard warning statements
- The name and address of the chemical manufacturer or other responsible party must be present
- Manufacturer's product labels must remain on all containers, and must not be defaced in any way. Appropriate hazard warning statements and Proposition 65 warnings must be present, if not that information must be added
- Labels must be legible, in English, and prominently displayed
- Symbols and/or other languages are required for non-English speaking employees
- Secondary containers (such as spray bottles) must be labeled with the identity of the substance and appropriate hazard warnings
- New synthesized compounds must be labeled with the appropriate hazard warnings based on the knowledge of the chemical and physical properties of that substance.

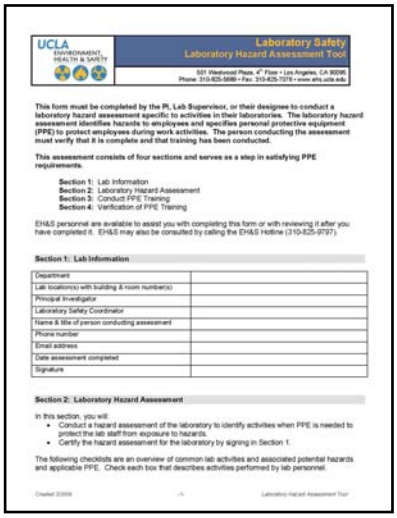
Additional information on container labeling is provided in *Appendix C*.

EMPLOYEE INFORMATION AND TRAINING

Employee training on specific workplace hazards must be provided at the time of initial assignment, whenever a new hazard is introduced into the workplace, and whenever employees may be exposed to hazards in other work areas. General Hazard Communication Training is available online through the Bruin Safety training module (*http://www.biolchem.ucla.edu/Information_Safety.htm*). The online Bruin Safety training is not a substitution for Laboratory Safety Fundamentals Concepts (see Chapter 7). Additional employee training is required whenever a new hazard is introduced into the work environment, and must be provided within 30 days of receiving the MSDS or other safety information. All training must be in the appropriate language, educational level, and vocabulary for laboratory personnel. Employees must be given the opportunity to ask questions.

LABORATORY HAZARD ASSESSMENT TOOL

The Laboratory Hazard Assessment Tool (LHAT), found at *http://lsm.ehs.ucla.edu*, was developed to broadly identify activities involving chemical and other types of hazards and is an effective method of hazard communication. The LHAT captures information on the specific type of hazard(s), the location of the hazard(s), the name of the PI/Laboratory Supervisor who oversees the facility and helps identify the proper PPE that should be used by laboratory personnel to protect themselves against these hazards. Once the required PPE is identified, the laboratory is required to conduct and document training for laboratory personnel on the use of PPE.


UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety
Laboratory Hazard Assessment Tool

This form must be completed by the PI, Lab Supervisor, or their designee to conduct a laboratory hazard assessment specific to activities in their laboratories. The laboratory hazard assessment identifies hazards to employees and specifies personal protective equipment (PPE) to protect employees during work activities. The person conducting the assessment must verify that it is complete and that training has been conducted.

This assessment consists of four sections and serves as a step in satisfying PPE requirements.

Section 1: Lab Information
Section 2: Laboratory Hazard Assessment
Section 3: Conduct PPE Training
Section 4: Verification of PPE Training

EH&S personnel are available to assist you with completing this form or with reviewing it after you have completed it. EH&S may also be consulted by calling the EH&S Hotline (310-825-9797).

Section 1: Lab Information

Department	
Lab location(s) with building & room number(s)	
Principal Investigator	
Laboratory Safety Coordinator	
Name & title of person conducting assessment	
Phone number	
Email address	
Date assessment completed	
Signature	

Section 2: Laboratory Hazard Assessment

In this section, you will:
- Conduct a hazard assessment of the laboratory to identify activities when PPE is needed to protect the lab staff from exposure to hazards.
- Certify the hazard assessment for the laboratory by signing in Section 1.

The following checklists are an overview of common lab activities and associated potential hazards and applicable PPE. Check each box that describes activities performed by lab personnel.

Created 2/2009 -1- Laboratory Hazard Assessment Tool

Other Resources

1. "Occupational Exposure to Hazardous Chemicals in Laboratories." California Code of Regulations (CCR) Title 8, Section 5191;
2. Standard Operating Procedures (SOPs) for handling toxic chemicals (*Appendix D*);
3. General information on the signs and symptoms associated with exposure to hazardous substances used in the laboratory or facility
   - Identity labels, showing contents of containers (including waste receptacles) and associated hazards;
   - Label hazardous waste containers. See the EH&S website for information about the Online Tag Program (*http://map.ais.ucla.edu/go/1002753*);
   - Warnings at areas or equipment where special or unusual hazards exist (e.g., particularly hazardous substances);
4. Procedures to follow in case of an emergency; including the posting of the "In Case of Serious Injury at Work" (*http://ehs.ucla.edu/Pub/IPD_EHS%20123%20Poster.pdf*)
   - Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers; and
   - 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.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 3: Classes of Hazardous Chemicals

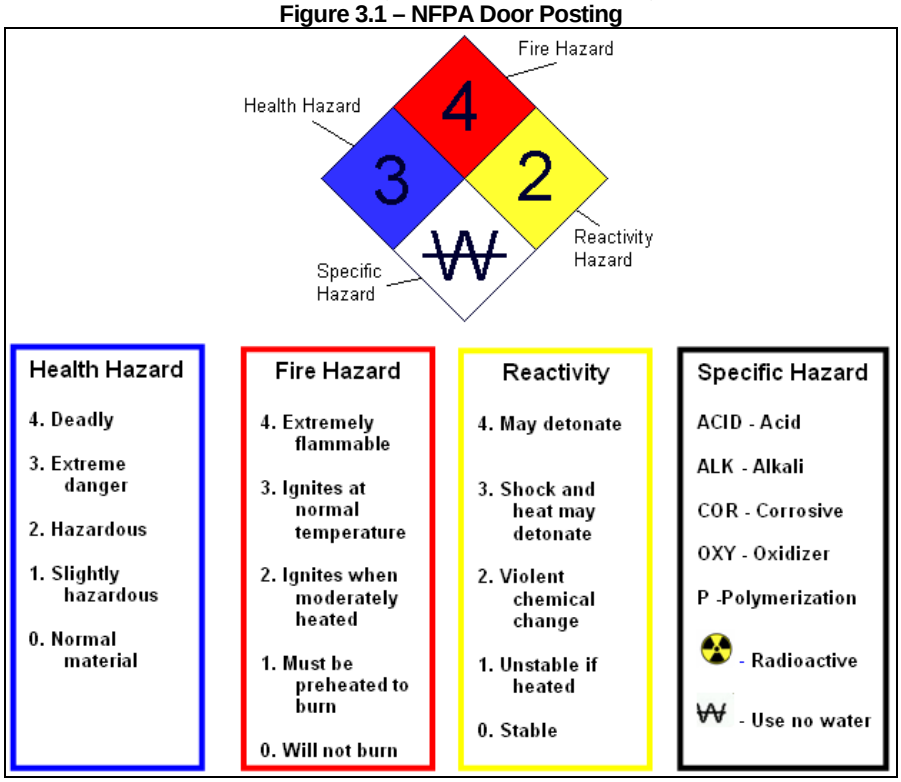
Identification & Classification of Hazardous Chemicals

Chemicals can be divided into several different hazard classes. The hazard class will determine how these materials should be stored and handled and what special equipment and procedures are needed to use them safely. Each chemical container, whether supplied by a vendor or produced in the laboratory, must include labels that clearly identify the hazards associated with that chemical. In addition to specific chemical labels, hazard information for specific chemicals can be found by referencing the Material Safety Data Sheet (MSDS) for that chemical.

Rooms containing hazardous chemicals must be labeled with a National Fire Prevention Association (NFPA) door placard that gives an overview of the key chemical hazards contained within that room. These postings have the familiar four color, 1-4 number rating that quickly supplies the hazard information broken down into four hazard classes, with 1 indicating a low level of hazard and 4 indicating a high hazard level. The four chemical hazard types correspond to the four color areas: red indicates a flammability hazard, yellow indicates a reactive hazard, blue indicates a health hazard and the white area is reserved for special hazards that are identified by hazard symbols or labels to indicate hazards such as radioactivity, biohazard, water reactive chemicals, etc. Each of these hazards has a different set of safety precautions associated with them. Figure 3.1 illustrates the NFPA rating system.

<note: remove ACID, ALK and P from Specific Hazard list (not standard symbols for NFPA) add biohazard symbol instead.>

Figure 3.1 – NFPA Door Posting



It is essential that all laboratory workers understand the types of hazards, recognize the routes of exposure, and are familiar with the major hazard classes of chemicals. In many cases, the specific

hazards associated with new compounds and mixtures will not be known, so it is recommended that all chemical compounds be treated as if they were potentially harmful and to use appropriate eye, inhalation and skin protection equipment.

FLAMMABILITY HAZARDS

A number of highly flammable substances are in common use in campus laboratories. Flammable liquids include those chemicals that have a flashpoint of less than 100 degrees Fahrenheit. These materials must be stored in flammable storage cabinets in aggregate quantities of 10 gallons or more. Flame-resistant laboratory coats must be worn when working with large quantities (4 liters or more) of flammable materials and/or with procedures where a significant fire risk is present (e.g., when working with open flame, etc.). These materials can constitute a significant immediate threat and should be treated with particular care, even though the use of these materials is fairly common in the laboratory setting. Particular attention should be given to preventing static electricity and sparks when handling flammable liquids.

REACTIVITY HAZARDS

Reactive and explosive substances are materials that decompose under conditions of mechanical shock, elevated temperature, or chemical action, and release of large volumes of gases and heat. Some materials, such as peroxide formers, may not be explosive, but may form explosive substances over time. These substances pose an immediate potential hazard and procedures which use them must be carefully reviewed. These materials must also be stored in a separate flame-resistant storage cabinet or, in many cases, in laboratory grade refrigerator or freezer that are designed for flammable and reactive chemicals. Pyrophoric chemicals are a special classification of reactive materials that spontaneously combust when in contact with air and require laboratory-specific training. Flame-resistant laboratory coats must always be worn when working with pyrophoric chemicals.

HEALTH HAZARDS

Cal/OSHA uses the following definition for health hazards:

> The term ‘health hazard’ includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

The major classes of “hazardous” and “particularly hazardous substances” and their related health and safety risks are detailed below.

Corrosive Substances

As a health hazard, corrosive substances cause destruction of, or alterations in, living tissue by chemical action at the site of contact.

Major classes of corrosive substances include:

- Strong acids – e.g., sulfuric, nitric, hydrochloric and hydrofluoric acids
- Strong bases – e.g., sodium hydroxide, potassium hydroxide and ammonium hydroxide
- Dehydrating agents – e.g., sulfuric acid, sodium hydroxide, phosphorus pentoxide and calcium oxide
- Oxidizing agents – e.g., hydrogen peroxide, chlorine and bromine.

Symptoms of exposure for inhalation include a burning sensation, coughing, wheezing, laryngitis, shortness of breath, nausea, and vomiting. For eyes, symptoms include pain, blood shot eyes, tearing, and blurring of vision. For skin, symptoms may include reddening, pain, inflammation, bleeding, blistering and burns. As a physical hazard, corrosive substances may corrode materials they come in contact with and may be highly reactive with other substances. It is important to review information regarding the materials they may corrode, and their reactivity with other substances, as well as information on health effects. In most cases, these materials should be segregated from other chemicals and require secondary containment when in storage.

Irritants

Irritants are defined as non-corrosive chemicals that cause reversible inflammatory effects on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic compounds, including many chemicals that are in a powder or crystalline form, are irritants. The most common example of an irritant may be ordinary smoke which can irritate the nasal passages and respiratory system. Consequently, eye and skin contact with all laboratory chemicals should always be avoided. Symptoms of exposure can include reddening or discomfort of the skin and irritation to respiratory systems.

Sensitizers

A sensitizer (allergen) is a substance that causes exposed people to develop an allergic reaction in normal tissue after repeated exposure to the substance. Examples of sensitizers include diazomethane, chromium, nickel, formaldehyde, isocyanates, arylhydrazines, benzylic and allylic halides, and many phenol derivatives. Sensitizer exposure can lead to all of the symptoms associated with allergic reactions, or can increase an individual's existing allergies.

Hazardous Substances with Toxic Effects on Specific Organs

Substances included in this category include:

- Hepatotoxins – i.e., substances that produce liver damage, such as nitrosamines and carbon tetrachloride
- Nephrotoxins – i.e., agents causing damage to the kidneys, such as certain halogenated hydrocarbons
- Neurotoxins – i.e., substances which produce their primary toxic effects on the nervous system, such as mercury, acrylamide and carbon disulfide
- Agents which act on the hematopoietic system – e.g., carbon monoxide and cyanides which decrease hemoglobin function and deprive the body tissues of oxygen
- Agents which damage lung tissue – e.g., asbestos and silica.

Symptoms of exposure to these materials vary. Staff working with these materials should review the MSDS for the specific material being used and should take special note of the associated symptoms of exposure.

Particularly Hazardous Substances

OSHA recognizes that some classes of chemical substances pose a greater health and safety risk than others. To differentiate this different risk characteristic, OSHA identifies two categories of hazardous chemicals:

1. **hazardous chemicals**; and
2. **particularly hazardous substances**.

Substances that pose such significant threats to human health are classified as "particularly hazardous substances" (PHSs). The OSHA Laboratory Standard and Cal/OSHA regulation require that special provisions be established to prevent the harmful exposure of researchers to PHSs, including the establishment of designated areas for their use.

See UCLA's Particularly Hazardous Substances Policy (*Appendix E*) for more information, which also includes a list of common particularly hazardous chemicals used inside laboratories.

Particularly hazardous substances are divided into three primary types:

1. **Acute Toxins**;
2. **Reproductive Toxins**; and
3. **Carcinogens**.

Acute Toxins

Substances that have a high degree of acute toxicity are interpreted by OSHA as being substances that "may be fatal or cause damage to target organs as the result of a single exposure or exposures of short duration." These chemicals, associated chemical waste, and storage containers must be handled with care to prevent cross contamination of work areas and unexpected contact. These chemicals must be labeled as "Toxic." Empty containers of these substances must be packaged and disposed of as hazardous waste without rinsing trace amounts into the sanitary sewer system.

Reproductive Toxins

Reproductive toxins (*http://web.princeton.edu/sites/ehs/labsafetymanual/appa.htm*) include any chemical that may affect the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Reproductive toxins can affect the reproductive health of both men and women if proper procedures and controls are not used. For women, exposure to reproductive toxins during pregnancy can cause adverse effects on the fetus; these effects include embryolethality (death of the fertilized egg, embryo or fetus), malformations (teratogenic effects), and postnatal functional defects. For men, exposure can lead to sterility.

Examples of embryotoxins include thalidomide and certain antibiotics such as tetracycline. Women of childbearing potential should note that embryotoxins have the greatest impact during the first trimester of pregnancy. Because a woman often does not know that she is pregnant during this period of high susceptibility, special caution is advised when working with all chemicals, especially those rapidly absorbed through the skin (e.g., formamide). Pregnant women and women intending to become pregnant should consult with their laboratory supervisor and EH&S before working with substances that are suspected to be reproductive toxins.

Carcinogens

Carcinogens are chemical or physical agents that cause cancer. Generally they are chronically toxic substances; that is, they cause damage after repeated or long-duration exposure, and their effects may only become evident after a long latency period. Chronic toxins are particularly insidious because they may have no immediately apparent harmful effects. These materials are separated into two classes:

1. **Select Carcinogens**; and
2. **Regulated Carcinogens**.

Select carcinogens are materials which have met certain criteria established by the National Toxicology Program or the International Agency for Research on Cancer regarding the risk of cancer via certain exposure routes. (See definition Select Carcinogen.) It is important to recognize that some substances involved in research laboratories are new compounds and have not been subjected to testing for carcinogenicity. The following references (links provided) are used to determine which substances are select carcinogens by Cal/OSHA's classification:

- OSHA Carcinogen List (*http://web.princeton.edu/sites/ehs/labsafetymanual/sec7j.htm*)
- Annual Report on Carcinogens published by the National Toxicology Program (NTP), including all of the substances listed as "known to be carcinogens" and some substances listed as "reasonably anticipated to be carcinogens" (*http://ntp.niehs.nih.gov/index.cfm?objectid=32BA9724-F1F6-975E-7FCE50709CB4C932*)
- International Agency for Research on Cancer (IARC), including all of Group 1 "carcinogen to humans" by the International Agency for Research on Cancer Monographs (IARC) (Volumes 1-48 and Supplements 1-8); and some in Group 2A or 2B, "reasonably anticipated to be carcinogens" by the National Toxicology Program (NTP), and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (i) after inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3; (ii) after repeated skin application of less than 300 mg/kg of body weight per week; or (iii) after oral dosages of less than 50 mg/kg of body weight per day (*http://monographs.iarc.fr/ENG/Classification/crthgr01.php*)

Regulated Carcinogens fall into a higher hazard class and have extensive additional requirements associated with them. The use of these agents may require personal exposure sampling based on usage. When working with Regulated Carcinogens, it is particularly important to review and effectively apply engineering and administrative safety controls as the regulatory requirements for laboratories that may exceed long term (8 hour) or short term (15 minutes) threshold values for these chemicals are very extensive. A complete list of Regulated Carcinogens can be found in *Appendix F*.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 4: How to Reduce Exposures to Hazardous Chemicals

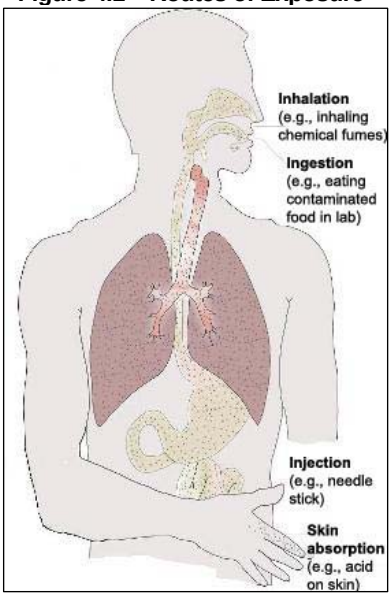
Introduction

Hazardous chemicals require a carefully considered, multi-tiered approach to ensure safety. There are four primary routes of exposure for chemicals which have associated health hazards (illustrated in Figure 4.1):

1. Inhalation;
2. Absorption (through the skin or eyes);
3. Ingestion; and
4. Injection (skin being punctured by a contaminated sharp object or uptake through an existing open wound).

Of these, the most likely route of exposure in the laboratory is by inhalation. Many hazardous chemicals may affect people through more than one of these exposure modes, so it is critical that protective measures are in place for each of these uptake mechanisms.

Figure 4.1 – Routes of Exposure



Safety Controls

Safety controls are divided into three main classifications:

1. Engineering Controls;
2. Administrative Controls; and
3. Protective Apparel and Equipment.

Elements of these three classes are used in a layered approach to create a safe working environment. The principles of each of these elements are detailed below.

ENGINEERING CONTROLS

Engineering controls include all "built in" safety systems. These controls offer the first line of protection and are highly effective in that they generally require minimal special procedures or actions on the part of the user except in emergency situations. A fundamental and very common example is the laboratory fume hood which is very effective at containing chemical hazards and protecting users from inhalation hazards. Other examples of engineering controls include general room ventilation, flammable material storage units, and secondary containment.

General Laboratory Ventilation

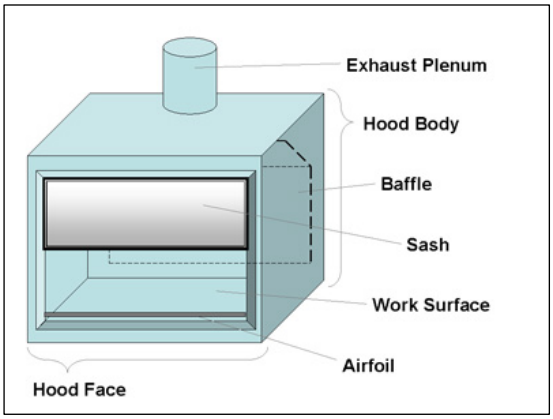
All laboratory rooms in which hazardous materials are used must have fresh air ventilation with 100% of the exhaust venting to the outside; laboratory rooms should not be part of recycled air systems. In cases where this is not desirable, a formal hazard evaluation will be made by EH&S to determine

what work can be done in the space and under what special conditions or limitations. Laboratory rooms should be kept at negative pressure compared to public areas to prevent the spread of hazardous vapors. See the University of California Environment, Health and Safety (EH&S) Laboratory Safety Design Guide for additional information on laboratory ventilation.

Fume Hoods

Fume hoods are the most commonly used local exhaust system on campus. Other methods include vented enclosures for large pieces of equipment or chemical storage, and portable exhaust systems for capturing contaminants near the point of release. Some systems are equipped with air cleaning devices (HEPA filters or carbon absorbers). Exhaust from fume hoods are designed to terminate at least ten feet above the roof deck or two feet above the top of any parapet wall, which ever is higher. Figure 4.2 displays the key components of a fume hood.

Figure 4.2 – Fume Hood



It is advisable to use a laboratory hood when working with all hazardous substances. In addition, a laboratory hood or other suitable containment device must be used for all work with "particularly hazardous substances." A properly operating and correctly used laboratory hood can reduce or eliminate volatile liquids, dusts and mists. Fume hoods are evaluated for operation and certified by EH&S on an annual basis. These annual evaluations check the fume hood air flow velocity to ensure that the unit will contain hazardous vapors. Data on annual fume hood monitoring will be maintained by EH&S. A complete report of fume hood monitoring data must be kept for one year; summary data must be maintained for 5 years.

Each fume hood should have a current calibration sticker and a marker indicating the highest sash height to be used when working with hazardous materials. Contact EH&S for a hood evaluation if these labels are missing.

Each fume hood must be equipped with at least one type of continuous quantitative monitoring device designed to provide the user with current information on the operational status of the hood. Many hoods also have motion sensors to determine when they are not in active use. These sensors will reduce the fume hood's air flow as part of the campus' energy savings effort. When hazardous materials are in a fume hood, but it is not under active use (e.g., during an unattended reaction or experiment), the sash should be closed. Fume hoods are not designed for storage of hazardous materials.

Routine maintenance and repairs of fume hoods are conducted by Facilities Management. Hood users may route requests for hood repair directly to Facilities via Facilities Service Requests (FSR). Make sure to indicate that the FSR has been "generated as a result of a health and safety deficiency" and mark it "urgent" in order to expedite processing. EH&S does not initiate maintenance but will coordinate with Facilities Management to ensure that it is completed. Upon reported completion by Facilities, EH&S will re-inspect the fume hood following maintenance or repairs.

General Rules for Fume Hood Use

The following general rules should be followed when using laboratory hoods:

1. Fume hoods should not be used for work involving hazardous substances unless they have a certification label that confirms certification has occurred within the past year
2. Always keep hazardous chemicals >6 inches behind the plane of the sash
3. **Never** put your head inside an operating laboratory hood. The plane of the sash is the barrier between contaminated and uncontaminated air
4. Work with the hood sash in the **lowest practical position.** The sash acts as a physical barrier in the event of an accident. Keep the sash closed when not conducting work in the hood
5. Do not clutter your hood with unnecessary bottles or equipment. Keep it clean and clear. Only materials actively in use should be in the hood
6. Do not make any modifications to hoods, duct work, or the exhaust system without first contacting the EH&S office via the **EH&S Hotline at 310-825-9797**
7. Do not use large equipment in laboratory hoods unless the hood is dedicated for this purpose, as large obstructions can change the airflow patterns and render the hood unsafe
8. Shut your sash! For energy efficiency, make sure to shut your sash when the hood is not in use

Laboratory fume hoods are one of the most important pieces of equipment used to protect laboratory and other workers from exposure to hazardous chemicals. Chemical fume hoods should be inspected upon installation, renovation, when a deficiency is reported, or a change has been made to the operating characteristics of the hood. Since fume hoods used for regulated carcinogens (as listed in the UCLA Particularly Hazardous Substances Policy: *http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=907*) have additional requirements, such as increased face velocity, contact the **EH&S Hotline at 310-825-9797** if the intended use changes.

Fume Hood Inspections

Step 1 – Physical Inspection
Evaluates the physical condition of the hood and the materials being used in the hood. This includes checking for:

- Improper storage of materials inside the fume hood
- Use of proper materials
- General hood cleanliness
- Physical damage to the fume hood (e.g., broken sash)
- Fully functioning lighting, fume hood indicator, airflow monitor, and alarm

Step 2 – Hood Performance Inspection
Evaluates the overall hood performance to ensure that it is functioning properly. This involves checking the:

- Average face velocity and set minimum face velocity, which is used to determine the rating of the hood and what the hood can be used for
- Noise generated by the fume hood, to ensure that it is below 85 dB
- If fume hood does not pass inspection, it will be labeled with a “DO NOT USE” sign until it can be repaired.

Glove Boxes and Ventilation Devices

In addition to fume hoods, some laboratories use contained glove box units for working with reactive chemicals under an inert environment, working with very toxic substances in a completely closed system, or for creating a stable, breeze free, system for weighing hazardous or reactive materials. These units can be very effective because they offer complete containment.

Other Engineering Controls

In addition to the elements listed above, consideration must be given to providing sufficient engineering controls for the storage and handling of hazardous materials. No more than 10 gallons of flammable chemicals may be stored outside of an approved flammable storage cabinet. For refrigerated or frozen storage, flammable and explosive materials must be kept in refrigeration units specifically designed for storing these materials. Generally these units do not have internal lights or electronic systems that could spark and trigger an ignition; additionally, the cooling elements are external to the unit. These units should be labeled with a rating from Underwriters Laboratory or other certifying organization

Secondary containment must be provided for corrosive and reactive chemicals and is recommended for all other hazardous chemicals. Secondary containment should be made of chemically resistant materials and should be sufficient to hold the volume of at least the largest single bottle stored in the container.

Laboratories that use hazardous materials must contain a sink, kept clear for hand washing to remove any final residual contamination. Hand washing is recommended whenever a staff member who has been working with hazardous materials plans to exit the laboratory or work on a project that does not involve hazardous materials.

ADMINISTRATIVE CONTROLS

The next layer of safety controls are Administrative Controls. These controls consist of policies and procedures; they are not generally as reliable as engineering controls in that the user has to carefully follow the appropriate procedures and must be fully trained and aware in order to do so.

EH&S requires that each laboratory have safety procedures, which include safety practices, for any work that involves hazardous materials. In many cases, a general safe operating procedure can be created in consultation with the Departmental Safety Committee, for a class of chemicals that have similar properties. For example, a laboratory group may have one set of safety guidelines for using acids in their laboratory if the acids used have similar properties and/or if the significant differences are delineated in the general procedure. In addition to safety procedures, laboratory groups must submit proposed changes in procedures to the Departmental Safety Committee for review prior to implementation if these changes could pose an additional or significantly greater hazard then the standard procedure. These reviews are especially important in cases where immediate hazards are present such as large quantities of flammable material, explosives or highly reactive material, or highly toxic substances.

Laboratory groups should also review their operations to minimize the amounts of hazardous substances in use or to replace them with less hazardous alternatives. Attention must also be paid to the appropriate segregation of incompatible materials.

Standard Operating Procedures

Standard operating procedures (SOPs) (*Appendix D*) or Job Safety Analysis (JSAs) that are relevant to safety and health considerations must be developed and followed when laboratory work involves the use of hazardous chemicals (CCR, Title 8, Section 5191 (e)(3)(A)), especially for “particularly hazardous substances” (PHS). SOPs are written instructions that detail the steps that will be performed during a given experimental procedure and include information about potential hazards and how these hazards will be mitigated. SOPs should be written by laboratory personnel who are most knowledgeable and involved with the experimental process. The development and

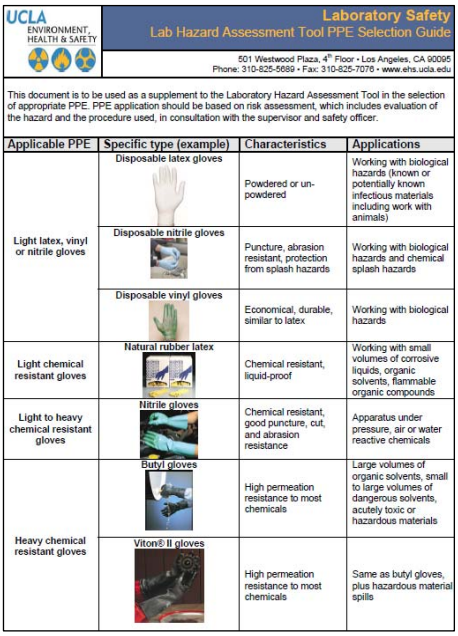
implementation of SOPs is a core component of promoting a strong safety culture in the laboratory and helps ensure a safe work environment.

While general guidance regarding laboratory work with chemicals is contained in this plan, PIs/Laboratory Supervisors are required to develop and implement laboratory-specific SOPs for certain hazardous chemicals and PHS that are used in their laboratories. These SOPs must be submitted and reviewed by the Department Safety Committee prior to implementation. For certain hazardous chemicals, PHS, or specialized practices, consideration must be given to whether additional consultation with safety professionals is warranted or required.

Circumstances requiring prior approval from the PI/Laboratory Supervisor must also be addressed in laboratory specific SOPs. These circumstances are based on the inherent hazards of the material being used, the hazards associated with the experimental process, the experience level of the worker, and the scale of the experiment. Some examples of circumstances that may require prior approval include working alone in a laboratory, unattended or overnight operations, the use of highly toxic gas of any amount, the use of large quantities of toxic or corrosive gases, the use of extremely reactive chemicals (e.g., pyrophorics, water reactive chemicals), or the use of carcinogens.

EH&S maintains a website (*www.ehs.ucla.edu*) with tools and resources that may be referenced while developing SOPs, including fact sheets for the use of certain hazardous chemicals, online safety videos and an SOP Library (http://www.sop.ehs.ucla.edu/). EH&S is also available to assist with the development of SOPs. SOPs must be developed prior to initiating any experiments with hazardous chemicals or PHS and are to be filed and maintained in the Laboratory Safety Manual where they are available to all laboratory personnel.

When drafting an SOP, consider the type and quantity of the chemical being used, along with the frequency of use. The Material Safety Data Sheet (MSDS) for each hazardous chemical or PHS that will be addressed in the SOP should be referenced during SOP development. The MSDS lists important information that will need to be considered, such as exposure limits, type of toxicity, warning properties, and symptoms of exposure. If a new chemical will be produced during the experiment, an MSDS will not necessarily be available. In these cases, the toxicity is unknown and it must be assumed that the substance is particularly hazardous, as a mixture of chemicals will generally be more toxic than its most toxic component.



UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety
Lab Hazard Assessment Tool PPE Selection Guide

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5689 • Fax: 310-825-7076 • www.ehs.ucla.edu

This document is to be used as a supplement to the Laboratory Hazard Assessment Tool in the selection of appropriate PPE. PPE application should be based on risk assessment, which includes evaluation of the hazard and the procedure used, in consultation with the supervisor and safety officer.

Applicable PPE	Specific type (example)	Characteristics	Applications
Light latex, vinyl or nitrile gloves	Disposable latex gloves	Powdered or un-powdered	Working with biological hazards (known or potentially known infectious materials including work with animals)
	Disposable nitrile gloves	Puncture, abrasion resistant, protection from splash hazards	Working with biological hazards and chemical splash hazards
	Disposable vinyl gloves	Economical, durable, similar to latex	Working with biological hazards
Light chemical resistant gloves	Natural rubber latex	Chemical resistant, liquid-proof	Working with small volumes of corrosive liquids, organic solvents, flammable organic compounds
Light to heavy chemical resistant gloves	Nitrile gloves	Chemical resistant, good puncture, cut, and abrasion resistance	Apparatus under pressure, air or water reactive chemicals
Heavy chemical resistant gloves	Butyl gloves	High permeation resistance to most chemicals	Large volumes of organic solvents, small to large volumes of dangerous solvents, acutely toxic or hazardous materials
	Viton® II gloves	High permeation resistance to most chemicals	Same as butyl gloves, plus hazardous material spills

PROTECTIVE APPAREL AND EQUIPMENT

Personal Protective Equipment

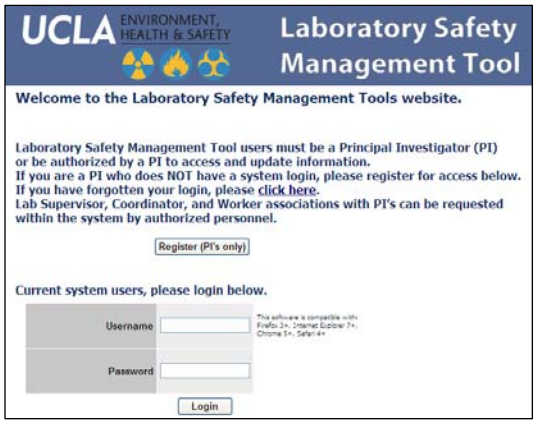
Personal protective equipment (PPE) serves as a researcher's last line of defense against chemical exposures and is required by everyone entering a laboratory containing hazardous chemicals. Specific minimum requirements for PPE use for chemical operations are contained in UCLA Policy 905 (*http://www.adminpolicies.ucla.edu/pdf/905.pdf* and *Appendix Q*).

The PPE policy outlines the basic PPE requirements, which include but are not limited to:

- Full length pants and close-toed shoes, or equivalent
- Protective gloves, laboratory coats, & eye protection when working with, or adjacent to, hazardous chemicals
- Flame resistant laboratory coats for high hazard materials, pyrophorics, and ≥4 liters of flammables

The primary goal of basic PPE is to mitigate, at a minimum, the hazard associated with exposure to hazardous substances. In some cases, additional, or more protective, equipment must be used. If a project involves a chemical splash hazard, chemical goggles are required; face shields may also be required when working with chemicals that may cause immediate skin damage. Safety goggles differ from safety glasses in that they form a seal with the face, which completely isolates the eyes from the hazard. If a significant splash hazard exists, heavy gloves, protective aprons and sleeves may also be needed. Gloves should only be used under the specific condition for which they are designed, as no glove is impervious to all chemicals. It is also important to note that gloves degrade over time, so they should be replaced as necessary to ensure adequate protection. The EH&S website (*www.ehs.ucla.edu*) provides PPE Selection Guide (*http://ehs.ucla.edu/Pub/PPE_Guidance.pdf*) to assist in selecting the appropriate glove type for the type of potential hazard.

EH&S policy requires each laboratory to complete a "Hazard Assessment Tool" prior to beginning work and to provide annual updates thereafter. PPE can be selected based on this hazard assessment. The online Hazard Assessment Tool can be accessed at: *http://lsm.ehs.ucla.edu*.



How to Use and Maintain PPE

Personal protective equipment should be kept clean and stored in an area where it will not become contaminated. Personal protective equipment should be inspected prior to use to ensure it is in good condition. It should fit properly and be worn properly. If it becomes contaminated or damaged, it should be cleaned or repaired when possible, or discarded and replaced.

For additional requirements and information on selection of PPE, see UCLA Policy 905 (*http://www.adminpolicies.ucla.edu/pdf/905.pdf* and *Appendix Q*).

Contaminated Clothing/PPE

In cases where spills or splashes of hazardous chemicals on clothing or PPE occur, the clothing/PPE should immediately be removed and placed in a closed container that prevents release of the chemical. Heavily contaminated clothing/PPE resulting from an accidental spill should be disposed of as hazardous waste. Non-heavily contaminated laboratory coats should be cleaned and properly laundered, as appropriate. Laboratory personnel should **never** take contaminated items home for cleaning or laundering. Persons or companies hired to clean contaminated items must be informed of potentially harmful effects of exposure to hazardous chemicals and must be provided with information to protect themselves.

Respiratory Protection

Typically, respiratory protection is not needed in a laboratory. Under most circumstances, safe work practices, small scale usage, and engineering controls (fume hoods, biosafety cabinets, and general ventilation) adequately protect laboratory workers from chemical and biological hazards. Under certain circumstances, however, respiratory protection may be needed. These can include:

- An accidental spill such as:
  - a chemical spill outside the fume hood
  - a spill of biohazardous material outside a biosafety cabinet
- Performance of an unusual operation that cannot be conducted under the fume hood or biosafety cabinet
- When weighing powdered chemicals or microbiological media outside a glove box or other protective enclosure. Disposable filtering face-piece respirators are generally recommended for nuisance dusts. If the chemicals are toxic, contact EH&S for additional evaluation
- When exposure monitoring indicates that exposures exist that cannot be controlled by engineering or administrative controls
- As required by a specific laboratory protocol or as defined by applicable regulations

Because there are numerous types of respirators available, and each has specific limitations and applications, respirator selection and use requires pre-approval by EH&S. For either required or voluntary use of a respirator, the employee must fill out the Respiratory Hazard Assessment form (*Appendix G*), review it with his/her supervisor, and fax the completed form to the EH&S Respirator Program Administrator at 310-825-7076. EH&S will contact the employee to evaluate the potential exposure. The review will include an evaluation of the work area and activities for the following:

- Provision of additional ventilation controls or enclosure of the airborne hazard
- Substitution with a less hazardous substance
- Qualitative or quantitative exposure assessment
- Respirator usage

Tasks with potential airborne hazards that cannot be eliminated by engineering or administrative controls will not be authorized by EH&S until affected employees can be incorporated into UCLA's Respiratory Protection Program.

If EH&S recommends respirator use for a task, the employee must first enroll in the next available Respirator Training and Fit Testing offered through EH&S. These classes contain the three components required by Cal/OSHA: medical evaluation, training and fit testing. The class schedule is available on the EH&S website (*www.ehs.ucla.edu*). Employees must complete all components prior to starting work that requires respirator use.

Because wearing respiratory equipment places a physical burden on the user, laboratory workers must be medically evaluated prior to wearing respiratory equipment. Certain individuals (e.g., persons with severe asthma, heart conditions, or claustrophobia) may not be medically qualified to wear a respirator. Upon enrollment in Respirator Training and Fit Testing, the employee will be sent the appropriate medical questionnaire. The completed medical questionnaire will be evaluated by a nurse practitioner before the employee proceeds with the training. NOTE: This medical questionnaire is confidential. The employee will be provided additional information on how to contact the nurse practitioner for follow up questions.

After successful completion of the medical evaluation, the employee will be trained and fit tested by EH&S. Training topics include:

- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator
- What the limitations and capabilities of the respirator are
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions
- How to inspect, put on and remove, use, and check the seals of the respirator
- What the procedures are for maintenance and storage of the respirator
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators
- The general requirements of the respiratory program

Finally, a qualitative or quantitative fit test is conducted by EH&S for each respirator user. The fit test ensures a proper face to face piece seal for each individual and his/her mask. Fit testing is done in accordance with UCLA's Respiratory Protection Program and Cal/OSHA regulations (8 CCR 5144) (*http://www.dir.ca.gov/title8/5144.html*).

An annual refresher is required for the medical evaluation, respirator training, and fit testing. In addition to the annual training refresher, a more frequent re-training, fit testing or medical evaluation must be performed when any of the following occur:

- Changes in the workplace or the type of respirator render previous training obsolete
- Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill
- Any other situation arises in which reevaluation appears necessary to ensure safe respirator use
- Facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight
- An employee reports medical signs or symptoms related to their ability to use a respirator

Laboratory Safety Equipment

New personnel must be instructed in the location of fire extinguishers, safety showers, and other safety equipment *before* they begin work in the laboratory. This training is considered part of the laboratory specific training that all staff members must attend.

Fire Extinguishers

All laboratories working with combustible or flammable chemicals must be outfitted with appropriate fire extinguishers. All extinguishers should be mounted on a wall in an area free of clutter or stored in a fire extinguisher cabinet. Research personnel should be familiar with the location, use and classification of the extinguishers in their laboratory.

Laboratory personnel are <u>not required</u> to extinguish fires that occur in their work areas and should not attempt to do so unless:

- It is a small fire (i.e., small trash can sized fire)
- Appropriate training has been received
- It is safe to do so

Any time a fire extinguisher is used, no matter for how brief a period, the PI/Laboratory Supervisor, or most senior laboratory personnel present at the time of the incident, must immediately report the incident to the **EH&S Hotline at 310-825-9797**.

The EH&S website contains a *Fire Safety in the Laboratory* video, which provides information on fire extinguisher use. Visit the EH&S Online Video page to view this video, and other safety videos: *http://map.ais.ucla.edu/go/1004476*.

Safety Showers and Eyewash Stations

All laboratories using hazardous chemicals must have immediate access to safety showers with eye wash stations. Access must be available in **10 seconds** or less for a potentially injured individual and access routes must be kept clear. Safety showers must have a minimum clearance of 16 inches from the centerline of the spray pattern in all directions at all times; this means that no objects should be stored or left within this distance of the safety shower. Sink based eyewash stations and drench hoses are <u>not adequate</u> to meet this requirement and can only be used to support an existing compliant system.

In the event of an emergency, individuals using the safety shower should be assisted by an uninjured person to aid in decontamination and should be encouraged to stay in the safety shower for 15 minutes to remove all hazardous material.

Safety shower/eyewash stations are tested by Facilities Management on a monthly basis. Any units which do not have a testing date within one month should be reported immediately to the **EH&S Hotline at 310-825-9797**. If an eyewash or safety shower needs repair, call Facilities Management Trouble Call at 310-825-9236 and give the operator the specific location of the defective equipment. Facilities Services Requests (FSRs) that have been generated as a result of a health and safety deficiency, such as this, must be flagged as "URGENT". A system has been implemented to expedite these FSRs.

Fire Doors

Many areas of research buildings may contain critical fire doors as part of the building design. These doors are an important element of the fire containment system and should remain closed unless they are on a magnetic self-closing or other automated self-closing system.

Safe Laboratory Habits

As detailed above, a safety program must include layers of policies and protective equipment to allow for a safe working environment, but to achieve effectiveness, a number of fundamental elements must become basic working habits for the research community. Some of these elements are detailed below:

Personal Protective Equipment:

- Wear closed-toe shoes and full length pants, or equivalent, at all times when in the laboratory
- Utilize appropriate PPE while in the laboratory and while performing procedures that involve the use of hazardous chemicals or materials
- Confine long hair and loose clothing

- Remove laboratory coats or gloves immediately on significant contamination, as well as before leaving the laboratory
- Avoid use of contact lenses in the laboratory unless necessary. If they are used, inform supervisor so special precautions can be taken
- Use any other protective and emergency apparel and equipment as appropriate. Be aware of the locations of first aid kits and emergency eyewash and shower station

Chemical Handling:

- Properly label and store all chemicals. Use secondary containment at all times
- Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan
- Do not smell or taste chemicals
- Never use mouth suction for pipetting or starting a siphon
- Do not dispose of any hazardous chemicals through the sewer system
- Be prepared for an accident or spill and refer to the emergency response procedures for the specific material. Procedures should be readily available to all personnel. Information on minor chemical spill mitigation may also be referenced in *Appendix O*. For general guidance, the following situations should be addressed:
    - o Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention
    - o Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention

Equipment Storage and Handling:

- Store laboratory glassware with care to avoid damage. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur
- Use certified fume hoods, glove boxes, or other ventilation devices for operations which might result in release of toxic chemical vapors or dust. Preventing the escape of these types of materials into the working atmosphere is one of the best ways to prevent exposure
- Keep hood closed when you are not working in the hood
- Do not use damaged glassware or other equipment
- Do not use uncertified fume hoods or glove boxes for hazardous chemical handling
- Avoid storing materials in hoods
- Do not allow the vents or air flow to be blocked

Laboratory Operations:

- Keep the work area clean and uncluttered
- Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation
- If unattended operations are unavoidable, and have been approved by the PI/Laboratory Supervisor, place an appropriate sign on the door, leave lights on, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water)
- Be alert to unsafe conditions and ensure that they are corrected when detected
- Research staff and students should never work alone on procedures involving hazardous chemicals, biological agents, or other physical hazards

- Do not engage in distracting behavior such as practical jokes in the laboratory. This type of conduct may confuse, startle, or distract another worker

Food/Drink:

- Do not eat, drink, smoke, chew gum, or apply cosmetics in areas where laboratory chemicals are present; wash hands before conducting these activities
- Do not store, handle, or consume food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations
- Wash areas of exposed skin well before leaving the laboratory

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 5: Chemical Exposure Assessment

Regulatory Overview

It is University policy to comply with all applicable health, safety and environmental protection laws, regulations and requirements. Cal/OSHA requires that all employers *"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 exceed the action level (or in the absence of an action level, the exposure limit)."* Repeated monitoring may be required if initial monitoring identifies employee exposure over the action level or exposure limit.

Cal/OSHA regulates Permissible Exposure Limits (PELs) for airborne contaminants to which *"nearly all workers may be exposed daily during a 40-hour workweek for a working lifetime (of 40 years) without adverse effect"*, and are based upon an 8-hour Time-Weighted Average (TWA) exposure. Thus, the PELs are the maximum permitted 8-hour TWA concentration of an airborne contaminant without the use of respiratory protection. Cal/OSHA has also defined Short Term Exposure Limits (STELs) as the maximum TWA exposure during any 15 minute period, provided the daily PEL is not exceeded and Ceiling (C) exposures that shall not be exceeded at any time.

Cal/OSHA has listed established PELs, STELs and Ceiling exposures for chemical contaminants identified in CCR Title 8 Section 5155 (Airborne Contaminants) Table AC-1 (*http://www.dir.ca.gov/Title8/ac1.pdf*). In the absence of a published Ceiling limit, Cal/OSHA requires employee exposure to concentrations above the PEL be controlled to prevent harmful effects. Further, Cal/OSHA has promulgated specific standards covering several regulated carcinogens, which may include an Action Level (AL), triggering medical surveillance requirements or the imposition of a specific Excursion Limit (such as for asbestos) with a unique measurement of the duration of an exposure.

Additionally, the Safe Drinking Water and Toxic Enforcement Act of 1986 requires Cal/EPA to publish annually a list of Proposition 65 chemicals known to the State to cause cancer or other reproductive toxicity (*http://www.oehha.ca.gov/prop65/prop65_list/files/P65single061110.pdf*).

Exposure Assessment Overview

All University employees require protection from exposure to hazardous chemicals above PELs, STELs and Ceiling concentrations. Cal/OSHA requires the person supervising, directing or evaluating the exposure assessment monitoring be competent in the practice of industrial hygiene. Thus, exposure assessment should be performed only by representatives of EH&S and not the PI/Laboratory Supervisor. General questions regarding exposure assessment or the Industrial Hygiene Program can be directed to *indyg@ehs.ucla.edu*.

Minimizing an exposure may be accomplished using a combination of engineering controls, administrative controls and personal protective equipment, listed in order of priority. Assessing exposure to hazardous chemicals may be accomplished through a number of methods performed by EH&S, including employee interviews, visual observation of chemical use, evaluation of engineering controls, use of direct reading instrumentation, or the collection of

analytical samples from the employee's breathing zone. Personal exposure assessment will be performed under either of the following situations:

1. Based on chemical inventories, review of Standard Operating Procedures (SOPs), types of engineering controls present, laboratory inspection results and/or review of the annual Laboratory Hazard Assessment Tool, EH&S determines whether an exposure assessment is warranted; or
2. User of a hazardous chemical has concern or reason to believe exposure is not minimized or eliminated through use of engineering controls or administrative practices (such as transfer of chemical through double needle performed entirely in a fume hood) and the potential for exposure exists. The user should then inform his or her PI/Laboratory Supervisor, who will in turn contact the EH&S Industrial Hygiene Program, EH&S Radiation Safety Division, EH&S Injury Prevention Division, or the University's Occupational Health Facility (OHF). EH&S and OHF will then determine the best course of action in assessing employee exposure, including visual assessment, air monitoring, medical evaluation, examination, or medical surveillance.

In event of any serious injury or exposure, including chemical splash involving dermal or eye contact, immediately call **911** from a campus phone or **310-825-1491** from an off-campus or cell phone and obtain medical treatment immediately. Do not wait for an exposure assessment to be performed before seeking medical care.

EXPOSURE ASSESSMENT PROTOCOL – NOTIFICATION TO EMPLOYEES OR EMPLOYEE REPRESENTATIVES AND RIGHT TO OBSERVE MONITORING (SECTION 340.1)

The EH&S Industrial Hygiene Program conducts exposure assessments for members of the campus community. Employees have a right to observe testing, sampling, monitoring or measuring of employee exposure. They are also allowed access to the records and reports related to the exposure assessment. Exposure assessments may be performed for hazardous chemicals, as well as for physical hazards including noise and heat stress to determine if exposures are within PELs or other appropriate exposure limits that are considered safe for routine occupational exposure. General protocol in conducting an exposure assessment may include any of the following:

1. Employee interviews;
2. Visual observation of chemical usage and/or laboratory operations;
3. Evaluation of simultaneous exposure to multiple chemicals;
4. Evaluation of potential for absorption through the skin, mucus membranes or eyes;
5. Evaluating existing engineering controls (such as measuring face velocity of a fume hood);
6. Use of direct reading instrumentation; and
7. Collection of analytical samples of concentrations of hazardous chemicals taken from the employees breathing zone, or noise dosimetry collected from an employee's shirt collar or various forms of radiation dosimetry.

If exposure monitoring determines an employee exposure to be over the action level (or the PEL) for a hazard for which OSHA has developed a specific standard (e.g., lead), the medical surveillance provisions of that standard shall be followed. It is the responsibility of the PI/Laboratory Supervisor to ensure that any necessary medical surveillance requirements are met. When necessary, EH&S will make recommendations regarding adjustments engineering controls or administrative procedures to maintain exposure below any applicable PEL. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, UCLA will provide, at no cost to the employee, the

proper respiratory equipment and training. Respirators will be selected and used in accordance with the requirements of CCR Title 8 Section 5144 (*http://www.dir.ca.gov/Title8/5144.html*) and the University's Respiratory Protection Program.

In assessing exposure to hazardous chemicals for which Cal/OSHA has not published a PEL, STEL or Ceiling exposure, EH&S defers to the Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists (ACGIH) or the Recommended Exposure Limits (RELs) established by the National Institute of Occupational Safety & Health (NIOSH). Please contact the **EH&S Hotline at 310-825-9797** for more information regarding these chemicals.

NOTIFICATION

The Industrial Hygiene Program will promptly notify the employee and his/her PI/Laboratory Supervisor of the results in writing (within 15 working days or less if required) after the receipt of any monitoring results. The Industrial Hygiene Program will establish and maintain an accurate record of any measurements taken to monitor exposures for each employee. Records, including monitoring provided by qualified vendors, will be managed in accordance with CCR Title 8 Section 3204 "Access to Employee Exposure and Medical Records" (*http://www.dir.ca.gov/Title8/3204.html*).

EXPOSURE ASSESSMENT USE TO DETERMINE AND IMPLEMENT CONTROLS

EH&S and OHF will use any of the following criteria to determine required control measures to reduce employee's occupational exposure:

1. Verbal information obtained from employees regarding chemical usage;
2. Visual observations of chemical use or laboratory operations;
3. Evaluation of existing engineering control measures or administrative practices;
4. Recommendations expressed in Material Safety Data Sheets;
5. Regulatory requirements of Cal/OSHA;
6. Recommendations from professional industrial hygiene organizations;
7. Direct reading instrumentation results;
8. Employee exposure monitoring results; and/or
9. Medical evaluation, examination and/or surveillance findings.

Particular attention shall be given to the selection of safety control measures for chemicals that are known to be extremely hazardous. Per Cal/OSHA CCR Title 8 Section 5141 "Control of Harmful Exposure to Employees" (*http://www.dir.ca.gov/Title8/5141.html*), the control of harmful exposures shall be prevented by implementation of control measures in the following order:

1. Engineering controls, whenever feasible;
2. Administrative controls whenever engineering controls are not feasible or do not achieve full compliance and administrative controls are practical; and
3. Personal protective equipment, including respiratory protection, during:
    a. the time period necessary to install or implement feasible engineering controls
    b. when engineering and administrative controls fail to achieve full compliance
    c. in emergencies.

Medical Evaluation

All employees, student workers, medical health services volunteers, or laboratory personnel who work with hazardous chemicals shall have an opportunity to receive a free medical evaluation, including supplemental examinations which the evaluating physician determines necessary, under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which an employee may have been exposed in a laboratory;
2. Where personal monitoring indicates exposure to a hazardous chemical is above a Cal/OSHA Action Level (AL) or Permissible Exposure Limit (PEL) or recommended exposure levels established by the National Institute for Occupational Safety & Health (NIOSH) or the American Conference of Governmental Industrial Hygienists (ACGIH) in the event Cal/OSHA has not established an AL or PEL for a particular hazardous chemical;
3. Whenever an uncontrolled event takes place in the work area such as a spill, leak, explosion, fire, etc., resulting in the likelihood of exposure to a hazardous chemical; or
4. Upon reasonable request of the employee to discuss medical issues and health concerns regarding work-related exposure to hazardous chemicals.

All work-related medical evaluations and examinations will be performed under the direction of UCLA's Occupational Health Facility (OHF) by licensed physicians or staff under the direct supervision of a licensed physician. Evaluations and examinations will be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

Any laboratory employee or student worker who exhibits signs and symptoms of adverse health effects from work-related exposure to a hazardous chemical should report to OHF immediately for a medical evaluation.

Refer to your Department's Injury & Illness Prevention Program (IIPP) for procedures on how to obtain medical evaluation under the above-listed circumstances.

Information to Provide to the Clinician

At the time of the medical evaluation, the following information shall be provided to OHF:

1. Personal information such as age, weight and University employee ID number;
2. Common and/or IUPAC name of the hazardous chemicals to which the individual may have been exposed;
3. A description of the conditions under which the exposure occurred;
4. Quantitative exposure data, if available;
5. A description of the signs and symptoms of exposure that the employee is experiencing, if any;
6. A copy of the Material Safety Data Sheet (MSDS) of the hazardous chemical in question;
7. History of exposure including previous employment and non-occupational (recreational) hobbies; and
8. Any additional information helpful to OHF in assessing or treating an exposure or injury such as a biological component of exposure or existence of an antitoxin.

Physician's Written Opinion

For evaluation or examinations required by Cal/OSHA, the employer shall receive a written opinion from the examining physician which shall include the following:

1. Recommendation for further medical follow-up;
2. Results of the medical examination and any associated tests, if requested by the employee;
3. Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and
4. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

Confidentiality & Individual's Access to Personal Medical Records

All patient medical information is protected by California and federal law and is considered strictly confidential. OHF is prohibited from disclosing any patient medical information that is not directly related to the work-related exposure under evaluation and should not reveal any diagnosis unrelated to exposure. Any patient information disclosed by OHF to the employee's supervisor will be limited to information necessary in assessing an employee's return to work, including recommended restrictions in work activities, if any. Any patient information disclosed by OHF to EH&S will be limited to information necessary to develop a course of exposure monitoring, or perform hazard assessments and incident investigations, if appropriate. OHF will otherwise disclose patient medical information only as required by California and Federal law, such as for Worker's Compensation Insurance claims. Each employee has the right to access his/her own personal medical and exposure records. OHF will provide an employee with a copy of his/her medical records upon written request.

Medical Surveillance

Medical surveillance is the process of using medical examinations, questionnaires and/or biological monitoring to determine potential changes in health as a result of exposure to a hazardous chemical or other hazards. Certain Cal/OSHA standards require clinical examination as part of medical surveillance when exposure monitoring exceeds an established Action Level or PEL.

OHF and/or outside vendors may provide medical surveillance services. Medical surveillance is required of employees who are routinely exposed to certain hazards as part of their job description (such as asbestos) and may be offered to other employees based upon quantifiable or measured exposure. Examples of hazards that are monitored through the medical surveillance program may include:

- Asbestos
- Beryllium
- Formaldehyde
- Lead
- Methylene Chloride
- Noise (Hearing Conservation Program)
- Radioactive Chemicals (Bioassay Program)
- Respirator Use (Respirator Protection Program)
- Other Particularly Hazardous Substances

Individuals with questions regarding work-related medical surveillance are encouraged to contact OHF at 310-825-6771 or the **EH&S Hotline at 310-825-9797** for more information.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 6: Inventory, Labeling, Storage, and Transport

Chemical Inventories

Each laboratory group is required to maintain a current chemical inventory that lists the chemicals and compressed gases used and stored in the labs and the quantity of these chemicals. Specific storage locations must be kept as part of the inventory list to ensure that they can be easily located. Chemical inventories are used to ensure compliance with storage limits and fire regulations and can be used in an emergency to identify potential hazards for emergency response operations.

The chemical inventory list should be reviewed prior to ordering new chemicals and only the minimum quantities of chemicals necessary for the research should be purchased. As new chemicals are added to the inventory, each laboratory group must confirm that they have access to the Material Safety Data Sheet (MSDS) for that chemical. Where practical, each chemical should be dated so that expired chemicals can be easily identified for disposal. Inventory the materials in your laboratory frequently (at least annually) to avoid overcrowding with materials that are no longer useful and note the items that should be replaced, have deteriorated, or show container deterioration. Unneeded items should be returned to the storeroom/stockroom and compromised items should be discarded as chemical waste.

Indications for disposal include:

- Cloudiness in liquids
- Color change
- Evidence of liquids in solids, or solids in liquids
- "Puddling" of material around outside of containers
- Pressure build-up within containers
- Obvious deterioration of containers

Access to hazardous chemicals, including toxic and corrosive substances, should be restricted at all times. These materials must be stored in laboratories or storerooms that are kept locked when laboratory personnel are not present. Locked storage cabinets or other precautions are always recommended, and in some cases may be required in the case of unusually toxic or hazardous chemicals. Unusually toxic chemicals may include those that are associated with very low immediately dangerous to life or health (IDLH) conditions. For guidance on locked storage requirements, please contact the **EH&S Hotline at 310-825-9797**.

On termination or transfer of laboratory personnel, all related hazardous materials should be properly disposed of, or transferred to the laboratory supervisor or a designee.

Chemical Labeling

Every chemical found in the laboratory must be properly labeled. Most chemicals come with a manufacturer's label that contains the necessary information, so care should be taken to not damage

or remove these labels. Each chemical bottle, including diluted chemical solutions, must be labeled with its contents and the hazards associated with this chemical. It is recommended that each bottle also be dated when received and when opened to assist in determining which chemicals are expired and require disposal. When new chemicals and compounds are generated by laboratory operations, these new chemical bottles must be labeled with the name, date, and hazard information; the generator or other party responsible for this chemical should be named on the container so that they may be contacted if questions arise about the container's contents.

Peroxide forming chemicals (e.g., ethers) (*Appendix H*) must be labeled with a date on receipt and on first opening the bottle. These chemicals are only allowed a one year shelf life and should be disposed of as waste in one year. These chemicals can degrade to form shock sensitive, highly reactive compounds and should be stored and labeled very carefully.

Particularly Hazardous Substances (see *Chapter 3*) require additional labeling. Printable safety labels (see Figure 6.1) are available on the UCLA Chemistry website (*http://www.chemistry.ucla.edu/pages/safety*) which identify the specific hazard associated with each of these chemicals (carcinogen, reproductive toxin, acute toxin). In addition, the storage area where they are kept must be labeled with the type of hazard. These chemicals should be segregated from less hazardous chemicals to help with proper access control and hazard identification.

Figure 6.1 – Printable Safety Label Sample

Chemical Storage & Segregation

Establish and follow safe chemical storage & segregation procedures for your laboratory.

Storage guidelines are included for materials that are flammable, oxidizers, corrosive, water reactive, explosive and highly toxic. The specific Material Safety Data Sheet (MSDS) should always be consulted when doubts arise concerning chemical properties and associated hazards. All procedures employed must comply with Cal/OSHA, Fire Code and building code regulations. Always wear appropriate personal protective equipment (e.g., laboratory coat, safety glasses, gloves, safety goggles, apron) when handling hazardous chemicals. Be aware of the locations of the safety showers and emergency eyewash stations. Each laboratory is required to provide appropriate laboratory-specific training on how to use this equipment **prior** to working with hazardous chemicals. Table 6.1 lists chemical safety storage priorities.

Table 6.1 – Chemical Safety Storage Priorities

Keep in mind that most chemicals have multiple hazards and a decision must be made as to which storage area would be most appropriate for each specific chemical. First you have to determine your priorities:

1. **Flammability.** When establishing a storage scheme, the number one consideration should be the flammability characteristics of the material. If the material is flammable, it should be stored in a flammable cabinet.
2. **Isolate.** If the material will contribute significantly to a fire (e.g., oxidizers), it should be isolated from the flammables. If there were a fire in the laboratory and response to the fire with water would exaggerate the situation, isolate the water reactive material away from contact with water.
3. **Corrosivity.** Next look at the corrosivity of the material, and store accordingly.
4. **Toxicity.** Finally, consider the toxicity of the material, with particular attention paid to regulated materials. In some cases, this may mean that certain chemicals will be isolated within a storage area. For example, a material that is an extreme poison but is also flammable, should be locked away in the flammable storage cabinet to protect it against accidental release.

There will always be some chemicals that will not fit neatly in one category or another, but with careful consideration of the hazards involved, most of these cases can be handled in a reasonable fashion.

GENERAL RECOMMENDATIONS FOR SAFE STORAGE OF CHEMICALS

Each chemical in the laboratory must be stored in a specific location and returned there after each use. Acceptable chemical storage locations may include corrosive cabinets, flammable cabinets, laboratory shelves, or appropriate refrigerators or freezers. Fume hoods should not be used as general storage areas for chemicals, as this may seriously impair the ventilating capacity of the hood. Figure 6.2 depicts improper fume hood storage. Chemicals should not be routinely stored on bench tops or stored on the floor. Additionally, bulk quantities of chemicals (i.e., larger than one-gallon) should be stored in a separate storage area, such as a stockroom or supply room.

Figure 6.2 – Improper Fume Hood Storage

Laboratory shelves should have a raised lip along the outer edge to prevent containers from falling. Hazardous liquids or corrosive chemicals should not be stored on shelves above eye-level and chemicals which are highly toxic or corrosive should be in unbreakable secondary containers.

Chemicals must be stored at an appropriate temperature and humidity level and should **never** be stored in direct sunlight or near heat sources, such as laboratory ovens. Incompatible materials should be stored in separate cabinets, whenever possible. If these chemicals must be stored in one cabinet, due to space limitations, adequate segregation and secondary containment must be ensured to prevent adverse reactions. All stored containers and research samples must be appropriately labeled and tightly capped to prevent vapor interactions and to alleviate nuisance odors. Flasks with cork, rubber or glass stoppers should be avoided because of the potential for leaking.

Laboratory refrigerators and freezers must be labeled appropriately with "No Food/Drink" and must **never** be used for the storage of consumables. Freezers should be defrosted periodically so that chemicals do not become trapped in ice formations. **Never** store peroxide formers (e.g., ether) in a refrigerator!

FLAMMABLE AND COMBUSTIBLE LIQUIDS

Large quantities of flammable or combustible materials should not be stored in the laboratory. The maximum total quantity of flammable and combustible liquids must not exceed **60 gallons** within a flammable storage cabinet. The maximum quantity allowed to be kept outside a flammable storage cabinet, safety can, or approved refrigerator/freezer is **10 gallons**. Only the amounts needed for the current procedure should be kept on bench tops and the remainder should be kept in flammable storage cabinets, explosion proof refrigerators/freezers that are approved for the storage of flammable substances, or approved safety cans or drums that are grounded. Always segregate flammable or combustible liquids from oxidizing acids and oxidizers. Flammable materials must **never** be stored in domestic-type refrigerators/freezers and should not be stored in a refrigerator/freezer if the chemical has a flash point below the temperature of the equipment. Flammable or combustible liquids must not be stored on the floor or in any exit access.

Handle flammable and combustible substances only in areas free of ignition sources and use the chemical in a fume hood whenever practical. Only the amount of material required for the experiment or procedure should be stored in the work area. Always transfer flammable and combustible chemicals from glass containers to glassware or from glass container/glassware to plastic. Transferring these types of chemicals between plastic containers may lead to a fire hazard due to static electricity. The transfer of flammable liquid from 5 gallon or larger metal containers should **not** be done in the laboratory.

The EH&S *Fire Safety in the Laboratory* video provides fire safety information and can be viewed online at: *http://map.ais.ucla.edu/go/1004476.*

PYROPHORIC & WATER REACTIVE SUBSTANCES

Because pyrophoric substances can spontaneously ignite on contact with air and/or water, they must be handled under an inert atmosphere and in such a way that rigorously excludes air and moisture. Some pyrophoric materials are also toxic and many are dissolved or immersed in a flammable solvent. Other common hazards include corrosivity, teratogenicity, or peroxide formation.

Only minimal amounts of reactive chemicals should be used in experiments or stored in the laboratory. These chemicals must be stored as recommended in the MSDS. Reactive materials containers must be clearly labeled with the correct chemical name, in English, along with a hazard warning.

Suitable storage locations may include inert gas-filled desiccators or glove boxes; however, some pyrophoric materials must be stored in a flammable substance approved freezer. If pyrophoric or water reactive reagents are received in a specially designed shipping, storage or dispensing container (such as the Aldrich Sure/Seal packaging system), ensure that the integrity of that container is maintained. Ensure that sufficient protective solvent, oil, kerosene, or inert gas remains in the container while pyrophoric materials are stored. Never store reactive chemicals with flammable materials or in a flammable liquids storage cabinet.

Storage of pyrophoric gases is described in the California Fire Code, Chapter 41. Gas cabinets, with remote sensors and fire suppression equipment, are required. Gas flow, purge and exhaust systems should have redundant controls to prevent pyrophoric gas from igniting or exploding. Emergency back-up power should be provided for all electrical controls, alarms and safeguards associated with the pyrophoric gas storage and process systems.

Never return excess reactive chemical to the original container. Small amounts of impurities introduced into the container may cause a fire or explosion. For storage of excess chemical, prepare a storage vessel in the following manner:

1. Dry any new empty containers thoroughly;
2. Insert the septum into the neck in a way that prevents atmosphere from entering the clean dry (or reagent filled) flask;
3. Insert a needle to vent the flask and quickly inject inert gas through a second needle to maintain a blanket of dry inert gas above the reagent;
4. Once the vessel is fully purged with inert gas, remove the vent needle then the gas line. To introduce the excess chemical, use the procedure described in the handling section, below;
5. For long-term storage, the septum should be secured with a copper wire;
6. For extra protection a second same-sized septa (sans holes) can be placed over the first; and
7. Use parafilm around the outer septa and remove the parafilm and outer septum before accessing the reagent through the primary septum.

The EH&S *Pyrophoric Liquid Safety* video provides information about the safe handling of pyrophoric chemicals and can be viewed online at: *http://map.ais.ucla.edu/go/1004476.*

OXIDIZERS

Oxidizers (e.g., hydrogen peroxide, ferric chloride, potassium dichromate, sodium nitrate) should be stored in a cool, dry place and kept away from flammable and combustible materials, such as wood, paper, Styrofoam, plastics, flammable organic chemicals, and away from reducing agents, such as zinc, alkaline metals, and formic acid.

PEROXIDE FORMING CHEMICALS

Peroxide forming chemicals (e.g., ethyl ether, diethylether, cyclohexene) should be stored in airtight containers in a dark, cool, and dry place and must be segregated from other classes of chemicals that could create a serious hazard to life or property should an accident occur (e.g., acids, bases, oxidizers). The containers should be labeled with the date received and the date opened. This information, along with the chemical identity should face forward to minimize container handling during inspection. These chemicals must also be tested and documented for the presence of peroxides periodically. Minimize the quantity of peroxide forming chemicals stored in the laboratory and dispose of peroxide forming chemicals before peroxide formation. Refer to Appendix H for specific guidelines and/or contact EH&S with questions.

Carefully review all cautionary material supplied by the manufacturer prior to use. Avoid evaporation or distillation, as distillation defeats the stabilizer added to the solvents. Ensure that containers are tightly sealed to avoid evaporation and that they are free of exterior contamination or crystallization. **Never** return unused quantities back to the original container and clean all spills immediately.

If old containers of peroxide forming chemicals are discovered in the laboratory, (greater than two years past the expiration date or if the date of the container is unknown), **do not handle the container**. If crystallization is present in or on the exterior of a container, **do not handle the container**. Secure it and contact the **EH&S Hotline at 310-825-9797** for pick-up and disposal.

CORROSIVES

Store corrosive chemicals (i.e., acids, bases) below eye level and in secondary containers that are large enough to contain at least 10% of the total volume of liquid stored or the volume of the largest container, whichever is greater. Acids must always be segregated from bases and from active metals (e.g., sodium, potassium, magnesium) at all times and must also be segregated from chemicals which could generate toxic gases upon contact (e.g., sodium cyanide, iron sulfide).

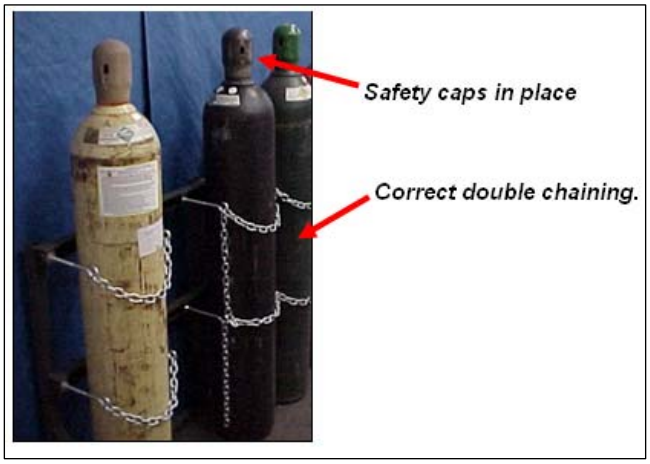
Specific types of acids require additional segregation. Mineral acids must be kept away from organic acids and oxidizing acids must be segregated from flammable and combustible substances. Perchloric acid should be stored by itself, away from other chemicals. Picric Acid is reactive with metals or metal salts and explosive when dry and must contain at least 10% water to inhibit explosion.

SPECIAL STORAGE REQUIREMENTS

Compressed Gas Cylinders

Compressed gas cylinders that are stored in the laboratory must be chained to the wall, with the safety cap in place. The cylinders must be restrained by two chains; one chain must be placed at one third from the top of the cylinder, and the other placed at one third from the bottom of the cylinder (see Figure 6.3). Bolted "clam shells" may be used in instances where gas cylinders must be stored or used away from the wall. Store liquefied fuel-gas cylinders securely in the upright position. **Cylinders containing certain gases are prohibited from being stored in a horizontal position, including those which contain a water volume of more than 5 liters.** Do not expose cylinders to excessive dampness, corrosive chemicals or fumes.

Figure 6.3 – Cylinders Stored and Chained Correctly



Certain gas cylinders require additional precautions. Flammable gas cylinders must use only flame-resistant gas lines and hoses which carry flammable or toxic gases from cylinders and must have all connections wired. Compressed oxygen gas cylinders must be stored at least 20 feet away from combustible materials and flammable gases.

Gas cylinder connections must be inspected frequently for deterioration and must never be used without a regulator. Never use a leaking, corroded or damaged cylinder and never refill compressed gas cylinders. When stopping a leak between cylinder and regulator, always close the valve before tightening the union nut. The regulator should be replaced with a safety cap when the cylinder is not in use. Move gas cylinders with the safety cap in place

using carts designed for this purpose. Refer to the UCLA Compressed Gas Cylinder Storage and Handling policy (*http://chem.ctrl.ucla.edu/file-storage/publicview/pdfs/safety-website-files/SOP_-_Compressed_Gas_Cylinders.pdf*) for further details.

Liquid Nitrogen

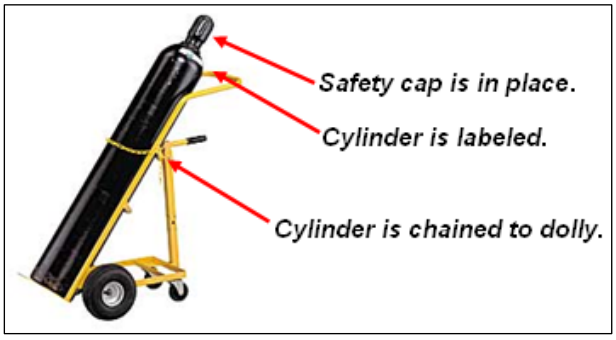
Because liquid nitrogen containers are at low pressure and have protective rings mounted around the regulator, they are not required to be affixed to a permanent fixture such as a wall. However, additional protection considerations should be addressed when storing liquid nitrogen in a laboratory. The primary risk to laboratory personnel from liquid nitrogen is skin or eye thermal damage caused by contact with the material. In addition, nitrogen expands 696:1 when changing from a cryogenic liquid to a room temperature gas. The gases usually are not toxic, but if too much oxygen is displaced, asphyxiation is a possibility. Always use appropriate thermally insulated gloves when handling liquid nitrogen. Face shields may be needed in cases where splashing can occur.

On-Campus Distribution of Hazardous Chemicals

Precautions must be taken when transporting hazardous substances between laboratories. Chemicals must be transported between stockrooms and laboratories in break-resistant, secondary containers such as commercially available bottle carriers made of rubber, metal, or plastic, that include carrying handle(s) and which are large enough to hold the contents of the chemical container in the event of breakage. Refer to UCLA's Chemistry and Biochemistry Department for information on the "Procedures for Transporting Chemicals" policy (*http://www.chemistry.ucla.edu/file-storage/publicview/pdfs/Procedures_for_Transporting_Chemicals.pdf*).

When transporting cylinders of compressed gases, always secure the cylinder with straps or chains onto a suitable hand truck and protect the valve with a cover cap. Avoid dragging, sliding, or rolling cylinders and use a freight elevator when possible. The EH&S website (*www.ehs.ucla.edu*) offers a "Compressed Cylinder" Fact Sheet (*http://map.ais.ucla.edu/go/1004391*) that may be referenced for the safe transport of compressed gases. Figure 6.4 illustrates correct cylinder transport.

Figure 6.4 – Correct Cylinder Transport



Off-Campus Distribution of Hazardous Chemicals

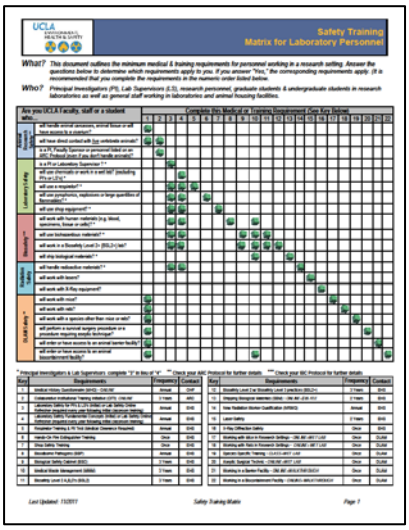
The transportation of hazardous chemicals and compressed gases over public roads, or by air, is strictly governed by international, federal, and state regulatory agencies, including the U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA). Any person who prepares and/or ships these types of materials must ensure compliance with pertinent regulations regarding training, quantity, packaging, and labeling. Without proper training, it is illegal to ship hazardous materials. Those who violate the hazardous materials shipment regulations are subject to criminal investigation and penalties. UCLA campus personnel who sign hazardous

materials manifests, shipping papers, or those who package hazardous material for shipment, must be trained and certified by EH&S.

Individuals who wish to ship or transport hazardous chemicals or compressed gases off-campus, even when using UCLA or personal vehicles, must contact EH&S at *laboratorysafety@ehs.ucla.edu* or the **EH&S Hotline at 310-825-9797** for assistance.

Chapter 7: Training

Introduction



Effective training is critical to facilitate a safe and healthy work environment and prevent laboratory accidents. All PIs/Laboratory Supervisors must participate in formal safety training and ensure that all their employees have appropriate safety training before working in a laboratory. The EH&S Training and Outreach Program provides both classroom and online training to help meet this requirement and can be contacted by emailing at *training@ehs.ucla.edu.*

Types of Training

All laboratory personnel must complete general safety training before:

1. Beginning work in the laboratory;
2. Prior to new exposure situations; and
3. As work conditions change.

Annual refresher training is also required for all laboratory personnel. EH&S offers general classroom and online training, plus resource materials to assist laboratories in implementing laboratory-specific training.

GENERAL LABORATORY SAFETY TRAINING

Anyone working in a laboratory is required to complete General Laboratory Safety training, which includes:

- Review of laboratory rules and regulations, including the Chemical Hygiene Plan
- Recognition of laboratory hazards
- Use of engineering controls, administrative controls and personal protective equipment to mitigate hazards
- Exposure limits for hazardous chemicals
- Signs and symptoms associated with exposures to hazardous chemicals
- Chemical exposure monitoring
- Review of reference materials (e.g., MSDS) on hazards, handling, storage and disposal of hazardous chemicals
- Procedures for disposing of hazardous chemical waste
- Fire safety and emergency procedures
- Information required by Section 3204 regarding access to employee exposure and medical records (annually required)

All employees must take one of the following basic laboratory classes provided by EH&S as appropriate for their employment status:

- **Laboratory Safety Fundamental Concepts** – for anyone working in a laboratory
- **Laboratory Safety for Principal Investigators and Laboratory Supervisors** – for PIs/Laboratory Supervisors responsible for implementing a laboratory safety plan

General laboratory safety training requirements are summarized on the EH&S Safety Training Matrix for Laboratory Personnel *(Appendix I*). Additional information can be obtained on the EH&S website (*www.ehs.ucla.edu*).

LABORATORY-SPECIFIC TRAINING

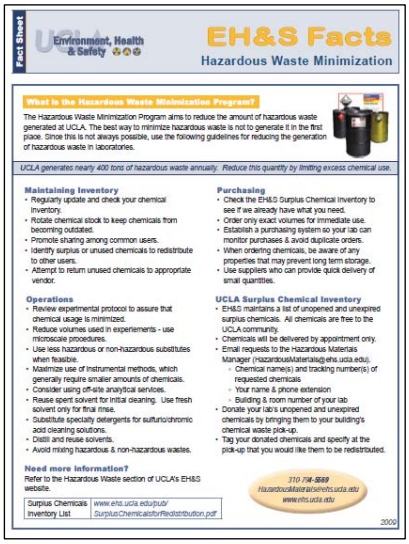
PIs/Laboratory Supervisors must also provide laboratory-specific training. Topics that require specific training include:

- Location and use of the Chemical Hygiene Plan, IIPP, MSDS(s) and other regulatory information
- Review of IIPP and Emergency Management Plan, including location of emergency equipment and exit routes
- Specialized equipment
- Standard Operating Procedures
- Specialized procedures and protocols
- Particularly Hazardous Substances including physical and health hazards, potential exposure, medical surveillance, and emergency procedures

Resources

EH&S has a number of tools available for laboratories to simplify the completion of appropriate training, including:

- Online training modules *(www.training.ucla.edu/ehs*)
  - Chemical Fume Hood
  - Cryogenic Nitrogen Safety
  - Fire Diamond
  - Fire Safety
  - Hazard Communication
  - Laboratory Safety Training
  - Personal Protective Equipment
  - Working Safely with Formaldehyde
- Fact Sheets (*http://map.ais.ucla.edu/go/1004391*)
  - Compressed Gas Cylinders
  - Ethidium Bromide
  - Formaldehyde Use
  - Hazardous Waste Minimization
  - Laboratory Safety Orientation
  - Online Tag Program


Fact Sheet

Environment, Health & Safety

EH&S Facts

Hazardous Waste Minimization

What is the Hazardous Waste Minimization Program?

The Hazardous Waste Minimization Program aims to reduce the amount of hazardous waste generated at UCLA. The best way to minimize hazardous waste is not to generate it in the first place. Since this is not always possible, use the following guidelines for reducing the generation of hazardous waste in laboratories.

UCLA generates nearly 400 tons of hazardous waste annually. Reduce this quantity by limiting excess chemical use.

Maintaining Inventory
- Regularly update and check your chemical inventory.
- Rotate chemical stock to keep chemicals from becoming outdated.
- Promote sharing among common users.
- Identify surplus or unused chemicals to redistribute to other users.
- Attempt to return unused chemicals to appropriate vendor.

Purchasing
- Check the EH&S Surplus Chemical Inventory to see if we already have what you need.
- Order only exact volumes for immediate use.
- Establish a purchasing system so your lab can monitor purchases & avoid duplicate orders.
- When ordering chemicals, be aware of any properties that may prevent long term storage.
- Use suppliers who can provide quick delivery of small quantities.

Operations
- Review experimental protocol to assure that chemical usage is minimized.
- Reduce volumes used in experiements - use microscale procedures.
- Use less hazardous or non-hazardous substitutes when feasible.
- Maximize use of instrumental methods, which generally require smaller amounts of chemicals.
- Consider using off-site analytical services.
- Reuse spent solvent for initial cleaning. Use fresh solvent only for final rinse.
- Substitute specialty detergents for sulfuric/chromic acid cleaning solutions.
- Distill and reuse solvents.
- Avoid mixing hazardous & non-hazardous wastes.

UCLA Surplus Chemical Inventory
- EH&S maintains a list of unopened and unexpired surplus chemicals. All chemicals are free to the UCLA community.
- Chemicals will be delivered by appointment only.
- Email requests to the Hazardous Materials Manager (HazardousMaterials@ehs.ucla.edu).
  - Chemical name(s) and tracking number(s) of requested chemicals
  - Your name & phone extension
  - Building & room number of your lab
- Donate your lab's unopened and unexpired chemicals by bringing them to your building's chemical waste pick-up.
- Tag your donated chemicals and specify at the pick-up that you would like them to be redistributed.

Need more information?

Refer to the Hazardous Waste section of UCLA's EH&S website.

Surplus Chemicals Inventory List	www.ehs.ucla.edu/pub/SurplusChemicalsforRedistribution.pdf

310 794-5569
HazardousMaterials@ehs.ucla.edu
www.ehs.ucla.edu

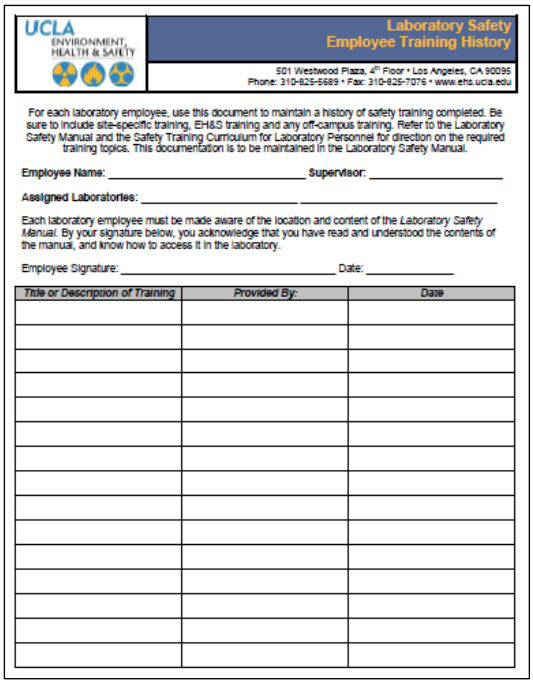
2008

- Online Safety Videos *(http://map.ais.ucla.edu/go/1004476*)
    - Pyrophoric Liquids Safety
    - Pipette Safety & Ergonomics
    - Hazardous Waste Management Safety
    - Fire Safety in the Laboratory
- DVD Lending Library (*http://map.ais.ucla.edu/go/1004476*)
    - Accident Prevention and Investigation
    - Air Quality Control
    - Chemical Hygiene/Laboratory Safety
    - Hazard Communication and General Safety
    - Respiratory Protection
    - Waste Management

EH&S provides additional assistance in planning laboratory-specific training upon request.

Documentation of Training

Accurate recordkeeping is a critical component of health and safety training. Per OSHA regulations, departments or laboratories are responsible for documenting health and safety training, including safety meetings, one-on-one training, and classroom and online training. Documentation should be maintained in the laboratory safety manual. Additional information on recordkeeping can be found in *Chapter 8: Compliance and Enforcement.*



UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety Employee Training History

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5689 • Fax: 310-825-7076 • www.ehs.ucla.edu

For each laboratory employee, use this document to maintain a history of safety training completed. Be sure to include site-specific training, EH&S training and any off-campus training. Refer to the Laboratory Safety Manual and the Safety Training Curriculum for Laboratory Personnel for direction on the required training topics. This documentation is to be maintained in the Laboratory Safety Manual.

Employee Name: _____ **Supervisor:** _____

Assigned Laboratories: _____

Each laboratory employee must be made aware of the location and content of the *Laboratory Safety Manual*. By your signature below, you acknowledge that you have read and understood the contents of the manual, and know how to access it in the laboratory.

Employee Signature: _____ Date: _____

Title or Description of Training	*Provided By:*	*Date*

EH&S provides recordkeeping resources. See the EH&S website (*www.ehs.ucla.edu*) for templates, including a Training History – Individual Employee template (*Appendix J*) and a Training Roster – Site-specific Training template (*Appendix K*).

A training history for all laboratory employees is available to PIs/Laboratory Supervisors upon request. This document can serve as an official record of laboratory safety training conducted by EH&S.

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 8: Inspections and Compliance

Chemical Safety Inspections

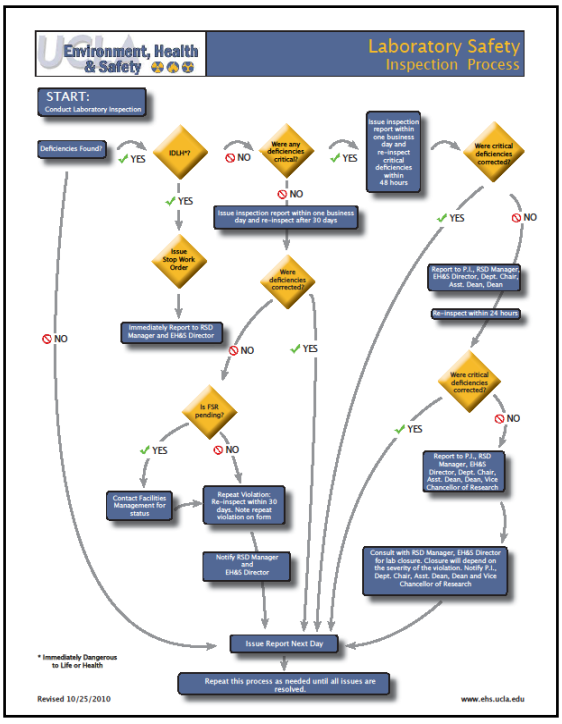
EH&S has a comprehensive chemical safety compliance program to assist laboratories and other facilities that use, handle or store hazardous chemicals to maintain a safe work environment. This program helps to ensure compliance with regulations and to fulfill UCLA's commitment to protecting the health and safety of the campus community.

As part of this chemical safety program, EH&S conducts annual inspections of laboratories and other facilities with hazardous chemicals to ensure the laboratory is operating in a safe manner and to ensure compliance with all federal, state and university safety requirements. The primary goal of inspection is to identify both existing and potential accident-causing hazards, actions, faulty operations and procedures that can be corrected **before** an accident occurs. UCLA Policy 811 (*http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=811*) explicitly authorizes EH&S to order the cessation of any activity that is "Immediately Dangerous to Life and Health" (IDLH) until that hazardous condition or activity is abated.

The chemical safety inspection is comprehensive in nature and looks into all key aspects of working with hazardous chemicals. While inspections are a snapshot in time and cannot identify every accident-causing mistake, they do provide important information on the overall operation of a particular laboratory. They can also help to identify weaknesses that may require more systematic action across a broader spectrum of laboratories, and strengths that should be fostered in other laboratories. The complete inspection checklist (see Figure 8.1) can be found in *Appendix L*. Specific inspection compliance categories include:

1. Documentation and Training;
2. Hazard Communication (including review of SOPs);
3. Emergency and Safety Information;
4. Fire Safety;
5. General Safety;
6. Use of personal protective equipment (PPE);
7. Housekeeping;
8. Chemical Storage;
9. Fume Hoods;
10. Chemical Waste Disposal and Transport;
11. Seismic Safety; and
12. Mechanical and Electrical Safety.

Figure 8.1 – Laboratory Inspection Flow Chart



Planned, focused inspections are also conducted. Examples of these include Category A chemical inspections and unannounced PPE inspections. Once the inspection is completed, EH&S issues an Laboratory Inspection Report via email. The report identifies deficiencies in the laboratory, both critical and non-critical. Critical deficiencies are those that have the potential to lead to serious injuries or be of critical importance in the event of an emergency. These deficiencies must be immediately corrected. Non-critical deficiencies must be corrected within 30-days. Any deficiency that requires a "Facilities Service Request" (FSR) for completion will be added to the FSR database so that it can be expedited by Facilities Management. Figure 7.1 illustrates the work flow for the laboratory inspection process. A copy of the most recent *Laboratory Inspection Checklist* and *Inspection Report* should be maintained as part of the records inside the Laboratory Manual.

NOTIFICATION AND ACCOUNTABILITY

The compliance program requires that PIs/Laboratory Supervisors and other responsible parties take appropriate and effective corrective action upon receipt of written notification of inspection findings. Critical deficiencies are required to be corrected within 48-hours; non-critical deficiencies must be corrected within 30-days. Failure to take corrective actions within the required timeframe will result in a repeat deficiency finding and an escalation of the notification to the Department Chair, Dean and Vice-Chancellor for Research. Depending on the severity of the deficiency, the EH&S Director, in consultation with the Vice-Chancellor for Research and Laboratory Safety Committee, may temporarily suspend research activities until the violation is corrected. In some cases, the PI may be required to provide a corrective action plan to the Laboratory Safety Committee prior to resumption of research activities. Figure 7.1 illustrates the notification procedures.

RECORDKEEPING REQUIREMENTS

Accurate recordkeeping demonstrates a commitment to the safety and health of the UCLA community, integrity of research, and protection of the environment. EH&S is responsible for maintaining records of inspections, accident investigations, equipment calibration, and training conducted by EH&S staff. Per OSHA regulations, departments or laboratories must document health and safety training, including safety meetings, one-on-one training, and classroom and online training. Additionally, the following records must be retained in accordance with the requirements of state and federal regulations:

1. Accident records;
2. Measurements taken to monitor employee exposures;
3. Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations;
4. Inventory and usage records for high-risk substances should be kept;
5. Any medical consultation and examinations, including tests or written opinions required by CCR, Title 8, Section 5191; and
6. Medical records must be retained in accordance with the requirements of state and federal regulations.

Chapter 9: Hazardous Chemical Waste Management

Hazardous Waste Program

The EH&S Hazardous Materials Program manages the shipment and disposal of all hazardous waste generated on campus. Each laboratory employee must comply with the campus Hazardous Waste Management Program requirements and all applicable regulations. A regular pick-up service is provided to most research buildings equipped with wet labs, and a pick-up is available upon request to other locations where hazardous waste is generated. Laboratory personnel are responsible for identifying waste, labeling it, storing it properly in the laboratory, and transporting waste to their designated pick-up location on time. Laboratory clean-outs and disposal of high hazard compounds must be scheduled in advance, and fees for these services are sometimes applied. The PI/Laboratory Supervisor is responsible for coordinating the disposal of all chemicals from his/her laboratories prior to closing down laboratory operations. The EH&S website (*www.ehs.ucla.edu*) contains a *Hazardous Waste Management Safety* video, which provides information on fire extinguisher use. Visit the EH&S Online Video page to view this video, and other safety videos: *http://map.ais.ucla.edu/go/1004476*.

Regulation of Hazardous Waste

In California, hazardous waste is regulated by the Department of Toxic Substance Control (DTSC), a division within the California Environmental Protection Agency (Cal/EPA). Federal EPA regulations also govern certain aspects of hazardous waste management, since most of our waste is treated and disposed out of state. These hazardous waste regulations are part of the Resource Conservation and Recovery Act, or RCRA. Local enforcement authority is administered by the Los Angeles County Health Hazardous Materials Division.

DEFINITION OF HAZARDOUS WASTE

EPA regulations define hazardous waste as substances having one of the following hazardous characteristics:

- Corrosive: pH < 2 or >12.5*
- Ignitable: liquids with flash point below 60º C or 140º F [e.g. Methanol, Acetone]
- Reactive: unstable, explosive or reacts violently with air or water, or produces a toxic gas when combined with water [e.g. Sodium metal]
- Toxic: Determined by toxicity testing [e.g. Mercury]

* There are additional restrictions on the disposal of substances with a non-neutral pH; see the section on Drain Disposal, below.

The EPA definition of hazardous waste also extends to the following items:

- Abandoned chemicals
- Unused or unwanted chemicals
- Chemicals in deteriorating containers
- Empty containers that have visible residues
- Containers with conflicting labels
- Unlabeled or unknown chemicals

Chemicals not in frequent use must be carefully managed to prevent them from being considered a hazardous waste. This is especially true for certain compounds that degrade and destabilize over time and require careful management so that they do not become a safety hazard (see the section below titled "Wastes that Require Special Handling").

EXTREMELY HAZARDOUS WASTE

Certain compounds meet an additional definition known as "extremely hazardous waste". This list of compounds includes carcinogens, pesticides, and reactive compounds, among others (e.g., formaldehyde, chloroform, and hydrofluoric acid). The Federal EPA refers to this waste as "acutely hazardous waste", but Cal/EPA has published a more detailed list of extremely hazardous waste. Both the State and the Federal lists are included in the EH&S list of extremely hazardous waste, found at: *http://map.ais.ucla.edu/go/1002773*. NOTE: While there is some overlap with the list of Particularly Hazardous Substances, such as the examples listed above, the extremely hazardous waste list is specific to the hazardous waste management program.

Proper Hazardous Waste Management

TRAINING

All personnel who are responsible for handling, managing or disposing of hazardous waste must attend training **prior** to working with these materials. The Hazardous Chemical Waste training, which is also a component of the Laboratory Safety Fundamental Concepts course, covers the hazardous waste program requirements and includes training on the container labeling program, or online tag program (*http://map.ais.ucla.edu/go/1002753*). See the EH&S website (*www.ehs.ucla.edu*) for the training schedule and course description.

WASTE IDENTIFICATION

All the chemical constituents in each hazardous waste stream must be accurately identified by knowledgeable laboratory personnel. This is a critical safety issue for both laboratory employees and the waste technicians that handle the waste once it is turned over to EH&S. Mixing of incompatible waste streams has the potential to create violent reactions and is a common cause of laboratory accidents. If there is uncertainty about the composition of a waste stream resulting from an experimental process, laboratory workers must consult the PI/Laboratory Supervisor, the Chemical Hygiene Officer or the Hazardous Materials Manager. In most cases, careful documentation and review of all chemical products used in the experimental protocol will result in accurate waste stream characterization.

The manufacturer's MSDS provides detailed information on each hazardous ingredient in laboratory reagents and other chemical products, and also the chemical, physical, and toxicological properties of that ingredient. The UC MSDS library (*http://www.ucmsds.com/?X*) provides an extensive library of research chemicals. Waste streams that have a large percentage of ingredients listed as proprietary information should be discussed with the Hazardous Materials Program Manager.

LABELING

UCLA utilizes the UC system-wide online tag program (OTP). Information on how to use OTP is included in the Hazardous Chemical Waste and Laboratory Safety Fundamental Concepts course and online (*http://map.ais.ucla.edu/go/1002753*).

Online Tag Program

How to Create an Account
Online Tag Program (OTP) accounts are maintained under the name of the PI (see *http://map.ais.ucla.edu/go/1002753*). Employees should ascertain if an account has already been established for their PI and associated laboratory(s). If a new account needs to be established, the OTP account request form (found at the end of the OTP Manual) must be completed and faxed to EH&S as 310-825-7076.

How to Use OTP
- Once an account has been established, employees can print labels from their laboratory's printer, and then affix the tag to the waste container by sliding it into the plastic envelope provided by EH&S
- Each label must be completed accurately, and the tag must be updated as the contents of the waste container change. Product names or abbreviations for waste container ingredients should not be used. OTP tags cannot be photocopied, as each tag has a unique bar code that is used to track that individual container. Employees may save a profile in the program for waste streams that are frequently generated
- When waste containers approach the maximum allowable storage period in the laboratory accumulation area, all the contacts for that OTP account are emailed a reminder to bring their waste to a scheduled pick-up location or to request a pick-up from EH&S. When EH&S collects the waste, the tags are scanned and the containers are entered into the inventory for the campus waste accumulation area and removed from the laboratory inventory

STORAGE

The hazardous waste storage area in each laboratory is considered a Satellite Accumulation Area (SAA) by the EPA. According to EPA requirements, this area must remain under the control of the persons producing the waste. This means that it should be located in an area that is supervised and is not accessible to the public. Other SAA requirements include:

- Hazardous waste containers must be labeled with an OTP tag at all times
- Waste must be collected and stored at or near the point of generation
- According to State law, the maximum amount of waste that can be stored in a SAA is 55 gallons of a hazardous waste or 1 quart of extremely hazardous waste. If you reach these volumes for a specific waste stream, you must dispose of the waste within 3 days
- The maximum amount of flammable solvents allowed to be stored in a laboratory is 60 gallons; this figure also includes waste solvents
- All hazardous waste containers in the laboratory must be kept closed when not in use

- Hazardous waste streams must have compatible constituents, and must be compatible with the containers that they are stored in
- Hazardous waste containers must be stored in secondary containment at all times.
- Containers must be in good condition with leak proof lids
- Containers must be less than 90% full
- Dry wastes must be double-bagged in clear, 3-mil plastic bags

SEGREGATION

All hazardous materials must be managed in a manner that prevents spills and uncontrolled reactions. Stored chemicals and waste should be segregated by hazard class. Examples of proper segregation are:

- Segregate acids from bases
- Segregate oxidizers from organics
- Segregate cyanides from acids

Segregation of waste streams should be conducted in a similar manner to segregation of chemical products. Refer to *Appendix M* for chemical segregation guidelines.

INCOMPATIBLE WASTE STREAMS

Mixing incompatible waste streams, or selecting a container that is not compatible with its contents, is a common cause of accidents in laboratories and waste storage facilities. Reactive mixtures can rupture containers and explode, resulting in serious injury and property damage. All chemical constituents and their waste byproducts must be compatible for each waste container generated. Waste tags must be immediately updated when a new constituent is added to a mixed waste container, so that others in the laboratory will be aware and manage it accordingly.

Some common incompatible waste streams include:

- Oxidizers added to any fuel can create an exothermic reaction and explode. The most frequent is acids oxidizing flammable liquids. For this reason, all flammable liquids are pH tested before they are consolidated
- Piranha etch solution is a specific waste stream that contains sulfuric acid and hydrogen peroxide, which form a reactive mixture that is often still fuming during disposal. For this waste stream, and other reactive mixtures like it, vented caps are mandatory

WASTES THAT REQUIRE SPECIAL HANDLING

Unknowns

Unlabeled chemical containers and unknown/unlabeled wastes are considered unknowns, and additional fees must be paid to have these materials analyzed and identified. These containers must be labeled with the word “unknown”. When disposing of these chemicals, the laboratory must complete a recharge order request or P39 form. The P39 form is available at: *http://map.ais.ucla.edu/go/1002778*.

Peroxide Forming Chemicals

Peroxide forming chemicals, or PFCs, include a number of substances that can react with air, moisture or product impurities, and undergo a change in their chemical composition during normal storage. The peroxides that form are highly reactive and can explode upon shock or spark. Peroxides are not particularly volatile and thus tend to precipitate out of liquid solutions. It is particularly dangerous to allow a container of these materials to evaporate to dryness, leaving the crystals of peroxide on the surfaces of the container.

Each container of peroxide forming chemicals should be dated with the date received and the date first opened. There are three classes of peroxide forming chemicals, with each class having different management guidelines. A guide to managing some PFCs commonly found in research labs is provided in *Appendix H*. Since this Appendix does not provide an exhaustive list of PFCs, review the safety information provided by the manufacturer for any chemicals you purchase.

Ensure containers of PFCs are kept tightly sealed to avoid unnecessary evaporation, as this inhibits the stabilizers that are sometimes added. Visually inspect containers periodically to ensure that they are free of exterior contamination or crystallization. PFC containers must be disposed of prior to expiration date. If old containers of peroxide forming chemicals are discovered in the laboratory, (greater than two years past the expiration date or if the date of the container is unknown), **do not handle the container**. If crystallization is present in or on the exterior of a container, **do not handle the container**. Secure it and contact the **EH&S Hotline at 310-825-9797** for pick-up and disposal.

Dry Picric Acid

Picric acid (also know as trinitrophenol) must be kept hydrated at all times, as it becomes increasingly unstable as it looses water content. When dehydrated, it is not only explosive but also sensitive to shock, heat and friction. Picric acid is highly reactive with a wide variety of compounds (including many metals) and is extremely susceptible to the formation of picrate salts. Be sure to label all containers that contain picric acid with the date received, and then monitor the water content every 6 months. Add distilled water as needed to maintain a consistent liquid volume.

If old or previously unaccounted for bottles of picric acid are discovered, **do not touch the container**. Depending on how long the bottle has been abandoned and the state of the product inside, even a minor disturbance could be dangerous. Visually inspect the contents of the bottle without moving it to evaluate its water content and look for signs of crystallization inside the bottle and around the lid. If there is even the slightest indication of crystallization, signs of evaporation, or the formation of solids in the bottle, **do not handle the container** and contact the **EH&S Hotline at 310-825-9797** immediately. Secure the area and restrict access to the container until it can be evaluated by EH&S personnel.

Explosives and Compounds with Shipping Restrictions

A variety of other compounds that are classified as explosives or are water or air reactive are used in research laboratories. These compounds often have shipping restrictions and special packaging requirements. When disposing of these compounds, employees must ensure that they are stored appropriately for transport. Flammable metals must be completely submerged in oil before they are brought to a waste pick-up . Many pyrophoric and reactive compounds can be stabilized using a quenching procedure prior to disposal. Chemicals classified by the Department of Transportation (DOT) as explosives (e.g., many

nitro- and azo- compounds) will require special packaging and shipping, and may require stabilization prior to disposal. Consult with the Chemical Hygiene Officer and the Hazardous Materials Program Manager for disposal considerations of these compounds.

Chemotherapy Waste

Pourable chemotherapy/oncology chemicals should be left in their original container and may be brought to the hazardous waste pick-up. Place the bottles in the designated plastic container for bulk chemotherapy waste (usually a five-gallon, sealable bucket), and bring it to hazardous waste pick-up.

Medical devices and supplies that are associated with patient treatment, including tubes, empty containers, syringes, and sharps that are also contaminated with chemotherapy drugs should not be brought to the hazardous waste pick-up; these are disposed via the medical waste program. Because chemotherapy drugs are potent toxins, special yellow barrels are available for these materials, which are usually located in medical waste storage areas. For more information, contact the Biosafety Program at 310-825-3323 or by emailing *biosafety@ehs.ucla.edu*.

MANAGING EMPTY CONTAINERS

Empty containers that held Extremely Hazardous waste must be managed as hazardous waste, and brought to the waste pick-up. Do not rinse or reuse these containers.

All other hazardous waste containers, if they are less than 5 gallons in size, should either be reused for hazardous waste collection, or should be cleaned and discarded or recycled. Proper cleaning involves triple rinsing the container, with the first rinse collected as hazardous waste. Then the labels should be completely defaced (remove it or mark it out completely). Dispose or recycle rinsed plastic or glass containers as regular trash or in a campus recycling bin. To request a recycling bin, go to: *http://www.sustain.ucla.edu/article.asp?parentid=2248*.

Empty containers 5 gallons in size or more should be turned in to EH&S or brought to a hazardous waste pick-up.

TRANSPORTATION

It is a violation of DOT regulations to transport hazardous waste in personal vehicles, or to carry hazardous waste across campus streets that are open to the public. As a result, EH&S provides pick-up services for all hazardous waste generators. These routine waste pick-ups are for routinely generated research wastes. Special pick-ups and laboratory clean-outs are available upon request for large volumes (more than 20 containers or 20 gallons). Labs that are not on the routine pick-up schedule must call 310-206-1887 for a pick-up.

When transporting waste to the pick-up location, inspect all containers to make sure that they are safe to transport. Verify that each container has an accurate waste tag, and the containers are clean and free of residue and do not show any signs of bulging, fuming, or bubbling. Use only a stable, heavy duty cart for transporting waste. Containers should be segregated on carts, and carts should be equipped with secondary containment. Do not overload a cart or stack containers more than one level high. Never leave the waste unattended once departing the laboratory. As a best practice, employees should wear eye protection and closed toe shoes (and carry gloves with them) when transporting waste.

DISPOSAL

Frequent disposal will ensure that waste accumulation areas in labs are managed properly, and that maximum storage volumes are not exceeded. UCLA policy states that hazardous chemical waste can be stored in a laboratory for up to 90 days. Once a waste container is 90% full or it is near the 90 day time limit, it should be brought to the next designated pick-up. Once an experiment or process is completed, all partially filled containers should be brought to the next scheduled pick-up for that building.

Acceptable Wastes for a Routine Pick Up

EH&S accepts the following materials at a routine pick-up:

- 20 containers or less of research generated waste
- Liquid waste in suitable containers that are clean, free of contamination, and have a leak proof cap
- Dry waste that is double bagged in clear 3-mil plastic
- Chemical contaminated sharps (with no infectious or biohazardous contamination) in a rigid sharps container
- Treated infectious waste streams or deactivated biological agents that are mixed with chemical wastes
- Batteries
- Small hand held electronic devices
- Florescent and other lamps

Wastes that will **not** be accepted at a routine pick-up location include:

- Biohazardous waste (medical waste, infectious materials or biohazardous agents) - contact Biosafety at 310-825-3323 or *biosafety@ehs.ucla.edu*
- Radioactive Wastes - contact Radiation Safety at 310-825-6995 or *radiationsafety@ehs.ucla.edu*
- Controlled Substances - contact the Reagan Hospital Pharmacy Vault at 310-207-8513
- Reactive waste streams without a properly vented cap, or containers that are bulging, fuming or bubbling
- Leaking, overflowing, or contaminated containers, or containers that are compromised
- Bags that have protruding glass or other sharps, or bags that are ripped or punctured
- Wastes that require special handling procedures or have shipping restrictions
- Waste streams in incompatible containers
- Unknowns and expired PFCs with out a recharge ID

Information about hazardous waste pick-ups is provided in *Appendix N*. A current pick-up schedule can be found on the EH&S Hazardous Waste page: *http://map.ais.ucla.edu/go/1002751*.

Hazardous Waste Minimization

UCLA is a large quantity generator of hazardous waste. In order to meet our permit obligations and our sustainability mission, EH&S has developed a Hazardous Waste Minimization Program, in an effort to minimize the costs, health hazards, and environmental impacts associated with the disposal of hazardous waste.

ADMINISTRATIVE CONTROLS

In order to reduce the amount of chemicals that become waste, administrative and operational waste minimization controls can be implemented. Usage of chemicals in the laboratory areas should be reviewed to identify practices which can be modified to reduce the amount of hazardous waste generated.

Purchasing Control: Check the inventory of the Surplus Chemical Redistribution Program (*http://map.ais.ucla.edu/go/1002826*) before new products are ordered. When ordering chemicals, be aware of any properties that may preclude long term storage, and order only exact volumes to be used. Using suppliers who can provide quick delivery of small quantities can assist with reducing surplus chemical inventory. Consider establishing a centralized purchasing program to monitor chemical purchases and avoid duplicate orders.

Inventory Control: Rotate chemical stock to keep chemicals from becoming outdated. Locate surplus/unused chemicals and attempt to redistribute these to other users, or investigate returning unused chemicals to the vendor.

Operational Controls: Review your experimental protocol to ensure that chemical usage is minimized. Reduce total volumes used in experiments; employ small scale procedures when possible. Instead of wet chemical techniques, use instrumental methods, as these generally require smaller quantities of chemicals. Evaluate the costs and benefits of off-site analytical services. Avoid mixing hazardous and non-hazardous waste streams. Distill and reuse solvents if possible. Spent solvents can also be used for initial cleaning, using fresh solvent only for final rinse. Use less hazardous or non-hazardous substitutes when feasible. Some examples include:

- Specialty detergents can be substituted for sulfuric acid/chromic acid cleaning solutions
- Gel Green and Gel Red are recommended in place of ethidium bromide

DRAIN DISPOSAL

UCLA does not permit drain disposal of chemical wastes, unless a specific dilution and/or neutralization method for a consistent waste stream has been reviewed and approved by EH&S. This applies to weak acid and base solutions. As indicated in previous sections, EPA hazardous waste definitions specify that materials with a pH between 2.5 and 12.5 are not hazardous wastes. However, drain disposal of these materials is still not permitted, because local industrial waste water discharge requirements have more restrictive pH thresholds. In addition, acid and base neutralization is considered waste treatment, a process that is strictly regulated by the EPA (see "Bench Top Treatment" below). Contact EH&S for specific questions about drain disposal variances.

Drain disposal of properly disinfected infectious or biohazardous liquids is acceptable, if disinfection is conducted as specified by the EH&S Biosafety Program, and the liquids disposed contain no other hazardous constituents.

BENCH TOP TREATMENT

EPA regulations allow some limited bench top treatment of certain chemical waste streams in laboratories provided that specific procedures are followed. Due to the stringent nature of these requirements, any treatment of hazardous waste in labs must be reviewed and approved by EH&S.

The EPA requirements for treating hazardous waste in laboratories generally follow the "Prudent Practices in the Laboratory 1995" (p. 160-171) National Research Council procedures, or other peer-reviewed scientific publications. The quantity of waste treated in one batch cannot exceed 5 gallons of liquid or 18 kilograms of solid/semi-solid waste. As treatment may result in residuals which may have to be managed as hazardous waste, all residual hazardous waste must be handled according to UCLA's Hazardous Waste Program requirements.

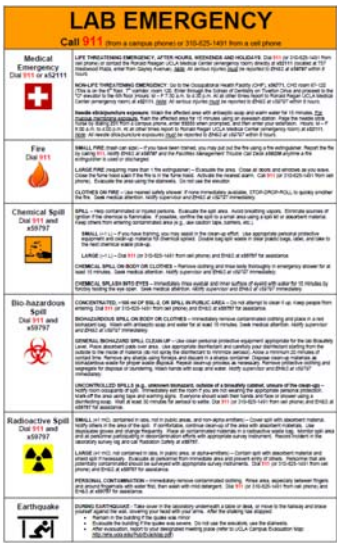
MERCURY THERMOMETER EXCHANGE PROGRAM

Cleaning up spilled mercury from a broken thermometer is the most frequent EH&S Haz Mat response. Mercury is a potent neurotoxin and environmental contaminant, and UCLA has a goal of having a mercury free campus. EH&S will exchange mercury thermometers with non-mercury thermometers free of charge. To request an exchange of mercury thermometers, fill out the form at: *http://ehs.ucla.edu/Pub/ThermometerExchange.pdf.*

THIS PAGE INTENTIONALLY LEFT BLANK.

Chapter 10: Accidents and Chemical Spills

Overview



Laboratory emergencies may result from a variety of factors, including serious injuries, fires and explosions, spills and exposures, and natural disasters. All laboratory employees should be familiar with and aware of the location of their laboratory's emergency response plans and safety manuals. **Before beginning any laboratory task**, know what to do in the event of an emergency situation. Identify the location of safety equipment, including first aid kits, eye washes, safety showers, fire extinguishers, fire alarm pull stations, and spill kits. Plan ahead and know the location of the closest fire alarms, exits, and telephones in your laboratory. The Lab Emergency Poster (*Appendix P*) provides an overview of emergency response procedures for laboratories. It should be posted in each laboratory.

For all incidents requiring emergency response, call UCPD at 911 from a campus phone or 310- 825-1491 from off-campus or cell phones.

Accidents

PIs/Laboratory Supervisors are responsible for ensuring that their employees receive appropriate medical attention in the event of an occupational injury or illness. All accidents and near misses must be reported to the **EH&S Hotline at 310-825-9797**. EH&S will conduct an accident investigation and develop recommendations and corrective actions to prevent future accidents. At a minimum, each laboratory must have the following preparations in place:

- Fully stocked first aid kit
- Posting of emergency telephone numbers and locations of emergency treatment facilities, including OHF
- Training of adequate number of staff in basic CPR and first aid
- Training of staff to accompany injured personnel to medical treatment site and to provide medical personnel with copies of MSDS(s) for the chemical(s) involved in the incident

Accident Prevention Methods	
Do	**Don't**
• Always wear appropriate eye protection • Always wear appropriate laboratory coat • Always wear appropriate gloves • Always wear closed-toe shoes and long pants • Always confine long hair and loose clothing • Always use the appropriate safety controls (e.g., certified fume hoods) • Always label and store chemicals properly • Always keep the work area clean and uncluttered	• Never enter the laboratory wearing inappropriate clothing (e.g., open-toe shoes and shorts) • Never work alone on procedures involving hazardous chemicals, biological agents, or other physical hazards • Never eat, drink, chew gum or tobacco, smoke, or apply cosmetics in the laboratory • Never use damaged glassware or other equipment

If an employee has a severe or life threatening injury, call for emergency response. Employees with minor injuries should be treated with first aid kits as appropriate, and sent to the Occupational Health Facility for further evaluation and treatment. After normal business hours, treatment can be obtained at designated medical centers and emergency rooms.

Serious occupational injuries, illnesses, and exposures to hazardous substances must be reported to the EH&S Hotline at 310-825-9797 within 8 hours. EH&S will report the event to Cal/OSHA, investigate the accident, and complete exposure monitoring if necessary. Serious injuries include those that result in permanent impairment or disfigurement, or require hospitalization. Examples include amputations, lacerations with severe bleeding, burns, concussions, fractures and crush injuries. As soon as PIs/Laboratory Supervisors are aware of a potentially serious incident, they must contact EH&S. Serious injury posters are displayed across campus with instructions on reporting injuries to EH&S to ensure that all serious injuries are reported to Cal/OHSA within 8 hours.

Fire-Related Emergencies

If you encounter a fire, or a fire-related emergency (e.g., abnormal heating, smoke, burning odor), immediately follow these instructions:

1. Pull the fire alarm pull station **and call 911 from a campus phone or 310-825-1491** from an off-campus or cell phone to notify the Fire Department;
2. Evacuate and isolate the area
   - Use portable fire extinguishers to facilitate evacuation and/or control a small fire (i.e., size of a small trash can), if safe to do so
   - If possible, shut off equipment before leaving
   - Close doors;
3. Remain safely outside the affected area to provide details to emergency responders; and
4. Evacuate the building when the alarm sounds. **It is against state law to remain in the building when the alarm is sounding.** If the alarm sounds due to a false alarm or drill, you will be allowed to re-enter the building as soon as the Fire Department determines that it is safe to do so. **Do not go back in the building until the alarm stops and you are cleared to reenter.**

If your clothing catches on fire, go to the nearest emergency shower immediately. If a shower is not immediately available, then stop, drop, and roll. A fire extinguisher may be used to extinguish a fire on someone's person. Report any burn injuries to the supervisor immediately and seek medical treatment. Report to the EH&S Hotline at 310-825-9797 within 8 hours every time a fire extinguisher is discharged.

Chemical Spills

Chemical spills can result in chemical exposures and contaminations. Chemical spills become emergencies when:

- The spill results in a release to the environment (e.g., sink or floor drain)
- The material or its hazards are unknown
- Laboratory staff cannot safety manage the hazard because the material is too hazardous or the quantity is too large

Effective emergency response to these situations is imperative to mitigate or minimize adverse reactions when chemical incidents occur. After emergency procedures are completed, all personnel involved in the incident should follow UCLA chemical exposure procedures as appropriate (see *Chapter 5: Chemical Exposure Assessment*).

Factors to Consider Before Spill Clean-Up

1. Size of spill area
2. Quantity of chemical
3. Toxicity
4. Volatility
5. Clean up materials available
6. Training of responders

In the event of a significant chemical exposure or contamination, immediately try to remove or isolate the chemical if safe to do so. When skin or eye exposures occur, remove contaminated clothing and flush the affected area using an eye wash or shower for at least 15 minutes. If a chemical is ingested, drink plenty of water. Obtain medical assistance as indicated. Remember to wear appropriate PPE before helping others. PIs/ Laboratory Supervisors must review all exposure situations, make sure affected employees receive appropriate medical treatment and/or assessment, and arrange for containment and clean-up of the chemical as appropriate.

Small chemical spills can be cleaned up by laboratory personnel who have been trained in spill clean up and with the appropriate materials. A small spill is generally defined as < 1 liter of chemical that is not highly toxic, does not present a significant fire or environmental hazard, and is not in a public area such as a common hallway. **Large chemical spills** include spills of larger quantities, spills of any quantity of highly toxic chemicals, or chemicals in public areas or adjacent to drains. Large spills require emergency response. Call **911 from a campus phone or 310-825-1491** from an off-campus or cell phone for assistance.

WHAT TO DO WITH A SMALL CHEMICAL SPILL (<1 LITER)

- Evacuate all non-essential persons from the spill area
- If needed, call for medical assistance by dialing **911** from a campus phone or **310-825-1491** from an off-campus or cell phone
- Help anyone who may have been contaminated. Use emergency eyewashes/showers by flushing the skin or eyes for *at least 15 minutes*
- Post someone just outside the spill area to keep people from entering. Avoid walking through contaminated areas
- You must have the proper protective equipment and clean-up materials to clean-up spills. Check the chemical's Material Safety Data Sheet (MSDS) in your laboratory or online *(http://www.ucmsds.com/?X)* for spill clean-up procedures, or call the **EH&S Hotline at 310-825-9797** for advice
- Turn off sources of flames, electrical heaters, and other electrical apparatus, and close valves on gas cylinders if the chemical is flammable

- Confine the spill to a small area. Do not let it spread
- Avoid breathing vapors from the spill. If the spill is in a non-ventilated area, do not attempt to clean it up. Call for emergency personnel to respond and clean up the spill
- Wear personal protective equipment, including safety goggles, gloves, and a laboratory coat or other protective garment to clean-up the spill
- Work with another person to clean-up the spill. Do not clean-up a spill alone
- DO NOT ADD WATER TO THE SPILL
- Use an appropriate kit to neutralize and absorb inorganic acids and bases. For other chemicals, use the appropriate kit or absorb the spill with sorbent pads, paper towels, vermiculite, dry sand, or diatomaceous earth. For mercury spills and specific procedures for all other spills see *Appendix O.*
- Collect the residue and place it in a clear plastic bag. Double bag the waste and label the bag with the contents. Take it to the Chemical Waste Pick-up for your building (see *http://map.ais.ucla.edu/go/1002751*)

WHAT TO DO WITH A LARGE CHEMICAL SPILL (>1 LITER)

Large chemical spills require emergency response. Call 911 from a campus phone or 310-825-1491 from an off-campus or cell phone. If the spill presents a situation that is immediately dangerous to life or health (IDLH) or presents a significant fire risk, activate a fire alarm, evacuate the area and wait for emergency response to arrive.

- Remove the injured and/or contaminated person(s) and provide first aid
- Call for emergency medical response
- As you evacuate the laboratory, close the door behind you, and:
    - Post someone safely outside and away from the spill area to keep people from entering
    - Confine the spill area if possible and safe to do so
    - Leave on or establish exhaust ventilation
    - If possible, turn off all sources of flames, electrical heaters, and other electrical equipment if the spilled material is flammable
    - Avoid walking through contaminated areas or breathing vapors of the spilled material
- Any employee with known contact with a particularly hazardous chemical must shower, including washing of the hair as soon as possible unless contraindicated by physical injuries

Highly Toxic Chemical Spills

Do no try to clean up spills of any size. All spills require emergency response:

- Aromatic amines
- Bromines
- Carbon disulfide
- Cyanides
- Ethers
- Hydrazine
- Nitriles
- Nitro-compounds
- Organic halides

Appendices

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix A: General Rules for Laboratory Work with Chemicals

PRUDENT LABORATORY PRACTICES

It is prudent to minimize all chemical exposures. Few laboratory chemicals are without hazards, and general precautions for handling all laboratory chemicals should be adopted, in addition to specific guidelines for particular chemicals. Exposure should be minimized even for substances of no known significant hazard, and special precautions should be taken for work with substances that present special hazards. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.

Avoid inadvertent exposures to hazardous chemicals by developing and encouraging safe habits and thereby promoting a strong safety culture.

SAFE LABORATORY HABITS

Personal Protective Equipment:

- Wear closed-toe shoes and full length pants, or equivalent, at all times when in the laboratory
- Utilize appropriate PPE while in the laboratory and while performing procedures that involve the use of hazardous chemicals or materials. These items may include laboratory coats, gloves, and safety glasses or goggles. (See UCLA Policy 905: *http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=905* and *Appendix Q*)
- Confine long hair and loose clothing
- Wear appropriate gloves when the potential for contact with toxic materials exists; inspect the gloves before each use, and replace them often
- Remove laboratory coats or gloves immediately on significant contamination, as well as before leaving the laboratory
- Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken
- Ensure that appropriate PPE is worn by all persons, including visitors, where chemicals are stored or handled
- Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls, inspecting the respirator before use. Use of respirators requires successful completion of the EH&S Respirator Training and Fit Test course. Visit *www.ehs.ucla.edu* for course description and registration information
- Use any other protective and emergency apparel and equipment as appropriate. Be aware of the locations of first aid kits and emergency eyewash and shower stations

Chemical Handling:

- Use only those chemicals for which the quality of the available ventilation system is appropriate
- Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices
- Properly label and store all chemicals. Use secondary containment at all times
- Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan
- In the case of an accident or spill, refer to the emergency response procedures for the specific material. These procedures should be readily available to all personnel. Information on minor chemical spill mitigation may also be referenced in *Appendix O*. For general guidance, the following situations should be addressed:
    - Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention
    - Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention
    - Clean-up: Promptly clean up spills, using appropriate protective apparel and equipment, and proper disposal

Equipment Storage and Handling:

- Use equipment only for its designed purpose
- Store laboratory glassware with care to avoid damage. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur
- Use certified fume hoods, glove boxes, or other ventilation devices for operations which might result in release of toxic chemical vapors or dust. Preventing the escape of these types of materials into the working atmosphere is one of the best ways to prevent exposure
- Keep hood closed at all times, except when adjustments within the hood are being made
- Leave the fume hood "on" even when it is not in active use if toxic substances are in the fume hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off"

Laboratory Operations:

- Keep the work area clean and uncluttered
- Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation
- If unattended operations are unavoidable, and have been approved by the PI/Laboratory Supervisor, place an appropriate sign on the door, leave lights on, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water)
- Be alert to unsafe conditions and ensure that they are corrected when detected

UNSAFE LABORATORY HABITS

Personal Protective Equipment:

- Do not enter the laboratory without wearing appropriate clothing, including closed-toe shoes and full length pants, or equivalent. The area of skin between the shoe and ankle should not be exposed. (See UCLA Policy 905: *http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=905*)
- Do not wear laboratory coats or gloves outside of the laboratory area

Chemical Handling:

- Do not smell or taste chemicals.
- Do not allow release of toxic substances or fumes into cold or warm rooms, as these types of areas typically involve re-circulated atmospheres
- Never use mouth suction for pipeting or starting a siphon
- Do not dispose of any hazardous chemicals through the sewer system. These substances might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow

Equipment Storage and Handling:

- Do not use damaged glassware or other equipment, under any circumstances. The use of damaged glassware increases the risks of implosion, explosion, spills, and other accidents
- Do not use uncertified fume hoods or glove boxes for hazardous chemical handling
- Avoid storing materials in hoods and do not allow them to block vents or air flow

Laboratory Operations:

- Never work alone on procedures involving hazardous chemicals, biological agents, or other physical hazards
- Avoid unattended operations, if at all possible. Unattended operations require prior approval from the PI/Laboratory Supervisor
- Do not engage in distracting behavior such as practical joke playing in the laboratory. This type of conduct may confuse, startle, or distract another worker

Food/Drink:

- Do not eat, drink, smoke, chew gum, or apply cosmetics in areas where laboratory chemicals are present; wash hands before conducting these activities
- Do not store, handle, or consume food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations
- Wash areas of exposed skin well before leaving the laboratory

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix B: Sample Material Safety Data Sheet (MSDS)

ScienceLab.com
Chemicals & Laboratory Equipment

Health	3
Fire	2
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Formaldehyde 37% solution MSDS

Section 1: Chemical Product and Company Identification

Product Name: Formaldehyde 37% solution

Catalog Codes: SLF1426

CAS#: Mixture.

RTECS: LP8925000

TSCA: TSCA 8(b) inventory: Formaldehyde; Methyl alcohol; Water

CI#: Not applicable.

Synonym: Formalin

Chemical Name: Formaldehyde

Chemical Formula: HCHO

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Formaldehyde	50-00-0	36.5-38
Methyl alcohol	67-56-1	10-15
Water	7732-18-5	47-53.5

Toxicological Data on Ingredients: Formaldehyde: ORAL (LD50): Acute: 100 mg/kg [Rat]. 42 mg/kg [Mouse]. 260 mg/kg [Guinea pig]. MIST (LC50): Acute: 454000 mg/m 4 hours [Mouse]. Methyl alcohol: ORAL (LD50): Acute: 5628 mg/kg [Rat]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 64000 ppm 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (irritant, sensitizer, permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2A (Probable for human.) by IARC [Formaldehyde]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Formaldehyde]. Mutagenic for bacteria and/or yeast. [Formaldehyde]. Mutagenic for mammalian somatic cells. [Methyl

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

alcohol]. Mutagenic for bacteria and/or yeast. [Methyl alcohol]. TERATOGENIC EFFECTS: Classified POSSIBLE for human [Methyl alcohol]. DEVELOPMENTAL TOXICITY: Not available The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 430°C (806°F)

Flash Points: CLOSED CUP: 50°C (122°F). OPEN CUP: 60°C (140°F).

Flammable Limits: The greatest known range is LOWER: 6% UPPER: 36.5% (Methyl alcohol)

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks, of oxidizing materials, of reducing materials, of combustible materials, of organic materials, of metals, of acids, of alkalis.

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME (Methyl alcohol)

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

Special Remarks on Explosion Hazards:
Reaction with peroxide, nitrogen dioxide, and permformic acid can cause an explosion. (Formaldehyde gas)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Flammable liquid. Poisonous liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis, moisture.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Formaldehyde gas STEL: 0.3 (ppm) from ACGIH (TLV) [United States] STEL: 0.37 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.75 STEL: 2 (ppm) from OSHA (PEL) [United States] TWA: 2 STEL: 2 (ppm) [United Kingdom (UK)] TWA: 2.5 STEL: 2.5 (mg/m3) [United Kingdom (UK)] Methyl alcohol TWA: 200 from OSHA (PEL) [United States] TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) [United States] [1999] STEL: 250 from NIOSH [United States] TWA: 200 STEL: 250 (ppm) from NIOSH SKIN TWA: 200 STEL: 250 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Suffocating. (Strong.)

Taste: Not available.

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

Molecular Weight: 30.02

Color: Clear Colorless.

pH (1% soln/water): 3 [Acidic.] pH of the solution as is.

Boiling Point: 98°C (208.4°F)

Melting Point: -15°C (5°F)

Critical Temperature: The lowest known value is 240°C (464°F) (Methyl alcohol).

Specific Gravity: 1.08 (Water = 1)

Vapor Pressure: 2.4 kPa (@ 20°C)

Vapor Density: 1.03 (Air = 1)

Volatility: 100% (w/w).

Odor Threshold: The highest known value is 100 ppm (Methyl alcohol)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Non-ionic.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Easily soluble in cold water, hot water. Soluble in diethyl ether, acetone, alcohol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks), incompatible materials

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, acids, alkalis. Slightly reactive to reactive with metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Also incompatible with urea, phenol, isocyanates, anhydrides, amines, AZO compounds, carbonyl compounds, oxides(e.g. nitrogen dioxide), performic acid, dithiocarbmates, or peroxides. Polymerization can be inhibited by the addition of methanol or stabilizers such as hydorxypropyl methyl cellulose, methyl ethyl celluloses, or isophthalobisguanamine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 42 mg/kg [Mouse]. (Formaldehyde) Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. (Methyl alcohol). Acute toxicity of the mist(LC50): 454000 mg/m 4 hours [Mouse]. (Formaldehyde) 3

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2A (Probable for human.) by IARC [Formaldehyde]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Formaldehyde]. Mutagenic for bacteria and/or yeast. [Formaldehyde]. Mutagenic for mammalian somatic cells. [Methyl alcohol]. Mutagenic for bacteria and/or yeast. [Methyl alcohol]. TERATOGENIC EFFECTS: Classified POSSIBLE for human [Methyl alcohol]. DEVELOPMENTAL TOXICITY: Not available May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, . Hazardous in case of skin contact (irritant, sensitizer, permeator), of eye contact (corrosive), of inhalation (lung corrosive). Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals:
Formaldehyde: LD50 [Rabbit] - Route: Skin; Dose: 270 ul/kg

Special Remarks on Chronic Effects on Humans:
Exposure to Formaldehyde and Methanol may affect genetic material (mutagenic). Exposure to Formaldehyde and Methanol may cause adverse reproductive effects and birth defects(teratogenic). Adverse reproductive effects of Formaldehyde as well as Methanol are primarily based on animal studies. Very few human studies have been done on the adverse reproductive effects from exposure to Formaldehyde. Studies produced a weak association (limited evidence) between advese human female reproductive effects and occupational exposure. Furthermore, no human data could be found on adverse reproductive effects from occupational exposure to Methanol. Exposure to Formaldehyde may cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes skin irritation which may range from mild to severe with possible burns depending on the extent of exposure and concentration of solution. Other symptoms may include brownish discoloration of the skin, urticaria, and pustulovesicffular eruptions. May be absorbed through skin with symptoms paralleling those of ingestion. Eyes: Corrosive. Contact with liquid causes severe eye irritation and burns. It may cause irreversible eye damage (severe corneal Solutions containing low formaldehyde concentrations may produce transient discomfort and irritation. Inhalation: Causes irritation of the respiratory tract (nose, throat, airways). Symptoms may include dry and sore mouth and throat, thirst, and sleep disturbances, difficulty breathing, shortness of breath, coughing, sneezing, wheezing rhinitis, chest tightness, pulmonary edema, bronchitis, tracheitis, laryngospasm, pneumonia, palpitations. It may also affect metabolism weight loss, metabolic acidosis), behavior/central nervous system (excitement, central nervous system depression, somnolence, convulsions, stupor, aggression, headache, weakness, dizziness, drowsiness, coma), peripheral nervous system, and blood. Ingestion: Harmful if swallowed. May be fatal. Causes gastrointestinal irritation with nausea, vomiting (possibly with blood), diarrhea, severe pain in mouth, throat and stomach, and possible corrosive injury to the gastrointestinal mucosa/ulceration or bleeding from stomach. May also affect the liver(jaundice), urinary system/kidneys (difficulty urinating, albuminuria, hematuria, anuria), blood, endocrine system, respiration (respiratory obstruction, pulmonary edema, bronchiolar obstruction), cardiovascular system (hypotension), metabolism (metabolic acidosis), eyes (retinal changes, visual field changes), and behavior/central nervous system (symptoms similar to those for inhalation). Contains Methanol which may cause blindness if swallowed. Chronic Potential Health Effects: Skin: Prolonged or repeated exposure may cause contact dermatits both irritant and allergic. It may also cause skin discoloration. Inhalation: Although there is no clear evidence, prolonged or repeated exposure may induce allergic asthma. Other effects are similar to that of acute exposure. Ingestion: Prolonged or repeated ingestion may cause gastrointestinal tract irritation and ulceration or bleeding from the stomach. Other effects may be similar to that of acute ingestion.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:
Methanol in water is rapidly biodegraded and volatilized. Aquatic hydrolysis, oxidation, photolysis, adsorption to sediment, and bioconcentration are not significant fate processes. The half-life of methanol in surfact water ranges from 24 hrs. to 168 hrs. Based on its vapor pressure, methanol exists almost entirely in the vapor phase in the ambient atmosphere. It is degraded by reaction with photochemically produced hydroxyl radicals and has an estimated half-life of 17.8 days. Methanol is physically removed from air by rain due to its solubility. Methanol can react with NO2 in pollulted to form methyl nitrate. The half-life of methanol in air ranges from 71 hrs. (3 days) to 713 hrs. (29.7 days) based on photooxidation half-life in air. (Methyl alcohol)

Section 13: Disposal Considerations

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification:
CLASS 3: Flammable liquid. Class 8: Corrosive material

Identification: : Formaldehyde Solution, flammable (Methyl alcohol) UNNA: 1198 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Formaldehyde California prop. 65 (no significant risk level): Formaldehyde: 0.04 mg/day (inhalation) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Formaldehyde Solution Connecticut hazardous material survey.: Formaldehyde; Methyl alcohol Illinois toxic substances disclosure to employee act: Formaldehyde; Methyl alcohol Illinois chemical safety act: Formaldehyde; Methyl alcohol New York release reporting list: Formaldehyde; Methyl alcohol Rhode Island RTK hazardous substances: Formaldehyde; Methyl alcohol Pennsylvania RTK: Formaldehyde; Methyl alcohol Minnesota: Formaldehyde gas; Methyl alcohol Massachusetts RTK: Formaldehyde; Methyl alcohol Massachusetts spill list: Formaldehyde; Methyl alcohol New Jersey: Formaldehyde; Methyl alcohol New Jersey spill list: Formaldehyde; Methyl alcohol Louisiana RTK reporting list: Formaldehyde Louisiana spill reporting: Formaldehyde; Methyl alcohol California Director's List of Hazardous Substances: Formaldehyde; Methyl alcohol TSCA 8(b) inventory: Formaldehyde gas; Methyl alcohol; Water TSCA 4(f) priority risk review: Formaldehyde, Reagnt, ACS SARA 302/304/311/312 extremely hazardous substances: Formaldehyde SARA 313 toxic chemical notification and release reporting: Formaldehyde; Methyl alcohol CERCLA: Hazardous substances.: Formaldehyde: 100 lbs. (45.36 kg); Methyl alcohol: 5000 lbs. (2268 kg);

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F). CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 2

Reactivity: 0

Personal Protection: G

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 2

Reactivity: 0

Specific hazard:

Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

Sample MSDS, cont.

Protective Equipment:
Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:35 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

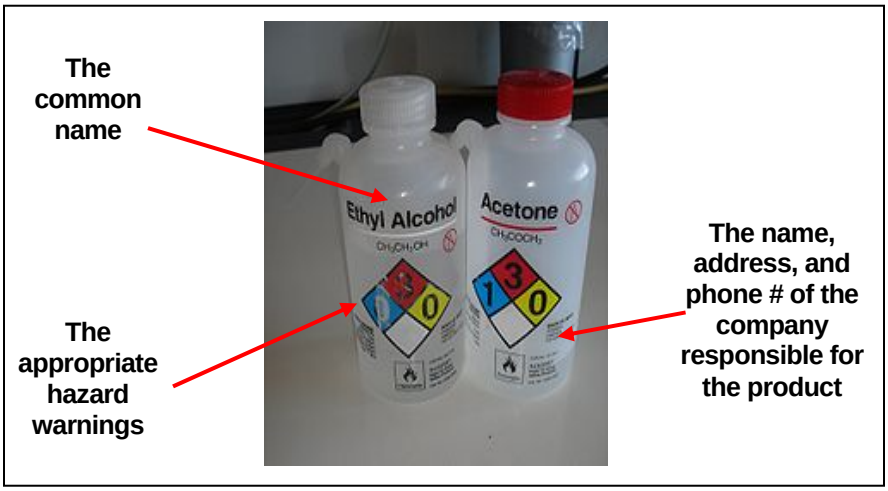
Obtain MSDS from the online UC MSDS library: *http://www.ucmsds.com/?X.*

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix C: Container Labeling

Chemical container labels are a good resource for information on chemical hazards. All containers of hazardous chemicals must have labels attached. Figure C.1 displays the label requirements.

Figure C.1. – Container Labeling Requirements



The warning may be a single word (e.g. Danger, Caution, Warning) or may identify the primary hazards, including both physical (e.g. water reactive, flammable, or explosive) and health (e.g. carcinogen, corrosive or irritant), such as what is found on an NFPA diamond and hazard warnings from the label or MSDS.

Most labels provide additional safety information to help workers protect themselves from the substance. This information may include protective measures and/or protective clothing to be used, first aid instructions, storage information and emergency procedures.

Chemical Labeling – What are Laboratory Personnel Responsible for?

- Inspecting incoming containers to be sure that labels are attached and are in good condition and contain the information outlined above
- Reading the container label each time a newly purchased chemical is used. It is possible that the manufacturer may have added new hazard information or reformulated the product since the last purchase
- Ensuring that chemical container labels are not removed or defaced, except when containers are empty
- Labeling any secondary containers used in the laboratory, to prevent unknown chemicals or inadvertent reaction
- Verifying that chemical waste containers have complete and accurate chemical waste labels

Labeling is important for the safe management of chemicals, preventing accidental misuse, inadvertent mixing of incompatible chemicals, and facilitating proper chemical storage. Proper labeling helps ensure quick response in the event of an accident, such as a chemical spill or chemical exposure incident. Finally, proper labeling prevents the high costs associated with disposal of "unknown" chemicals.

With the exception of transient containers that will contain chemicals for immediate use, all containers of chemicals being used or generated in UCLA research laboratories must be labeled sufficiently to indicate the contents of the container. On original containers, the label must not be removed or defaced in any way until the container is emptied of its original contents. Incoming containers must be inspected to make sure the label is in good condition. It is also advisable to put a date on new chemicals when they are received in the laboratory, and to put a date on containers of chemicals generated in the laboratory, as well as the initials of the responsible person.

Abbreviations or other acronyms may be used to label containers of chemicals generated in the laboratory as long as all personnel working in the laboratory understand the meaning of the label, or know the location of information, such as a laboratory notebook or log sheet that contains the code associated with content information. In addition, small containers, such as vials and test tubes, can be labeled as a group by labeling the outer container (e.g., rack or box). Alternatively, a placard can be used to label the storage location for small containers (e.g., shelf, refrigerator, etc.). This information must be provided to janitorial and maintenance staff as part of their hazard communication training.

Containers of practically non-toxic and relatively harmless chemicals must also be labeled with content information, including containers such as squirt bottles containing water.

With respect to chemical labeling, all potentially hazardous chemicals transferred from their original container to a second container must be labeled with the chemical name and the principal hazards found on the primary container label or MSDS. For more information on labeling, see Chapter 6: Labeling, Storage, Inventory and Transport.

Appendix D: SOP Instructions and Template

INSTRUCTIONS FOR COMPLETING STANDARD OPERATING PROCEDURES

To be in compliance with the Cal/OSHA Laboratory Standard, laboratory-specific Standard Operating Procedures (SOPs) are required to be included in your Chemical Hygiene Plan. This manual does not provide specific SOPs for the hazardous chemical or hazardous substance use operations or procedures in your particular laboratory. If your laboratory research involves the use of hazardous substances or chemicals, you must develop laboratory-specific SOPs to supplement the information found in the EH&S Laboratory Safety Manual and Chemical Hygiene Plan. You may work with your departmental safety committee and EH&S, as required. Below are instructions for completing the laboratory-specific SOPs with the corresponding template. Please contact your designated Laboratory Safety Officer with any questions or comments you may have while completing your SOPs. Completed SOPs are reviewed by the Laboratory Safety Officer during annual inspections.

1. Type of SOP

- **Process**: the SOP will be for a process such as distillation, synthesis, etc.
- **Hazardous chemical**: the SOP will be for an individual chemical such as arsenic, formaldehyde, nitric acid, etc.
- **Hazard class:** the SOP will be for a hazard class of chemicals such as oxidizer, flammable, corrosive, etc.

2. Describe the Process, Hazardous Chemical or Hazard Class

- **Process**: Briefly describe the process and name all the hazardous chemicals or substances used in the process
- **Hazardous chemical**: Provide the name of the chemical. Include the full name, common name, and any abbreviations used for the chemical
- **Hazard class:** Name the hazard class and list the name of the chemicals in this hazard class used or stored in your laboratory

3. Potential Hazards

Describe all the potential hazards for each process, hazardous chemical, or hazard class. Describe the potential for both physical and health hazards. Health hazards include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. State the potential for chronic and/or acute health hazard effects of the chemical(s).

Physical hazards include radioactivity, cryogen, high temperature, electrical, compressed gas or other pressure systems, UV light, laser, flammable or combustible, corrosive, water-reactive, unstable, oxidizer, pyrophoric, explosive, or peroxide formers.

4. Circumstances Requiring Prior Approval

Discuss the circumstances under which this particular process, hazardous chemical or hazard class will require prior approval (if any) from the PI/Laboratory Supervisor or Chemical Hygiene Officer. The circumstances may be based on such criteria as: the inherent hazards of the material(s) used,

the hazards of the experimental process, the experience level of the worker, the scale of the reaction, etc. Some examples of circumstances that may require prior approval include unattended or overnight operations, use of explosives or pyrophorics, use of highly toxic gas in any amount, use of large quantities of toxic or corrosive gases or use of carcinogens.

5. Personal Protective Equipment (PPE)
Identify the required PPE for the process, hazardous chemical, or hazard class. PPE includes, but is not limited to: gloves, aprons, laboratory coats, safety glasses, goggles, masks, respirators, or face shields.

6. Engineering Controls
Describe or list engineering controls that will be used to prevent or reduce employee exposure to hazards. Examples of engineering controls are fume hoods, glove boxes, interlocks on equipment, and shielding of various kinds.

7. Special Handling and Storage Requirements
Describe the storage requirements for hazardous substances, including special containment devices, special temperature requirements, special storage areas or cabinets, chemical compatibility storage requirements, etc. State the policy regarding access to the substance(s). Provide the exact storage location in the laboratory. Describe any special procedures, such as dating peroxide forming chemicals on receipt, opening and disposal, or testing after an appropriate amount of time has passed. Describe safe methods of transport, such as in a secondary container using a low, stable cart, or using two hands to carry the chemical container.

8. Spill and Accident Procedures
Describe special procedures for spills, releases or exposures (e.g., neutralizing agents, use of fluorescence to detect materials, etc.). Indicate how spills, accidental releases and exposures will be handled. List location of the following emergency equipment: chemical spill clean-up kit, first-aid kit, emergency shower, eyewash, and fire extinguisher.

9. Decontamination Procedures
Describe specific decontamination procedures for equipment, glassware or work areas.

10. Waste Disposal Procedures
Describe the anticipated waste products as well as how waste will be collected and disposed.

11. Designated Area
Indicate the designated area established for experiments using particularly hazardous substances (PHS). A portion of a laboratory bench, a piece of equipment, the fume hood, or the entire laboratory may be considered as a designated area for experiments using PHS.

12. Material Safety Data Sheet (MSDS) Location
State where the MSDSs are kept for the chemicals, or hazardous substances, used in the laboratory. Indicate the location of other pertinent safety information (e.g., references, equipment manuals, etc.).

13. Protocols

Insert a copy of your specific laboratory procedures for the process, hazardous chemical or hazard class.

SOP TEMPLATE

Standard Operating Procedures
Laboratory Specific

Please fill out the form completely. Print a copy and insert into your
Laboratory Safety Manual.
Refer to SOP instructions for assistance.

Department: _____ Date: _____

Principal Investigator: _____

Chemical Hygiene Officer: _____

Laboratory Phone: _____ Office Phone: _____

Emergency Contact:_____
(Name and Phone Number)

Location(s) covered by this SOP: _____
(Building/Room Number)

---

1. Type of SOP (check one)

☐ Process ☐ Hazardous Chemical ☐ Hazard Class

2. Describe Process, Hazardous Chemical or Class:

3. Potential Hazards:

4. Circumstances Requiring Prior Approval:

5. **Personal Protective Equipment (PPE):**

6. **Engineering Controls:**

7. **Special Handling & Storage Requirements:**

8. **Spill & Accident Procedures:**

9. **Decontamination Procedures:**

10. **Waste Disposal Procedures:**

11. **Designated Area:**

12. **Material Safety Data Sheet (MSDS) Location:**

13. **Protocol(s):**

Appendix E: UCLA Particularly Hazardous Substances Policy*

UCLA Policy 907:	**Safe Handling of Particularly Hazardous Substances**
Issuing Officer:	Vice Chancellor for Research
Responsible Dept:	Environment, Health & Safety
Effective Date:	December 9, 2010
Supersedes:	New

I. REFERENCES

1. Title 8, California Code of Regulations (CCR), Section 5191 (Occupational Exposures to Hazardous Chemicals in Laboratories; Article 110 (Regulated Carcinogens); Section 5209 (Listed Carcinogens); Section 5203 (Report of Use Requirements); Section 5154.1 (Ventilation Requirements for Laboratory-Type Hood Operations);
2. UCLA Policy 905, Research Laboratory Personal Safety and Protective Equipment;
3. UCLA Policy 811, Environmental Health and Safety;
4. UCLA Laboratory Safety Manual (includes Chemical Hygiene Plan).

II. PURPOSE

This Policy provides general guidance on how to work safely with chemicals that have been designated as "particularly hazardous" by Cal/OSHA. It describes the minimum requirements for the safe storage, use, handling, and disposal of particularly hazardous substances, including spill and accident response procedures. Particularly hazardous substances are defined by Cal/OSHA as: reproductive toxins, acutely toxic substances and select carcinogens, which include regulated carcinogens. Refer to Attachment A, Particularly Hazardous Substances Definitions, for specific definitions.

III. STATEMENT

This Policy is applicable to, and must be adhered to by, all UCLA laboratory workers (i.e., Principal Investigators, laboratory personnel, students, visiting researchers, etc.) who use or work with particularly hazardous substances. Careful handling and stringent controls of these chemicals are essential to protect workers and the environment, and to comply with Cal/OSHA regulations.

* UCLA Policy 907: Safe Handling of Particularly Hazardous Substances can be accessed at: *http://www.adminpolicies.ucla.edu/app/Default.aspx?&id=907*

Additional safety requirements may apply, depending on the specific chemical. For example, carcinogens that are also highly flammable require both particularly hazardous substance controls as well as fire safety controls. Contact the Office of Environment, Health & Safety (310-825-9797) for guidance on use of chemicals that may require further controls. Information and guidance on handling of particularly hazardous substances can also be found in UCLA's Chemical Hygiene Plan.

IV. RESPONSIBILITIES

Preventing workplace injuries, exposures, and illnesses is the responsibility of every member of the campus community. Specific responsibilities are assigned to more senior members of the research and teaching community in order to implement, and ensure compliance with this Policy by their subordinate personnel.

The Chancellor has overall responsibility for compliance with health and safety requirements at all facilities and programs under campus control.

The Vice Chancellor for Research is responsible for the implementation of this Policy in all applicable research and teaching laboratories within his or her jurisdiction.

The UCLA Laboratory Safety Committee (LSC) has a broad oversight role in overseeing research activities and is responsible for promoting a safe working environment in all research and teaching laboratories on campus, and for developing, updating and maintaining policies applicable to the health and safety of laboratory work.

Department Chairpersons are responsible for communicating, promoting and enforcing this Policy in their respective research and teaching areas.

Principal Investigators and laboratory management staff are responsible for complying with this Policy and ensuring their laboratory personnel receive appropriate training and comply with this Policy as it relates to their research and teaching activities.

All Laboratory Personnel working in laboratory areas are responsible for following laboratory safety requirements, including how to work safely with substances designated as particularly hazardous.

The UCLA Office of Environment, Health & Safety (EH&S) is responsible for inspection of laboratories and for campus compliance with this Policy. In cases where laboratory activities pose an immediate danger to life or health, designated EH&S staff have the responsibility and authority to order the temporary cessation of the activity until the hazardous condition is abated.

The UCLA Chemical Hygiene Officer (CHO), also referred to as the Chemical Safety Officer, is responsible for facilitating necessary reviews of procedures that involve the use of hazardous chemicals. The reviews of procedures should primarily be provided by subject experts as part of a departmental safety committee. The CHO, with the support of other EH&S Research Safety Experts, will support, and assist in the organization of, and provide annual oversight for this process.

V. LABORATORY SAFETY REQUIREMENTS & PROCEDURES

A. Laboratory Specific Standard Operating Procedures

1. Individual laboratory groups must prepare and maintain laboratory-specific standard operating procedures (SOP) for identifying hazards and handling methods to avoid exposure to particularly hazardous substances. The procedures must indicate the designated use areas, limitations on the quantities and procedures used, information on containments, and information on hazards involved. These procedures may be specific to particular

substances or generalized over a group of chemicals with similar hazardous properties and use limitations. Chemical-specific procedures must be developed for each Cal/OSHA regulated carcinogen and procedures should be developed for reproductive toxins, acutely toxic materials, and select carcinogens. EH&S can provide additional guidance for specific chemical hazards.

2. A copy of the particularly hazardous substances procedures, including laboratory specific information, and the Material Safety Data Sheets (MSDS) for the chemical(s) used must be readily accessible in the lab.

3 EH&S must be notified immediately via the EH&S Hotline at 310-825-9797 if members of the laboratory become ill or exhibit signs or symptoms associated with exposure to hazardous chemicals used in the laboratory. Affected employees must be provided immediate first aid and medical surveillance within 24-hours of the event.

4. Principal Investigators must identify what classes of particularly hazardous substances are in use in their labs on their Laboratory Hazard Assessment Tool (LHAT), which must be completed as conditions change in the laboratory, or at least once each calendar year.

B. Training and Documentation

1. All laboratory personnel who work with or may be exposed to particularly hazardous substances must be provided laboratory-specific training and information by the Principal Investigator or their designee prior to beginning their initial assignment. Laboratory-specific training should cover specific policies and procedures, etc. and is in addition to the basics covered in the Laboratory Safety Fundamental Concepts training. Records of laboratory-specific training must be maintained in the laboratory and should include an outline of the topics covered. See http://ehs.ucla.edu/LabTrainingRecord.pdf for a sample documentation form. Training shall include:
    - The hazards/toxicological effects associated with the chemicals being used.
    - Routine procedures and decontamination methods.
    - Emergency response practices and procedures.
    - Methods and observations for detecting the presence or release of hazardous chemicals.
    - Available protection measures, including appropriate work practices and personal protective equipment (PPE).
    - A review of written SOP and MSDSs and the Chemical Hygiene Plan (CHP).
    - A review of this Policy.
2. All laboratory personnel are responsible for knowing and complying with all safety guidelines, regulations, and procedures required for the task assigned and for reporting unsafe conditions, accidents or near misses to the Principal Investigator, immediate laboratory management staff or EH&S.
3. Continuing training shall be conducted as needed to maintain a working knowledge of hazards and the safety requirements for all laboratory personnel who work with particularly hazardous substances, including an annual refresher for particularly hazardous substances. Written records must be maintained for each training session. See http://ehs.ucla.edu/LabTrainingRecord.pdf for a sample documentation form.

C. Use in Designated Areas

1. Designated area(s) for use of particularly hazardous substances must be formally established by developing SOPs and posting appropriate signage. This designated area(s)

may be an entire laboratory, a specific work bench, or a chemical fume hood. When particularly hazardous substances are in use, access to the designated area shall be limited to personnel following appropriate procedures and who are trained in working with these chemicals.

2. Access to areas where particularly hazardous substances are used or stored must be controlled by trained employees. Working quantities of particularly hazardous substances should be kept as small as practical and their use should be physically contained as much as possible, usually within a laboratory fume hood or glove box. It is the responsibility of each Principal Investigator, or their designee, to train and authorize their staff for these operations and to maintain documentation of this training and authorization.
3. Signage is required for all containers, designated work areas and storage locations. Sign wording must state the following as appropriate for the specific chemical hazard:

   "DANGER, CANCER HAZARD – SUSPECT AGENT"

   "DANGER, CANCER HAZARD – REGULATED CARCINOGEN"

   "DANGER, REPRODUCTIVE TOXIN"

   "DANGER, ACUTE TOXIN"

   Entrances to designated work areas and storage locations must include signage, "AUTHORIZED PERSONNEL ONLY", in addition to the above specific hazard warning wording. Signage templates can be obtained from the UCLA Chemistry and Biochemistry safety webpage.
4. Work surfaces should be stainless steel, plastic trays, dry absorbent plastic backed paper, chemically resistant epoxy surfaces, or other chemically impervious material.
5. Protocols, procedures, and experiments must be designed and performed in a manner to safely maintain control of the particularly hazardous substances. Laboratory personnel must specifically consult with their Principal Investigators if a special hazard is involved (e.g., material under pressure) or if they are uncertain of the potential hazards.

D. Personal Protective Equipment (PPE)

1. PPE must be sufficient to protect eyes and skin from contact with the hazardous agents. At minimum, safety glasses, lab coat, long pants, closed toe shoes, and gloves are required when working with particularly hazardous substances. See UCLA Policy 905, Research Laboratory Personal Safety and Protective Equipment for more information. Goggles may be required for processes in which a splash or spray hazard may exist and flame resistant lab coats may be required if the chemicals being used are flammable.
2. Refer to the specific chemical's MSDS and SOP for specific information on additional PPE and glove selection.
3. Contaminated PPE and clothing must be disposed of or decontaminated prior to removal from the designated work area. While small spots of contamination may be cleaned in the lab, grossly contaminated lab coats may need to be disposed of as dry hazardous waste. Refer to UCLA Policy 905 and the Chemical Hygiene Plan for guidance on handling contaminated protective apparel and other PPE.

E. Engineering Controls

1. Bench top work with particularly hazardous substances should be avoided whenever practical in favor of contained systems (such as fume hoods or glove boxes) and is not permitted if there is a reasonable likelihood of workers exceeding regulatory exposure limits. For questions regarding exposure limits and for assistance in conducting a hazard assessment for uncontained procedures, contact the EH&S Hotline at 310-825-9797.
2. Laboratories and rooms where particularly hazardous substances are used outside of containment systems must have general room ventilation that is maintained at negative pressure with respect to public areas. Air from these ventilation systems must be vented externally; recirculation is not permitted. Doors providing access from public areas must be kept closed.

F. Special Handling & Storage Requirements

1. Particularly hazardous substances must be stored in a designated area and used in a manner that will minimize the risk of accidental release (e.g., capped tightly, use of chemical resistant secondary containment, whenever possible). Laboratory personnel should remove chemicals from storage only as needed and return them to storage as soon as practical.
2. Chemicals should be segregated from incompatible materials, as described in the UCLA Chemical Hygiene Plan. The use of particularly hazardous substances must be confined to an established designated area (see C. Use in Designated Areas, above).
3. Additional requirements for the safe storage of a specific chemical may be found in the manufacturer's instructions or in the MSDS.
4. When transporting chemicals beyond the immediate laboratory environment, containers should be protected from breakage by using a bottle carrier or other effective containment.
5. Contact the EH&S Hotline at 310-825-9797 for guidance on the planned use of chemicals that may require further controls.

G. Spill & Accident Procedures

1. Immediate measures must be available to prevent the possible spread of contamination in the event of a small spill of a particularly hazardous substance. Absorbent materials and clean up materials should be available in all laboratories sufficient to contain and decontaminate individuals and equipment and areas. Any known spills must be contained and decontaminated as soon as possible.
2. In the event of a large spill that is beyond a laboratory group's immediate response capabilities, the following procedures should be followed:
    a. Evacuate the area immediately.
    b. Restrict access to the affected areas to emergency responders and post signage and barriers as needed to prevent unauthorized entry.
    c. Contact EH&S Hazmat immediately for response and remediation. Call 911 from a UCLA campus phone, or (310) 825-1491 from a cell phone (to UCPD) as needed.
3. In the event of direct skin contact with a particularly hazardous substance, the affected person must shower or flush the affected areas for a minimum of 15 minutes. Whenever personal contamination occurs, the event must be reported to EH&S at (310-825-9797) and an incident report will be completed and maintained by EH&S.

4. If the spill involves acutely toxic materials, the spill should be treated as a large spill if there is any doubt about the group's ability to safely mitigate the spill.
5. If the spill involves regulated carcinogens, a Report of Use may need to be filed (see J. Regulated Carcinogens and Report of Use Requirements, below).

H. Routine Decontamination Procedures

1. To limit the spread of contamination, laboratory work surfaces should be decontaminated at the conclusion of each procedure and at the end of each day on which particularly hazardous substances are used.
2. All equipment should be decontaminated before removing it from the designated area; this decontamination should be carried out in a glove box or fume hood where practical.
3. Contaminated PPE must not be removed from the designated area until properly decontaminated; refer to UCLA Policy 905 and the Chemical Hygiene Plan for guidance on the cleaning of protective apparel and other PPE. After working with these chemicals, gloves must immediately be removed and disposed of as hazardous waste and hands and arms washed with soap and water.

I. Waste Disposal Procedures

1. Disposal of waste materials that include particularly hazardous substances must comply with the hazardous chemical waste disposal procedures found in the Laboratory Safety Manual.
2. In addition to general hazardous waste labeling requirements, waste containers containing particularly hazardous substances must also be labeled as appropriate for the specific chemical hazard:

   "DANGER, CANCER HAZARD – SUSPECT AGENT"

   "DANGER, CANCER HAZARD – REGULATED CARCINOGEN"

   "DANGER, REPRODUCTIVE TOXIN"

   "DANGER, ACUTE TOXIN"

   Signage templates can be obtained from the UCLA Chemistry and Biochemistry safety webpage.
3. All non-radioactive chemical waste must be disposed of through the UCLA Hazardous Chemical Waste Program. Mixed wastes of hazardous chemicals and radioactive material are disposed of through the Radiation Safety Department. Due to regulatory restrictions and the high cost of disposal, the Radiation Safety Department should be contacted prior to producing mixed wastes.

J. Regulated Carcinogens and Report of Use Requirements

1. Regulated carcinogens are a specific subset of select carcinogens which have special additional requirements associated with their use under certain circumstances. See Attachment B for the specific list. EH&S maintains an air sampling program to monitor individuals to determine if they are, or may reasonably be expected to, exceed short or long term exposure limits. Every effort should be made to keep exposure levels below these limits by using fume hoods, limiting the quantities used, and following SOP designed to

reduce exposure. If levels cannot be kept below these levels, additional requirements may include:

- Required medical evaluations.
- Additional documented training.
- Use of respirators with required initial and ongoing training, medical evaluations, and maintenance documentation.
- Additional documented hazard evaluations.

2. Listed carcinogens are a further subset of regulated carcinogens. See Attachment C for the specific list. The use of these materials must be registered with EH&S through the Laboratory Hazard Assessment Tool or other equivalent EH&S approved process. An evaluation will be completed to assess safety requirements for groups that use these materials.

   Report of Use Requirements must be met for each group when they:

   - Begin the use of, or make significant changes to existing use of any listed carcinogen.
   - Use regulated carcinogens such that there is a reasonable expectation that exposure limits may be exceeded.
   - In the event of an emergency in which employees have been exposed to any regulated carcinogen.

VI. ATTACHMENTS

A. Particularly Hazardous Substances Definitions

B. Regulated Carcinogens

C. Listed Carcinogens

Issuing Officer

/s/ James S. Economou

Vice Chancellor for Research

Questions concerning this policy or procedure should be referred to the Responsible Department listed at the top of this document.

A T T A C H M E N T A

Particularly Hazardous Substances Definitions

Particularly hazardous substances fall into the following three major categories: acute toxins, reproductive toxins and carcinogens.

Section 1.01 Acute Toxins

Substances that have a high degree of acute toxicity are substances that may be fatal or cause damage to target organs as the result of a single exposure or exposures of short duration. They can be defined as:

1. A chemical with a median lethal dose (LD50) of 50 mg or less per Kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each;
2. A chemical with a median lethal dose (LD50) of 200 mg or less per Kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 Kg each; and
3. A chemical that has a median lethal concentration (LC50) in air of 5000 ppm by volume or less of gas or vapor, or 50 mg per liter or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 gm each.

Section 1.02 Reproductive Toxins

Reproductive toxins include any chemical that may affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). A list of reproductive toxins is maintained online at http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html#files.

Section 1.03 Carcinogens

Carcinogens are chemical or physical agents that cause cancer. Generally, they are chronically toxic substances; that is, they cause damage after repeated or long-duration exposure, and their effects may only become evident after a long latency period.

The term “regulated carcinogen” means a recognized cancer causing substance, compound, mixture, or product regulated by Cal/OSHA sections 1529, 1532, 1532.2, 1535, 8358, 8359 or Article 110, sections 5200-5220. *See Attachment B for the specific list of Regulated Carcinogens*.

The term “Listed Carcinogen” refers to a specific list of 13 chemicals regulated by Cal/OSHA and Federal OSHA and has specific use and handling requirements. *See Attachment C for the specific list of Listed Carcinogens.*

The term “select carcinogen” refers to a category of chemicals where the available evidence strongly indicates that the substances cause human carcinogenicity. A select carcinogen meets one of the following criteria:

1. It is regulated by Cal/OSHA as a carcinogen; or
2. It is listed under the category “known to be carcinogens” in the annual report by the National Toxicology Program (NTP); or
3. It is listed under Group 1 – “carcinogenic to humans” – by the International Agency for Research on Cancer (IARC); or

4. It is listed in either Group 2A or Group 2B by the IARC or under the category “reasonably anticipated to be carcinogens” by the NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
   a. After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

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

   c. After oral dosages of less than 50 mg/kg of body weight per day.

A T T A C H M E N T B

Regulated Carcinogens

The term “regulated carcinogen” means a recognized cancer causing substance, compound, mixture, or product regulated by Cal/OSHA sections 1529, 1532, 1532.2, 1535, 8358, 8359 or Article 110, sections 5200-5220. For more information, see UCLA Policy 907.

- Acrylonitrile
- Arsenic metal and inorganic arsenic compounds
- Asbestos
- Benzene
- 1,3-butadiene
- Cadmium metal and cadmium compounds
- Chromium(VI) compounds
- Coke Oven Emissions
- 1,2-Dibromo-3-chloropropane (DBCP)
- Ethylene Dibromide (EDB)
- Ethylene Oxide (EtO)
- Formaldehyde gas and formaldehyde solutions
- Lead metal and inorganic lead compounds
- Methylene Chloride
- 4,4'-Methylene bis(2-chloroaniline) (MBOCA)
- Methylenedianiline (MDA)
- Vinyl Chloride
- 2-Acetylaminofluorene
- 4-Aminodiphenyl
- Benzidine (and its salts)
- 3,3'-Dichlorobenzidine(and its salts)
- 4-Dimethylaminoazobenzene
- alpha-Naphthylamine
- beta-Naphthylamine
- 4-Nitrobiphenyl
- N-Nitrosodimethylamine
- beta-Propiolactone
- bis-Chloromethyl ether
- Methyl chloromethyl ether
- Ethyleneimine

A T T A C H M E N T C

Listed Carcinogens

The term “listed carcinogen” refers to a specific list of 13 chemicals regulated by Cal/OSHA and Federal OSHA and has specific use and handling requirements. For more information, see UCLA Policy 907.

- 2-Acetylaminofluorene
- 4-Aminodiphenyl
- Benzidine (and its salts)
- 3,3'-Dichlorobenzidine(and its salts)
- 4-Dimethylaminoazobenzene
- alpha-Naphthylamine
- beta-Naphthylamine
- 4-Nitrobiphenyl
- N-Nitrosodimethylamine
- beta-Propiolactone
- bis-Chloromethyl ether
- Methyl chloromethyl ether
- Ethyleneimine

THIS PAGE INTENTIONALLY LEFT BLANK.

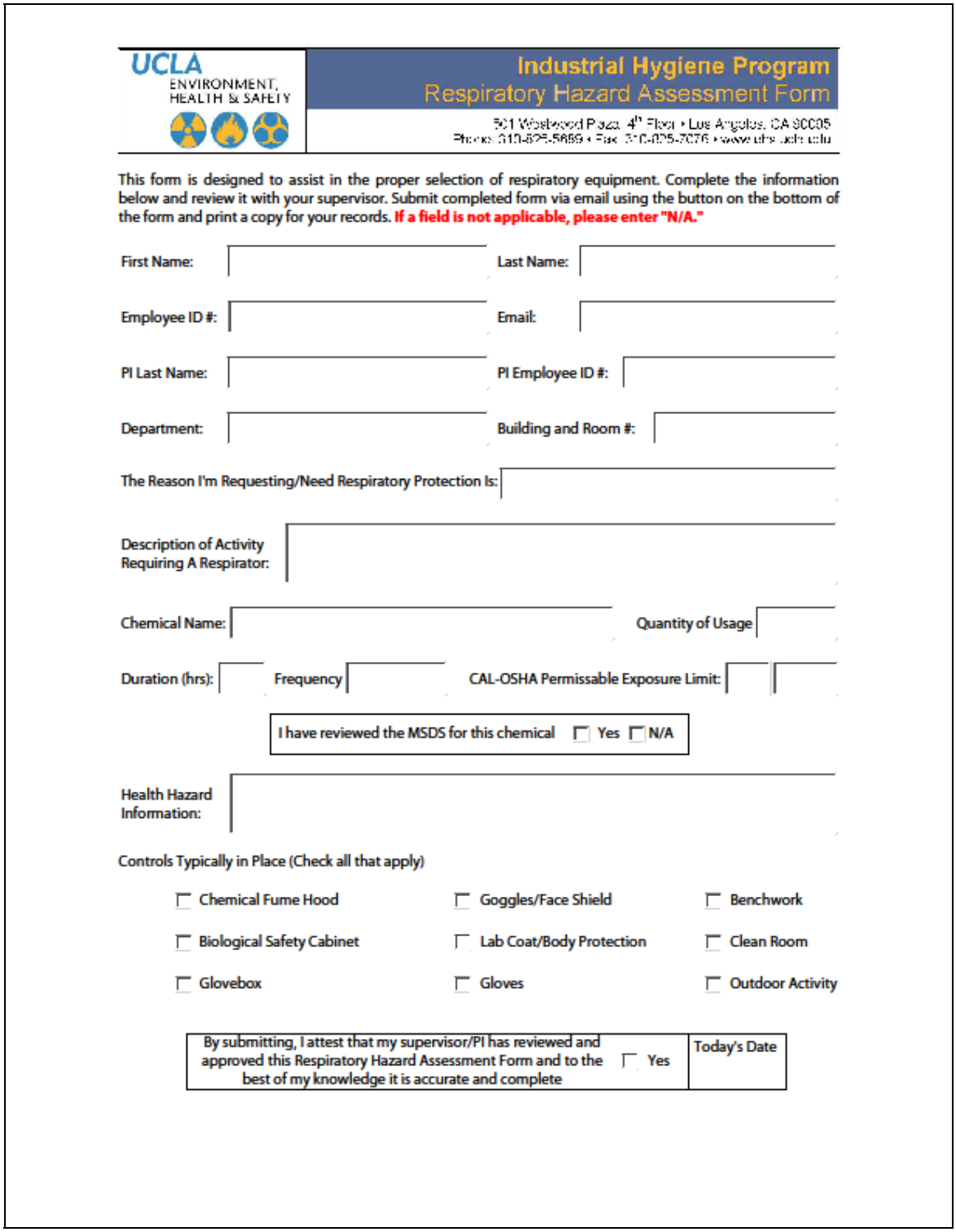
Appendix F: Regulated Carcinogens

Cal/OSHA Regulated Carcinogens fall into a higher hazard class and have extensive additional requirements associated with them. The use of these agents may require personal exposure sampling based on usage. The following is the list of Cal/OSHA Regulated Carcinogens.

Cal/OSHA Regulated Carcinogens		
Acrylonitrile	Arsenic (Inorganic)	Ethylene Oxide (EtO)
(MBOCA)	Asbestos	Ethyleneimine
1,2-Dibromo-3-chloropropane (DBCP)	Benzene	Formaldehyde
1,3-butadiene	Benzidine (and its salts)	Lead
2-Acetylaminofluorene	Beta-Naphthylamine	Methyl chloromethyl ether
3,3'-Dichlorobenzidine(and its salts)	Beta-Propiolactone	Methylene Chloride
4,4'-Methylene bis(2-chloroaniline)	Bis-Chloromethyl ether	Methylenedianiline (MDA)
4-Aminodipheny	Cadmium	N-Nitrosodimethylamine
4-Dimethylaminoazobenzene	Chromium (VI)	Non Asbestiform Tremolite, Anthophyllite, and Actinolite
4-Nitrobiphenyl	Coke Oven Emissions	Vinyl Chloride
Alpha-Naphthylamine	Ethylene Dibromide (EDB)	

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix G: Respiratory Hazard Assessment Form



UCLA ENVIRONMENT, HEALTH & SAFETY

Industrial Hygiene Program
Respiratory Hazard Assessment Form

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5669 • Fax: 310-825-7076 • www.ehs.ucla.edu

This form is designed to assist in the proper selection of respiratory equipment. Complete the information below and review it with your supervisor. Submit completed form via email using the button on the bottom of the form and print a copy for your records. **If a field is not applicable, please enter "N/A."**

First Name: | Last Name:

Employee ID #: | Email:

PI Last Name: | PI Employee ID #:

Department: | Building and Room #:

The Reason I'm Requesting/Need Respiratory Protection Is:

Description of Activity Requiring A Respirator:

Chemical Name: | Quantity of Usage

Duration (hrs): | Frequency | CAL-OSHA Permissable Exposure Limit:

I have reviewed the MSDS for this chemical ☐ Yes ☐ N/A

Health Hazard Information:

Controls Typically in Place (Check all that apply)

☐ Chemical Fume Hood	☐ Goggles/Face Shield	☐ Benchwork
☐ Biological Safety Cabinet	☐ Lab Coat/Body Protection	☐ Clean Room
☐ Glovebox	☐ Gloves	☐ Outdoor Activity

By submitting, I attest that my supervisor/PI has reviewed and approved this Respiratory Hazard Assessment Form and to the best of my knowledge it is accurate and complete ☐ Yes | Today's Date

Obtain this form online at: *http://map.ais.ucla.edu/go/1004655*.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix H: Peroxide Forming Chemicals Common to Research

Class 1 PFCs

Class 1 chemicals form peroxides after prolonged storage. The chemicals listed below should be tested for the formation of peroxides on a periodic basis. Several methods are available to check for peroxides; the two most common are the use of peroxide test strips or the potassium iodide test.

Class 1 PFCs		
Isopropyl ether	Potassium amide	Vinylidene chloride
Divinyl acetylene	Potassium metal	
Divinyl ether	Sodium amide	

Class 2 PFCs

This group of chemicals will readily form peroxides when they become concentrated (e.g., via evaporation or distillation). The concentration process defeats the action of most auto-oxidation inhibitors. As a result, these chemicals should be disposed of within12 months of receiving.

Class 2 PFCs		
Acetal	Diethylether	Methyl isobutyl ketone
Cumene	Dioxane	Tetrahydrofuran
Cyclohexene	Ethylene glycol dimethyl ether	Tetrahydronaphthalene
Cyclopentene	Furan	Vinyl ethers
Diacetylene	Methylacetylene	
Dicyclopentadiene	Methylcyclopentane	

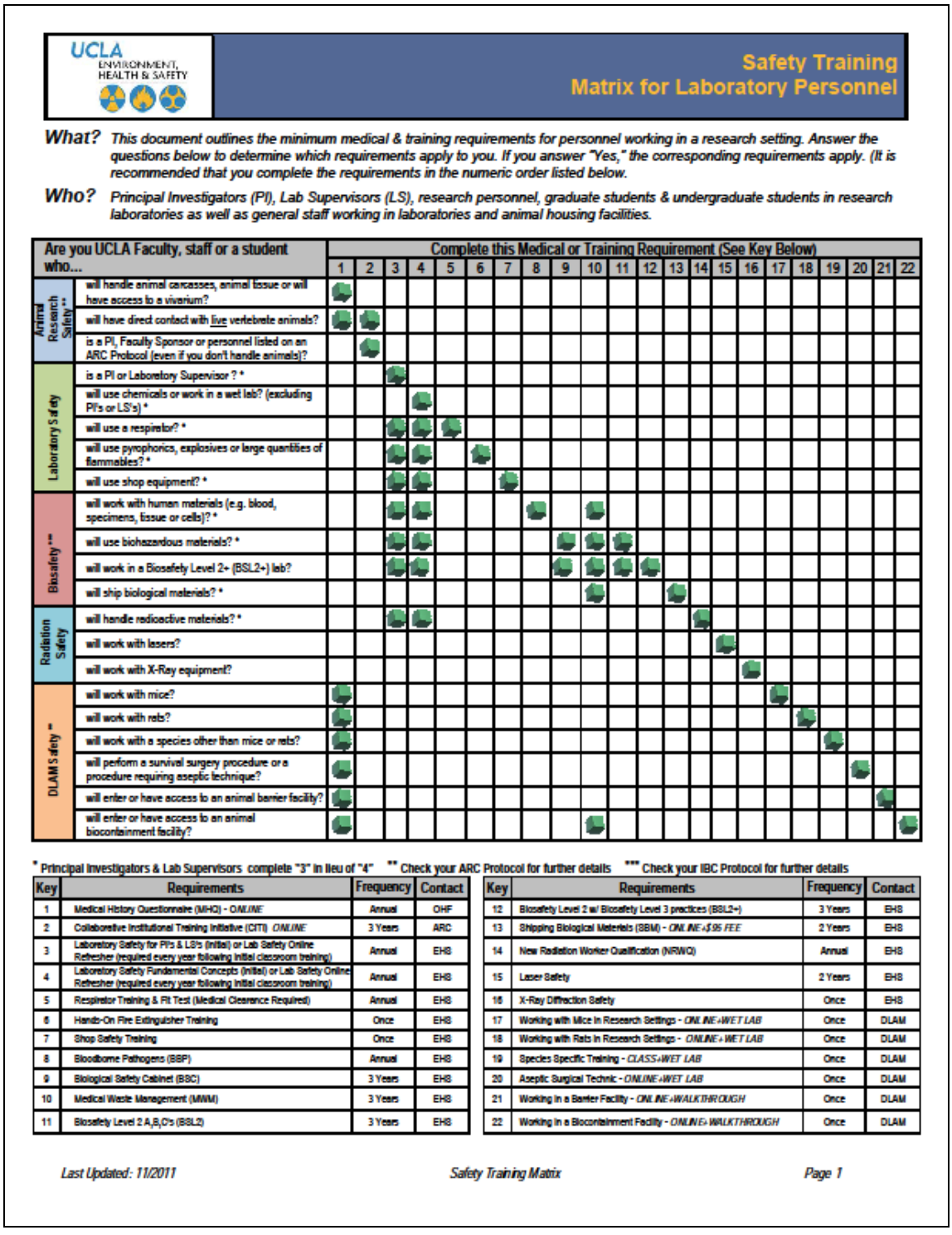
Class 3 PFCs

This group of chemicals forms peroxides due to initiation of polymerization. When stored in a liquid state, the peroxide forming potential dramatically increases. These chemicals should be disposed of if they become degraded or are no longer needed.

Class 3 PFCs		
Acrylic acid	Chlorotrifluoroethylene	Vinyl acetate
Acrylonitrile	Methyl methacrylate	Vinyl acetylene Vinyl chloride
Butadiene	Styrene	Vinyl pyridine
Chlorobutadiene	Tetrafluoroethylene	Vinylidene chloride

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix I: EH&S Safety Training Matrix for Laboratory Personnel



UCLA ENVIRONMENT, HEALTH & SAFETY

Safety Training Matrix for Laboratory Personnel

What? *This document outlines the minimum medical & training requirements for personnel working in a research setting. Answer the questions below to determine which requirements apply to you. If you answer "Yes," the corresponding requirements apply. (It is recommended that you complete the requirements in the numeric order listed below.*

Who? *Principal Investigators (PI), Lab Supervisors (LS), research personnel, graduate students & undergraduate students in research laboratories as well as general staff working in laboratories and animal housing facilities.*

Are you UCLA Faculty, staff or a student who...		Complete this Medical or Training Requirement (See Key Below)																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Animal Research Safety **	will handle animal carcasses, animal tissue or will have access to a vivarium?	●																					
	will have direct contact with live vertebrate animals?	●	●																				
	is a PI, Faculty Sponsor or personnel listed on an ARC Protocol (even if you don't handle animals)?		●																				
Laboratory Safety	is a PI or Laboratory Supervisor ? *			●																			
	will use chemicals or work in a wet lab? (excluding PI's or LS's) *				●																		
	will use a respirator? *			●	●	●																	
	will use pyrophorics, explosives or large quantities of flammables? *			●	●		●																
	will use shop equipment? *			●	●			●															
Biosafety ***	will work with human materials (e.g. blood, specimens, tissue or cells)? *			●	●				●		●												
	will use biohazardous materials? *			●	●					●	●	●											
	will work in a Biosafety Level 2+ (BSL2+) lab?			●	●					●	●	●	●										
	will ship biological materials? *										●			●									
Radiation Safety	will handle radioactive materials? *			●	●										●								
	will work with lasers?															●							
	will work with X-Ray equipment?																●						
DLAM Safety **	will work with mice?	●																●					
	will work with rats?	●																	●				
	will work with a species other than mice or rats?	●																		●			
	will perform a survival surgery procedure or a procedure requiring aseptic technique?	●																			●		
	will enter or have access to an animal barrier facility?	●																				●	
	will enter or have access to an animal biocontainment facility?	●									●												●

* Principal Investigators & Lab Supervisors complete "3" in lieu of "4" ** Check your ARC Protocol for further details *** Check your IBC Protocol for further details

Key	Requirements	Frequency	Contact
1	Medical History Questionnaire (MHQ) - *ONLINE*	Annual	OHF
2	Collaborative Institutional Training Initiative (CITI) *ONLINE*	3 Years	ARC
3	Laboratory Safety for PI's & LS's (Initial) or Lab Safety Online Refresher (required every year following initial classroom training)	Annual	EHS
4	Laboratory Safety Fundamental Concepts (Initial) or Lab Safety Online Refresher (required every year following initial classroom training)	Annual	EHS
5	Respirator Training & Fit Test (Medical Clearance Required)	Annual	EHS
6	Hands-On Fire Extinguisher Training	Once	EHS
7	Shop Safety Training	Once	EHS
8	Bloodborne Pathogens (BBP)	Annual	EHS
9	Biological Safety Cabinet (BSC)	3 Years	EHS
10	Medical Waste Management (MWM)	3 Years	EHS
11	Biosafety Level 2 A,B,C's (BSL2)	3 Years	EHS

Key	Requirements	Frequency	Contact
12	Biosafety Level 2 w/ Biosafety Level 3 practices (BSL2+)	3 Years	EHS
13	Shipping Biological Materials (SBM) - *ONLINE+$95 FEE*	2 Years	EHS
14	New Radiation Worker Qualification (NRWQ)	Annual	EHS
15	Laser Safety	2 Years	EHS
16	X-Ray Diffraction Safety	Once	EHS
17	Working with Mice in Research Settings - *ONLINE+WET LAB*	Once	DLAM
18	Working with Rats in Research Settings - *ONLINE+WET LAB*	Once	DLAM
19	Species Specific Training - *CLASS+WET LAB*	Once	DLAM
20	Aseptic Surgical Technic - *ONLINE+WET LAB*	Once	DLAM
21	Working in a Barrier Facility - *ONLINE+WALKTHROUGH*	Once	DLAM
22	Working in a Biocontainment Facility - *ONLINE+WALKTHROUGH*	Once	DLAM

Last Updated: 11/2011 *Safety Training Matrix* *Page 1*

Obtain this matrix on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix J: Employee Training History

UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety
Employee Training History

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5689 • Fax: 310-825-7076 • www.ehs.ucla.edu

For each laboratory employee, use this document to maintain a history of safety training completed. Be sure to include site-specific training, EH&S training and any off-campus training. Refer to the Laboratory Safety Manual and the Safety Training Curriculum for Laboratory Personnel for direction on the required training topics. This documentation is to be maintained in the Laboratory Safety Manual.

Employee Name: _____ **Supervisor:** _____

Assigned Laboratories: _____ _____

Each laboratory employee must be made aware of the location and content of the *Laboratory Safety Manual*. By your signature below, you acknowledge that you have read and understood the contents of the manual, and know how to access it in the laboratory.

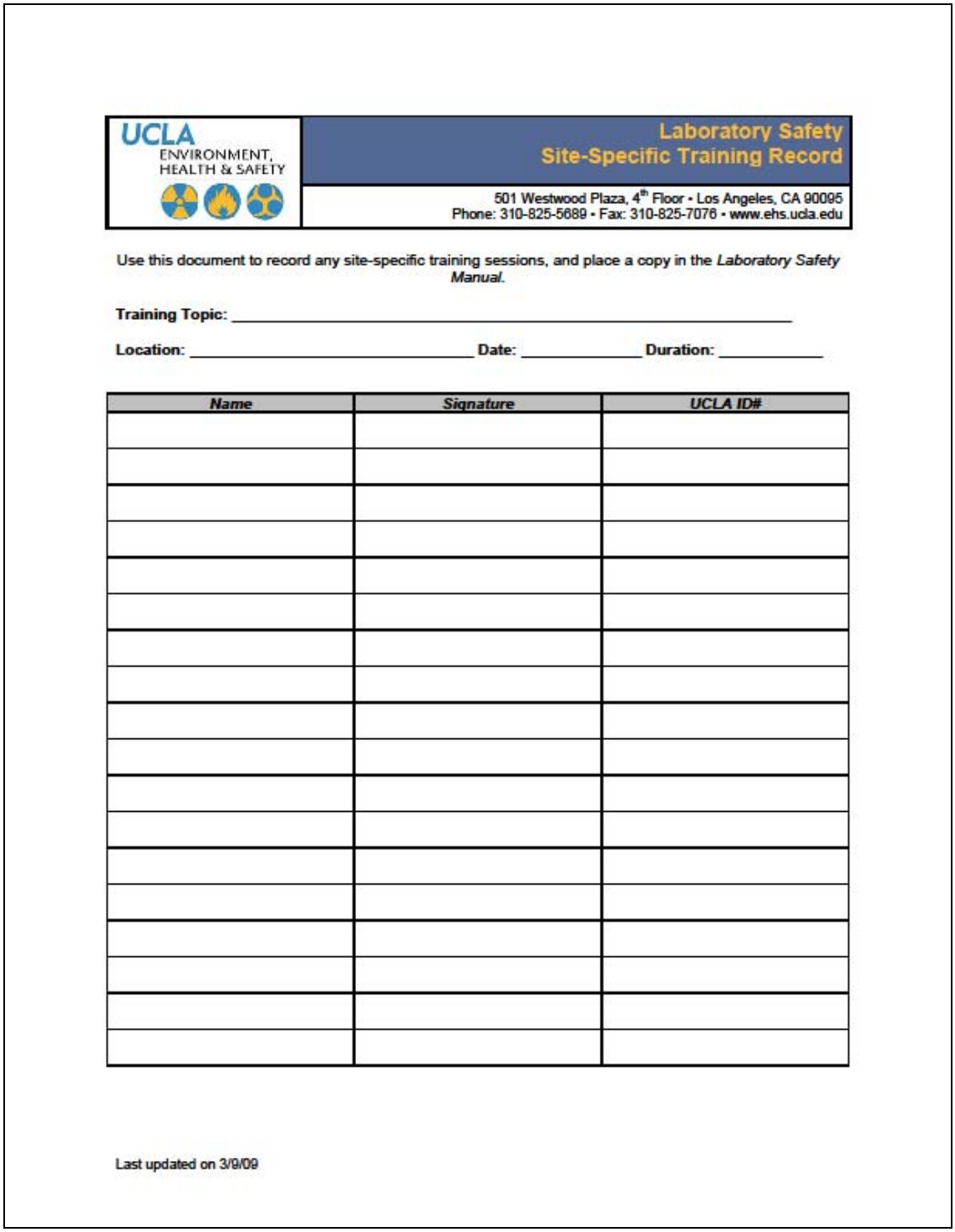
Employee Signature: _____ Date: _____

Title or Description of Training	*Provided By:*	*Date*

Obtain this form on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix K: Site-Specific Training Record



UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety
Site-Specific Training Record

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5689 • Fax: 310-825-7076 • www.ehs.ucla.edu

Use this document to record any site-specific training sessions, and place a copy in the *Laboratory Safety Manual*.

Training Topic: _____

Location: _____ **Date:** _____ **Duration:** _____

Name	*Signature*	*UCLA ID#*

Last updated on 3/9/09

Obtain this form on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix L: Laboratory Inspection Checklist

UCLA ENVIRONMENT, HEALTH & SAFETY

Laboratory Safety
Laboratory Inspection Checklist

501 Westwood Plaza, 4th Floor • Los Angeles, CA 90095
Phone: 310-825-5689 • Fax: 310-825-7076 • www.ehs.ucla.edu

Date	

Lab Information	
Department	
Principal investigator (PI)	
PI telephone number	
PI email address	
Building	
Lab room numbers	
Lab Safety contact person	
Lab Safety contact telephone number	
Lab Safety contact email address	
Lab phone number	

☐ Radiation	☐ Biosafety 2 or greater	☐ Lasers	☐ Animals

Chemical Types Present			
☐	Particularly Hazardous Substances (select carcinogens, acute toxins, reproductive toxins)	☐	Flammables
☐	Regulated carcinogens	☐	Explosives
☐	Pyrophorics	☐	Peroxide Formers
☐	Water Reactives	☐	Corrosives

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Personnel Information		
First Name	Last Name	UID

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Laboratory Inspection Checklist, cont.

Inspection Information	
Inspector	
Inspector email address	
Accompanied by	

Documentation & Training					
1	0	C	N/A	Inspected	Comments
○	○		○	Lab Safety Manual accessible to all laboratory personnel	
○	○		○	Hazard Assessment Tool updated and located inside Lab Safety Manual	
○	○		○	Initial EH&S Safety training documented	
○	○		○	Lab Specific Safety training documented and sufficient to cover lab operations	
○	○		○	Initial and annual training for respirator users	
○	○		○	Documented Hazardous Waste Handling Training	
○	○		○	Documented Fire Safety Training	
○	○		○	Laboratory accidents documented	

Hazard Communication					
1	0	C	N/A	Inspected	Comments
○		○	○	MSDS accessible (i.e., hard copy or on-line)	
○	○		○	MSDS location known to each employee	
○	○		○	SOP available (experiment/equipment/ hazardous activity)	
○	○		○	Containers labeled with contents (full name, hazard warning, and date; no conflicting labels)	
○	○		○	Current chemical inventory accessible	
○	○		○	Chemical storage cabinets labeled (i.e., corrosives, flammables, etc…)	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this form on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Emergency & Safety Information					
1	0	C	N/A	Inspected	Comments
○		○	○	Emergency assistance information posted in lab	
○	○		○	NFPA fire diamond posted	
○	○		○	NFPA fire diamond updated with current occupants & emergency contacts	

Fire Safety					
1	0	C	N/A	Inspected	Comments
○	○		○	Storage clearance from ceiling: 18" with sprinklers, 24" without sprinklers	
○		○	○	Fire extinguisher present/charged/accessible/tag updated; signage clearly visible	

General Safety					
1	0	C	N/A	Inspected	Comments
○	○		○	Exits/aisles/corridors are not blocked (24" minimum width)	
○	○		○	Laboratory doors kept closed	
○		○	○	Approved safety shower & eyewash station accessible within 10 seconds (travel distance no greater than 100 feet)	
○	○		○	Emergency shower / Eyewash Station inspected monthly	
○		○	○	Clearance area around safety shower at least 16" in each direction. Signage clearly visible.	
○	○		○	First-aid kit present, stocked and without expired products	
○	○		○	Chemical spill material or kit available, spill procedures known to staff	
○	○		○	Gas cylinders secured upright with double chains to a stable structure (i.e., wall or with clam shell/frame casing.)	
○	○		○	Gas cylinder valve protection cap in place when not in use	
○	○		○	Refrigerators/freezers labeled with food and drink specifications	
○	○		○	Sink available for hand washing	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Laboratory Inspection Checklist, cont.

General Safety					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Engineering controls functional	

Personal Protective Equipment (PPE)					
1	0	C	N/A	Inspected	Comments
◯		◯	◯	Closed-toe shoes and long pants worn by laboratory personnel as required by campus PPE policy	
◯		◯	◯	Lab coats worn as required by campus PPE policy	
◯		◯	◯	Gloves worn as required by campus PPE policy	
◯		◯	◯	Eye protection worn as required by campus PPE policy (Goggles must be worn for procedures involving chemical splashes)	
◯	◯		◯	Adequate supply of specialty PPE available (i.e. UV/IR glasses, face shields, lab aprons, cryogenic gloves)	
◯	◯		◯	PPE contaminated with hazardous materials disposed of as Haz Waste	

Housekeeping					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	No food or drink in lab areas	
◯		◯	◯	Secondary containment provided for floor storage of glass bottles that contain chemicals.	
◯	◯		◯	Minimal glassware on bench top	
◯	◯		◯	Minimal glassware in sink	
◯	◯		◯	Minimal glassware in fume hood	
◯	◯		◯	Proper waste disposal of sharps (broken glass, pipettes, needles, razors, etc)	
◯	◯		◯	Sharps containers less than ¾ full	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Laboratory Inspection Checklist, cont.

Chemical Storage and Compatibility					
1	0	C	N/A	Inspected	Comments
◯		◯	◯	Less than 10 gallons of flammables located outside flammable storage cabinet	
◯		◯	◯	Maximum of 60 gallons flammable liquids per flammable storage cabinet, maximum of 3 flammable storage cabinets per lab/fire area.	
◯	◯		◯	Flammable storage refrigerator/freezer approved and labeled	
◯	◯		◯	Minimal acids stored outside corrosive cabinet	
◯	◯		◯	Strong acids and strong bases stored in secondary containers	
◯	◯		◯	Incompatible materials properly segregated	
◯	◯		◯	Chemicals stored safely (e.g. seismic restraints, etc.)	
◯	◯		◯	Combustible materials not stored with flammable chemicals	
◯	◯		◯	Chemical storage cabinets clearly labeled (i.e. flammables, corrosives, etc.)	
◯	◯		◯	Chemical containers in good condition	
◯	◯		◯	Corrosive chemicals stored below eye level	
◯		◯	◯	Ethers and other peroxide formers dated	
◯		◯	◯	Water reactive chemicals segregated, contained, and labeled	
◯		◯	◯	Carcinogens segregated and stored in designated areas.	
◯		◯	◯	Pyrophoric chemicals segregated, contained, and labeled	

Fume Hoods					
1	0	C	N/A	Inspected	Comments
◯		◯	◯	Certified within one year	
◯	◯		◯	Proper sash height indicated	
◯	◯		◯	Sash at or below marked approval level	
◯	◯		◯	Sash stoppers functional where present	
◯	◯		◯	Hood illumination functional	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Laboratory Inspection Checklist, cont.

Fume Hoods					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Audible/visual alarm functional	
◯		◯	◯	Minimal clutter in hood (equipment, chemicals)	
◯	◯		◯	Functional fume hood not used for storage	

Biosafety Cabinets					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Certified within one year	

Chemical Waste Disposal and Transport					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Safety cans available and labeled for disposal of solvents	
◯	◯		◯	Containers available and labeled for disposal of hazardous waste	
◯		◯	◯	Waste manifests or tags attached to waste cans, containers	
◯	◯		◯	Chemical waste containers in good condition and kept closed (i.e. no funnels in place)	
◯	◯		◯	Sturdy cart available for transport of hazardous waste as needed	
◯	◯		◯	Hazardous waste in secondary containment	
◯	◯		◯	Designated hazardous waste storage areas	
◯	◯		◯	Chemical waste disposed when full or within 90 days, whichever is sooner	
◯	◯		◯	Dry hazardous waste double-bagged in transparent bags	
◯	◯		◯	Hazardous chemicals/materials not found in regular trash.	

Seismic Safety					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Shelving and file cabinets 5' or over anchored/bolted	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Seismic Safety					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Storage shelves have seismic restraints (e.g. lips, bars, bungee cords)	
◯	◯		◯	High overhead storage is secured	
◯	◯		◯	Heavy items stored on lower shelves	

Mechanical and Electrical Safety					
1	0	C	N/A	Inspected	Comments
◯	◯		◯	Moveable parts guarded on equipment as appropriate	
◯	◯		◯	Electric panel accessible	
◯	◯		◯	Nothing posted on electric panel	
◯		◯	◯	Plugs, cords, outlets in good condition	
◯		◯	◯	No overloaded outlets, no daisy-chained power strips	
◯	◯		◯	Extension cords only present for immediate use and do not pose trip hazards (i.e., taped down, covered)	
◯	◯		◯	Power strips secured off the floor and away from liquids	
◯	◯		◯	No power cords found under doors, carpets, or through ceilings	

Explanation of Ratings
1: Compliant • 0: Non compliant/not acceptable • N/A: Not applicable • *Denotes Administrative Deficiency
C: Critical violation that must be corrected within 48 hours or less, depending on severity of violation

Obtain this checklist on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

Appendix M: Segregation of Incompatible Chemicals

Table M.1 contains a list of incompatible chemicals. The following chemicals, listed in the left column, should not be used with chemicals listed in the right column, except under specially controlled conditions. Chemicals in the left column should not be stored in the immediate area with chemicals in the right column. Incompatible chemicals should always be handled, stored or packed so that they cannot accidentally come into contact with one another. This list is representative of chemical incompatibilities and is not complete, nor are all incompatibilities shown.

Table M.1 – Incompatible Chemicals

Chemical	Keep Out of Contact with:
Alkaline metals, such as powdered aluminum, magnesium, sodium, potassium, etc.	Carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide and water
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides and permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver and mercury
Ammonia	Mercury, chlorine, calcium hypochlorite, iodine, bromine and hydrofluoric acid
Ammonium nitrate	Acids, metal powders, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Carbon, activated	Calcium hypochlorite
Copper	Acetylene and hydrogen peroxide
Chromic acid	Acetic acid, naphthalene, camphor, glycerin, turpentine, alcohol and flammable liquids
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane, hydrogen, sodium carbide, turpentine, benzene and finely divided metals
Cyanides	Acids - organic or inorganic
Hydrogen peroxide	Copper, chromium, iron, most metals, alcohols, acetone, organic materials, aniline, nitromethane, flammable liquids and combustible materials
Hydrogen sulfide	Fuming nitric acid and oxidizing gases
Hydrocarbons (butane, propane, benzene, gasoline, turpentine etc.)	Fluorine, chlorine, bromine, chromic acid and sodium peroxide
Iodine	Acetylene, ammonia and hydrogen
Nitric acid	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass and any heavy metals
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, ether, oils and grease
Phosphorous	Oxidizing agents, oxygen, strong bases
Potassium chlorate	Sulfuric and other acids
Potassium permanganate	Glycerin, ethylene glycol, benzaldehyde and sulfuric acid
Sodium	Carbon tetrachloride, carbon dioxide and 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 and furfural
Sulfides, inorganic	Acids Sulfuric acid Potassium chlorate, potassium perchlorate and potassium permanganate

Special Segregation of Incompatible Chemicals

In addition to the segregation noted in Table M.1, dangerously incompatible substances, even in small quantities, should not be stored next to each other on shelves or in such a position that accidental rupture of containers may allow mixing. Table M.2 contains examples of dangerously incompatible substances. Table M.3 contains examples of incompatible oxidizing agents and reducing agents.

Table M.2 – Dangerously Incompatible Substances

Chemical	Keep out of contact with:
Chlorine	Acetylene
Chromic acid	Ethyl alcohol
Oxygen (compressed, liquefied)	Propane
Sodium	Chloroform and aqueous solutions
Nitrocellulose (wet, dry)	Phosphorous
Potassium permanganate	Sulfuric acid
Perchloric acid	Acetic acid
Sodium chlorate	Sulfur in bulk

Table M.3 – Incompatible Oxidizing Agents and Reducing Agents

Oxidizing Agents	Reducing Agents
Chlorates	Ammonia
Chromates	Carbon
Dichromates	Metals
Chromium trioxide	Metal hydrides
Halogens	Nitrates
Halogenating agents	Organic Compounds
Hydrogen peroxide	Phosphorus
Nitric acid	Silicon
Nitrates	Sulfur
Perchlorates	
Peroxides	
Permanganates	
Persulfates	

Appendix N: Hazardous Waste Pick-Up

Scheduled pick-ups are only for routinely generated waste. For laboratory clean-outs, large, or special pick-ups, call EH&S at 310-825-9797 for instructions. Refer to the UCLA Hazardous Waste Pick-Up Schedule (*http://map.ais.ucla.edu/go/1002751*) for the time and date of the pick-up for your building or call the **EH&S Hotline at 310-825-9797**.

Transportation to Pick-up Location

- All personnel transporting chemical waste must be trained on the hazards of chemical waste, safe handling techniques and procedures to follow in the event of a spill
- Label all hazardous chemical waste using an Online Hazardous Waste Tag
- Materials should be segregated according to hazard classification for transportation. Each hazard class should have a separate secondary container
- Use a heavy duty cart and secondary containment (do not carry containers)
- Do not transport materials on public streets. Follow the hazardous waste pick-up schedule for your building date and time
- Hazardous waste can never be left unattended in any public area or at the pick-up location. Waste must be given directly to EH&S personnel
- Wear appropriate personal protective equipment such as safety glasses, laboratory coats and closed-toed shoes

Waste Disposal Information

All waste must be labeled with a UCLA Online Hazardous Waste Tag when the first drop of waste is added.

Container Requirements

- **Liquid Waste**:
  - Containers must be free of exterior contamination
  - Containers must be chemically compatible and the size should be suitable for the material stored
  - Containers must be in good condition with screw tops or sealed lids
  - Containers MUST NOT be leaking, rusting or have any other defects
  - Containers MUST NOT be filled to the top. (Leave 10% air space)
- **Dry Waste** must be double-bagged in transparent, sturdy bags and cannot have sharp or protruding edges
- **Transportation to pick-up**: All waste brought to the pick-up must be transported in a sturdy cart and with secondary containment
- **Unknown chemicals** require the generator to bring a University Recharge Order Request Form (P-39) completed and signed to cover the costs of analysis

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX O: Spill Clean-up Procedures

Laboratory personnel can clean up small spills if trained and competent to do so. Small spills include chemical spills that are up to 1 liter in size and of limited toxicity, flammability and volatility, and mercury spills from broken thermometers (about 1.5 grams). If respiratory protection is needed for spill clean up, the spill is too large to be handled by laboratory personnel – dial **911 or the EH&S Hotline at 310-825-9797**. Commercial chemical and mercury spill kits are available, which include protective equipment such as goggles and gloves, neutralizing and absorbing materials, bags, and scoops. You can also make your own spill kits to include the materials described below.

Chemical Spills:

- Sodium Bicarbonate
- Citric Acid
- Vermiculite or other diking material
- pH paper
- 1 pair neoprene or nitrile gloves
- 1 pair goggles
- 1 scoop
- Spill pillows, sorbent pads
- Disposable shoe covers (plastic bags may work)

Mercury Spills:

- Disposable gloves
- Disposable shoe covers (plastic bags will work)
- Index card or rubber squeegee
- Disposable syringe or a vacuum trap flask fitted with tubing or Pasteur pipette
- Inactivating solutions and/or powders

Weak Inorganic Acid or Base Spill Clean Up Procedure

1. Wear gloves, goggles, laboratory coat and shoe covers.

2. To clean-up a spill of weak inorganic acid or base, neutralize the spilled liquid to pH 5 to 8 using a **Neutralizing Agent** such as:
   - Sodium bicarbonate
   - Sodium bisulfate
   - Soda ash
   - Citric acid

3. Absorb the neutralized liquid with an **Absorbent** such as:
   - Sorbent pads
   - Sponges
   - Diatomaceous earth
   - Paper towels
   - Dry sand
   - Vermiculite

4. Rinse the absorbent pads or sponges in a sink with water. Scoop or place the other absorbent materials into a clear plastic bag. Double bag and tag the bag with a chemical waste tag. Take it to your chemical waste pick-up. Refer to the UCLA Hazardous Waste Pick-Up Schedule (*http://map.ais.ucla.edu/go/1002751*) for the time and date of the pick-up for your building or call the **EH&S Hotline at 310-825-9797**.

Solvent Spill Clean Up Procedure

1. Absorb the spill with a non-reactive material such as:
   - Vermiculite
   - Dry sand
   - Paper towels
   - Sponges

2. Package as described above. Do not rinse or dispose of any chemicals down the sink or into any drain.

Broken Thermometer Clean Up Procedure

1. Clean up the spill immediately after it has occurred.
2. Prevent the spread of the spilled mercury. Do not allow people to walk through spill area.
3. Wear disposable gloves and shoe covers or place plastic bags over your shoes during the clean-up.
4. Push the mercury droplets together into a bead using an index card or rubber squeegee.
5. Aspirate the beaded mercury into a disposable syringe, or use a disposable Pasteur Pipette attached with tubing to a vacuum flask to aspirate the mercury into the flask. The flask should contain water. Always have a second vacuum flask between the mercury flask and the house vacuum.
6. Chemically inactivate any residual mercury. There are several methods to inactivate the residual mercury including:
   - Use a commercial inactivating powder following its directions for use
   - Sprinkle zinc powder over the spill area. Then moisten the zinc with a 5 to 10 percent sulfuric acid solution until a paste is formed. Scour the contaminated surface and allow the paste to dry. Sweep up the dried paste
   - Wash the contaminated area with a detergent solution. Rinse and then swab the area with a calcium polysulfide solution containing two to four tablespoons of calcium polysulfide per gallon of water
7. Place the collected mercury and materials used in the clean-up into a clear plastic bag. Double bag and label the waste. Take it to the chemical waste pick-up for your building.

If a large spill occurs, call 911 from a campus phone (or 310-825-1491 from an off-campus or cell phone) or the EH&S Hotline at 310-825-9797.

Appendix P: Lab Emergency Poster

LAB EMERGENCY

Call 911 (from a campus phone) or 310-825-1491 from a cell phone

Medical Emergency Dial 911 or x52111	**LIFE THREATENING EMERGENCY, AFTER HOURS, WEEKENDS AND HOLIDAYS:** Dial 911 (or 310-825-1491 from cell phone) or contact the Ronald Reagan UCLA Medical Center (emergency room) directly at **x52111** (located at 757 Westwood Plaza, enter from Gayley Avenue). *Note: All serious injuries must be reported to EH&S at **x59797** within 8 hours.* **NON-LIFE THREATENING EMERGENCY:** Go to the Occupational Health Facility (OHF), **x56771**, CHS room 67-120 (This is on the 6th floor, 7th corridor, room 120. Enter through the School of Dentistry on Tiverton Drive and proceed to the "O" elevator to the 6th floor.)Hours: M – F 7:30 a.m. to 4:30 p.m. At all other times report to Ronald Regan UCLA Medical Center (emergency room) at **x52111**. *Note: All serious injuries must be reported to EH&S at x59797 within 8 hours.* **Needle stick/puncture exposure:** Wash the affected area with antiseptic soap and warm water for 15 minutes. For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station. Page the needle stick nurse by dialing **231** from a campus phone, enter **93333** when prompted, and then enter your extension. Hours: M – F 8:00 a.m. to 4:00 p.m. At all other times report to Ronald Regan UCLA Medical Center (emergency room) at **x52111**. *Note: All needle stick/puncture exposures must be reported to EH&S at x59797 within 8 hours.*
Fire Dial 911	**SMALL FIRE** (trash can size) – If you have been trained, you may put out the fire using a fire extinguisher. Report the file by calling 911. *Notify EH&S at **x59797** and the Facilities Management Trouble Call Desk **x59236** anytime a fire extinguisher is used or discharged.* **LARGE FIRE** (requiring more than 1 fire extinguisher) – Evacuate the area. Close all doors and windows as you leave. Close the fume hood sash if the fire is in the fume hood. Activate the nearest alarm. Call 911 (or 310-825-1491 from cell phone). Evacuate the area using the stairwells. Do not use the elevator. **CLOTHES ON FIRE** – Use nearest safety shower. If none immediately available, STOP-DROP-ROLL to quickly smother the fire. Seek medical attention. *Notify supervisor and EH&S at x59797 immediately.*
Chemical Spill Dial 911 and x59797	**SPILL** – Help contaminated or injured persons. Evacuate the spill area. Avoid breathing vapors. Eliminate sources of ignition if the chemical is flammable. If possible, confine the spill to a small area using a spill kit or absorbent material. Keep others from entering contaminated area (e.g., use caution tape, barriers, etc.). **SMALL** (<1 L) – If you have training, you may assist in the clean-up effort. Use appropriate personal protective equipment and clean-up material for chemical spilled. Double bag spill waste in clear plastic bags, label, and take to the next chemical waste pick-up. **LARGE** (>1 L) – Dial 911 (or 310-825-1491 from cell phone) and EH&S at **x59797** for assistance. **CHEMICAL SPILL ON BODY OR CLOTHES** – Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S at x59797 immediately.* **CHEMICAL SPLASH INTO EYES** – Immediately rinse eyeball and inner surface of eyelid with water for 15 minutes by forcibly holding the eye open. Seek medical attention. *Notify supervisor and EH&S at x59797 immediately.*
Bio-hazardous Spill Dial 911 and x59797	**CONCENTRATED, >100 ml OF BSL-2, OR SPILL IN PUBLIC AREA** – Do not attempt to clean it up. Keep people from entering. Dial 911 (or 310-825-1491 from cell phone) and EH&S at **x59797** for assistance. **BIOHAZARDOUS SPILL ON BODY OR CLOTHES** – Immediately remove contaminated clothing and place in a red biohazard bag. Wash with antiseptic soap and water for at least 15 minutes. Seek medical attention. *Notify supervisor and EH&S at x59797 immediately.* **GENERAL BIOHAZARD SPILL CLEAN-UP** – Use clean personal protective equipment appropriate for the lab Biosafety Level. Place absorbent pads over area. Use appropriate disinfectant and carefully pour disinfectant starting from the outside to the inside of material (do not spray the disinfectant to minimize aerosol). Allow a minimum 20 minutes of contact time. Remove any sharps using forceps and discard in a sharps container. Dispose clean-up materials as biohazardous waste for proper waste disposal. Repeat clean-up process as necessary. Remove protective clothing and segregate for disposal or laundering. Wash hands with soap and water. *Notify supervisor and EH&S at x59797 immediately.* **UNCONTROLLED SPILLS (e.g., unknown biohazard, outside of a biosafety cabinet, unsure of the clean-up)** – Notify room occupants of spill. Immediately exit the room if you are not wearing the appropriate personal protection. Mark-off the area using tape and warning signs. Everyone should wash their hands and face or shower using a disinfecting soap. Wait at least 30 minutes for aerosol to settle. Dial 911 (or 310-825-1491 from cell phone) and EH&S at **x59797** for assistance.
Radioactive Spill Dial 911 and x59797	**SMALL** (≤1 mCi, contained in labs, not in public areas, and non-alpha emitters) – Cover spill with absorbent material. Notify others in the area of the spill. If comfortable, continue clean-up of the area with absorbent materials. Use disposable gloves and change frequently. Place all contaminated materials in a radioactive waste bag. Monitor spill area and all personnel participating in decontamination efforts with appropriate survey instrument. Record incident in the laboratory survey log and call Radiation Safety at **x59797.** **LARGE** (≥1 mCi, not contained in labs, in public area, or alpha-emitters) – Contain spill with absorbent material and shield spill if necessary. Evacuate all personnel from immediate area and prevent entry of others. Personnel that are potentially contaminated should be surveyed with appropriate survey instruments. Dial 911 (or 310-825-1491 from cell phone) and EH&S at **x59797** for assistance. **PERSONAL CONTAMINATION** – Immediately remove contaminated clothing. Rinse area, especially between fingers and around fingernails with water first, then wash with mild detergent. Dial 911 (or 310-825-1491 from cell phone) and EH&S at **x59797** for assistance.
Earthquake	**DURING EARTHQUAKE** - Take cover in the laboratory underneath a table or desk, or move to the hallway and brace yourself against the wall, covering your head with your arms. After the shaking has stopped: • Remain in the building if the quake was minor • Evacuate the building if the quake was severe. Do not use the elevators; use the stairwells. • After evacuation, report to your designated meeting place (refer to UCLA Campus Evacuation Map: http://ehs.ucla.edu/Pub/EvacMap.pdf)

Obtain this poster on the EH&S website (*www.ehs.ucla.edu*) under Laboratory Safety.

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix Q: Policy 905 – Research Laboratory Personal Safety and Protective Equipment*

UCLA Policy 905:	**Research Laboratory Personal Safety and Protective Equipment**
Issuing Officer:	Vice Chancellor for Research
Responsible Dept:	Environment, Health & Safety
Effective Date:	February 1, 2010
Supersedes:	New

I. REFERENCES

1. University of California Policy on Management of Health, Safety and the Environment (10/28/2005);
2. Guiding Principles to Implement the University of California Policy on Management of Health, Safety and the Environment (10/28/2005);
3. UCLA Policy 811, Environmental Health and Safety;
4. Code of Federal Regulations, Title 29 CFR, Part 1910, Subpart 1;
5. California Code of Regulations – Subchapter 7. General Industry Safety Orders – Group 16. Control of Hazardous Substances – Article 109. Hazardous Substances and Processes - §5194. Hazard Communication.

II. STATEMENT

The University of California is committed to providing a healthy and safe working environment for all members of the campus community. It is University policy to comply with all applicable health, safety and environmental protection laws, regulations and requirements. The Occupational Safety and Health Administration (OSHA) ensures workplace safety through the enforcement of established federal legislation, and the California Occupational Safety and Health Administration (CalOSHA) operates as the acting regulatory enforcement body under the direction of the OSHA act.

Title 29 of the Code of Federal Regulations, Part 1910, Subpart 1. *Personal Protective Equipment*, states that "protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact." Pursuant to this

* Policy 905 can be obtained at: *http://www.adminpolicies.ucla.edu/pdf/905.pdf*.

regulation, and in an effort to prevent workplace injuries and illnesses, UCLA has established this Policy regarding Personal Protective Equipment (PPE) requirements for all campus research laboratory faculty, staff and students.

III. RESPONSIBILITIES

Preventing workplace injuries and illnesses is the responsibility of every member of the campus community. Specific responsibilities are assigned to higher level members of the research and teaching community in order to implement and ensure compliance with this Policy by their subordinate staffs.

The Chancellor has overall responsibility for compliance with health and safety requirements at all facilities and programs under campus control.

The Vice Chancellor for Research is responsible for the implementation of this Policy in all applicable research and teaching laboratories within his or her jurisdiction.

The UCLA Laboratory Safety Committee (LSC) is responsible for promoting a safe working environment in all research and teaching laboratories on campus.

Department Chairpersons are responsible for communicating, promoting and enforcing the Policy in their respective research and teaching areas.

Principal Investigators and laboratory management staff are responsible for complying with this Policy and ensuring their staff receive appropriate training and comply with this Policy as it relates to their research and teaching activities.

All staff members working in laboratory areas are responsible for following laboratory safety requirements and for wearing PPE as outlined in this Policy and in laboratory-specific safety training.

The UCLA Office of Environment, Health & Safety (EH&S) is responsible for inspection of laboratories and enforcement of this Policy. In cases where laboratory activities pose an immediate danger to life or health, designated EH&S staff have the responsibility and authority to order the temporary cessation of the activity until the hazardous condition is abated.

IV. SAFETY REQUIREMENTS

The following requirements pertain to all research and teaching laboratory environments utilizing hazardous chemical, hazardous biological or unsealed radiological materials (see section V., below). The requirements do not apply to those research and teaching laboratories that involve solely mechanical, computer, laser, other non-ionizing radiation, or electrical operations; these hazards will be addressed under separate policies, as appropriate. In addition, these requirements will not apply to laboratories which have been designated as non-hazardous materials use areas. In order to qualify as a non-hazardous materials use area, a laboratory must obtain approval and appropriate labeling from EH&S. EH&S, in cooperation with regulation mandated safety committees, has the final authority for determining whether any specific material is classified as hazardous. Deviations from these requirements, including the defining of specific hazardous materials use areas within rooms, may be permitted under certain conditions and will require express, written approval from EH&S.

A. Full length pants, or equivalent, and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

B. Protective gloves must be worn while utilizing any hazardous chemical, biological or unsealed radiological material. These gloves must be appropriate for the material being used. The Material Safety Data Sheet (MSDS) for the material should be referenced when determining the effectiveness of the type of glove to be used. Additionally, the EH&S website offers guidance on glove selection based on material handling as well as links to other resources. This requirement does not apply when working with non-hazardous materials and an open flame or other heat source that might cause injury by melting plastic gloves.

C. Laboratory coats, or equivalent, are required to be worn while working on, or adjacent to, all bench top procedures utilizing hazardous chemicals, biological or unsealed radiological materials. These laboratory coats must be appropriately sized for the individual and be buttoned to their full length. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves.

D. Flame resistant laboratory coats must be worn when working with pyrophoric materials or large amounts (greater than four (4) liters) of flammable liquids. It is recommended that cotton (or other non-synthetic material) clothing be worn during these procedures to minimize injury in the case of a fire emergency.

E. Laboratory coats may not be worn outside of a laboratory unless the individual is traveling directly to an adjacent laboratory work area. Protective gloves must not be worn in any public area outside of the laboratory (i.e., hallways, elevators, offices). Gloves should also be removed prior to handling any equipment that could likely result in cross-contamination (e.g., telephones, computer work stations, etc.).

F. Each department or research unit shall be responsible for providing professional laundry services as needed to maintain the hygiene of laboratory coats. They may not be cleaned by staff members at private residences or public laundry facilities. Any clothing that becomes contaminated with hazardous materials must be decontaminated before it leaves the laboratory.

G. Eye protection or equivalent engineering controls must be used while handling any hazardous chemical, biological or unsealed radiological materials. All eye protection equipment must be American National Standards Institute (ANSI) approved and appropriate for the work being done.

H. Some operations and procedures may warrant further PPE, as indicated by the MSDS, the standard operating procedures for the material being used, facility policies, regulatory requirements, or the EH&S Laboratory Hazard Assessment Tool.

V. DEFINITIONS OF HAZARDOUS MATERIALS

The following materials are defined as hazardous for the purposes of this Policy:

1. Any unsealed radioactive material.
2. Biological materials in the BSL-2 Category, or greater.
3. Chemicals listed as Select Carcinogens and Regulated Carcinogens. (See http://www.dir.ca.gov/Title8/5191.html for the Cal/OSHA criteria for select carcinogens)
4. Chemicals listed as Reproductive Toxins. (See http://www.oehha.org/prop65/prop65_list/Newlist.html#files for a list of reproductive toxins and carcinogens identified under California Proposition 65)
5. Chemicals listed as Toxic or Highly Toxic. (See http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10100 for OSHA guidance on identifying Highly Toxic Chemicals)

6. Flammable chemicals in excess of one (1) liter by volume, or any amount of violently air reactive or water reactive chemicals.
7. Corrosive chemicals in concentrations of one (1) molar or greater.
8. Known significant skin or eye irritants.

This list is to be used as a guideline and allows for some laboratories to be classified as non-hazardous materials laboratories. It does not supersede Cal/OSHA regulations or accepted safe work practices for specific materials. PPE and other safety measures, as appropriate, must be used to protect workers from any and all known hazards that are present in all work-related activities at UCLA. Refer to the California Code of Regulations for additional guidance in developing protective measures for laboratory use of hazardous materials.

Issuing Officer

/s/ Roberto Peccei

Vice Chancellor for Research

Questions concerning this policy or procedure should be referred to the Responsible Department listed at the top of this document.

Appendix R: Glossary

ACGIH - The American Conference of Governmental Industrial Hygienists is a voluntary membership organization of professional industrial hygiene personnel in governmental or educational institutions. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

ACTION LEVEL - A concentration designated in Title 8, California Code of Regulations for a specific substance, calculated as an eight (8)-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

AEROSOL - Liquid droplets or solid particles dispersed in air that are of fine enough size (less than 100 micrometers) to remain dispersed for a period of time.

ASPHYXIANT - A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.

"C" OR CEILING - A description usually seen in connection with a published exposure limit. It refers to the concentration that should not be exceeded, even for an instant. It may be written as TLV-C or Threshold Limit Value - Ceiling. (See also Threshold Limit Value).

CARCINOGEN - A cancer-producing substance or physical agent in animals or humans. A chemical is considered a carcinogen or potential carcinogen if it is so identified in any of the following:

- National Toxicology Program, "Annual Report of Carcinogens" (latest edition)
- International Agency for Research on Cancer, "Monographs" (latest edition)
- OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances

CHEMICAL HYGIENE OFFICER - An employee who is designated by the employer and who is qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

CHEMICAL HYGIENE PLAN - A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that (1) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (2) meets the requirements of OSHA regulation 29 CFR 1910.1450.

COMBUSTIBLE LIQUID - Any liquid having a flashpoint at or above 100°F (37.8°C) but below 200°F (93.3°C) except any mixture having components with flashpoints of 200°F or higher, the total volume of which make up 99% or more of the total volume of the mixture.

COMPRESSED GAS - A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70oF (21.1°C), or; a gas or mixture of gases having, in a container, an absolute

pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70oF (21.1°C), or; a liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

CORROSIVE - A substance that, according to the DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact or is highly corrosive to steel.
DESIGNATED AREA - An area which has been established and posted with signage for work involving hazards (e.g., "select carcinogens," reproductive toxins, or substances which have a high degree of acute toxicity). A designated area may be the entire laboratory, an area of a laboratory, or a device such as a laboratory hood.

EMERGENCY - Any potential occurrence, such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

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

FLAMMABLE - A chemical that falls into one of the following categories:

1. Flammable aerosol - an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
2. Flammable gas - a gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13% by volume or less; or a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit;
3. Flammable liquid - any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture; or
4. Flammable solid - a solid, other than a blasting agent or explosive as defined in1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a greater than one-tenth of an inch per second along its major axis.

FLASHPOINT - The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite in the presence of an ignition source or when tested as follows:

1. Tagliabue Closed Tester (See American National Standard Method of Test for Flashpoint by Tag Closed Tested, Z11.24-1979 (ASTM D-56-79) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100oF (37.8°C) or that contain suspended solids and do not have a tendency to form a surface film under test;
2. Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D-73-79) for liquids with a viscosity equal to or greater than 45 SUS at 100oF (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or,
3. Setaflash Closed Tester (See American National Standard Method of Test for Flashpoint of Setaflash Closed Tester (ASTM D-3278-78)). Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any flashpoint determination methods specified above.

GENERAL VENTILATION - Also known as general exhaust ventilation, this is a system of ventilation consisting of either natural or mechanically induced fresh air movements to mix with and dilute contaminants in the workroom air. This is not the recommended type of ventilation to control contaminants that are highly toxic, when there may be corrosion problems from the contaminant, when the worker is close to where the contaminant is being generated, and where fire or explosion hazards are generated close to sources of ignition. (See Local Exhaust Ventilation)

HAZARD ASSESSMENT - A formal procedure undertaken by the supervisor in which occupational hazards for all employees are described per procedure or task, and by affected body part(s) or organ(s), and which is documented and posted in the workplace with all personal protective equipment requirements.

HAZARD WARNING - Any words, pictures, symbols or combination thereof appearing on a label or other appropriate form of warning which convey the hazards of the chemical(s) in the container(s).

HAZARDOUS MATERIAL - Any material which is a potential/actual physical or health hazard to humans.

HAZARDOUS MATERIAL (DOT) - A substance or material capable of posing an unreasonable risk to health, safety, and property when transported including, but not limited to, compressed gas, combustible liquid, corrosive material, cryogenic liquid, flammable solid, irritating material, material poisonous by inhalation, magnetic material, organic peroxide, oxidizer, poisonous material, pyrophoric liquid, radioactive material, spontaneously combustible material, an water-reactive material.

HAZARDOUS CHEMICAL - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes or mucous membranes. A chemical is also considered hazardous if it is listed in any of the following:

1. OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances;
2. “Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment,” ACGIH (latest edition);
3. “The Registry of Toxic Effects of Chemical Substances,” NIOSH (latest edition); or
4. Director’s List.

HIGHLY TOXIC - A substance falling within any of the following categories:

1. A substance that has a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each;
2. A substance that has a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each; or
3. A substance that has a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

IGNITABLE - A solid, liquid or compressed gas waste that has a flashpoint of less than 140°F. Ignitable material may be regulated by the EPA as a hazardous waste as well.

INCOMPATIBLE - The term applies to two substances to indicate that one material cannot be mixed with the other without the possibility of a dangerous reaction.

IRRITANT - A substance which, by contact in sufficient concentration for a sufficient period of time, will cause an inflammatory response or reaction of the eye, skin, nose or respiratory system. The contact may be a single exposure or multiple exposures. Some primary irritants: chromic acid, nitric acid, sodium hydroxide, calcium chloride, amines, metallic salts, chlorinated hydrocarbons, ketones and alcohols.

LABEL - Any written, printed or graphic material displayed on or affixed to containers of chemicals, both hazardous and non-hazardous.

LABORATORY TYPE HOOD - A device located in a laboratory, enclosed on five sides with a movable sash or fixed partial enclosure on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

LABORATORY USE OF HAZARDOUS CHEMICALS - Handling or use of such chemicals in which all of the following conditions are met::

1. Chemical manipulations are carried out on a "laboratory scale";
2. Multiple chemical procedures or chemicals are used;
3. The procedures involved are not part of a production process nor in any way simulate a production process; and
4. 4. "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

LOCAL EXHAUST VENTILATION (Also known as exhaust ventilation) – A ventilation system that captures and removes the contaminants at the point they are being produced before they escape into the workroom air. The system consists of hoods, ductwork, a fan, and possibly an air-cleaning device. Advantages of local exhaust ventilation over general ventilation include: it removes the contaminant rather than dilutes it, requires less airflow and, thus, is more economical over the long term; and the system can be used to conserve or reclaim valuable materials; however, the system must be properly designed with the correctly shaped and placed hoods, and correctly sized fans and ductwork.

MATERIAL SAFETY DATA SHEET (MSDS) - Written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of 29 CFR 1910.1200.

MEDICAL CONSULTATION - A consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

MIXTURE - Any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

MUTAGEN - Anything that can cause a change (or mutation) in the genetic material of a living cell.

NFPA - The National Fire Protection Association; a voluntary membership organization whose aims are to promote and improve fire protection and prevention. NFPA has published 16 volumes of codes known as the National Fire Codes. Within these codes is Standard No. 705, "Identification of the Fire Hazards of Materials". This is a system that rates the hazard of a material during a fire. These hazards are divided into health, flammability, and reactivity hazards and appear in a well-known diamond system using from zero through four to indicate severity of the hazard. Zero indicates no special hazard and four indicates severe hazard.

NIOSH - The National Institute for Occupational Safety and Health; a federal agency that among its various responsibilities trains occupational health and safety professionals, conducts research on health and safety concerns, and tests and certifies respirators for workplace use.

ODOR THRESHOLD - The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.

OXIDIZER - Is a substance that gives up oxygen easily to stimulate combustion of organic material.

PERMISSIBLE EXPOSURE LIMIT (PEL) - An exposure, inhalation or dermal permissible exposure limit specified in 8 CCR 5155. PELs may be either a time-weighted average (TWA) exposure limit (8-hour), a 15-minute short-term limit (STEL), or a ceiling (C).

PERSONAL PROTECTIVE EQUIPMENT - Any devices or clothing worn by the worker to protect against hazards in the environment. Examples are respirators, gloves, and chemical splash goggles.

PHYSICAL HAZARD - A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.

PYROPHORIC - A chemical that will spontaneously ignite in the air at a temperature of 130oF (54.4oC) or below.

REACTIVITY - A substance's susceptibility to undergoing a chemical reaction or change that may result in dangerous side effects, such as explosion, burning, and corrosive or toxic emissions. The conditions that cause the reaction, such as heat, other chemicals, and dropping, will usually be specified as "Conditions to Avoid" when a chemical's reactivity is discussed on an MSDS.

REPRODUCTIVE TOXINS - Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

RESPIRATOR - A device which is designed to protect the wearer from inhaling harmful contaminants.

RESPIRATORY HAZARD - A particular concentration of an airborne contaminant that, when it enters the body by way of the respiratory system or by being breathed into the lungs, results in some body function impairment.

SELECT CARCINOGENS - Any substance which meets one of the following:

1. It is regulated by OSHA as a carcinogen; or
2. It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition);or
3. It is listed under Group 1 ("carcinogen to humans") by the International Agency for Research on Cancer Monographs (IARC)(latest editions); or
4. It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP.

SENSITIZER - A substance that may cause no reaction in a person during initial exposures, but afterwards, further exposures will cause an allergic response to the substance.

SHORT-TERM EXPOSURE LIMIT - Represented as STEL or TLV-STEL, this is the maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures. Also the daily TLV-TWA must not be exceeded.

SOLVENT - A substance, commonly water, but in industry often an organic compound, which dissolves another substance.

THRESHOLD LIMIT VALUE (TLV) - Airborne concentration of substances devised by the ACGIH that represents conditions under which it is believed that nearly all workers may be exposed day after day with no adverse effect. TLVs are advisory exposure guidelines, not legal standards, that are based on evidence from industrial experience, animal studies, or human studies when they exist. There are three different types of TLVs: Time-Weighted Average (TLV-TWA), Short-Term Exposure Limit (TLV-STEL), and Ceiling (TLV-C). (See also PEL).

TOXICITY - A relative property of a material to exert a poisonous effect on humans or animals and a description of the effect and the conditions or concentration under which the effect takes place.

VAPOR - The gaseous form of substances which are normally in the liquid or solid state (at normal room temperature and pressure). Vapors evaporate into the air from liquids such as solvents. Solvents with lower boiling points will evaporate faster.

Lab Specific SOPs

Training Records

UCLA Environment, Health & Safety

Guide to Services

The Office of Environment, Health and Safety (EH&S) is committed to promoting a safe and healthful environment for research, instruction and the campus community through the programs listed below.

Research Safety

Biosafety biosafety@ehs.ucla.edu
Helps laboratory personnel work safely with all types of biohazards. Establishes and reviews protocols for operations involving infectious agents capable of transmitting pathogens.

Laboratory Safety laboratorysafety@ehs.ucla.edu
Provides training, information and inspections to foster safe and legal lab practices to protect personnel against chemical and physical hazards.

Laser Safety lasersafety@ehs.ucla.edu
Provides training and assists personnel in the safe use of lasers. Monitors laser hazards.

Radiation Safety radiationsafety@ehs.ucla.edu
Provides radiation safety training, exposure monitoring, and environmental monitoring. Manages radioactive waste disposal program. Provides support for campus research using radioactive materials and radiation machines.

Injury Prevention

Injury & Illness Prevention injuryprevention@ehs.ucla.edu
Coordinates development and implementation of departmental Injury and Illness Prevention Programs and Safety Committees.

Shop Safety injuryprevention@ehs.ucla.edu
Fosters a safe work environment for campus employees working in shops by providing training, inspections and consultation.

Ergonomics ergonomics@ehs.ucla.edu
Prevents injuries from repetition, awkward posture and lifting, with a goal of f tting work to workers to make jobs safer, more comfortable and more eff cient.

Fire & Life Safety
f resafety@ehs.ucla.edu

Prevents and reduces the loss of life and property from f res. Approves building and renovation plans to ensure compliance with f re and life safety codes.

Environmental Programs

Environmental Health envhealth@ehs.ucla.edu
Oversees the community health and sanitation programs, including food safety, drinking water quality, integrated pest management, and pool sanitation.

Environmental Programs envprgms@ehs.ucla.edu
Manages compliance with campus air, industrial waste water, and storm water permits. Oversees tank inspection programs and environmental remediation activities.

Industrial Hygiene indhyg@ehs.ucla.edu
Consults on and investigates occupational exposures, illnesses, and indoor air quality. Provides respirator f t testing & training, manages MSDS library, and provides hazard communication guidance.

Asbestos / Lead (Pb) indhyg@ehs.ucla.edu
Inspects for the presence of asbestos, lead and mold in building materials. Oversees safe removal of hazardous materials during renovations and construction. Trains campus personnel on minimizing hazardous exposures to asbestos, lead and mold.

Hazardous Waste
hazardousmaterials@ehs.ucla.edu

Manages the proper disposal of all hazardous waste generated on campus. Provides routine waste pick-ups in all research buildings. Trains staff who handle hazardous waste.

Training & Outreach
training@ehs.ucla.edu

Assists campus to meet regulatory training requirements in health and safety practices and workplace hazards by providing instructor-led classes, online modules, videos, publications, and internet resources to employees.

General Information: (310) 825-5689
EH&S Hotline: 310-825-9797
www.ehs.ucla.edu

THIS PAGE INTENTIONALLY LEFT BLANK.

Fact Sheet

UCLA ENVIRONMENT, HEALTH & SAFETY

EH&S Facts

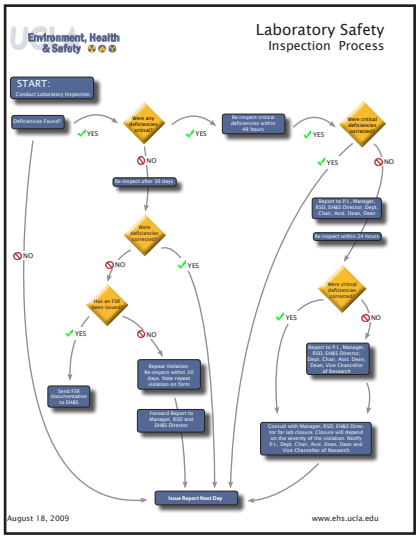
Laboratory Safety Orientation

The PI/Laboratory Supervisor has responsibility for the health and safety of all laboratory personnel working in their laboratory. Use this fact sheet to orient new laboratory employees to expectations, hazards and safety requirements in the laboratory. This orientation should occur before the employee is allowed to work in the laboratory.

1. Know Your Responsibilities

Outline expectations by reviewing *Laboratory Duties and Responsibilities*. Communication of expectations from day one sets the stage for individuals to take responsibility for their own safety and the safety of their laboratory colleagues. The list below highlights key points:

- ✓ Follow oral and written safety rules, regulations and standard operating procedures required
- ✓ Consult with PI/Laboratory Supervisor before using highly hazardous materials or conducting higher risk experimental procedures; obtain prior approval, if required)
- ✓ Report all emergencies, injuries, near misses or safety concerns to the PI/Laboratory Supervisor
- ✓ In the event of an emergency, call 911 and the EH&S Hotline at (310)82***5-9797***
- ✓ Keep work area safe and uncluttered
- ✓ Avoid working alone in the laboratory whenever possible
- ✓ Absolutely no food, drink, or smoking is permitted in the laboratory at any time

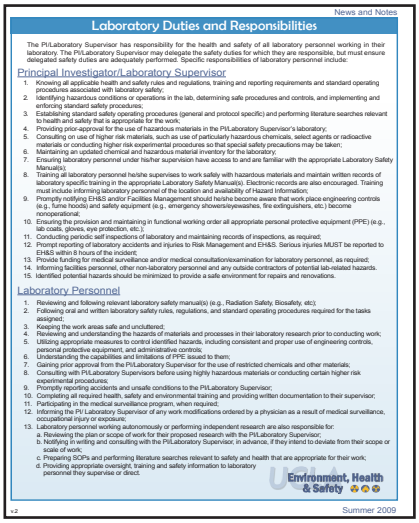


Introduce laboratory-specific requirements, such as:

- ✓ Procedures for handling, storing, segregating and packaging hazardous waste
- ✓ Use of fume hoods, biosafety cabinets, other local ventilation devices and engineering controls
- ✓ Requirements for proper chemical labeling
- ✓ Location and type of biological, radiological or other hazards (e.g. lasers, liquid nitrogen, sharps, particularly hazardous substances)
- ✓ Information on and location of Hazard Placards and safety information

Communicate the importance of regular laboratory self-inspections:

- ✓ Initiate regular self-inspections to increase safety in the laboratory
- ✓ EH&S inspects all labs on campus at least annually
- ✓ Use the *Laboratory Safety Checklist* as a guide when conducting self-inspections


News and Notes

Laboratory Duties and Responsibilities

The PI/Laboratory Supervisor has responsibility for the health and safety of all laboratory personnel working in their laboratory. The PI/Laboratory Supervisor may delegate the safety duties for which they are responsible, but must ensure delegated safety duties are adequately performed. Specific responsibilities of laboratory personnel include:

Principal Investigator/Laboratory Supervisor

1. Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with laboratory safety;
2. Identifying hazardous conditions or operations in the lab, determining safe procedures and controls, and implementing and enforcing standard safety procedures;
3. Establishing standard safety operating procedures (general and protocol specific) and performing literature searches relevant to health and safety that is appropriate for the work;
4. Providing prior-approval for the use of hazardous materials in the PI/Laboratory Supervisor's laboratory;
5. Consulting on use of higher risk materials, such as use of particularly hazardous chemicals, select agents or radioactive materials or conducting higher risk experimental procedures so that special safety precautions may be taken;
6. Maintaining an updated chemical and hazardous material inventory for the laboratory;
7. Ensuring laboratory personnel under his/her supervision have access to and are familiar with the appropriate Laboratory Safety Manual(s);
8. Training all laboratory personnel he/she supervises to work safely with hazardous materials and maintain written records of laboratory specific training in the appropriate Laboratory Safety Manual(s). Electronic records are also encouraged. Training must include informing laboratory personnel of the location and availability of Hazard Information;
9. Promptly notifying EH&S and/or Facilities Management should he/she become aware that work place engineering controls (e.g., fume hoods) and safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become nonoperational;
10. Ensuring the provision and maintaining in functional working order all appropriate personal protective equipment (PPE) (e.g., lab coats, gloves, eye protection, etc.);
11. Conducting periodic self inspections of laboratory and maintaining records of inspections, as required;
12. Prompt reporting of laboratory accidents and injuries to Risk Management and EH&S. Serious injuries MUST be reported to EH&S within 8 hours of the incident;
13. Provide funding for medical surveillance and/or medical consultation/examination for laboratory personnel, as required;
14. Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential lab-related hazards.
15. Identified potential hazards should be minimized to provide a safe environment for repairs and renovations.

Laboratory Personnel

1. Reviewing and following relevant laboratory safety manual(s) (e.g., Radiation Safety, Biosafety, etc);
2. Following oral and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned;
3. Keeping the work areas safe and uncluttered;
4. Reviewing and understanding the hazards of materials and processes in their laboratory research prior to conducting work;
5. Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment, and administrative controls;
6. Understanding the capabilities and limitations of PPE issued to them;
7. Gaining prior approval from the PI/Laboratory Supervisor for the use of restricted chemicals and other materials;
8. Consulting with PI/Laboratory Supervisors before using highly hazardous materials or conducting certain higher risk experimental procedures;
9. Promptly reporting accidents and unsafe conditions to the PI/Laboratory Supervisor;
10. Completing all required health, safety and environmental training and providing written documentation to their supervisor;
11. Participating in the medical surveillance program, when required;
12. Informing the PI/ Laboratory Supervisor of any work modifications ordered by a physician as a result of medical surveillance, occupational injury or exposure;
13. Laboratory personnel working autonomously or performing independent research are also responsible for:
    a. Reviewing the plan or scope of work for their proposed research with the PI/Laboratory Supervisor;
    b. Notifying in writing and consulting with the PI/Laboratory Supervisor, in advance, if they intend to deviate from their scope or scale of work;
    c. Preparing SOPs and performing literature searches relevant to safety and health that are appropriate for their work;
    d. Providing appropriate oversight, training and safety information to laboratory personnel they supervise or direct.

Environment, Health & Safety

Summer 2009

2. Review Safety Manuals & Resources

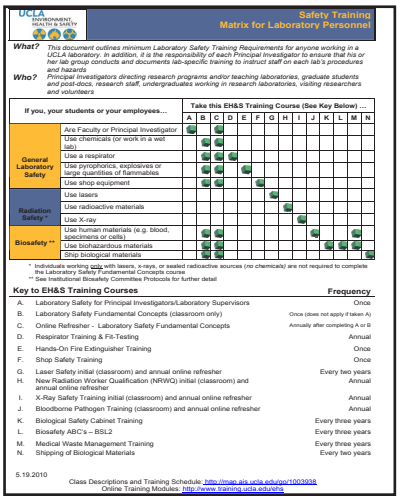
Be familiar with the contents and know the location of the following safety manuals, documents and other resources, as applicable:

- ✓ *Injury and Illness Prevention Plan (IIPP)*
- ✓ *Lab Safety Manual*
- ✓ *Chemical Hygiene Plan*
- ✓ *Biosafety Manual*
- ✓ *Radiation Safety Manual*
- ✓ *Laser Safety Manual*
- ✓ *Shop Safety Manual*
- ✓ *Material Safety Data Sheets*
- ✓ *EH&S Fact Sheets*
- ✓ *Lab Safety Videos*
- ✓ Laboratory Specific Standard Operating Procedures
- ✓ Laboratory Chemical Inventory

3. Outline Lab Safety Training Requirements

All personnel must be properly trained before beginning their work, when given new assignments, or when new hazards are introduced:

- ✓ Review the *Safety Training Matrix* to determine training requirements for anyone working in a UCLA laboratory
- ✓ Conduct lab specific training required based on hazardous materials present or procedures used
- ✓ See the *EH&S Online Training Center* for modules to support lab specific training
- ✓ Maintain annual requirements for laboratory safety training
- ✓ Obtain training records through *EH&S Training* (classroom training records) and the *EH&S Online Training Center* (online training records)



UCLA ENVIRONMENT, HEALTH & SAFETY

Safety Training Matrix for Laboratory Personnel

What? *This document outlines minimum Laboratory Safety Training Requirements for anyone working in a UCLA laboratory. In addition, it is the responsibility of each Principal Investigator to ensure that his or her lab group conducts and documents lab-specific training to instruct staff on each lab's procedures and hazards*

Who? *Principal Investigators directing research programs and/or teaching laboratories, graduate students and post-docs, research staff, undergraduates working in research laboratories, visiting researchers and volunteers*

If you, your students or your employees…		Take this EH&S Training Course (See Key Below) …												
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
General Laboratory Safety	Are Faculty or Principal Investigator	●		●											
	Use chemicals (or work in a wet lab)		●	●											
	Use a respirator		●	●	●										
	Use pyrophorics, explosives or large quantities of flammables		●	●		●									
	Use shop equipment		●	●			●								
Radiation Safety *	Use lasers							●							
	Use radioactive materials								●						
	Use X-ray									●					
Biosafety **	Use human materials (e.g. blood, specimens or cells)		●	●							●			●	
	Use biohazardous materials		●	●								●	●	●	
	Ship biological materials		●	●											●

* Individuals working only with lasers, x-rays, or sealed radioactive sources (no chemicals) are not required to complete the Laboratory Safety Fundamental Concepts course.

** See Institutional Biosafety Committee Protocols for further detail

Key to EH&S Training Courses		Frequency
A.	Laboratory Safety for Principal Investigators/Laboratory Supervisors	Once
B.	Laboratory Safety Fundamental Concepts (classroom only)	Once (does not apply if taken A)
C.	Online Refresher - Laboratory Safety Fundamental Concepts	Annually after completing A or B
D.	Respirator Training & Fit-Testing	Annual
E.	Hands-On Fire Extinguisher Training	Once
F.	Shop Safety Training	Once
G.	Laser Safety initial (classroom) and annual online refresher	Every two years
H.	New Radiation Worker Qualification (NRWQ) initial (classroom) and annual online refresher	Annual
I.	X-Ray Safety Training initial (classroom) and annual online refresher	Annual
J.	Bloodborne Pathogen Training (classroom) and annual online refresher	Annual
K.	Biological Safety Cabinet Training	Every three years
L.	Biosafety ABC's – BSL2	Every three years
M.	Medical Waste Management Training	Every three years
N.	Shipping of Biological Materials	Every two years

5.19.2010

Class Descriptions and Training Schedule: http://map.ais.ucla.edu/go/1003938
Online Training Modules: http://www.training.ucla.edu/ehs

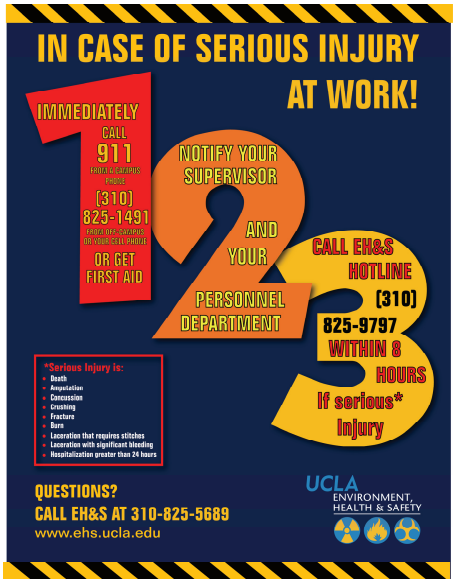
4. Explain Personal Protective Equipment (PPE)

PPE is required for all persons in the laboratory and can be determined by using the resources below.

- ✓ Review *UCLA Policy 905: Research Laboratory Personal Safety and Protective Equipment*
- ✓ Discuss *Laboratory Hazard Assessment Tool*
- ✓ Understand the capabilities and limitations of PPE

5. Review Emergency Procedures

Review the location and use of these emergency response procedures, supplies and equipment:



- ✓ *Campus Emergency Response Plan*
- ✓ Evacuation assembly points, fire extinguisher(s), emergency exits, first aid kit and nearest phone
- ✓ Eyewash stations and safety showers
- ✓ Chemical spill kit and protocol
- ✓ Importance of reporting every incidents, accidents and unsafe conditions to a supervisor

For life-threatening emergencies or fire, call from any UCLA phone line	911
For life-threatening emergencies or fire, call from cell phones	(310) 825-1491
For Serious Injury, call the EH&S Hotline	(310 825-9797
For medical treatment, go to the *Occupational Health Facility,* Mon - Fri, 7 a.m. to 4 p.m., CHS 67-120	(310) 825-6771
Medical emergency or after hours/on weekends, go to the *Ronald Reagan UCLA Medical Center*, enter on Gayley	(310) 267-8400

6. Know additional Contacts

Know who to contact and how to obtain health and safety information:

- ✓ Laboratory Safety Contacts
  - PI/Laboratory Supervisor
  - Safety Coordinator
- ✓ *Guide to EH&S Services* (list of EH&S Contacts)
- ✓ EH&S Hotline (310) 825-9797

Notes