Report to the Chancellor

on

UCLA Laboratory Safety

July 2009

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1.0 Executive Summary

Following the tragic death of a staff research associate from injuries sustained in a laboratory chemical fire in December 2008, the Chancellor announced a series of sweeping initiatives aimed at improving laboratory safety. One of these initiatives established a campus-wide Laboratory Safety Committee (LSC) chaired by the Vice Chancellor for Research and composed of members from across the research spectrum to promote a safe work environment in the more than 2,000 teaching and research laboratories on campus. The committee was charged with preparing an initial report on the state of laboratory safety on campus that included specific recommendations for improving the health and safety of all laboratory personnel.

The LSC, working with the Office of Environment, Health & Safety (EH&S), compiled the following report that evaluates the current programs and resources dedicated to laboratory safety. It also identifies areas in programs and resources where enhancements should be made and offers recommendations for action to further improve laboratory safety in all research and teaching laboratories.

The report documents the significant and existing efforts and resources that are dedicated to ensuring the health and safety of all laboratory personnel and highlights many of the recent improvements that were put into place following the December 29, 2008, laboratory accident. Despite these efforts and advances, many challenges remain. Section 12 of the report identifies several areas where significant improvements should be considered. The key recommendations of the report are summarized as follows:

- *Develop a Strong Safety Culture – A top down culture of safety consciousness should be developed that involves a management approach in which the Chancellor, Vice Chancellors, Deans, Department Heads and Principal Investigators embrace the necessity of laboratory safety, support efforts to improve safety, and stress to staff that the health and safety of each individual depends on teamwork and personal responsibility. Reward systems should be developed to encourage all laboratory personnel to willingly comply with all safety procedures in their facilities.*
- *Improve and Expand Outreach and Training – A critical element of safety education includes developing and encouraging basic attitudes and habits of prudent behavior in the laboratory so that safety is valued as an inextricable component of all laboratory activities. To achieve this, improvements in the quality, frequency, availability, tracking, and documentation of training are needed. Additional personnel or IT resources may be necessary to facilitate these efforts.*
- *Increase Accountability and Oversight – Oversight of safety in research activities should be expanded to ensure consistent maintenance of high*

professional standards and hold Principal Investigators and other laboratory staff accountable for implementation of safe laboratory practices and procedures. Extension of revised laboratory inspection procedures to all programs within the Research Safety Division will provide increased oversight by EH&S. The formation of a formal inter-departmental committee with delegated authority from the Vice Chancellor for Research that is charged specifically with oversight of research areas involving chemical and physical hazards would help to strengthen safety in these areas and bring oversight closer to that in more highly regulated areas such as Radiation and Biological Safety.

- *Improve Laboratory Design – It is essential that laboratories be designed by experts who are familiar with how laboratories operate. To prevent accidents, research should be viewed in the context of the entire laboratory system that includes facilities and equipment. EH&S and other laboratory experts should routinely be consulted to help ensure the safe design and renovation of laboratories and to ensure regulatory compliance. EH&S can also assist with ensuring adequate fire protection, ample chemical and hazardous waste storage capacity, and proper ergonomic design.*
- *Improve Inventory and Recordkeeping – A more systematic approach for the tracking of laboratory space, laboratory personnel, laboratory hazards, chemical and hazardous material inventories, etc. should be developed and implemented. Resources should be allocated to allow the collected information to be regularly updated and analyzed.*

The activities, programs and initiatives presented in the body of this report reflect our commitment to ensuring the safety of students, faculty and staff who work in laboratories. The report's recommendations highlight many of the human and organizational factors that complicate the successful implementation of laboratory safety programs and can serve as a framework for improving laboratory safety. The LSC, which is a permanent standing committee headed by the Vice Chancellor for Research, is committed to fulfilling its mandate of improving the health and safety of all laboratory staff and strongly supports the adoption of the recommendations in this report and encourages the provision of necessary resources to ensure they are swiftly implemented.

2.0 Introduction

This report is a review and summary of the current state of laboratory safety at UCLA. It includes both general and discipline-specific laboratory safety practices and assessments. It also summarizes the activities and progress made in addressing laboratory health and safety issues and makes recommendations for continued improvement. Two broad themes of the report are the University's safety culture, and compliance needs and requirements.

The Office of Environment, Health and Safety (EH&S) and the Laboratory Safety Committee (LSC) worked jointly to prepare this report. Both entities worked together to undertake a comprehensive review of laboratory safety on campus with the aim of identifying potentially unsafe conditions, procedures, or practices in the laboratory and providing recommendations to enhance the health and safety of laboratories personnel.

Continuous identification and correction of factors which may contribute to the incidence of accidental injury is a key component of protecting the health and well-being of the campus community. For laboratories, these factors should include the University's safety culture, training, communication, accident investigation, safety engineering and design, and maintenance of facilities and equipment.

This report is intended to assist UCLA in meeting its commitment to provide a healthy and safe working environment for laboratory personnel. The University's collective goal is to prevent all workplace injuries and illnesses, environmental incidents and property losses or damage, and to comply with all applicable health, safety and environmental protection laws, regulations and requirements. These goals are expressed in UCLA Policy 811.

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3.0 General Laboratory Safety

As an institution of higher learning, it is essential that we teach students by example and demonstrate an unwavering commitment to ensuring the health and safety of all laboratory personnel. This commitment must be demonstrated from the top down so that those working in the laboratory respect this environment and those who enforce the safety rules. By instilling a sense of responsibility for laboratory safety in everyone working in the laboratory, we are better preparing our students to enter the workforce and be proactive in preventing accidents and injuries.

UCLA Policy 811 clearly spells out the commitment of the University of California to provide a healthy and safe working environment and outlines the responsibilities of every member of the campus community for achieving this goal. We quote below directly from this policy:

> *It is University policy to comply with all applicable health, safety and environmental protection laws, regulations and requirements. All University activities are to be conducted in a manner that ensures the protection of students, faculty, staff, visitors and the environment.*

The **Chancellor and Vice Chancellors** are responsible for the implementation of UCLA's Environmental Health and Safety Policy 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 and living environment. Each campus unit will provide ongoing support for its safety program in its annual budget.

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 lab practices rests with the Principal Investigator (PI)/Laboratory Supervisor within individual laboratory units and associated departments. All personnel, including Principal Investigators, Laboratory Supervisors, employees and students have a duty to fulfill their obligations with respect to maintaining a safe work environment. These responsibilities are explained more fully below.

As part of its ongoing efforts to review laboratory safety, the Laboratory Safety Committee will review Policy 811 and other applicable policies relating to health and safety and determine whether updates are needed to ensure the health and safety of all laboratory personnel.

3.1 Responsibilities

Broad responsibilities are quoted above from Policy 811. Specific responsibilities include:

3.1.1 Duties of Principal Investigator/Laboratory Supervisor

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**.**

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 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 non-operational;
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; and
14. Informing facilities personnel, other non-laboratory personnel and any outside contractors of potential lab-related hazards when they are required to work in the laboratory environment. Identified potential hazards should be minimized to provide a safe environment for repairs and renovations.

3.1.2 Duties of All Laboratory Personnel

All laboratory personnel in research laboratories are responsible for:

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; and

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; and
    d. Providing appropriate oversight, training and safety information to laboratory personnel they supervise or direct.

3.1.3 Duties of the Office of Environmental Health & Safety

EH&S is responsible for administering and overseeing institutional implementation of the Laboratory Safety Program. 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. Specifically, EH&S is responsible for:

1. Informing PIs/Supervisors of all health and safety requirements and assisting with the selection of appropriate safety controls, including laboratory practices, personal protective equipment, engineering controls, training, etc.;
2. Conducting periodic inspections and immediately eliminating hazards that may pose a risk to life or safety;
3. Performing hazards assessments, upon request;
4. Maintaining area and personal exposure-monitoring records;
5. Reviewing and providing advice on Laboratory SOPs, upon request;
6. Providing technical consultation and investigation, as appropriate, for laboratory accidents and injuries;
7. Helping to determine medical surveillance requirements for laboratory personnel;
8. Reviewing plans for installation of engineering controls and new laboratory construction/renovation, as requested;
9. Reviewing and evaluating the effectiveness of the Laboratory Safety Plan at least annually and updating it as appropriate; and
10. Providing management oversight and assistance with environmental compliance and transport and disposal of hazardous waste.

3.1.4 Duties of the Laboratory Safety Committee

Formed in January, 2009, the campus-wide Laboratory Safety Committee (LSC) provides general oversight and guidance to the campus through promotion of a safe work environment in all research and teaching laboratories. The Committee advises and reports to the Chancellor through the Executive Vice Chancellor. It consists of members from a broad range of departments and reflects the diversity of scientific disciplines involved with Laboratory Safety on campus (see Appendix A). Committee responsibilities include:

1. Developing, recommending, updating and maintaining policies applicable to the health and safety of laboratory work;
2. Establishing strategies to ensure ongoing and adequate hazard identification, surveillance and risk evaluation of laboratory activities;
3. Reviewing findings of inspection and campus hazard surveillance programs;
4. Communicating with the other campus Safety Committees to ensure consistency and encourage collaboration;
5. The LSC has the authority to modify, suspend, revoke and terminate any Laboratory activities that are deemed to pose an unacceptable risk to life or safety.

3.2 Laboratory Hazard Assessment Tool

A Laboratory Hazard Assessment Tool was developed in January 2009 to quickly identify those laboratories which could most benefit from an immediate safety review. The initial draft of the Hazard Assessment Tool was distributed to faculty members and laboratory coordinators in the Department of Chemistry and Biochemistry on January 15, 2009, and included a list of acutely toxic chemicals (see Appendix E). The tool was used to quickly identify laboratory activities involving chemical hazards and to specify the proper PPE that should be used by laboratory personnel to protect themselves against these hazards. Once the required PPE was identified, the laboratory was required to conduct and document training for laboratory personnel on the use of the PPE. As part of the Hazard Assessment Tool, laboratories were required to provide information to EH&S concerning the laboratory location, the PI/Laboratory Supervisor, the Laboratory Safety Coordinator, and certification that the assessment and training were completed. A refresher training must be conducted whenever the hazard assessment is updated, or at least annually.

In March 2009, the Hazard Assessment Tool was expanded to include biological, radiological, laser, physical, and nanomaterial hazards that might be encountered

in laboratories. These hazards were also quantitatively classified into four hazard classes depending on risk level. The four classes are:

1. Level A: Very high hazard
2. Level B: High hazard
3. Level C: Moderate hazard
4. Level D: Low hazard

This expanded version was sent to all campus departments on March 24, 2009.

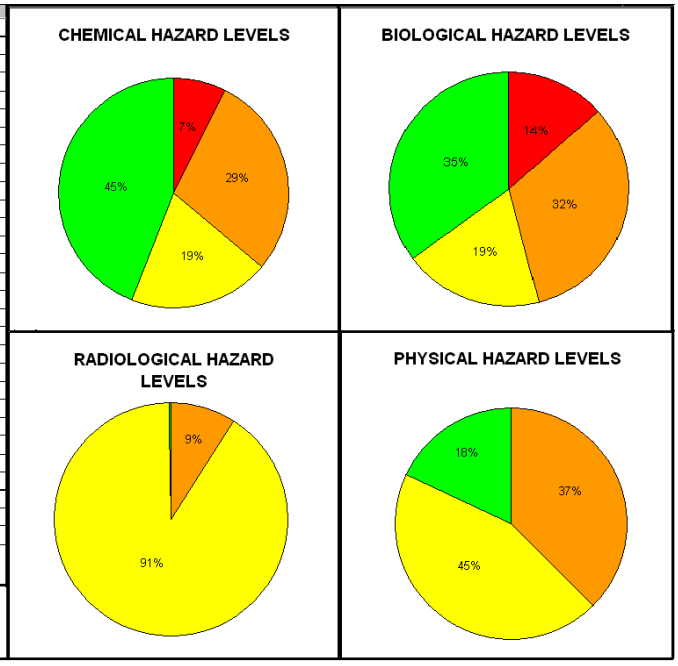
As of June 25, 2009, 477 Hazard Assessment Tool forms were collected from various departments. These responses account for just over 1,000 laboratories. While the response is encouraging, it does not approach full participation from the estimated 2,000 laboratories on campus. EH&S will continue to send email reminders and will require the Hazard Assessment Tool to be completed as part of laboratory inspections to encourage full participation. A summary of the collected information is presented in Figure 3.1. In brief, the Hazard Assessment Tool indicated that:

- 2821 employees were trained on the proper PPE for hazardous activities in their laboratory
- 183 labs have Level A chemical hazards
- 156 labs have Level A biohazard hazards
- 77 labs have nanomaterial hazards (there are no Level A nanomaterial hazards on the Hazard Assessment Tool at this time)
- No labs have Level A radiological, laser, or physical hazards

Figure 3.1 – Laboratory Assessment Summary

ITEM	TOTAL
Forms Submitted	477
Principal Investigators (P.I.'s)	459
Number of Lab Rooms	1033
Chemical Hazards	**2462**
Level - A	183
Level - B	713
Level - C	477
Level - D	1089
Biological Hazards	**1147**
Level - A	156
Level - B	370
Level - C	215
Level - D	406
Radiological Hazards	**423**
Level - A	0
Level - B	37
Level - C	385
Level - D	1
Physical Hazards	**2493**
Level - A	0
Level - B	936
Level - C	1106
Level - D	451
Laser Hazards	**152**
Level - A	0
Level - B	152
Level - C	0
Level - D	0
Nanomaterial Hazards	77
Employees Trained on Personal Protective Equipment	2821

KEY: A B C D



EH&S will prioritize laboratory inspections based on the responses from the Hazard Assessment Tool and will conduct follow-up inspections of laboratories with Level A hazards during the summer of 2009. In addition, the Hazard Assessment Tool will be used as a quality assurance check of the current laboratory space inventory. Maintaining an up-to-date inventory is a difficult and time consuming task and should be more frequently updated by campus Space Inventory Services.

3.3 Health and Safety Training

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 record keeping, instruction on the proper use of PPE (e.g., eye protection, gloves, lab coats, respirators, etc.), and extensive outreach. EH&S offers basic safety training required for an effective program. However, improvements to each area are needed. The addition in June 2008 of a full-time staff member dedicated to the coordination of the health and safety training program was an important step in improving the overall training program.

3.3.1 Methods of Training

Many types of training are available to UCLA faculty, staff, students and visitors. Online training modules and videos allow for efficient delivery of introductory-level material, with the flexibility of on-demand access. Classroom sessions allow for face-to-face contact with EH&S specialists for in-depth discussion and the communication of real world experiences. Also critical for the successful implementation of health and safety training is laboratory or department specific training, which provides a higher level of detail regarding specific job hazards encountered by employees.

Laboratory-Specific Training
It is the responsibility of PIs and Laboratory Supervisors to ensure that each new laboratory staff member, whether temporary or permanent, attend new employee orientation programs and receive appropriate safety training in general safe work practices at the beginning of employment. Additionally, employees must receive the necessary *laboratory-specific* training based on the work to be performed, and instructions on hazards unique to job assignments. Principal investigators or supervisors must often create, implement and communicate standard operating procedures for such lab-specific training.

The recent implementation of the Laboratory Hazard Assessment Tool has been instrumental in assisting labs to determine laboratory and/or job specific training required. Further guidance, in the form of a required PI/Lab Supervisor orientation session, would clarify training and safety requirements for individuals in these roles. Such a session would also explain the responsibilities of departments or laboratories in the maintenance of employee training records, which should be kept in the Laboratory Safety Manual and electronically.

EH&S Classroom Training

EH&S offers classroom training in the areas of general laboratory safety, biosafety, radiation and laser safety, hazardous chemical waste, ergonomics, and fire/life safety. The scheduling, development of materials, and program evaluation are administered by the EH&S training coordinator in partnership with EH&S subject matter experts. (See Appendix B for a complete listing of current training offerings.) Participation in EH&S classroom training has substantially increased in recent months, and is expected to exceed the 2008 demand. See Table 3.1.

Table 3.1 – Classroom Training Statistics

Course	Attendees	
	2008	Jan - March 2009
Bloodborne Pathogens (BBP)	582	173
Biological Safety Cabinet (BSC)	614	215
Biosafety ABC's (BSL2)	678	263
BSL2 with BSL3 Practices (BSL2+)	69	68
Fire Safety	240	42
Hazardous Chemical Waste	697	327
Laboratory Safety: Basic Fundamentals	89	70
Fire Safety in the Lab	90	58
Laser Safety	136	72
Medical Waste Management (MWM)	767	250
New Radiation Worker Qualification (NRWQ)	372	92
Shipping Biological Materials	68	15
X-Ray Diffraction Safety	70	31
TOTALS	**4472**	**1676**

Currently, lecture is the primary delivery method for EH&S classroom training. While presenting the required information, the lecture style of training often does not provide appropriate hands-on exercises, and does not offer the benefit of interaction with other participants learning the same topic. EH&S subject matter experts designing and facilitating training now participate in train-the-trainer sessions and work collaboratively with the EH&S training

coordinator to improve delivery methods and materials. Hands-on activities, such as spill clean-up, the handling of hazardous materials, the use of Material Safety Data Sheets, donning and doffing of personal protective equipment, training record-keeping and departmental safety orientation are examples of exercises to be included in classroom training sessions.

It is recommended that the following instructor-led courses be created and made available to the UCLA community:

- Lab Safety Orientation (components would include Laboratory Safety: Basic Fundamentals, Fire Extinguisher Training, and Hazardous Chemical Waste)
- New Faculty Orientation – Introduce Health and Safety as well as Regulatory and Training Requirements to all New Faculty
- Developing an Injury and Illness Prevention Program for your Lab or Department
- Laboratory Hazards for non-lab workers (ancillary employees)

Online Training and Video Resources

The diverse nature of UCLA laboratory work requires expanded access to online training and resources for faculty, staff, students and visitors. Additionally, the complexity of research and recent advances in technology require highly interactive, detailed and current training material. The benefits of online training include on-demand availability to users, reduction in learning time, increased retention of information, efficient management of EH&S staff time, and consistency of delivery.

The ten EH&S modules currently available through the School of Medicine's Online Training Portal provide elementary and static training materials. Completion of EH&S online training modules has substantially increased in recent months. See Table 3.2.

Table 3.2 – Online Training Statistics

Course	Learners	
	2008	Jan – March 2009
Bruin Safety	1193	790
Fire Safety	1143	829
HazCom	1066	725
Earthquake	1126	814
Laboratory Safety	853	808
Fire Diamond	762	657
Safe Use of Cryogenics	717	641
Chemical Fume	854	636
Bloodborne Pathogens	636	558
Safe Lifting	957	780

The current online modules are connected to a database which is accessible by EH&S and allows for users to print a certificate of completion. While adequate, this should be expanded to allow for departmental access. (See Section 3.3.2 Training Record-keeping for more information.)

An expansion of online training modules and resources is recommended. At a minimum, the following online modules should be created:

- First Aid in the Laboratory
- Fire Safety in the Laboratory
- Radiation Safety Refresher
- Hazardous Chemical Waste Training
- PI or Lab Supervisor Safety Orientation

The above-mentioned modules are a priority for EH&S and will be developed, but limited staff resources will affect the timetable for completion.

EH&S is working collaboratively with campus departments to expand its offering of educational resources, such as safety videos. In addition to the current pipetting and hazardous chemical waste disposal videos, EH&S is currently in production of an instructional video on the safe use of liquid pyrophorics and is planning to produce videos on the correct donning and doffing of personal protective equipment, and other laboratory-specific activities. Such safety videos will be used to enhance classroom and online learning, and will be made available through the EH&S website.

3.3.2 Training Record-keeping

Accurate record-keeping 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. Per OSHA regulations, departments or laboratories must document health and safety training including safety meetings, one-on-one training, and classroom and online training.

The UCLA campus should develop a more effective tracking system that will support complex classroom and online learning needs. Such a system would provide easy tracking of compliance and other essential training (registration for instructor-led courses, delivery of online learning materials, and tracking and reporting of learning). The current *Learning Management System* (LMS) in development through UCOP has the potential to provide such a solution. It would allow all training to be easily accessible in one place; record a personal training transcript for each individual; and potentially provide robust reporting capabilities for Principal Investigators/Laboratory Supervisors, departments and EH&S. The implementation of the LMS would also insure the identification of required training, track refresher training requirements, and flag new employees.

Numerous challenges, however, exist regarding the implementation of the LMS. The system, while robust and powerful, requires significant user training. Implementation of the system would require additional staff resources to train users how to access the system, to track training registration and completion, and to create and analyze reports.

3.3.3 Training Outreach

Effective outreach is required to guarantee a successful training program. By efficiently communicating and collaborating with its clients, EH&S will be able to further ensure the safety of the UCLA community.

To this end, a comprehensive, up-to-date database of EH&S clients is necessary. Using this tool, EH&S would be able to target specific groups with safety messages, training opportunities, changes in programs, etc. This, in addition to the website and personal consultation, would greatly improve EH&S' reach across campus.

EH&S should also expand outreach to further improve the communication of expectations. Departmental presentations,

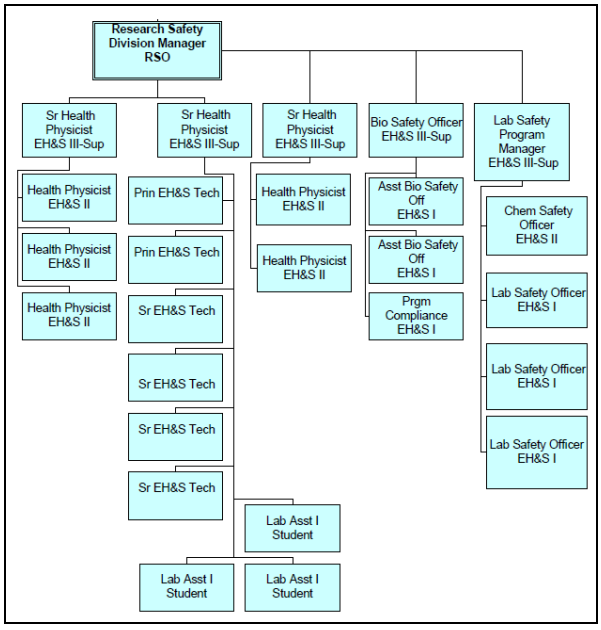
online modules, and additional resources on the EH&S website outlining responsibilities are required.

3.4 Laboratory Inspection Program

EH&S has instituted a revised 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 the California Code of Regulations, Title 8, General Industry Safety Orders and Title 19, State Fire Marshal and in the Environmental Protection Agency, Code of Federal Regulations, Title 40. EH&S Safety Specialists conduct the inspections, issue reports, conduct re-inspections when deficiencies are noted, and provide training and coaching on safety and compliance in laboratories.

EH&S recently realigned its organizational structure and formed the Research Safety Division (RSD). This reorganization combined all of the Laboratory Safety Specialists from radiation, chemistry, biosafety, and general laboratory safety into one division, as depicted in Figure 3.2. The result is a consistent approach to the laboratory inspection program with consistent expectations. New laboratory inspection procedures and performance requirements, that will include revised frequency of inspections, including new requirements for quarterly self-audits, are described in the following sections. Pending notification by the Department, inspections will also be conducted before new PIs begin their research and before departing PIs close their labs. Performance metrics will be adopted by all of the inspectors in the RSD as this reorganization is completed.

Figure 3.2 – Research Safety Division

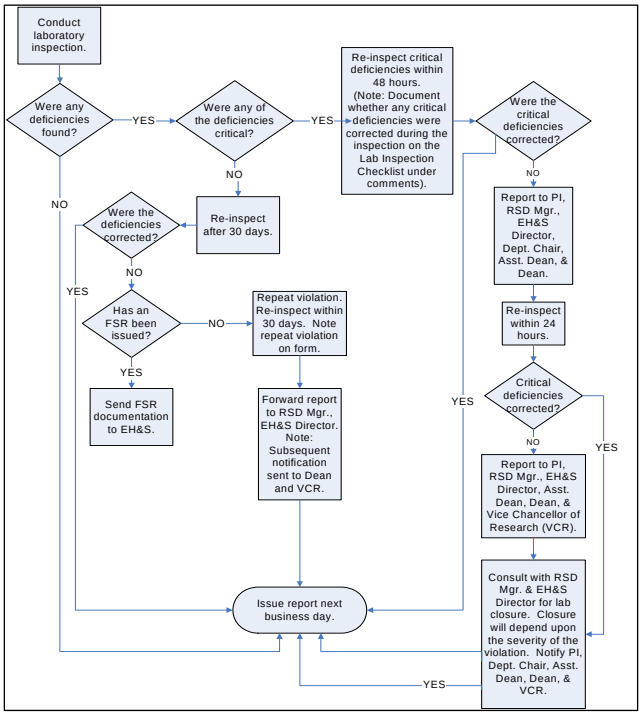


3.4.1 Laboratory Inspection Process

The Laboratory Safety Specialist (i.e., inspector) who conducts a laboratory inspection issues a Laboratory Inspection Report within 24 hours from the time the inspection took place. The Inspection 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. It is a requirement of the Laboratory Inspection Program that critical deficiencies be corrected within 48 hours. When critical deficiencies are noted, the inspector re-inspects the laboratory within 48 hours to ensure that the critical deficiencies have been corrected. In the event that the deficiency is not corrected, the report is provided to the next higher level of management. If the deficiency is still not corrected within the next 48 hour time period, reports are provided to higher levels of management. If corrections are not implemented, laboratory closure may result, depending on the severity of the violation, for non-compliance. For non-critical deficiencies, the inspector re-inspects the laboratory within the 30 day time period allowed to check that the deficiencies have been corrected (see Figure 3.3). As an additional enhancement to the inspection process, each laboratory will also be required to conduct periodic self-inspections using the Laboratory Checklist. These self-audits will be reviewed by the Laboratory Inspection Program.

EH&S also tracks performance metrics of Laboratory Safety Specialists. Each inspector is expected to conduct a minimum of 7 inspections weekly (this may be a combination of initial and re-inspections), issue all reports the next business day, and conduct re-inspections within the prescribed timelines. An 85% performance rating meets expectations for these performance metrics. In addition, a Program Manager conducts random Quality Assurance inspections to ensure that inspections are thorough and done properly.

Figure 3.3 – Laboratory Inspection Flowchart



3.4.2 Formalized Self-Inspection Process

EH&S plans to implement a formalized self-inspection process for laboratories in 2009. Self inspections, which will be performed periodically, should better enable PIs/Laboratory Supervisors to maintain high safety standards, comply with regulations and help to better prepare laboratories for EH&S inspections and inspections from outside agencies.

3.4.3 Laboratory Inspection Checklist

A revised Laboratory Safety Checklist was developed to assist inspectors in performing comprehensive assessments of laboratory safety, to ensure inspection consistency and to identify areas of non-compliance. A new feature in the checklist is the addition of critical deficiencies. Critical deficiencies could lead to serious injuries or be of critical importance in the event of an emergency. For example, it is considered critical that fire extinguishers are present in the laboratories. If one is not found during the inspection, a critical deficiency is noted. Similarly, it is considered critical if there is no emergency information posted in the laboratory. Both of these deficiencies could lead to serious mistakes being made, resulting in possible serious injury. Sixty parameters were added to the checklist and 21 critical deficiencies were identified, for a total of 113 inspection parameters. Laboratory

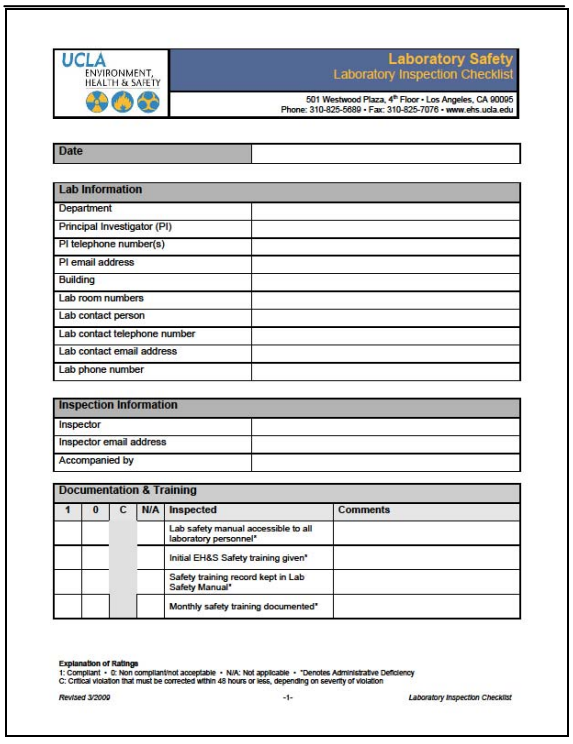
inspection reports are issued by email the next business day after the inspection. All critical deficiencies must be corrected within 48 hours of the receipt of the laboratory inspection.

The inspection points fall under twelve subject categories and are:

1. Documentation and Training;
2. Hazard Communication;
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.

Following each inspection, laboratories receive an Inspection Report with the completed Inspection Checklist (see Figure 3.4). Laboratories can improve their compliance and safety requirements by following the inspection checklist and are required to implement the safety recommendations and corrections identified in the report.

Figure 3.4 – 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(s)	
PI email address	
Building	
Lab room numbers	
Lab contact person	
Lab contact telephone number	
Lab contact email address	
Lab phone number	

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*	
				Initial EH&S Safety training given*	
				Safety training record kept in Lab Safety Manual*	
				Monthly safety training documented*	

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

Revised 3/2009 -1- *Laboratory Inspection Checklist*

3.4.4 Laboratory Inspection Productivity and Quality Control

EH&S Specialists have responsibility to inspect over 2000 laboratories on campus on a continuous basis and are committed to inspecting each laboratory at least once per year. From January 2009 through May 2009, 859 laboratory inspections have been performed. Of the 859 laboratory inspections, there were 422 initial lab inspections and 437 re-inspections. In the course of the inspections, 137 critical deficiencies were identified. Of these deficiencies, all have been corrected, most within the 48 hour timeframe allowed. By comparison, there were a total of 491 initial laboratory inspections performed in calendar year 2008. Quality Control inspections are performed by the Program Manager to ensure that the Laboratory Inspections conform to high quality standards.

The increased inspection productivity and quality should strengthen the safety culture within laboratories and will consequently result in fewer laboratory deficiencies and reduce the need for follow-up re-inspections over time.

3.5 Fume Hood Certification Program

Laboratory fume hoods are the most important components used to protect laboratory workers from exposure to hazardous chemicals and substances used in the laboratory. The average velocity of air drawn through the face of the hood is called the face velocity. Cal/OSHA and agencies such as American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE), America National Standards Institute (ANSI), and American Conference of Governmental Industrial Hygienists (ACGIH) offer requirements and guidelines on fume hood design, operation and certification, including recommended face velocities for general use chemical fume hoods of 100 feet per minute through the sash opening. There is also a requirement, in effect since January 2008, that all chemical fume hoods are equipped with quantitative airflow monitors that continuously indicate whether air is flowing into the exhaust system during operation. In 2007-2008, all 624 fume hoods without these devices were retrofitted with quantitative airflow monitors.

Each year, EH&S personnel measure the airflow across the face of the 1450 fume hoods on campus. Each of them is checked, airflow measured, and results recorded in a database. The process is ongoing, with Laboratory Safety Specialists performing the testing, and certifying the fume hoods in each laboratory building. A certification sticker is placed on each fume hood indicating the date of testing, the inspector, and the height of the sash opening. For optimum performance, it is recommended that experimental work be conducted with the sash at the certified height. For energy conservation purposes,

laboratory personnel are encouraged to shut the sash when the fume hood is not being used. Some fume hoods are equipped with Zone Presence Sensors, which reduce the airflow in the hood when there are no fume hood users present.

Obstacles faced in the fume hood certification program include the lack of an efficient process to initiate and document the completion of repairs to fume hoods. Currently, EH&S has a paper/email system to initiate repair to fume hoods. A certification process connected to a Facilities Management database would streamline the process and ensure faster repair and corrections.

3.6 Laboratory Design

EH&S provides consultation services on laboratory design issues to Capital Programs and Facilities Management (FM) on an as needed basis. EH&S also reviews design plans when design professionals need expert opinion on issues involving requirements for laboratory ventilation, Biosafety level 2, 2+ or 3 level labs, and issues concerning eyewashes, showers, fume hoods, or other safety equipment. EH&S Biosafety division has been involved in the early planning of two BSL 3 labs on campus and has provided consulting services to assist with the renovation of laboratories.

To improve the level of collaboration on laboratory design projects, a formal process should be developed to ensure EH&S' involvement with laboratory design. Although EH&S has been more involved over the last few years, there is no tracking mechanism to determine whether EH&S has been consistently consulted on past laboratory renovation projects. An example of a preventable design deficiency was the misplacement of storage cabinets for water-reactive chemicals adjacent to emergency showers. This misplacement resulted in costly renovations to affected laboratories.

The University of California Industrial Hygiene Program Management Group developed a *University of California Laboratory Safety Design Guide* to assist design professionals and the campus community during the planning and design phases of laboratory planning, renovation, and construction. The construction and renovation projects often have significant health and safety requirements due to regulatory oversight or industry "best practices" guidelines. The design guide is a resource document which can be used to improve design efficiency and minimize costly design changes.

The requirements of the design guide apply to all laboratory buildings, laboratory units, and laboratory work areas in which hazardous materials are used, handled, or stored. It also addresses biological safety and ionizing and non-ionizing radiation issues commonly found in laboratories. A chapter is devoted to ergonomic design for laboratories. The Industrial Hygiene Program Management group believes that this standard represents the minimum requirement; more stringent requirements may be necessary, depending on the specific lab function or contaminants generated. Variances may be individually allowed for specific

remodeling projects when approved by the campus EH&S organization on a case-by-case basis. The design guide is not all inclusive, and does not cover all regulatory issues or all design situations.

3.7 Laboratory Security

The development and implementation of effective security measures that protect researchers – both on and off campus – is essential. This is especially true for animal researchers and animal research and care facilities. According to the National Association for Biomedical Research, the number of illegal incidents by U.S. animal extremist organizations has increased sharply over the past several years. Several UCLA researchers have recently been the targets of animal rights extremists. These extremists have staged protests at researchers' homes and have destroyed property, committed acts of vandalism, made personal threats and harassed researchers and their families.

In addition to animal research and care, there are many other aspects of laboratory research that require effective security measures, such as the use of radioactive materials. The Department of Homeland Security and the Nuclear Regulatory Commission require increased control measures for radioactive materials meeting the definition of quantities of concern. UCLA has established and implemented an extensive security management program dedicated to safeguarding these materials, while striving to limit impact to the UCLA research and medical communities. This program involves the communication and coordination of many different groups, from Human Resources and UCPD to PIs and the Radiation Safety Committee. In addition to these specific requirements for high activity sources, the Radiation Safety Division has instituted security controls for commonly used quantities. These controls include identification requirements for isotope receipt, basic security requirements for all low level radioactive storage areas, and cradle to grave tracking of isotope shipments.

Select agents and other infectious materials pose additional concerns. Security plans must be developed that address threats, vulnerabilities, and risks associated with these materials. The plans must describe select agent and toxin inventory control procedures, provisions for securing the areas (e.g., access and locks), procedures for what to do in the event that passwords or keys are compromised, procedures for loss or theft, alteration of inventory records, or release of agents or toxins, and measures to escort and monitor maintenance staff, visitors, etc. These measures are currently in place in the BSL-3 labs on campus.

Chemical research also requires unique security measures. Hazardous chemical waste must be stored in a secured location with the lab (per CCR Title 22 Section 4.5) and governmental security regulations mandate certain precautions, as described below.

In January 2008, EH&S conducted a campus-wide survey to comply with the Chemical Anti-Terrorism Standard of the Department of Homeland Security Chemical Screening Project. The standard gives screening threshold quantities (STQ) for listed chemicals of interest (COI). The survey results showed none of the campus' COIs to be over the STQ.

A security initiative from the Department of Justice (DOJ) requires that a manufacturer, wholesaler, retailer, or other person or entity in California, is required to report to the DOJ any transaction involving a large group of substances called precursor (List 1) substances. These substances can be used in the manufacture of illegal drugs. However, many of these substances are used routinely for legitimate research purposes. Each researcher who wants to use a chemical on the precursor list is required to obtain a Drug Enforcement Agency (DEA) number for purchasing the chemical of interest. Sometimes, a PI or Laboratory Supervisor is unwilling to obtain a DEA registration number for the purchase of chemicals that he/she uses routinely. The solution to the problem is not clear, with neither Purchasing nor EH&S able to obtain a DEA registration number for that purpose. The hospital pharmacist, in the past, has been willing to obtain these chemicals occasionally, but a more comprehensive solution is necessary.

A challenge posed to chemical security is the lack of a comprehensive campus chemical inventory. Currently, individual PIs/Laboratory Supervisors are required to keep an inventory of the chemicals stored in their laboratories, but there is no centralized tracking mechanism on the department or campus level.

UCLA has demonstrated its commitment and ability to assign resources to monitor security efforts, deploy campus resources as necessary, and communicate with affected researchers. It is essential that EH&S continue to work with campus and local, state and federal law enforcement officials to ensure an effective, rapid, coordinated, and sustained response and establish an organizational structure that anticipates and rapidly responds to threats to researchers and develop and strengthen security protocols.

3.8 Electrical and High Voltage Hazards

Laboratories contain many diverse types of electrically powered equipment, such as lasers, hot plates and heating mantles, stirrers, vacuum pumps, electrophoresis apparatus, ultrasonicators, etc. This equipment – if not handled properly - can pose a significant risk to the health and safety of laboratory workers. Many laboratories, such as those with lasers, also have high voltage or high power requirements and some laboratories have electrical systems that can potentially store lethal amounts of energy and pose a serious danger even if the power source has been disconnected. To protect the health and safety of laboratory personnel, minimum standards must be established that prevent hazardous electrical exposures and ensure compliance with regulatory

requirements applicable to electrical systems. Currently, EH&S' Laboratory Safety Program inspects for these hazards as part of its routine laboratory inspection. It is recommended that this aspect of the program be revaluated to ensure the laboratory staff are adequately protected against electrical shock, burns and other potential electrical safety hazards and that labs comply with regulatory requirements.

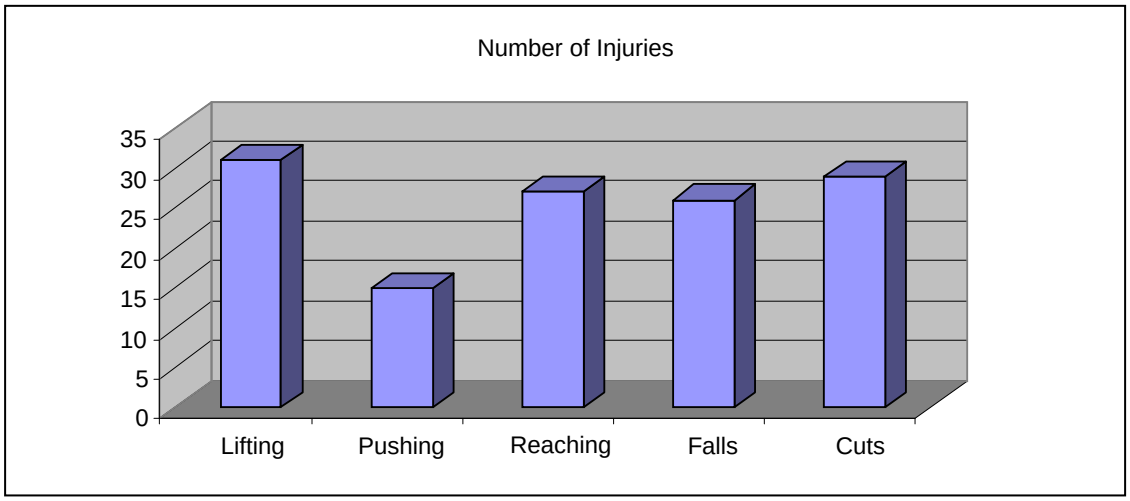
4.0 Accident Prevention

Injuries and illnesses increase workers' compensation and retraining costs as well as absenteeism. Injured or ill employees also work less accurately and efficiently, reducing productivity and quality of work. Effective safety and health management systems can reduce these costs and improve efficiencies.

Departments with laboratories had 674 workers' compensation claims with approximately $2,350,000 in incurred costs during the period January 2008-June 2009. These injuries included slips, trips and falls, upper extremity overuse injuries, back injuries, lacerations, needle sticks, exposures to chemicals and blood borne pathogens, and issues related to stress. Employees involved in these injuries include both laboratory and administrative support personnel.

Numbers of injuries in the same period that are directly related to laboratory functions and personnel include the following categories (excluding chemical exposures which are reviewed in Section 5.0 of this report). See Table 4.1.

Table 4.1 – Laboratory Injuries



An effective accident and injury prevention program depends on the credibility of management's involvement in the program; inclusion of employees in safety and health decisions; rigorous worksite analysis to identify hazards and potential hazards, stringent prevention and control measures; and thorough training. A strong compliance program is a critical part of an effective safety program.

Environment, Health and Safety has many resources to assist PIs and Laboratory Supervisors in developing effective accident and injury prevention programs. These include safety program and procedure templates (i.e., IIPP), and consultant services to conduct safety inspections, develop training materials,

and provide training programs. (See Section 3.3 Health and Safety Training.) EH&S laboratory inspectors complete detailed inspections of laboratories as outlined in Section 3.4 Laboratory Inspection Program. EH&S safety specialists also review accident and injury statistics from Insurance and Risk Management to focus training and intervention efforts on areas with high numbers of injuries and incidences.

There has been a wide range of response from PIs and Laboratory Supervisors in participating in development of laboratory specific safety programs. The School of Medicine and School of Dentistry have Safety Committees with designated safety officers assigned to specific laboratories. The Chemistry and Biochemistry Department has an assigned Chemical Safety Officer from EH&S. He works with individual PIs and Laboratory Supervisors to complete safety inspections and programs. Overall, there is a wide range in safety program compliance in the various departments.

In FY 2008, designated safety officers affiliated with the School of Medicine were asked to complete a safety audit to assist in evaluating and improving their safety programs. Divisions that completed audits included Orthopedic Surgery, Biological Chemistry, Pathology, Pediatric Infectious Diseases, and Physiology. This is reflective of the priority placed on safety. Many PIs and Laboratory Supervisors have intensive workloads and responsibilities related to their primary teaching and research responsibilities. The provision of a structured orientation on their specific safety responsibilities has been inconsistent, leading to varying levels of awareness of their roles in safety training for their employees.

4.1 Illness and Injury Prevention Program

One of the most effective methods for strengthening a safety culture and program in laboratories is to require development of laboratory specific Injury and Illness Prevention Programs. The UCLA Injury and Illness Prevention Program (IIPP) is a guide that is available to assist PIs and 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 record keeping. A well-integrated IIPP provides the information required to monitor activities and resources to reduce risk of workplace injury and illness to maintain a safe work environment.

4.1.1 Scope

In California every employer is required by law (Labor Code Section) to provide a safe and healthful workplace for all

employees. Title 8 (T8), of the California Code of Regulations (CCR), requires every California employer to have an effective Injury and Illness Prevention Program in writing that must be in accord with T8 CCR Section 3203 of the General Industry Safety Orders. The current edition of the departmental "Laboratory Safety Manuals" 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." A specific commitment to a strong safety culture, methods of communicating safety information, and methods of insuring compliance to following safety procedures are not included. There is a need for a more comprehensive over-view of an IIPP appropriate for laboratories in the manual, as well as inclusion of additional information on the missing components of the IIPP.

4.1.2 Management Commitment and Assignment of Responsibilities

The existing Laboratory Safety Manual recognizes that safety is an important part of laboratory activities and outlines responsibilities for safety training and activities. (See Section 3.2 for Responsibilities.) There are several Chemical Hygiene Officers, a Chemical Hygiene Committee, and a Chemical Safety Committee to ensure development and on-going review of all procedures and activities to maintain an optimal level of safety in laboratories. It is recommended that the revised manuals emphasize the development of a strong safety culture and specifically identify management commitment to developing this culture.

The LSC has been created to complete a comprehensive review of laboratory safety. This new committee is making recommendations to improve the health and safety of laboratory personnel. The work of this committee is a demonstration of the campus' commitment to enhancing the culture of lab safety on campus.

4.1.3 Safety Communication

Safe working is essentially a collaborative effort and hinges on effective health and safety communication. Safety communication can be done in a variety of ways depending on the size and organization of the work group. This can range from discussion of safety issues at staff meetings to review of safety concerns at organized departmental or laboratory specific safety committee meetings. The area-specific IIPP should identify the methods used

to communicate safety issues and concerns with employees. This currently occurs using the following procedures:

1. PIs, laboratory supervisors and safety officers provide information to their assigned workers about safety and health issues including hazard information pertinent to their work assignments;
2. There are departmental School of Medicine and School of Dentistry Safety Committees. These committees have designated safety officers who are responsible for safety training and activities in specific laboratories;
3. Material Safety Data Sheets (MSDS) are used to provide information on the potential hazards of products or chemicals used in laboratories. Hard copies of MSDS are available in each laboratory;
4. Equipment operating manuals are available to assure that all laboratory equipment is operated in accordance with the manufacturer's instructions, as specified in the equipment's operating manual. All employees using equipment must be trained in operation before use;
5. Specialty safety manuals including the Chemical Hygiene Plan, the Laboratory Safety Manual, the Radiation Safety Manual and the Laser Safety Manual are available in all laboratories as appropriate;
6. Safety bulletin boards are available in all campus buildings with laboratories for posting information concerning workplace hazards. Safety information including changes in protocol, safety bulletins, accident statistics, and training announcements is posted. This information includes the required Cal/OSHA "Safety and Health Protection on the Job" posters and other mandated posters; and
7. Employees are encouraged to report potential health or safety hazards through use of e-mail, telephone calls to EH&S Hotline, suggestion boxes or mailboxes. There are no reprisals for expressing a concern, comment, suggestion, or complaint about a safety matter.

4.1.4 Identification and Correction of Hazards

Identification and evaluation of workplace hazards are made through systematic safety inspections. Inspections may be conducted by the EH&S Laboratory Safety Inspectors, Departmental Safety Committee Representatives, supervisors or other personnel. At a minimum, annual inspections will be performed of all laboratories by EH&S inspectors. Periodic self-inspections must be performed by Departmental Safety

Coordinators or other assigned laboratory personnel. All of these laboratory inspections are conducted to detect and eliminate any hazardous conditions that exist. Unscheduled safety inspections are completed whenever new substances, procedures, or equipment are introduced and present new safety or health hazards, or whenever new hazards are recognized. The Laboratory Hazard Assessment Tool, developed in January 2009, as an immediate response to a laboratory injury involving pyrophoric materials, is an example of new safety inspection procedures developed in response to newly identified hazards.

Corrective actions or plans for identified hazards, including suitable timetables for completion, are completed by the department with assistance from EH&S to determine appropriate abatement actions. Immediate actions must be taken to mitigate serious hazards that present an imminent danger to life or limb. The PI or Laboratory Supervisor is responsible for mitigation of all hazards or violations discovered either as a result of a scheduled periodic inspection or during normal operations. Critical violations found on laboratory inspections must be completed within 48 hours. Non-critical violations must be completed within 30 days.

4.1.5 Accident, Injury and Illness Treatment and Investigations

Employees who are injured or become ill at work must report the injury or illness immediately to their supervisor and personnel department. Procedures for reporting these conditions are included in the Laboratory Safety Manual.

When accidents or near misses occur on the job, supervisors must investigate them to identify the root cause and implement any procedural changes or repairs to correct conditions contributing to the accident or near miss. If the supervisor is unable to determine the cause(s) and appropriate corrective actions, assistance is available from EH&S. Procedures for completing accident investigations are not included in the existing Laboratory Safety Manual. Guidelines should be included in the next revision of the manual as part of the expanded IIPP.

4.1.6 Training and Recordkeeping

When questioned, PIs and Laboratory Supervisors report that all employees are trained in general safe work practices, including specific instructions on hazards unique to their job assignment. Minimal training should include use of workplace equipment, materials handling, identifying hazards in work area, use of

personal protective equipment, safe handling of hazardous materials and proper procedures for disposal of hazardous waste. Training must be completed before use of any dangerous equipment, exposure to any known hazardous conditions, or when new hazards are identified. All safety training must be documented, and records maintained for the duration of employment. However, documentation of required training is inconsistent between labs. Many labs have excellent documentation records; other labs have inadequate documentation of training.

Records of safety inspection forms, accident investigation forms, safety meeting agendas, and safety postings must be retained for 5 years to comply with Cal/OSHA regulations.

4.1.7 Compliance

Compliance is critical for an effective safety program. Managers and supervisors must set positive examples for working safely and require safe work practices from their staff.

An effective safety program should recognize employees who demonstrate safe work practices. This can be accomplished through the use of performance evaluations and incentive programs. There is currently no consistent program in place to provide this recognition. Performance evaluations do not consistently include safety as a critical performance standard.

University disciplinary procedures can be used to ensure that employees follow established policies and procedures. Initial training and reinforcement of training and safe practices are necessary initial steps in assuring compliance. When re-training is not effective, formal disciplinary action program may be implemented, including verbal warnings, written warnings, written performance evaluations, sanctions, and, as a last resort, termination. Disciplinary measures applied in a consistent manner would help ensure that PIs, Laboratory Supervisors, and staff follow required safety procedures.

4.2 Serious Laboratory Injuries

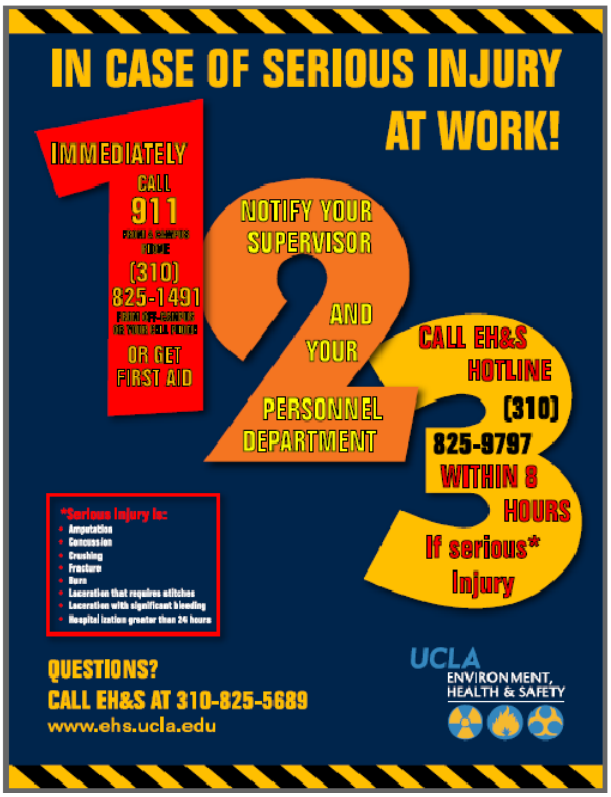
Serious occupational injuries, illnesses or exposures to hazardous substances, as defined by Cal/OSHA, must be reported to EH&S immediately when they become known to PIs or Laboratory Supervisors by calling 825-9797 from a campus phone. To encourage timely reporting, EH&S has developed educational materials,

including posters that have been widely distributed to make staff aware of reporting procedures for serious injuries (Figure 4.1).

Serious injuries include death, amputations, concussions, crush injuries, fractures, burns, lacerations with significant bleeding or requiring stitches, or hospitalization for greater than 24 hours for other than observation. Injuries not reported to Cal-OSHA within **8 hours** are subject to a $5,000 fine.

EH&S is responsible for contacting Cal-OSHA to report the injury. An accident investigation is conducted by EH&S in conjunction with the department where the injury occurred. Posters, supervisor training sessions, letters, and e-mails have been used to inform PIs and Laboratory Supervisors of this reporting requirement. There have been no violations for late reporting in the laboratories in the last two years.

Figure 4.1 – Serious Injury Poster



4.3 Ergonomics Evaluation

Laboratory researchers work long hours to maintain high levels of experimental efficiency and accuracy. This dedication and commitment to their research can place them at risk for developing musculoskeletal injuries such as neck, back, shoulder, and hand discomfort. The UCLA EH&S Laboratory Ergonomics program has focused on working with campus architects, designers and building managers to “design-out” ergonomic risks and hazards to reduce and eliminate

employee exposure. Services are also available to assist staff in improving the design of existing laboratories as new products and processes develop. Employees who do report discomfort are provided with individual workstation evaluations and training to promote recovery and optimize performance. Specific services that are available include:

1. Safety training on the UCLA Ergonomics website www.ergonomics.ucla.edu:
    1.1. Laboratory safety training for microscope users, pipetting, use of fume hoods and biosafety cabinets;
    1.2. Computer workstation assessment and training;
    1.3. Laboratory ergonomics risk checklist;
    1.4. Pipetting video; and
    1.5. Back safety training;
2. Customized group trainings on specific laboratory ergonomics issues upon request;
3. BruinErgo OES web-based ergonomics self-assessment and training program for all employees using computers to complete work duties;
4. Loaner pool of ergonomic laboratory equipment associated with high risk such as pipettes, de-capping devices, and precision hand tools;
5. Assistance with modifying laboratory equipment to reduce risk of overuse issues;
6. Cost-sharing program through Be Smart About Safety Program to assist researchers and lab managers in purchasing ergonomic equipment such as pipettes; and
7. “Ergonomics Chapter” in UC Laboratory Design Guide.

5.0 Chemical Safety

Chemical Safety involves numerous activities, such as proper handling and management of chemicals and controlling the risks associated with their use. Chemicals should be managed by controlling the methods of storage, transport and disposal used. Risk should be minimized by advanced planning, by development of a Chemical Hygiene Plan for each laboratory, and by working in properly designed and designated laboratories, and by learning how to respond to accidents and emergencies in the laboratory. These crucial elements, along with proper personal behavior and attitudes about safety, can successfully promote an overall culture of safety in the laboratory.

5.1 Chemistry and Biochemistry Safety Committee

The purpose of the Department of Chemistry and Biochemistry Safety Committee is to achieve and maintain a safe and healthy environment for the faculty, staff and students in the Department of Chemistry and Biochemistry. The Chemistry and Biochemistry Safety Committee meets quarterly or more frequently when required and is composed of the following staff:

1. Chair of the Chemistry & Biochemistry Department;
2. Chair of the Chemistry Safety Committee;
3. Four chemistry division representatives, one each from organic, inorganic, physical and biochemistry; and
4. The two staff members: Chemical Safety Officer and Department of Chemistry and Biochemistry MSO.

The main objectives of the committee are to:

1. Promote and publicize safety to department faculty, staff and students;
2. Obtain and review safety-related suggestions, reports of hazards or other information from personnel involved in the chemistry department that would help in creating a safe work environment;
3. Evaluate the department's practices and operations, which may affect safety and health in the workplace and make recommendations for improvement;
4. Evaluate the department's safety and health training practices and recommend procedures necessary to ensure that researchers are trained to perform their work in a safe manner;
5. Ensure that laboratory inspections are conducted to locate, identify and document safety and health hazards; and
6. Review and investigate accidents, injuries and make recommendations for remedy or improvement in procedures and operations.

Currently this Committee is limited to the Department of Chemistry and Biochemistry and does not have authority over chemical research in other campus units. The LSC recommends expanding this committee to include oversight of all campus research that involves chemical or other physical hazards. The LSC also recommends that this committee be endowed with similar regulatory authority to that of comparable campus committees (e.g., Radiation Safety Committee).

5.2 Chemical Hygiene Plan

The California Occupational Safety and Health Administration's (Cal/OSHA) Chemical Hygiene Standard requires each laboratory to have a written Chemical Hygiene Plan. The purpose of the Chemical Hygiene Plan is to minimize laboratory personnel exposures to chemical hazards. Each laboratory is required to have a Chemical Hygiene Plan for the specific hazards in the laboratory. Three specialized Laboratory Safety Manuals have been developed and are distributed by EH&S personnel, according to Department. The Chemistry and Biochemistry Laboratory Safety Manual is distributed to those in the Chemistry and Biochemistry Department. The Laboratory Safety Manual and Chemical Hygiene Plan are distributed to the departments within the School of Medicine, and Life Sciences. The Laboratory Safety Manual and Chemical Hygiene Plan for Engineering are distributed to the departments in the School of Engineering, and other physical sciences departments. One of the laboratory safety manuals is given to departments outside these categories. Department personnel are expected to read and maintain the Laboratory Safety Manual, and to maintain training records and other documentation in the binder.

5.2.1 Elements of the Chemical Hygiene Plan

The elements of the Chemical Hygiene Plan are contained in the Laboratory Safety Manuals. While there are some variations among Departments, the contents consist of the following general topics:

1. Introduction: defines responsibilities, the Chemical Hygiene Standard, Chemical Hygiene Officers, and the Illness and Injury Prevention Plan;
2. Emergency Response: UCLA campus emergency notification, and other phone numbers, personal injury in the lab, fire response, chemical spill, biohazardous material spill, radioactive material spill, earthquake response;
3. Personal Protective Safety Equipment: eye and face protection, protective clothing, respiratory protection;
4. Facility Safety Equipment: fire extinguishers, fire hoses, fire blankets, alarms and intercoms, first aid kits, eyewash

stations, safety showers, spill kits, fume hoods, biological safety cabinets and equipment maintenance;
5. Safety Procedures – Standard Operating Procedures: summary of laboratory safety rules, disposal procedures, chemical storage and use;
6. Hazard Communication and Identification;
7. Medical Consultation and Examinations; and
8. Information and Training: training requirements, training documentation form, lab safety manual documentation sign off form, respirator training flyer, bruin safety training, fire safety training, emergency preparedness, earthquake safety, safe lifting, back injury prevention training.

5.3 Chemical Inventory

Each laboratory is required to maintain an updated and complete chemical inventory. Most labs maintain an Excel spreadsheet or Word document, especially if there are only a small number of chemicals in the lab. For those laboratories with extensive inventories, a computerized database should be maintained. Each laboratory is encouraged to print out the chemical inventory and have it readily accessible for review during inspections by EH&S inspectors. Failure to comply with this requirement will result in an inspection violation that requires remediation within 30-days.

Chemical inventories are currently only kept at the lab level and there is no centralized tracking mechanism on the department or campus level. There are also no specific requirements for the kind of information that must be kept in the inventory, such as chemical name, quantity, characteristics, location, whether any chemicals are acutely toxic (see Appendix E), etc.

5.4 Chemical Incidents

The following table lists incidents involving chemicals as reported to the Office of Insurance and Risk Management from January 2008 to June 2009.

Chemical Incidents: January 2008 – June 2009	
Dermal chemical injuries	11
Inhalation chemical injuries	8
Other chemical injuries	5

Out of those injuries mentioned above, the Department of Chemistry and Biochemistry and the School of Medicine Department of Biological Chemistry reported 5 injuries each.

Because chemical hazards have the potential to cause serious harm and are largely unregulated, unlike radiation and biosafety hazards, the LSC will continue

to closely review and evaluate policies and procedures related to chemical safety in order to evaluate and mitigate any risks associated with these hazards.

6.0 Radiation Safety

As a broad-scope radioactive material licensee, the Radiation Safety Division is responsible for ensuring compliance with State and Federal regulations as they pertain to safety while working with radioactive material and radiation producing machines. The Radiation Safety Division achieves this through the establishment and enforcement of campus-wide policies and procedures that must be upheld by Principal Investigators and Laboratory Supervisors who have been authorized to use radioactive material.

6.1 Radiation Safety Committees

Regulatory and licensing requirements stipulate the existence and maintenance of a Radiation Safety Committee and a Medical Radiation Safety Committee to oversee activities involving the use of radiation and radioactive materials at UCLA. These committees oversee both research and clinical usage of radiation on campus, at the Santa Monica – UCLA Medical Center and Orthopedic Hospital, and at several minor satellite facilities as outlined in UCLA's state issued Radioactive Materials License.

The Radiation Safety Committee primarily oversees laboratory operations and usage while the Medical Radiation Safety Committee primarily reviews the use of radioactive materials in human use research, and some key components of clinical use. Both committees are mature, well established groups that are operating knowledgably and effectively. They are composed of a cross section of researchers and clinical staff members chosen to cover the breadth of operations and are appointed on an annual basis by the Vice Chancellor of Research.

6.1.1 Radiation Safety Committee (RSC)

The Radiation Safety Committee oversees general operations, primarily through their interface with the Radiation Safety Officer. Meetings are held quarterly and typically cover the following elements:

- Unusual occurrences
- The effectiveness of the EH&S Radiation Safety Division
- Escalating enforcement issues found in laboratory inspections
- Radiation doses received by occupational workers that exceed established warning limits
- The progress of special projects and program developments
- Incidents, spills and emergency responses

6.1.2 Medical Radiation Safety Committee (MRSC)

The Medical Radiation Safety Committee is much more specialized and is made up of experts in the field of medical imaging and medical research. Their primary focus is the administration of radiation and radioactive materials to humans for clinical or research purposes; human use research applications have increased by 77% from 2007 to 2008. The group routinely reviews:

- Patient safety issues
- Human use research applications involving radiation
- Radioactive drug research protocols
- Hospital response to large scale radioactive materials emergencies

6.2 Laboratory Inspections

The Radiation Safety Committee and the Radiation Safety Division authorize the use of specific procedures, radioisotopes, and quantities of radioactive material at UCLA by authority of the California Department of Public Health – Radiological Health Branch as outlined in the UCLA Broad-Scope Radioactive Materials License. This license allows authorized individuals to use radioactive material, as approved by the Radiation Safety Committee, without applying for a separate license with the State. Under the direction of the Radiation Safety Committee, the Radiation Safety Division provides vigilant oversight of the UCLA Radiation Safety Program. The State routinely inspects UCLA to ensure that the program is operating within regulatory requirements.

Principal Investigators/Laboratory Supervisors must apply to receive and use radioactive material through the Radiation Safety Division. Applications and subsequent authorizations must specify the following:

- Rooms in which radioisotopes will be used
- Specific radioisotopes to be used
- Quantities of radioisotopes to be received and used in each experiment
- Personnel that will handle radioisotopes
- Standard operating procedures for each experiment
- Radioactive waste handling procedures

The Radiation Safety Division maintains a database of all authorized groups and uses that database to ensure that each radioactive material use laboratory is inspected on a regular basis. A safety index value is assigned to an authorized group based on the radiological hazards involved. Inspection schedules are developed based on assigned safety index values. Most authorizations are

inspected semi-annually, while some higher risk authorizations are inspected on a quarterly basis.

The following elements are the primary focus of inspections:

- Use of appropriate safety apparel
- Radioactive contamination
- Personal monitoring equipment, if applicable
- Radioactive material work area labeling
- Adherence to food and drink policies
- Certification of chemical fume hoods and biosafety cabinets
- Calibration and function of radiation detection instruments
- Radioisotope inventory
- Documentation of routine laboratory contamination surveys
- Security of radioactive material
- Required postings
- Review of personnel authorized to use radioisotopes
- Training records
- Review of authorized radioactive material use locations
- Proper labeling and storage of radioactive waste
- Radioactive material shielding

In addition, any other performance elements and laboratory conditions are noted, as appropriate, to maintain safety and regulatory compliance.

In 2008, approximately 800 laboratories were inspected over the course of 594 inspections. Of these inspections, 125 inspections noted deficiencies. These figures are not great deviations from previous years, as presented in Table 6.1.

Table 6.1 – Radiation Safety Laboratory Inspections

Annual Comparisons

	2006		2007		2008	
Authorizations Audited:	589		574		594	
Overdue Audits:					88	14.81%
Radiation Safety Deficiencies:	84	14.26%	142	24.74%	125	21.04%
Food:	16	2.72%	13	2.26%	15	2.53%
Contamination:	11	1.87%	18	3.14%	13	2.19%
Records:	58	9.85%	78	13.59%	80	13.47%
Other:	17	2.89%	49	8.54%	39	6.57%

Deficiencies are grouped into four main areas. Radioactive contamination is considered to be a critical violation and requires immediate corrective action.

The increase in contamination deficiencies from 2006 to 2007 is not considered to be representative of an increase in existing violations, but rather an improvement in inspection reporting as a result of additional inspector training and an enhanced quality of laboratory inspections. Overdue audits were generally identified and corrected in the following month. This issue was addressed in staff re-training and past due audits are expected to significantly decrease in 2009.

The most prominent issue found is the failure to maintain required radiation safety records. This relates to two primary documents: the monthly Radiation Survey Report and the Radioactive Material Inventory records. While important, the lapses we see in these records are generally a regulatory issue and are rarely a safety issue.

The underlying cause of violations found is likely due to laboratory staff turn-over. As an educational research institution, it is expected that laboratory personnel will move on and be replaced with new student or other workers on a regular basis. The impact on safety and compliance is especially significant when the radiation safety supervisor or manager of an authorized group leaves the laboratory. These individuals are typically responsible for ensuring compliance with radiation safety policies and procedures. Training in radioactive material use procedures and the proper maintenance of radiation safety records should take place more quickly. Training is commonly provided to new radiation safety supervisors or managers during routine inspections in an effort to prevent future violations. The majority of users wish to maintain compliance and generally only require guidance and training in order to achieve this.

In order to correct violations and identify recurring problems, the Radiation Safety Committee has created an escalating enforcement system. Under this system, authorized groups are given guidance on campus policies and an opportunity to correct problems found during inspections. A follow up inspection is then performed to ensure that the initial deficiency has been rectified. If a repeat problem is found, a Strike One Memorandum is issued. On issuance of a Strike One Memorandum, the Principal Investigator is given 30 days to respond, in writing, with the corrective actions that have been implemented to address the issue. If an appropriate response is not received in 30 days, or if the violation recurs after the corrective action has been implemented, a Strike Two Memorandum is issued. On issuance of a Strike Two Memorandum, the Principal Investigator has 15 days to respond with appropriate corrective actions. In addition, the infraction is brought to the Radiation Safety Committee and the Department Chair for review. Failure to submit a response, or to correct the problem, results in the issuance of a Strike Three Memorandum. When a Strike Three Memorandum is issued, laboratory use of radioactive material is suspended and the Principal Investigator must appeal directly to the Radiation Safety Committee for reinstatement. A Strike Three Memorandum is rarely

issued, as problems are generally resolved before reaching this level of progressive review.

In 2008, nine Strike One Memorandums were issued and resolved. As of May 2009, three Strike One Memorandums and one Strike Two Memorandum have been issued. See Table 6.2 for detailed list of Strike Memorandums issued from 2008 to present.

Table 6.2 – Strike Memorandums (2008 – Present)

Level	Date Issued	Details
1	1/10/2008	Inadequate survey records and security of radioactive material
1	1/11/2008	Inadequate survey records
1	4/1/2008	Improperly labeled work area and storage of radioactive material in an unauthorized location
1	5/8/2008	Violation of food/drink policy
1	5/8/2008	Contamination found over action limits
1	8/19/2008	Inadequate survey records
1	9/23/2008	Inadequate training and untimely reporting of misadministration
1	10/16/2008	Missing dose calibrator linearity test records
1	10/28/2008	Violation of food/drink policy
1	3/2/2009	Violation of food/drink policy
1	3/16/2009	Inadequate survey records
2	4/30/2009	Violation of food/drink policy
1	5/6/2009	Inadequate inventory records

In addition to the actions listed above, on December 14, 2007, a research x-ray machine was shut down and the Principal Investigator was locked out of the unit pending the resolution of training issues. This was a very serious violation, as it was determined that the unit was being used on humans by an unlicensed operator. The Principal Investigator cooperated with the Radiation Safety Committee to resolve the issue.

6.3 Laboratory Incidents and Responses

Since 2008, the Radiation Safety Office responded to six incidents, not including false alarms and clinical incidents. The following is a brief summary of these events:

- On May 7, 2008, it was determined that an authorized group had disposed of 0.13 μCi of H-3 through the regular waste stream instead of through the required radioactive material waste stream.

The material could not be recovered, but fortunately was not of sufficient quantity to constitute a public health hazard.

- On June 27, 2008, members of the Radiation Safety Division responded to an emergency spill call from an authorized group. The spill was spread over a laboratory bench and the floor beneath. The level of P-33 contamination measured up to 1500 counts per minute on the floor. The Radiation Safety Division was able to mitigate the spill.
- On July 7, 2008, a major leak on the third floor of CHS poured through the ceiling to the second floor where it flooded radioactive material use and waste storage areas. The Radiation Safety Division was able to remove the radioactive material and contaminated equipment. The area was surveyed and then released to Facilities for additional clean up.
- On October 6, 2008, a researcher contacted the Radiation Safety Division believing his eye had been contaminated with radioactive material and that he was suffering from radioactive material related trauma. A thorough investigation and series of bioassays confirmed that the eye was not contaminated. A follow up ophthalmologic exam confirmed that the trauma experienced was due to a minor corneal scratch.
- On March 24, 2009, it was determined that four radioactive sealed sources were either lost or transferred without proper documentation. It is possible that this issue is a database data error. The radioisotopes and activities of the four sources were originally as follows: 1.83 μCi Cm-244, 50 μCi Co-60, 11 μCi Co-60, and 25 μCi Cs-137.
- On April 5, 2009, it was determined that two liquid scintillation counters normally containing generally licensed radioactive sources were disposed of without being properly documented.

6.4 Overview of Campus Radiation Safety Culture

Radioactive material use is a highly sensitive issue in the minds of the general public. Public concern in the early days of the development of radiation safety standards has led to a mature and comprehensive regulatory framework which specifically licenses users and oversees their activities, including regular inspections of licensed facilities. In order to comply with these well enforced regulations, industry and university licensees maintain active and effective programs. The program at UCLA is no exception. While the Radiation Safety Division experienced a large staff turnover between two and three years ago that slowed continuous improvement efforts, the key requirements of the program have been retained.

There are a number of tools and organizational elements that have been key to the continued success of the program.

- **Radiation Safety Database and Contact Information** – Approximately four years ago, the Radiation Safety Division started the migration towards a new database system from an aging, limited database. As part of this migration, work processes were reviewed from the ground up to ensure compatibility. One important change that resulted from this evaluation was the updating of Principal Investigator contact information and the identification of radiation safety supervisors. The designation of a radiation safety supervisor for each authorized group has substantially improved communications and has helped establish an effective chain of authority for the resolution of safety issues.
- **Survey Information Sheets** – The information contained in the database has allowed the development of comprehensive Survey Information Sheets that contain all pertinent radiation safety data for each authorized group. These summaries are an effective tool, allowing inspectors to audit an authorized group in toto and enabling Principal Investigators to easily assess their group as part of their annual review.
- **Updated Radiation Safety Journal** – As part of the last comprehensive revision, the Radiation Safety Manual was expanded into the current Radiation Safety Journal. The format now includes two parts: the Radiation Safety Manual and a set of tools designed to assist users in meeting radiation safety and regulatory requirements. The Journal is preconfigured for the storage of critical radiation safety records. At the time of its issuance, the Radiation Safety Division changed its policy and required groups to use a specific set of forms to document radioactive material use, radioactive contamination surveys, and employee training. A significant training effort was needed to establish this culture change with the Principal Investigators, but the end result is substantially improved compliance and an understanding of the requirements by authorized groups.
- **Established Committee Authority** – Regulatory mandate requires the existence of the Radiation Safety Committee and grants the Committee explicit authority to maintain the campus radiation safety license. The Radiation Safety Division uses the authority of the Committee to implement the three strike escalated enforcement system in cases where principal investigators are consistently non-compliant. The vast majority of authorized groups make the effort to meet requirements, but the established authority structure is critical for correcting those few who do not.
- **Effective Staff of Radiation Safety Specialists** – While smaller campuses are forced to hire a limited group of general safety personnel, UCLA is large enough to maintain specialists in various safety fields. UCLA has a large and diverse research program, and

as such, subject specialists, and even sub-specialists, are critical for ensuring safety and compliance throughout the campus.

Radiation Safety Culture Challenges

The list above details some of the established elements that help the program function. While the program is successful in its specifics, there are some general campus safety culture practices that should be addressed. First, the campus should more aggressively advocate for consistent use of safety apparel and appropriate dress codes in laboratories that use hazardous substances. This would include consistent use of appropriate lab coats, prohibition of shorts and open-toed shoes in hazardous material areas, and consistent use of safety eyewear. Second, the campus should implement an effective tracking and enforcement system for the safety training that is provided to all laboratory workers. It is important to ensure training, but it is equally important to ensure compliance with training through efficient mechanisms to track participation as a global program. Training tracking should be effective and efficient for specialty areas that are highly regulated such as radiation safety and biological safety, but equally effective for all areas whether or not subject to special regulations. Safety training is critical to the campus safety mission and the documentation of that training is a fundamental element of ensuring compliance on campus and demonstrating that compliance to regulators.

7.0 Biological Safety

The Biological Safety Program is responsible for ensuring compliance with State and Federal regulations as they pertain to work with biohazardous materials (e.g. infectious agents, recombinant DNA, bloodborne pathogens, biological toxins, select agents/toxins, and animals infected with zoonotic pathogens). The Biosafety Safety Program works to achieve this through the establishment and implementation of campus-wide policies and procedures that must be upheld by Principal Investigators/Laboratory Supervisors and laboratory personnel who have been authorized to work with biohazardous materials. The goal of the program is to reduce the risk of potential occupational exposure to biohazardous materials and to prevent the release of biohazardous materials into the environment.

The program is managed by the EH&S Biological Safety Officer (BSO) and receives oversight from EH&S and the Institutional Biosafety Committee (IBC).

7.1 Personnel and Functions

The BSO and the staff's duties are geared toward ensuring regulatory compliance in labs conducting research with biohazardous materials. This objective is achieved in a variety of ways, but primarily consists of:

- Conducting laboratory inspections to ensure that biohazard materials standards are met (e.g., NIH, CDC, USDA, OSHA, other federal, state, and local requirements)
- Developing policies and standard operating procedures involving biohazard materials
- Working with the IBC by providing professional and administrative support and reporting problems, violations, and accidents to the IBC
- Consulting on laboratory design and security involving biohazardous materials
- Providing technical advice to Principal Investigators and the IBC on research safety procedures
- Developing and implementing training programs involving biohazard materials
- Leading, directing, and managing other biohazard materials-related programs outside of research and teaching application (e.g., clinical laboratories, extension community, etc.).

7.2 Biosafety Committees

7.2.1 Institutional Biosafety Committee (IBC)

The IBC was established to meet the requirements set forth by the *NIH Guidelines* for Research Involving Recombinant DNA Molecules and to ensure UCLA's compliance with health and safety practices involving biohazardous materials in research or teaching. The Vice Chancellor of Research is responsible for the IBC and appointment of its members.

Responsibilities

General responsibilities of the IBC include advising the Vice Chancellor of Research on biohazardous material-related matters, establishing policy, practices, and procedures for reviewing protocols, reviewing and approving protocols, ensuring regulatory compliance, and suspending or terminating activities deemed to be unsafe and inconsistent with established requirements.

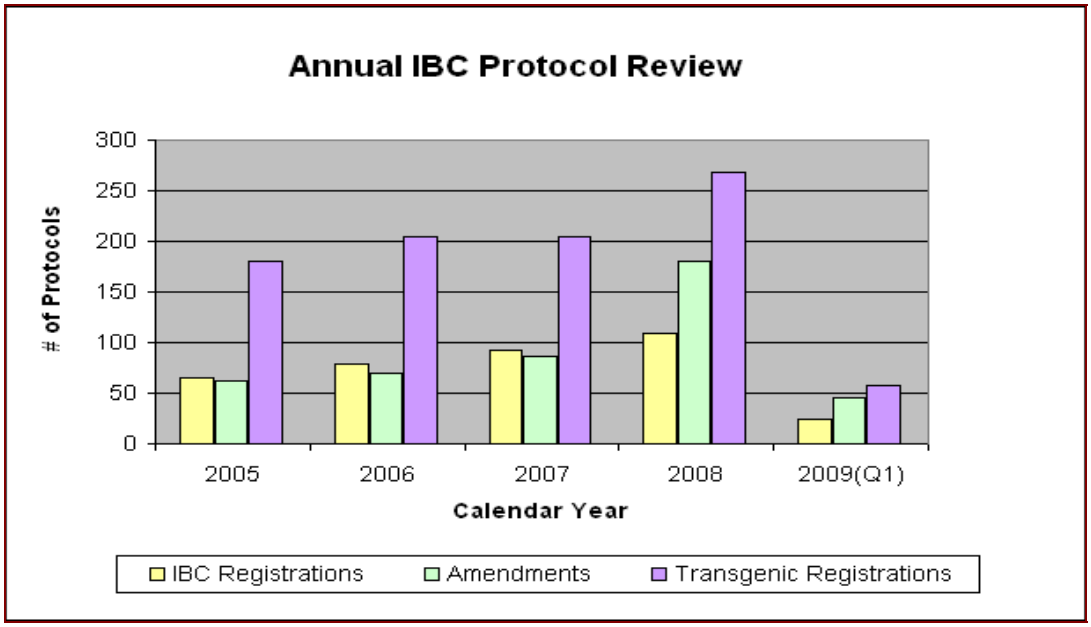
Protocol review and oversight has steadily increased over the last five years (see Table 7.1 and Figure 7.1).

Table 7.1 – Status of Current IBC Protocol Review

Calendar Year	IBC Registrations*	Amendments	Genetically Modified Organism Registrations	Total
2004	70	54	153	277
2005	65	62	181	308
2006	79	69	204	352
2007	92	86	204	382
2008	109	180	268	557
2009(Q1)	25	45	57	127

* IBC Registration includes: recombinant DNA research, infectious agents, BBP and other potentially infectious materials (e.g., human, non-human primate materials, other mammalian cells and tissues including zoonotic animals). Please note that the use of BBP and OPIM without rDNA or infectious agents were not officially reviewed or approved by the IBC until June 2008.

Figure 7.1 – IBC Protocol Review



A protocol approval is good for three years; PIs must reapply for protocol approval every three years or submit an amendment when their protocol changes (e.g. use of biohazard materials, personnel, laboratory locations, etc.). PIs must also review their protocol annually during the approval period as part of the required periodic review. There are currently 261 actively approved protocols and 43 protocols pending approval.

Incident Reports Filed

Research involving biohazardous materials has a good safety track record at UCLA. Two reports were submitted to the NIH Office of Biotechnologies over the last two years:

- December 2, 2008 – the IBC reported an incident of personnel not wearing the proper personal protective equipment and proper safety equipment in an ABSL2 facility.
- December 11, 2009 – reported an incident involving a needle stick injury to recombinant HIV in an ABSL2+ facility.

Internal Reporting (resulting in suspension within the last year):

- July 31, 2008 – IBC suspended a research project indefinitely until the facility meets containment and occupational health requirements.
- February 19, 2009 – IBC issued a suspension to a lab that was found to be noncompliant due to training issues and unsafe practices (not decontaminating the biosafety cabinet

and leaving a pilot light on inside the cabinet). This suspension was lifted March 2, 2009, after corrective actions were met.

IBC Challenges

The main challenge facing the IBC is the lack of an online registration tracking system of protocols, which would tremendously reduce the administrative paperwork involved in processing applications. This would also allow amendment, continuation, or renewal submissions to be readily accessed by PIs, IBC members, and Biosafety staff, and would provide enhanced security of sensitive registration applications involving high containment laboratory and animal research.

Although training is provided to IBC members, professional training, such as attending conferences or lectures hosted by the NIH, would benefit its members. New regulatory requirements are being put into place by the CDC, NIH, and Cal/OSHA, but professional development training opportunities and resources for members of the IBC to meet these regulatory challenges and advance the campus community on Biosafety and compliance are not readily available.

7.2.2 Animal Research Committee (ARC)

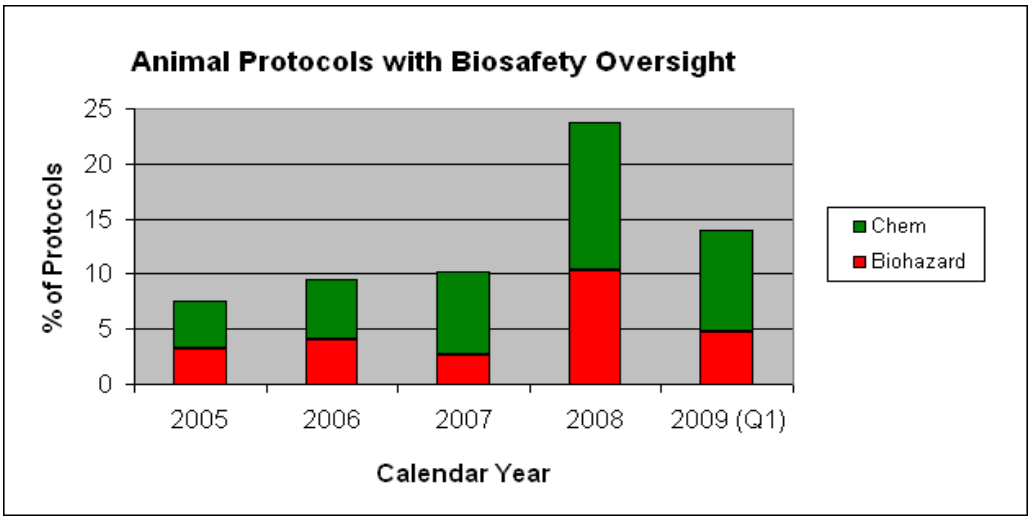
The Chancellor's Animal Research Committee (ARC) is an independent research review committee mandated by the Animal Welfare Act and the PHS Policy on the Humane Care and Use of Laboratory Animals (PHS Policy). The EH&S Biosafety Officer is an integral part of the ARC's role in carrying out its responsibilities in the care and use of animals involving biohazardous materials or other hazardous chemicals (e.g., carcinogens and highly toxic chemicals) that may pose an occupational risk to personnel or the environment. The Vice-Chancellor of Research is the institutional official responsible for the ARC and appointment of members.

Responsibilities

The main responsibilities of ARC are to review and approve protocols involving the care and use of animals. This includes inspecting all of the animal facilities, including satellite facilities, reviewing and investigating reports of potential noncompliance issues, and suspending noncompliant activities. ARC requires that appropriate training and education specific to animal handling be obtained. ARC reviews the program at least every six months and makes written recommendations to the VCR.

Animal protocols requiring the oversight from EH&S Biological Safety has steadily increased over the last four years, as demonstrated by Figure 7.2.

Figure 7.2 – ARC Applications Reviewed By Biosafety Division



Challenges

The main challenge facing ARC is to increase the frequency of animal biocontainment facility inspections from every three years to annually. It would also be beneficial to increase the frequency of ARC and DLAM meetings to discuss complicated protocols and to increase the involvement of ARC in the facility design review of upcoming animal biocontainment facilities and carcinogen housing facilities to ensure compliance. In addition, there is a need for an on-line system for transgenic registration and to improve the training programs for DLAM personnel. Tackling these challenges will require additional resources.

7.2.3 Vivarium Research Resources Advisory Committee (VRRAC)

The Vivarium Research Resources Advisory Committee (VRRAC) is a standing committee consisting of senior administrators and senior faculty who are involved in research with animals. VRRAC acts in an advisory capacity and enables timely improvements recommended by ARC and/or the Campus Veterinarian. This group assures rapid communication related to animal welfare.

Responsibilities

The Biosafety Program, IBC, and ARC work with VRRAC to ensure that UCLA continues to earn accreditation from the Association for Assessment and Accreditation of Laboratory Animal Care

(AAALAC), a nonprofit organization that promotes the humane treatment of animals in science through voluntary accreditation and assessment programs. This accreditation demonstrates the campus' commitment to responsible animal care and use.

AAALAC

UCLA has been AAALAC accredited since 1976. This organization conducts site-visits at UCLA, which the Biosafety Program is involved in regards to animal biocontainment. These site visits assess potential occupational health concerns and outline related corrective action.

VRRAC Challenges

The main challenges facing VRRAC are to engage increased involvement in the facility design process, increase the frequency of laboratory inspections, and to improve the communication of requirements and regulations to PIs. Ensuring completion of training and medical health questionnaires of personnel prior to handling of animals would be enhanced by development of a database or hiring of an Occupational Health Facility Director to communicate medical surveillance and occupational health issues. Tackling these challenges will require additional resources.

7.3 Biosafety Level 3 Laboratories

7.3.1 Overview

UCLA currently has three Principal Investigators approved to conduct BSL-3 work with consideration to select agents. Select agents are biological agents and toxins that have the potential to pose a severe threat to public, animal or plant health, or to animal or plant products.

Typical BSL-3 laboratories without select agents do not have additional compliance requirements other than what is required by the BMBL and the NIH Guidelines. However, BSL-3 laboratories with select agents must comply with additional regulations and must have an approved facility security plan, an incident response plan, and a biosafety plan in place. There are specific BSL-3 laboratory design requirements that must be met and BSL-3 laboratory personnel must be screened and receive specialized training.

7.3.2 Incident Reporting

To date, the UCLA Select Agent Program has reported two incidents. These incidents did not compromise laboratory

containment, personnel safety, or security and the appropriate regulatory agency was notified immediately. The first incident was deemed to be a non-reportable incident and the second as a transfer violation by a shipping entity. No further action was required for either incident; however, both incidents were addressed during annual training and changes were made to the appropriate select agent plans to ensure such incidents do not happen again.

7.3.3 Upcoming BSL-3 Facilities

UCLA has three upcoming BSL-3 Facilities:

- Department of Microbiology, Immunology, and Molecular Genetics, core facility for select agents, Fall 2009
- AIDS Institute, dedicated to HIV research and other infectious diseases, such as SARS, 2010
- School of Public Health – High-Throughput Laboratory, laboratory for diagnostic screening of avian influenza and other highly contagious agents, 2012

Challenges to Biosafety Level 3
The main challenge facing the Biosafety Program in regard to BSL-3 laboratories is to ensure increased involvement in the laboratory design phase, from beginning to end. This requires more resources.

7.4 Laboratory Inspections

Biosafety staff conducts consultations, pre-inspections, and inspections of the following:

- New, renovated, existing biosafety laboratory space (e.g., BSL-1, BSL-2, BSL-2+, and BSL-3).
- New, renovated, existing animal biocontainment facilities (e.g., ABSL-1, ABSL-2, ABSL-2+).

The following guidelines are used for inspections:

- NIH Design Criteria
- CDC/NIH Biosafety in Microbiological and Biomedical Laboratories
- UC Environment, Health & Safety Laboratory Design Guide (2007)

Biosafety has a laboratory inspection checklist that recently quadrupled in length. This expanded checklist is more comprehensive and is reflective of the different types of laboratories on campus, includes the proper regulatory requirements, and has been approved by the IBC.

All protocols submitted to the IBC must meet all of the applicable items on the inspection checklist prior to initiation of research. Laboratories are also not issued biohazard door cards until all of these requirements are met.

The Biosafety staff also maintains an in inventory of all biohazardous materials on campus (see Appendix C).

7.5 Other Regulatory Compliance

7.5.1 Bloodborne Pathogen Control Plans

To comply with CAL-OSHA Title 8 California Code of Regulations Section 5193, the IBC adopted a policy to require Principal Investigators using human materials (blood, blood products, human cells and tissues) to obtain approval from the IBC to ensure compliance with the regulation.

7.5.2 Medical Waste Management

EH&S has been charged with oversight of medical waste management to comply with California Department of Public Health (CADPH) Medical Waste Management Act of the California Health and Safety Code Sections 117600 – 11836. The Biosafety Program develops and implements the medical waste management plan for the campus to ensure compliance with this requirement by medical waste generators from research or teaching laboratories. The medical waste program covers biohazardous waste, sharps, pathology waste, trace chemotherapy waste, and some pharmaceutical waste.

A training program specific for compliance to medical waste management standards is required for those who are generating, packaging, transporting, and treating medical waste and biohazard waste on campus.

CADPH conducts inspections of the campus and the medical center to ensure compliance with the California Medical Waste Management Act. Fines can be levied for noncompliance, but to date, CADPH has not issued any fines to UCLA, but has provided recommendations to correct observed non-compliance.

CADPH inspection reports are kept on file by Biosafety Program and a copy of cited non-compliance is provided to each laboratory or appropriate department. A copy of the laboratory's response to the violation is provided to the CADPH for review including the medical waste management plan.

Challenges of Medical Waste Management
The main challenges facing the medical waste management program include implementing bilingual training classes, developing online training, and ensuring that individuals handling medical waste have been properly trained. More buildings also need to have dedicated waste accumulation sites to decrease the potential for exposure.

7.5.3 Shipping of Biological Materials

To comply with the requirements for shipping of infectious substances in accordance to Department of Transportation (49 CFR) and International Air Transport Association Dangerous Goods Regulations (IATA DGR), the Biosafety Program requires that shippers of Infectious Substances be trained on required shipping requirements prior to shipping these materials. The current registration form requires PIs to record the registered users and the personnel who will ship biological materials in the laboratory.

Procedures put into place by the Biosafety Program are a key component of the Materials Transfer Agreement (MTA) Office/Export Control for incoming and outgoing materials. The Biosafety Program is a resource for PIs who import or export biological materials by ensuring that the appropriate permits are obtained and reviewed prior to receiving or shipping and that personnel have taken the required training.

7.5.4 Biological Safety Cabinets

The Biosafety Program has oversight of biological safety cabinets (BSC) used in research and/or teaching laboratories. Upon request, Biosafety reviews and approves the purchase and installation of BSCs in accordance to the CDC/NIH Primary Containment for Biohazards: Selection, Installation, and Use of Biological Safety Cabinets (3rd ed.) and National Sanitation Foundation (NSF 49) for certification. A training specific for BSCs has been developed and implemented to cover the different types of BSCs, the difference between BSCs, and other primary equipment engineering controls, safe practices inside a BSC, and decontamination procedures.

BSC Management Challenges
The main challenges facing BSC management are communication and training. BSCs should be relocated only after a certified decontamination is conducted and new BSCs purchased, installed, and used only after receiving approval from the Biosafety Program. BSCs should also only be installed in locations consistent with the CDC/NIH guidelines to avoid

delay of approvals of protocols. Personnel who use BSCs should also consistently receive required training and understand the safety requirements.

7.6 Summary of Biosafety Challenges and Recommendations

Changing the campus safety culture is important to improve and ensure Biosafety. Proactive measures to ensure the prevention of certain practices, such as improper PPE usage and storage, and consumption of food in laboratories, should be undertaken. Likewise, additional measures should be taken to ensure that laboratory personnel always wear fundamental safety attire, such as laboratory coats, and consistently remove PPE such as lab coats and gloves before exiting the lab. A laboratory dress code that would specify basic safety requirements, such as wearing close toed shoes, should be implemented and enforced. Good hand washing practices also should be regularly employed.

Stronger policies should be developed and enforced to mitigate the risks associated with the consumption of food and beverages in laboratories, preventing unauthorized personal refrigerators in labs, and placement of personal food items in refrigerators that store biohazardous materials.

Laboratory equipment should be inspected and certified more regularly. And BSCs must be certified annually. The new Bunsen burner policy should also be more widely distributed and published to ensure that all PIs/Laboratory Supervisors are familiar with the new policy. This new policy training should be more broadly pursued to supplement the information provided by Biosafety staff as they perform inspections which occur every three years for most laboratories. Emergency showers and eyewash stations should be on a monthly inspection plan by Facilities Management to ensure effective operation and to ensure appropriate access is unobstructed. More frequent Biosafety laboratory inspections would enhance safety measures, along with improved communication and educational materials.

Facility oversight should be enhanced to ensure that biohazardous waste accumulation barrels are not overfilled (a common state inspection violation), proper disposal procedures are used, and personnel dispose of biohazardous waste with appropriate permission. The animal biocontainment facilities would benefit from improved HVAC and stronger efforts to eradicate pest problems. More frequent inspections and more support from building managers and departmental safety coordinators are needed.

The scarcity of outgoing material transfer agreements (MTAs) indicates that some faculty may continue to ship outgoing biological materials without appropriate institutional oversight. Increasing education and outreach on how to properly transfer biological materials is advised. There also need to be clearer policies and procedures for reporting personnel turnover, protocol modifications,

and laboratory changes (e.g., new labs coming online, lab closures, and reporting when projects end). More explicit policies and procedures would be a further help in maintaining regulatory compliance and other important records.

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8.0 Laser Safety

The EH&S Laser Safety Program seeks to ensure the continued safe use of laser devices on the UCLA campus. Program requirements are applicable to all individuals who use lasers and/or laser systems within the research, development and educational communities at UCLA. The program plays an important role in UCLA laboratory safety due to the increasing number of powerful lasers on campus and the diverse ways in which laser devices are currently deployed for research purposes.

The Laser Safety Program is responsible for the oversight and administration of required safety standards and procedures, and provides guidance in the safe use of lasers for workers who work with or come into contact with laser radiation. Program goals are accomplished through a combination of education, specific direction in lab operations for compliance with applicable American National Safety Institute (ANSI) standards, and continuing audits of the environment to ensure that requirements are met and maintained.

In the fourth quarter of 2008, EH&S developed and implemented a more focused Laser Safety Program and assigned specific resources to achieve the desired levels of user safety and regulatory compliance. Responsibility for the program was shifted to the Radiation Safety Division and specific performance goals were set. The changes implemented constituted a significant shift and has focused on establishing and strengthening partnerships with laser users.

8.1 The Laser Safety Committee

To facilitate the rebuilding of the program in a manner that targets user needs, the Laser Safety Committee was reconstituted to include expert laser users. Prior to the reorganization, the Committee had existed as an internal organization comprised only of EH&S staff, who met sporadically. The new Committee structure provides practical guidance and campus knowledge to the new Laser Safety Officer and represents the users to help in gaining community buy-off to program changes. A significant change is being made to the campus safety culture in the rebuilt Laser Safety Program, and it is critical that the users support the new program if compliance is to be achieved.

The new Committee was formally initiated in the first quarter of 2009 with a set of by-laws and a quarterly meeting schedule. It is comprised of four Principal Investigators, the Laser Safety Officer and/or his appointee, the EH&S Director, and other laser experts as required to support the Committee. Once formed, an initial focus of the Committee was suggested revisions to the updated Laser Safety Manual which was produced in the second quarter of 2009 and which will be distributed throughout the year. Additional advice was sought from the group in the development of a laser safety tracking database, the review of recommended and required safety equipment, and several campus safety

policies. The Committee represents a good cross section of campus users and is active and energetic in its participation with university laser safety development.

8.2 Laser Safety Training

One of the immediate needs identified by the Laser Safety Committee was the development and expansion of the Laser Safety Training Program. Prior to the redevelopment efforts, laser safety training was held twice per year and there was no mechanism for tracking individuals who had been trained and/or who needed training. Effective January 2009, laser safety training is offered monthly, and participation is recorded in the EH&S departmental training database.

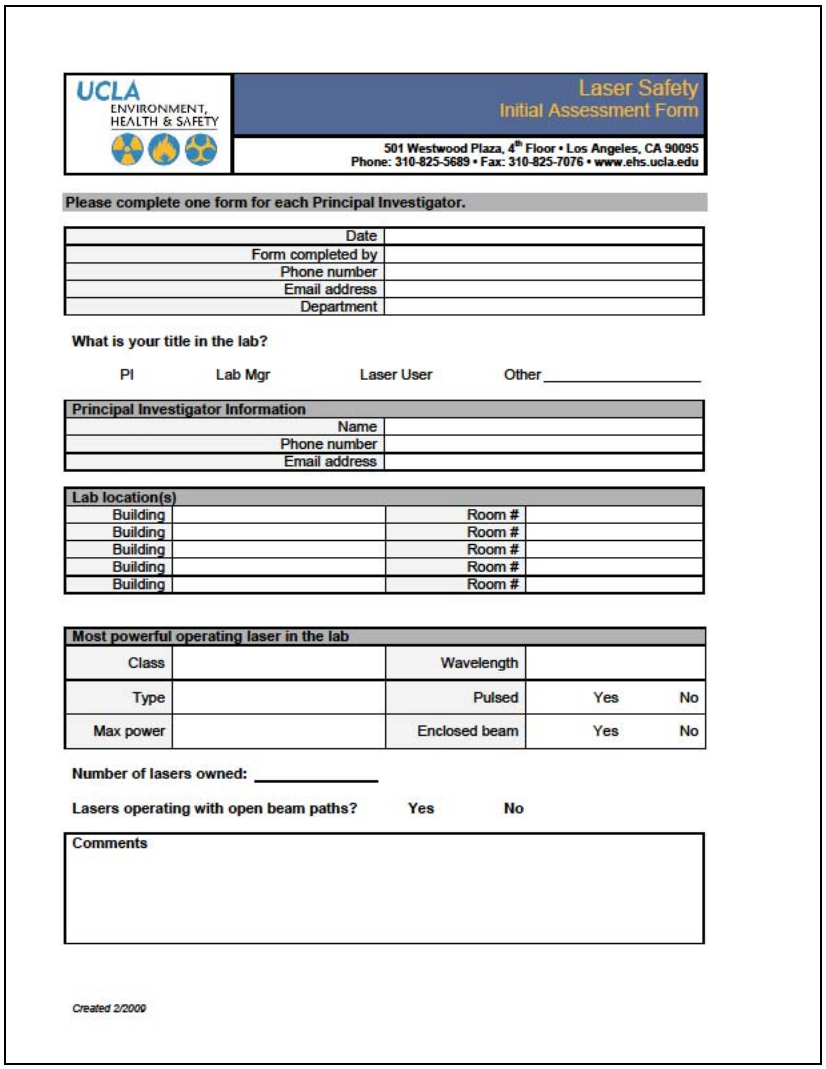
The focus of the training presentations was updated over the early part of the year to emphasize basic laser safety over technical theory. The intent was to make the training classes as broadly applicable to the users as possible so that users have the knowledge to adapt to changing laser usage. Another change was to limit the attendance numbers to facilitate a more effective and interactive training experience. Recent reports indicate that the users have responded positively to the updated content and increased class availability.

8.3 Laser Safety Inspections

Prior to recent changes, formal laser safety inspections were uncommon and largely voluntary. Some inspections were conducted of basic laser safety elements as part of the general laboratory safety inspection program. EH&S has begun a formal laser safety inspection schedule as the database is developed and populated to drive this process. While the formal program is being developed, the Health Physicist assigned to Laser Safety is conducting inspections to ensure safety, build our knowledge of laser research on campus, and to connect with the community in a partnering environment. As there are insufficient resources to directly control laser safety through a program of direct audits, it is essential that the Principal Investigators independently apply the safety principles that are being developed. It is important that the Laser Safety Program is seen as a support organization and not strictly as an enforcement agency if a culture shift is to be affected.

In March 2009, the Program sent an initial assessment form to laser users to gather data on the most powerful lasers operating in their respective labs (see Figure 8.1). This was one of the first steps in obtaining concrete information about lasers on campus. It provided important information about key safety features, such as whether laser beams are enclosed.

Figure 8.1 – Laser Safety Initial Assessment Form



UCLA ENVIRONMENT, HEALTH & SAFETY

Laser Safety
Initial Assessment Form

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

Please complete one form for each Principal Investigator.

Date	
Form completed by	
Phone number	
Email address	
Department	

What is your title in the lab?

PI Lab Mgr Laser User Other _____

Principal Investigator Information	
Name	
Phone number	
Email address	

Lab location(s)			
Building		Room #	
Building		Room #	
Building		Room #	
Building		Room #	
Building		Room #	

Most powerful operating laser in the lab				
Class		Wavelength		
Type		Pulsed	Yes	No
Max power		Enclosed beam	Yes	No

Number of lasers owned: _____

Lasers operating with open beam paths? Yes No

Comments

Created 2/2009

The next phase in developing the inspection program is to institute a series of safety scoping surveys to be conducted by Radiation Safety Technicians. These surveys will be targeted on identifying and correcting primary safety concerns, gathering additional data, and transitioning the users into a formal inspection program.

8.4 Status of Campus Laser Safety

Enhancements to the Laser Safety Program have already made inroads to the community and improvements to campus policies and practices, but this program is still in its early stages. Laser use has grown exponentially over the years, while the formal Laser Safety Program has remained relatively small and detached. It is estimated that the rebuilding effort will be a multi-year initiative given current staffing allocations. The campus has remained free of reported laser injuries over recent years largely due to the efforts of the individual Principal

Investigators. In the first few months of the redevelopment, it has become clear that there are many laser users who have not interacted with EH&S. It will be difficult to estimate user participation until a mature database is developed. Over the current transition period, training will be emphasized to assist users in maintaining their own programs; as the program develops, EH&S will begin to take a more direct role in assuring safe laser use at UCLA.

Another program designed to both improve campus safety and EH&S' partnering relationship with laser users is a program that provides matching funds for safety equipment purchases. This program is funded by a grant from the UCLA Injury Prevention Committee and supplements the purchase of eye protection and other laser safety equipment. Several Principal Investigators have participated in the program that will assist with new lab set ups and replace outdated safety equipment. The program's success will be evaluated in the third quarter of 2009.

9.0 MRI Safety

The purpose of this section is to discuss safety considerations related to Magnetic Resonance Imaging (MRI), where magnetic fields and radio frequency (RF) waves are used to obtain high quality images of soft tissue in the body. Unlike X-ray and computerized tomography (CT) procedures, the radio waves used in MRI are non-ionizing, that is they have very little or no interaction with the electrons that produce chemical bonds. The energy of a single RF photon is a trillion times less than a single X-ray photon, hence, MRI is considered a very safe imaging modality. However, that is not to say that there are no risks associated with MR imaging.

9.1 MRI Safety Concerns

Below are listed some of the issues that operators of MRI equipment must be aware of to ensure the safety of patients, visitors and all health care providers that may possibly enter the MRI scan room:

1. The magnetic fields used in MR imaging are as much as 30,000 (1.5T) - 60,000 (3T) times stronger than the earth's magnetic field. Any ferrous (iron) or magnetic object brought too close to an MRI scanner can easily be pulled into the magnet. Other objects (besides oxygen tanks) that have been pulled into MRI scanners include a heavy, commercial floor polisher, a vacuum cleaner, a chair, a gurney, welding tanks, guns, knives, scissors, stethoscopes, paper clips, hair clips and various tools. Although paper and hair clips are not likely to cause any damage, all of the other objects could easily cause serious harm to an individual caught in the line of flight.
2. Changing magnetic fields can induce electric currents in conductive materials or devices such as ECG gating leads, indwelling catheters with metallic components (e.g., thermodilution catheters), guide wires, some cervical fixation devices and improperly used physiological monitoring devices. These induced currents can produce localized heating or could possibly affect any implanted devices.
3. Although MRI doesn't utilize *ionizing* radiation, the radio waves used can deposit enough energy into the body that a slight raise in temperature of the tissue being imaged can occur. As long as the rate the energy is absorbed, known as the Specific Absorption Rate or SAR, is kept below a reasonable level, most people's body can easily handle this warming. The FDA has established guidelines for maximum SARs. Every manufacture has built into their scanner software guards against exceeding these maximum SAR limits. These rates are dependent upon the patient's weight and therefore it is important that the patient's correct body weight is entered at the start of the study.

9.2 MRI Contraindications

The list of metallic objects whose presence inside of a patient are absolute or likely contraindication for MRI scanning is quite long. This document does not attempt to list all such objects. An extensive list of metallic objects and their effect on MRI can be found in the book entitled *Pocket Guide to MRI Procedures and Metallic Objects: Update 2000* written by Frank Shellock, published by Lippincott Williams & Wilkins and is distributed by Bracco Diagnostics. This book is available with the MRIRC receptionist and the technologist. The objects listed in this book can also be found on Dr. Shellock's web site at www.mrisafety.com. Whenever any questions arise regarding the safety of an implanted/imbedded metal object, either this book or the web site should be consulted.

9.3 Screening Procedures

All individuals, including patients, volunteer subjects, visitors, MRI health care providers, and custodial workers, must be thoroughly screened by qualified personnel before being exposed to the MRI environment. Conducting a careful screening procedure is crucial to ensure the safety of anyone that enters the area of the MRI scanner.

10.0 Laboratory Hazardous Waste Program

The management and use of hazardous materials in laboratories constitutes an important part of laboratory safety. Hazardous materials used in labs include solvents, inorganic and organic chemicals, heavy metals, compressed gases, reactive materials and other types of materials. A material becomes a hazardous waste at that point when the material can no longer be used for its intended purpose, has expired, has become unstable or non-usable, or is no longer needed. One of the challenges in the lab is that while proper attention is given to the storage and inventory of chemicals in the lab, once these materials become waste the oversight of them is often neglected. The proper management of a hazardous material once it does become a hazardous waste is important both from a safety standpoint and for campus compliance with regulatory requirements. The UCLA Hazardous Waste Program covers the management of hazardous waste in the lab, transportation to a central accumulation area, and shipment off campus to a disposal facility. Following is a brief description of the various aspects of the Hazardous Waste Program on the UCLA campus.

10.1 Identification, Labeling, Storage and Disposal of Laboratory Waste

Before lab personnel are authorized to generate or handle hazardous waste, they are required to attend Hazardous Chemical Waste Training. These classes are offered weekly by EH&S and at alternate times/locations upon request. The curriculum includes what constitutes a hazardous waste according to EPA regulations, and how to identify hazardous components of different experimental waste streams. Classes also cover proper handling, storage, and labeling requirements for hazardous wastes, and how to prepare hazardous chemical wastes for pick up by EH&S. Lab personnel are directed to the available campus resources to identify hazardous constituents and to manage the waste properly. EH&S also reviews Departmental initiatives that provide opportunities to minimize the generation of hazardous waste.

One challenge in the training aspect of this program is to ensure all appropriate personnel are trained. Due to the transient nature of students and lab workers, there is a high turnover rate for workers in these labs, so the campus has to ensure that the resources and tracking systems are available to ensure all new personnel are trained.

Because both Federal and State regulations require hazardous waste containers to be labeled at all times, UCLA implemented the Online Tag Program (OTP) developed by UCOP. Lab personnel who have attended the Hazardous Chemical Waste training are informed about how to sign up for an OTP account. Once they set up an account, they are able to create their own labels (tags) for all waste containers, and manage their inventory of hazardous wastes. The tags can be printed right in their lab, and then affixed to waste containers by slipping

them into the adhesive plastic window provided by EH&S. When the containers approach the maximum allowable storage period in their lab accumulation area, the OTP account contacts are emailed a reminder to bring their waste to a scheduled pick up or to request a special pick up from EH&S. When EH&S picks up the waste, the tags are scanned and the containers are entered into our inventory database.

EH&S Hazardous Waste Technicians offer a weekly pick up at all campus research buildings with a high density of experimental labs. Other campus facilities receive pick ups on a monthly basis or upon request. Requests for special pick ups are usually completed within a few working days. After the pick up, wastes are temporarily stored in the Environmental Services Facility (ESF). Certain wastes, such as flammable solvents, are combined in bulk containers in order to minimize the costs and environmental impacts of disposal. Other more hazardous compounds must be segregated and can require special handling and packaging. Once waste has been packaged and labeled per Federal Department of Transportation guidelines, it is shipped off site by a licensed contractor on a monthly basis. All hazardous wastes are disposed at licensed and permitted hazardous waste facilities, which are periodically audited by the EPA and by a committee of UC Hazardous Waste Program Managers. All hazardous waste containers generated at UCLA are tracked using the uniform manifest system that documents the point of generation, each point of transit, and the final treatment, storage and disposal facilities (TSDFs). Manifest records are kept at UCLA EH&S, at the TSDF, and at the Cal-EPA Department of Toxic Substances Control (DTSC), as required.

The campus' greatest opportunity to minimize the hazards related to lab chemical wastes lies in facilitating the disposal of old inventories of outdated and unknown chemicals. Many of these compounds are reactive, have the potential to become unstable, or are degrading their containers. Certain chemicals, such as peroxide formers, become more reactive over time, and so timely disposal is critical. Over the past five years, EH&S has assisted with nearly 100 lab cleanouts, removing thousands of chemicals that were unusable and potentially unstable from the research environment. These lab cleanouts have secured hundreds of reactive, explosive, and extremely hazardous compounds, eliminating a serious lab safety hazard.

Another campus challenge in the management of waste in labs is to ensure that EH&S is always notified before a PI leaves the University and the lab is subsequently shut down. This notification should be required in order to ensure that all hazardous materials are removed from the lab before it is closed so the PI/Lab Supervisor can provide information on remaining inventories and potentially hazardous materials. The campus should improve proper lab close out procedures to ensure EH&S receives notification from the Department's personnel office of a researcher's pending departure.

10.2 Regulatory Oversight

The management of chemical waste at UCLA, including the identification, labeling, and storage of waste in labs, the processing and packaging of waste at the campus ESF, and the shipment of waste off campus, is strictly regulated by both the DTSC and the Federal Environmental Protection Agency (EPA). EH&S has developed programs and guidelines to ensure waste is properly managed in campus labs, properly handled and packaged at the campus ESF, and tracked to the final disposal facilities. EH&S is also responsible for all campus regulatory reporting. Each year the campus files a hazardous waste report with the State and pays State waste disposal taxes on the amount of waste shipped off campus. In addition, a more extensive “California Biennial Hazardous Waste Report “ is filed with the State every two years.

10.3 Recycling and Waste Minimization Program

The best way to minimize the volume of hazardous waste produced is not to generate it in the first place. For this reason, in 1991 EH&S implemented a hazardous waste minimization program. This program consists of waste minimization outreach, and specific programs such as the Surplus Chemical Redistribution Program and a mercury thermometer exchange program.

On the EH&S website, one page in the Hazardous Waste Program section is dedicated to Waste Minimization. This page provides suggestions for purchasing controls, inventory management, and modifications to experimental processes. These approaches are also summarized in EH&S’ Hazardous Chemical Waste training.

As part of UCLA’s chemical waste minimization efforts, EH&S implemented a Surplus Chemical Redistribution Program. This program helps minimize the amount of waste shipped off campus by redistributing unused chemicals to campus personnel who may be able to use them. These chemical are posted on the EH&S website, and researchers are able to obtain them from EH&S at no charge. This results in a cost savings to the lab and reduces the amount of waste the campus has to dispose.

One of EH&S’ most frequent HazMat response incidents is the clean up of mercury spills. Reducing the amount of mercury filled instruments on campus is the best way to address this problem. In 2008, EH&S implemented a mercury thermometer exchange program. Alcohol filled thermometers are provided free of charge to laboratories that turn in old mercury filled thermometers. A request form for a thermometer exchange is available on the EH&S website, and students of the Hazardous Chemical Waste training are reminded of this program. To date, over 500 mercury thermometers have been collected and properly disposed of.

In summary, the proper management of hazardous waste in the lab, the transport of waste to the ESF, and the final disposal of waste are critical to campus safety and compliance with environmental regulations. The campus has a well defined process for the overall management of hazardous waste. It must have equally well-defined procedures for ensuring all personnel are properly trained in the Hazardous Waste Program's policies and requirements. In addition, the campus should continue to improve its waste minimization efforts.

11.0 Fire Safety and Emergency Response Programs

The Fire Prevention and Life Safety Division supports laboratory safety efforts by conducting plan reviews, performing laboratory inspections, determining permissible quantities of hazardous materials for storage and use, managing the Hazardous Materials Response Team, and providing emergency fire response.

11.1 Hazardous Materials Response Team

The EH&S Hazardous Materials Response (Haz Mat) Team responds to spills or leaks of hazardous materials or toxic chemicals in campus facilities. The Haz Mat team is comprised of personnel from all the different disciplines of the EH&S department, including Radiation Safety, Biological Safety, Industrial Hygiene and Environmental Programs.

11.2. Regulatory Components

11.2.1 Memorandum of Understanding (MOU)

To maintain the operational effectiveness of the State Fire Marshal's (SFM) office during budget reductions, the SFM entered into a Memorandum of Understanding (MOU) with the University of California in March, 2003. This agreement gives designated UC Campus Fire Marshals the authority to perform Title 19 and Title 24 duties.

11.2.2 Title 19

Title 19, "Public Safety", of the California Code of Regulations (CCR) is a set of regulations based on authority provided in the California Health & Safety Code to "establish minimum standards for the prevention of fire and for the protection of life and property against fire, explosion and panic." Through Title 19, the State Fire Marshal (SFM) has authority to conduct yearly inspections of University facilities for compliance of these regulations.

UCLA accepted the Title 19 program as part of the MOU in 2008. The Campus Fire Marshal has conducted approximately 100 fire prevention and life safety inspections since 2008. The majority of these inspections were conducted in medical/research and on-campus housing facilities due to the high potential for life and property loss. Components regularly inspected include emergency power systems, smoke control/stair pressurization systems, fire extinguishers, and corridor/building ingress/egress. The Fire Division also provides fire protection services during special events. The most common violations found are obstructions in corridors,

exit sign deficiencies, illegal storage and rated door assemblies being propped open.

11.2.3 Title 24

California Code of Regulations, Title 24, is the minimum standard to which laboratory occupancies are constructed and must comply for the storage, use and handling of hazardous materials necessary for testing and research. The regulations of Title 24 are managed and enforced by SFM, and implemented on each UC campus.

Building code and adoption cycles prior to 1991 prohibited the use of hazardous materials usage above the third floor in UC buildings. A committee of representatives from each UC campus was formed to explore a new occupancy classification that would meet testing and research needs. This new classification was then submitted to the SFM for review and approval, which ultimately resulted in the adoption a new occupancy group type for university labs, known as the "H-8" Hazardous classification. This new classification permitted hazardous material usage above the third floor and satisfied the UC's need for increased laboratory space.

Fire Marshals of the UC system were successful in 2008 in maintaining this occupancy group type in the transition from the Uniform Building Code to the new nationally-adopted International Building Code. This is an example of the UC campus fire marshals' ongoing efforts to maintain codified language which supports the specialized needs of campus laboratories and research facilities.

UCLA has upgraded its existing laboratory structures by adding fire sprinkler systems and fire alarms. In instances where structure size or upgrades weren't feasible, UCLA constructed new buildings to accommodate our needs. Older structures were then converted to other compatible uses or were demolished to make way for new, compliant construction. An example of this approach is found in the Life Sciences Replacement Building (LSRB).

11.3 Fire Extinguisher Maintenance & Inspections

Primary duties for the inspection, maintenance and servicing of fire extinguishers falls within the purview of UCLA Facilities Management (FM). However, during Title 19 inspections, the Deputy Fire Marshal inspects extinguishers to ensure general conditions, access issues, and current service tags. Any deficiencies will be submitted to the building manager and FM for corrective actions.

11.3.1 Class D Fire Extinguisher Installation

Following an incident involving a combustible metal at the Molecular Sciences Building (MSB) in early 2008, EH&S evaluated the status of Class D extinguishers in MSB, Young Hall and other buildings where combustible metals are used in research. Utilizing funds from a grant from the UCLA Injury Prevention Committee, eight (8) Class D extinguishers were purchased. Five of these extinguishers were strategically mounted within MSB, two within Young Hall and one kept on a portable trolley for quick back-up response, as required. Regardless of the class of extinguisher utilized, users should be trained and familiar with their correct use.

11.4 Emergency Response

The University of California, Los Angeles is a research campus with approximately 2,000 laboratories utilizing chemical and biosafety hazards. The very nature of the testing/research performed here carries increased risk to participating and responding personnel. EH&S responds throughout the year to a variety of incidents in laboratories, including hazardous materials spills, chemical injuries, fires, explosions, false fire alarms and related emergencies not encountered in other occupancy classifications. In preparation for such responses, EH&S' Fire Prevention and Life Safety Division requires response professionals to receive ongoing training to meet campus needs. See Table 11.1 for a summary of incidents reported beginning in January 2008.

Table 11.1 – Incident Summary 2008/2009

	HazMat	Gas Odor	Alarm	Fire	Smoke	Fire Alarm	Total
January '08	0	0	4	8	2	49	63
February	6	2	2	1	7	41	59
March	1	3	1	2	5	35	47
April	3	1	1	3	12	33	53
May	4	1	0	3	10	61	79
June	3	3	6	1	6	43	62
July	4	6	7	5	8	71	101
August	3	2	6	1	4	67	83
September	0	6	3	1	6	48	64
October	2	3	0	5	8	50	68
November	0	6	3	5	7	52	73
December	3	2	7	2	3	48	65
January '09	3	0	2	5	7	31	48
February	1	0	5	2	3	28	39
March	6	3	1	3	5	49	67
April	6	1	0	4	2	31	44
Total	**45**	**39**	**48**	**51**	**95**	**737**	**1015**

11.5 Recommendations

To further improve operational effectiveness, it is recommended that the Fire Division increase the use of technology, including the use of hand held computers during inspections. The deployment of hand-held devices during the Title 19/24 inspections would help to increase the efficiency and timeliness of inspections, identify trends, facilitate tracking of corrections and would help in the development of comprehensive database to track the effectiveness of Title 19/24 programs and emergency response.

12.0 Findings and Recommendations

As part of its mandate to evaluate the status of laboratory safety in campus laboratories, the LSC broadly evaluated both general and program specific aspects of laboratory safety on campus. This evaluation identified numerous unmet safety challenges across the research spectrum. Specific challenges can be found in the main text of this document and will be considered by the LSC in the coming months. Broader and more systematic challenges are as follows:

12.1 Develop Strong Safety Culture

A significant shift in the safety culture within laboratories is necessary so that safety becomes internalized in all laboratory personnel and not simply driven by institutional rules. This change can most effectively be implemented through a top down management approach in which the Chancellor, Vice Chancellors, Deans and Department Heads and Principal Investigators/Laboratory Supervisors clearly and explicitly communicate the importance of safety in all aspects of laboratory research. Laboratory Safety must be fully integrated into all research protocols and become a fundamental component of laboratory instruction. Principal Investigators and Laboratory Supervisors are especially critical to developing this safety culture and must maintain high performance expectations and encourage and reward personal initiative. Ultimately, however, it is everyone's responsibility to effectively cultivate laboratory safety as an essential component of both teaching and research.

The LSC agrees that laboratories on campus can more consistently demonstrate a strong safety culture that promotes high expectations and personal initiative in regard to safety. While there are many laboratories on campus that have a strong safety culture – particularly among those that are highly regulated by state and/or federal authorities – some laboratories may not fully appreciate safety training and practices as critical to their mission or advancement of their research. Committee members strongly support efforts to stimulate action by all research and teaching laboratories to evaluate and enhance their safety practices and culture. To achieve this goal, it is essential that PIs and Laboratory Supervisors listen to concerns of their staff, encourage free communication, acknowledge and value staff opinions. Leading by example, demonstrating a non-punitive attitude toward error and quickly addressing safety concerns are also essential. In order to change the status quo, a strong sense of ownership for safety must be fostered. This ownership must extend to everyone in the campus community and must specifically include academic heads, managers, Principal Investigators, and Laboratory Supervisors who directly oversee the research and laboratory workers. It is necessary that those responsible for and most knowledgeable about the laboratory understand their roles in ensuring safety and be effectively rewarded when they do so.

Collecting and analyzing data on safety occurrences and the effectiveness of an organization's processes for tracking, investigating and preventing incidents must be ongoing. Findings must be widely disseminated and a process must be developed that provides quantitative measures of the safety culture in campus laboratories to assist with future enhancement actions. These actions will assist with the ongoing development of safety-related competencies, promote a better understanding of human performance issues, and improve accident prevention capabilities.

In order to effect the necessary change in safety culture, the LSC recommends that more specific laboratory safety policies and procedures be prepared by EH&S for review and approval by the LSC and implemented directly from the Office of the Vice Chancellor for Research. Any new policies and procedures must make safety expectations explicit and ensure that managers, supervisors, researchers and academic administrators have the guidance and support they need to carry out these responsibilities.

12.2 Improve and Expand Outreach and Training

Strengthening the overall health and safety training program will require collaboration at all levels within the UCLA community. This is especially critical for laboratory-specific training, where the responsibility for delivery and documentation lies with the Principal Investigator/Laboratory Supervisor or his/her designee. EH&S can support this effort by clearly communicating expectations, and partnering with departments to develop effective tools. It is also important that new Principal Investigators be provided a Health and Safety Orientation to review all safety related Policies and Procedures and inform them of resources that are available to assist them in setting up their laboratories. Although progress has been made over the last year to improve communication, accountability, and partnerships, additional advancement is necessary. Key areas include:

- **Improved Data-Management.** The implementation of a data-management system to support the delivery, management and tracking of training, personnel and safety contacts will greatly increase the integrity and oversight of record-keeping.
- **Expanded Communication and Collaboration.** EH&S must expand its outreach to departments to include job-aids such as videos, fact sheets, presentations to safety and departmental meetings, individual consultation and email notification and announcements.
- **Greater Classroom and Online Training Availability.** The number and quality of online training modules and instructor-led classes must be improved to better meet the needs of the diverse community. General areas of emphasis should be laboratory safety and emergency preparedness.

12.3 Increase Accountability and Oversight

Strides have been made in increasing accountability for safety across the campus, but this area still requires additional improvement. EH&S overhauled the laboratory inspection process to include a 24 hour turnaround time for report issuance and now inspects critical deficiencies 48 hours after their identification. The new process also includes a standard procedure for making unsatisfactory inspection results known to various members within the departmental and campus hierarchy, up to the Vice Chancellor of Research.

The University has an obligation to protect the health and safety of the campus community and to implement disciplinary measures when laboratory staff commit serious or chronic laboratory safety infractions. Principal Investigators/ Laboratory Supervisors and laboratory staff should be reminded of the existence of these disciplinary measures. Additional actions may need to be considered so that individuals more fully understand their responsibility for laboratory safety and are held accountable. For example, those laboratories found not to be in full compliance may be subject to random and unannounced laboratory inspections, quality control checks, and specific penalties when laboratory safety practices are not being followed (e.g., not wearing lab coats and other PPE when required).

12.4 Improve Laboratory Design

EH&S is working to improve the level of collaboration on laboratory design and to ensure that a Health and Safety professional is consulted on laboratory design issues. EH&S will also work to increase the utilization of the *UC Laboratory Design Guide* among Capital Programs and the Design and Project Management Group staff. It is essential that these units consult with this guide and with EH&S staff in all future design and renovation projects.

12.5 Improve Inventory and Recordkeeping

Vital information pertaining to laboratory activities, equipment, and personnel does not currently exist. For example, EH&S has very little information on the number and type of lasers on campus, many of which could pose significant safety hazards. It is recommended that comprehensive databases be created to gather and store information about the following:

- Laboratories (this should include the number of lab rooms per PI, be connected with Space Inventory Services, and other relevant information such as the date the lab was opened, inspection results and when a lab is scheduled to be closed.)
- Research and Safety Equipment (e.g., lasers, fume hoods, emergency showers, eyewash stations, fire extinguishers, biosafety cabinets, radioactive sources, select agents)
- Personnel (Principal Investigators and staff, training records)

- Activities (including chemical inventory information)

These databases should be able to sync with electronic forms, including laboratory inspections and the Laboratory Hazard Assessment Tool. This information would enable EH&S to provide more efficient oversight of laboratory activities and would help to ensure that regulatory requirements are met.

13.0 Appendices

Appendix A – Campus Laboratory Safety Committee Members

Laboratory Safety Committee
2008/2009

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Ex Officio Voting Member
**At Large Voting Member
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Appendix B – Laboratory-Related Safety Training Provided by EH&S

COURSE	DESCRIPTION	2008 COURSES	2008 ATTENDEES	Q1 2009 COURSES	Q1 2009 ATTENDEES
Biological Safety Cabinets (BSC)	This session provides the basic steps for proper use of Biological Safety Cabinets (BSCs), including safe work preparations, cabinet procedures and cleanup operations. Tips for improving work habits and engineering solutions to air contamination are also provided. (All Class II BSCs are reviewed.	29	614	6	215
Biosafety A,B,C's -- Biosafety Level 2	This session introduces safety precautions required for individuals working at the Biosafety Level 2. Specific topics include: emergency procedures (exposure reporting, medical emergency, and spill clean up), risk assessment, and BSL2 containment required.	31	678	8	263
Biosafety Level 2+	This session introduces participants to the safety precautions required for individuals working at the Biosafety Level 2+. Specific topics include risk assessment, containment requirements, and emergency procedures.	16	69	8	68
Biosafety Level 3	This session introduces participants to the safety precautions required for individuals working at the Biosafety Level 3. Specific topics include risk assessment, containment requirements, medical waste management and emergency procedures.	1	19	N/A	N/A
Bloodborne Pathogen Training	This session introduces the potential hazards associated with bloodborne pathogens, and instructs personnel on the proper handling and disposal.	24	582	10	250
Bloodborne Pathogen Online Refresher	Online refresher course for those working with bloodborne pathogens	N/A	636	N/A	302
Medical Waste Management	This session introduces participants to the proper procedures required for disposing of medical waste. Specific topics include the definition of biohazardous and medical waste, packaging and transportation of medical waste, and the disposal of sharps contaminated with biohazardous materials.	28	767	9	250
Shipping Biological Materials	Required for anyone shipping biological or infectious substances, this session introduces the regulatory and safety requirements of shipping biohazardous materials.	N/A	68	N/A	15
Community First Aid, Adult-Child-Infant CPR/AED	This course includes training on recognizing and handling emergency situations, providing first aid for sudden injuries or illness, and basic precautions for preventing disease transmission. Additional topics include how to respond to breathing and cardiac emergencies by performing CPR on an adult, child or infant victim and how to use an automated external defibrillator (AED) for victims of cardiac arrest. Meets OSHA guidelines for First Aid.	20	321	1	15
Standard First Aid with CPR	This course includes training on recognizing and handling emergency situations, caring for sudden injuries or illnesses and basic precautions for preventing disease transmission. Participants will also learn how to respond to breathing and cardiac emergencies by performing CPR on an adult victim and how to use an automated external defibrillator (AED) for victims of cardiac arrest.	6	65	N/A	N/A
Bruin Safety Online Module	This online module introduces UCLA's Injury and Illness Prevention Program (IIPP). Topics include: program benefits, elements, communication and training.	N/A	1193	N/A	502

COURSE	DESCRIPTION	2008 COURSES	2008 ATTENDEES	Q1 2009 COURSES	Q1 2009 ATTENDEES
Hazardous Chemical Waste Training	This session introduces the requirements of hazardous waste generators to properly manage chemical hazardous waste, including proper identification and labeling, safe storage procedures, appropriate transportation and spill response.	68	697	16	368
Cryogenic Nitrogen Safety	This online module introduces safety recommendations for working safely with cryogenic nitrogen. Topics include associated hazards, safe handling, filling and transport; and proper PPE required.	N/A	717	N/A	395
Fire Extinguisher Training	Covers the "do's and don'ts" of what to do during a fire, the type of fire extinguishers, how to use a fire extinguisher, and general fire prevention	12	240	7	125
Online Fire Safety Module	Covers the "do's and don'ts" of what to do during a fire, the type of fire extinguishers, how to use a fire extinguisher, and general fire prevention.	N/A	1143	N/A	502
Fire Diamond Online Module	This online module provides an overview of the NFPA fire diamond including its purpose, health hazards depicted, and how to obtain an NFPA sign at UCLA	N/A	762	N/A	404
Fire Extinguisher Training - Chemistry Lab	Covers the "do's and don'ts" of what to do during a fire, the type of fire extinguishers, how to use a fire extinguisher, and general fire prevention	3	90	1	70
Laboratory Safety-Chem and Biochemistry	Laboratory Safety overview for new Chemistry and Biochemistry graduate students: Identification and mitigation of chemical hazards; proper handling storage and disposal of chemicals, appropriate action during an emergency; reduction of hazardous conditions in the lab.	5	89	11	102
Laboratory Safety-SEAS	Laboratory Safety overview for new Chemistry and Biochemistry graduate students: Identification and mitigation of chemical hazards; proper handling storage and disposal of chemicals, appropriate action during an emergency; reduction of hazardous conditions in the lab.	6	316	N/A	N/A
Laboratory Safety online Basics	Online laboratory safety: Identification and mitigation of chemical hazards; proper handling storage and disposal of chemicals, appropriate action during an emergency; reduction of hazardous conditions in the lab.	N/A	853	N/A	484
Online Chemical Fume Hood Safety Module	This online module introduces the structure and safety requirements of working within a chemical fume hood, including monitoring, sash height, certification, and safety practices.	N/A	854	N/A	391
Dental X-Ray Safety Training	Radiation safety training for dental x-ray operators	2	6	N/A	N/A
Laser Safety training	Safety considerations when using lasers	2	136	2	73
Linear Accelerator Safety Training	Radiation safety training for analytical linear accelerator users			2	10
New Radiation Worker Qualification (NRWQ)	This session provides Principal Investigators, graduate students technical staff and other users with training on radiation hazards, safety procedures, and authorization to use sources of radiation. (* Additionally, 99.6 % of all labs completed refresher training)	34	372	9	92
X-Ray Diffraction Safety Training	Radiation Safety Training for X-ray Diffraction Users	15	70	4	40

Appendix C – Inventory of Biohazardous Materials

Biosafety has a database of biohazardous materials registered with the IBC. Due to sensitive information of some of the agents registered with the IBC, these agents are not listed here:

Recombinant DNA (vectors) – biosafety containment can range from BSL-1 to BSL-3 depending on the nature of the inserted DNA:
Adeno-associated virus
Adenovirus Type
Agrobacterium tumefaciens (Ti plasmids vector)
Avian Leukosis Virus, subgroup A (RCAS-Y)
Bacterial plasmids (various)
Baculovirus
Cryptococcus neoformans H99
E.coli K12
Enterococcus
Equine Infectious Anemia Virus
Fusobacterium nucleatum
Herpes Simplex Virus I (HSV-1)
HIV-1 subtype B (wild-type and inactivated)
Lentivirus vector
Listeria monocytogenes
Murine gamma herpesvirus-68 (MHV-68)
Murine Stem Cell PCMV Virus
Mycobacteria - E. coli shuttle vectors
Mycobacterium bovis, BCG strain
Pseudorabies virus (PRV)
RCAS viruses - Rous Sarcoma Virus (Replication Competent Derivative of Avian Leukemia Virus)
Retroviral vector (murine ecotrophic and amphotrophic)
Saccharomyces cerevisiae ATCC W303 - heat killed ("Baker's" Yeast expression vector)
Sindbis virus
Vaccinia
Vaccinia virus (vDK7)
Vaccinia virus strains (NYCVAC and ALVAC)
Vaccinia virus WR strain
Vaccinia Virus: NYCBH (ATCC VR-325)
VSV reporter virus system, Indiana serotype
Xenotropic MLV-related retrovirus (XMRV)

Infectious Agents or Potential Infectious Materials – containment can range from BSL-1 to BSL-3 depending on the nature of the manipulation and experiments
Actinobacillus actinomycetemcomitans
Actinomyces naeslundii
Adeno-associated virus
Adenovirus-Epstein Barr Virus Hybrid
Adenovirus (type 2 and 5)
Amphotrophic Murine retrovirus (MoMULV)
Aspergillus fumigatus
Bacillus anthracis BH450
Bacillus anthracis Sterne Strain
Bacteroides caccae
Bacteroides forsythus
Bacteroides thetaiotaomicron
Baculovirus
Baylisascaris procyonis ascarids (specifically adult eggs)
Bordetella bronchiseptica RB50
Bordetella parapertussis (Ovine:Fr107, and human: 12822, H1)
Bordetella pertussis BP369, GMT-1, 18323, BP536
Burkholderia cepacia
Burkholderia thailandensis E264
Campylobacter (environmental isolates)
Campylobacter jejuni (81-176, 11168)
Candida species
Chlamydia trachomatis; chlamydia muridarum
Coronavirus - mouse and human coronavirus
Cryptococcus gattii
Cryptococcus neoformans H99
Epstein Barr Virus
Escherichia coli
Escherichia coli AMC 198 and Escherichia coli Top10 - BSL1
Escherichia coli NCDC P 7a
Established cell lines from ATCC, PANC-a and BRT549
FIV
Formalin-inactivated Influenza A/PR8/34 (H1N1)
Francisella novicida U112
Francisella tularensis (LVS)
Fusobacterium nucleatum
Group A Streptococcus (Streptococcus pyogenes)
Hepatitis B Virus – HBV
Hepatitis C Virus - HCV
Herpes Simplex Virus 1 (Strain 17:B-Gal recombinant)
Herpes Simplex Virus Type 1 (HSV-1) Lab Strain
Herpes Simplex Virus Type 2 (HSV-2)
Histoplasma capsulatum, yeast phase
HIV – various strains: JR-CSF, NL4-3, ADA, BAL, HXB2
HIV-2
HTLV-1 and HTLV-2

Infectious Agents or Potential Infectious Materials – containment can range from BSL-1 to BSL-3 depending on the nature of the manipulation and experiments
Human blood (isolate dendritic cells)
Human Blood potentially infected with HIV, HBV, HCV, or other Bloodborne Pathogens: Urine, oral fluids, rectal secretions
Human Brain tissues and CSF
Human Clinical samples from HIV participants
Human cytomegalovirus
Human Herpesvirus 8
Human material (fecal samples for phage virus genomics)
Human Papilloma Virus (Types 16, 18, 31)
Human primary brain tumor cells (will be implanted into mice)
Human saliva and root canal samples from HIV/AIDS and Non HIV/AIDS patients to identify Candida albicans, Candida tropicalis, Candida globrata, Candida parapsilosis, and Candida guilliermondii'
Influenza (HON1) PR8
Influenza (PR8) and (A/WSN/33)
Influenza virus A/PR8 (H1N1)
Influenza virus A/WSN/33 (H1N1)
Karposi's sarcoma-associated herpesvirus (KSHV)
Klebsiella pneumoniae
Legionella pneumophilia
Leishmania chagasi
Lentivirus
Leptospira biflexia biflexia
Leptospira interrogans (Strains: serovar Copenhageni-RJ16441, serovar Canoicola, serovar Icterohaemorrhagiae, serovar Pomona)
Listeria monocytogenes wild-type and mutants
Lymphocytic choriomeningitis virus (LCMV)
Moloney Murine Leukemia Retrovirus (MLV) strain: LIG, LIA
MCMV (Smith)
MHV 68 (WUMS strain expressing luciferase)
Micrococcus luteus
Modified vaccinia ankara virus (MVA); modified vaccinia ankara virus expressing HER2/neu (MVA-mBn69)
Moloney murine leukemia virus (MoMLV)
Moloney murine sarcoma virus (MoMSV)
MSCV
Murine cytomegalovirus
Murine herpesvirus-68 (MHV-68)
Murine Retrovirus (amphotrophic)
Mycobacterium bovis, BCG vaccine strain
Mycobacterium fortuitum
Mycobacterium kanasii
Mycobacterium marinum
Mycobacterium paratuberculosis
Mycobacterium smegmatis
Mycobacterium tuberculosis strain H37Ra (avirulent strain)

Infectious Agents or Potential Infectious Materials – containment can range from BSL-1 to BSL-3 depending on the nature of the manipulation and experiments
Mycobacterium leprae
Mycobacterium xenopi
Neospora caninum NC1
Nitrogen-Fixing Plant bacteria: Burkholderia tuberum *(nodulates legumes) and Burkholderia unamae (originally isolated from maize and other plants in Mexico)
Patient derived enteroviruses: coxsackievirus strains B2, B3, and B4
Picornaviruses: Coxsackie B, Echovirus 22 (human parechovirus 1)
Porphyromonas gingivalis
Prevotella intermedia
Propionibacterium acnes
Pseudomonas aeruginosa (wild type PA01)
Pseudomonas fluorescens
Pseudomonas syringae
Pseudomonas tabaci
Pseudorabies Virus (Bartha)
Replication competent avian leukemia virus, RCAS (A)
Respiratory Syncytial Virus (RSV) A2 Strain
Rhesus macaques tissues, body fluids, and primary tissue culture materials
Rhesus macaques: Unfixed Non-human Primate Brain Tissue
Rhesus monkey Rhadinovirus
Salmonella (environmental isolates)
Salmonella paratyphi A
Salmonella typhimurium
Shigella sonnei
SHIV
SIV
Staphylococcal Enterotoxin A
Staphylococcus aureus (strain SH1000; ALC2906)
Staphylococcus aureus (Vancomycin-resistant strains (VRS1-5)
Staphylococcus aureus SA113 and Staphylococcus aureus RN4220
Staphylococcus epidermidis
Streptococcus crista
Streptococcus faecalis
Streptococcus mitis
Streptococcus pneumoniae
Streptococcus pyogenes (M1, M6)
Streptococcus salivarius
Streptococcus sanguinis
Toxoplasma gondii RH, 76K, Pruniaux, CEP
Treponema pallidum, Nichols strain
Trichomonas vaginalis (Strain B7RC2 mutant 1, 2 and 3, G3)
Trichomonas vaginalis (Strain T1)
Trypanosoma brucei brucei - strain 2913 procyclic cells
Trypanosoma brucei brucei (29-13, BSFSM)
Turicibacter sanguinis
Vaccinia virus NYCVAC and ALVAC

Infectious Agents or Potential Infectious Materials – containment can range from BSL-1 to BSL-3 depending on the nature of the manipulation and experiments
Vaccinia virus: vDK7 and vTF7-3 strains
Vesicular Stomatitis Virus (VSV) Indiana Strain
VZV 212 - a heat-treated varicella-zoster virus
XMRV
Yersinia enterocolitica

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Appendix D – Structures Housing Laboratories

GROUP B LABORATORIES	Group H-8/L laboratories:	Group H occupancy:
Boelter Hall	California Nanosystems Institute	EH&S Services Bldg
Botany	Biomedical Sciences Research Bldg	Young Hall
Boyer Hall	Engineering V	
Engineering I	Life Sciences Bldg.	
Engineering IV	Gonda Center	
Factor	Science & Technology Research Bldg	
Franz Hall		
Geology		
Knudsen Hall		
Hillblom Eyelet Research Ctr		
Life Sciences		
MacDonald Medical Research Lab		
Mathematical Sciences		
Molecular Sciences		
Neuroscience Research Bldg.		
Physics & Astronomy		
Plant Growth Center		
Rehab Center		
Slichter Hall		
Warren Hall		
Young Hall		
Center for Health Sciences (including School of Medicine, Vivarium, Public Health, Brain Research Institute, Reed, Neuropsychiatric Institute, Cyclotron, Brain Mapping, Dentistry, Doris Stein, Marion Davies, Jules Stein, and 700 Westwood Plaza)		

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Appendix E – Acutely Toxic Chemicals

The following is the list of acutely toxic chemicals referenced on the Laboratory Hazard Assessment Tool:

Acrolein	Acrylyl chloride	2-Aminopyridine
Benzyl chloride	Bromine	Chlorine dioxide
Chlorine trifluoride	Chlorpicrin	Cyanogen chloride
Cyanuric fluoride	Decaborane	Dichloro acetylene
Dimethyl disulfide	Dimethylsulfate	Dimethylsulfide
Ethylene chlorohydrin	Ethylene fluorohydrin	Hexamethylene diisocyanate
Hexamethyl phosphoramide	Iodine	Iron pentacarbonyl
Isopropyl formate	Methacryloyl chloride	Methacryloxyethyl isocyanate
Methyl acrylonitrile	Methyl chloroformate	Methylene biphenyl isocyanate
Methyl fluoroacetate	Methyl fluorosulfate	Methyl hydrazine
Methyl Mercury (and other organicforms)	Methyltrichlorosilane	Methyl vinyl ketone
Nickel carbonyl	Nitrogen tetroxide	Nitrogen trioxide
Organo Tin compounds	Osmium tetroxide	Oxygen difluoride
Ozone	Pentaborane	Perchloromethyl mercaptan
Phosphorus oxychloride	Phosphous trichloride	Sarin
Sulfur monochloride	Sulfur pentafluoride	Sulfuryl chloride
Tellurium hexafluoride	Tetramethyl succinonitrile	Tetranitromethane
Thionyl chloride	Toluene-2,4-diisocyanate	Trichloro (chlormethyl) silane