GENERAL INFORMATION

I. INTRODUCTION

The University is required by law to maintain an Injury and Illness Prevention Program for all employees. For your own personal safety, it is essential that:

- You are aware of the potential hazards in your working area.
- You know who to contact in the event of an emergency.
- You know the procedures to follow in the event of an emergency.

To ensure that you receive this information, the following training program has been established in the Life Sciences Addition (LSA)* :

- Required reading of the LSA Safety Manual;
- Initial general safety training for each new employee, to be conducted by the designated Safety Officer in the lab or office *(see list of officers on pp. 14-15)*;
- Annual review of general safety procedures, to be conducted by the designated Safety Officer in the lab or office;

Required Introduction to Laboratory Safety training and three year refresher class.

The LSA Safety manual is to be used as a training tool and a reference for building occupants. It presents a summary of emergency procedures and guidelines for some of the most commonly encountered safety problems. It is not intended to supersede University, State, or Federal safety regulations. **All persons working in LSA are required to read this manual and comply with its provisions.** Everyone must read the General Information sections (pp. 1- 4), while only laboratory personnel need to read the sections containing Laboratory Information (pp. 5-12). A complete list of safety officers is provided on pp. 14-16. Building keys will not be issued to new personnel, and they should not start work until they have submitted a signed training documentation form certifying that they have read the manual and have received initial safety training along with a copy of the EH&S online training completion certificate.

Each laboratory and administrative office in LSA has a reference copy of the LSA Safety Manual in a 3-ring binder, which is available for employees to read. Safety Officers are responsible for maintaining the reference copy of the Safety Manual for their unit. Supplemental safety materials relevant to the individual lab or office may be added to the binder at the discretion of the unit's Safety Officer.

Under the provisions of the Injury and Illness Prevention Program, each department has an IIPP Coordinator who is responsible for initiating and administering injury and illness prevention activities. The IIPP Coordinator maintains written documentation for the program. The implementation of policy and procedures in individual work units is the responsibility of principal investigators and faculty and staff supervisors. Each laboratory is also required to post a "Chemical Hygiene Plan" which provides specific guidelines for that work area. The Chemical Hygiene Plan is maintained by the Lab Safety Officer. Problems or questions regarding safety can be referred to any of the following:

IIPP Coordinator	**CampusCSS HR 664-9000 opt #3**
LSA Building Coordinator	**Barbara Duncan**, 165 LSA, 643-8121
Office of Environment, Health & Safety.	317 Univ. Hall, 642-3073
Safety Officer for your Lab or Office	
Safety Committee Members	*(See list on p. 14)*

II. EMERGENCY RESPONSE PLAN

EVACUATION PROCEDURES

1. ALL BUILDING OCCUPANTS MUST EVACUATE IN RESPONSE TO THE ALARM OR WHEN DIRECTED TO DO SO BY EMERGENCY PERSONNEL (e.g., in the case of a bomb threat). Do not assume it is a false alarm. Evacuate first, and give emergency officials an opportunity to assess the situation.

2. EXIT BUILDING VIA THE STAIRWAYS. DO NOT USE ELEVATORS. Take time to familiarize yourself with evacuation routes in advance. Maps showing location of emergency exits, fire alarms, and extinguishers are posted by all elevator doors.

3. ASSIST THE INJURED AND HANDICAPPED WHEN POSSIBLE. Do not move the seriously injured unless there is danger of further injury. Disabled persons in wheelchairs should be directed to the nearest enclosed stairwell to await evacuation by the emergency responders. If there are deaf or hearing impaired persons nearby, be sure they know there is an emergency. If it is necessary to leave someone in the building, leave the person in a relatively secure area (e.g., in a fire, the stairwell is one of the safer places to be). Upon exiting the building, notify roll taker or other responsible official that there is a person in wheelchair or other disabled person sheltering in place. Be sure to give the exact location.

4. DESIGNATED SAFETY OFFICERS IN INDIVIDUAL LABS AND OFFICES ARE RESPONSIBLE FOR CLEARING ALL ROOMS IN THEIR UNIT. If the safety officer is not in the area at the time of the emergency, another member of the lab/office must assume responsibility for clearing the unit before leaving the building. Efforts to clear rooms should be limited to five minutes. As rooms are cleared, all doors should be closed. Safety Officers must report to an Emergency Checkpoint to verify that their unit has been fully evacuated and to report any problems *(there are two Emergency Checkpoints, one on either end of the building; see LSA Evacuation Map on page 18).*

5. EVACUEES: ONCE OUTSIDE THE BUILDING, GO DIRECTLY TO THE MEETING SITE DESIGNATED BY YOUR LAB OR OFFICE. Keep a safe distance away from the building to avoid danger from falling glass, etc. *(Be sure you know where your meeting site is before an emergency occurs. If you do not know, ask your Safety Officer.)*

6. DO NOT RE-ENTER THE BUILDING UNTIL EMERGENCY OFFICIALS HAVE DETERMINED THAT IT IS SAFE.

FIRES

1. IF THE FIRE ALARM SOUNDS, TURN OFF ANY ELECTRICAL EQUIPMENT YOU ARE OPERATING AND EVACUATE BUILDING IMMEDIATELY. FOLLOW EVACUATION PROCEDURES CITED ABOVE. Close all doors to help prevent fires from spreading and exit via stairwells. Do not use elevators.

2. TO REPORT A FIRE: PULL NEAREST FIRE ALARM, and CALL **911** or **642-3333** from a cell phone TO GIVE LOCATION AND EXTENT OF FIRE. State if there are any special circumstances, such as the presence of animals or dangerous chemicals. Fire alarms are located on each stairwell landing and in hallways of each floor (look for red signs protruding from wall which mark location of each alarm in hall).

3. WHEN FEASIBLE, ATTEMPT TO PUT OUT FIRE WITH FIRE EXTINGUISHER. If your lab or office does not have a fire extinguisher, there are extinguishers located in the corridors on each floor (look for red signs protruding from wall which mark location of each extinguisher in hall). When fighting a

fire, always position yourself between the exit and the fire to ensure an escape route. IF THE FIRE CANNOT BE CONTAINED, GET OUT QUICKLY!

Fighting Small Fires:

- Always pull the fire alarm first (or send someone to do this), before attempting to fight a fire. Do not try to fight a fire unless you feel it can be done safely and there is a clear escape route.
- Know where the closest fire extinguisher is located. Also, be sure you are using the proper type of extinguisher. All extinguishers in the LSA core are multi-purpose type ABC which can be used for ordinary combustibles, flammable liquids and electrical equipment. If your laboratory or office does not have its own extinguisher, there are several on each floor throughout the building. These are located at the ends of each corridor near the elevators, as well as in the middle of the hallway. (Locations are marked by red signs protruding from the wall.)
- Before opening any doors to investigate a possible fire, feel the top of the door with the back of your hand. If it is hot, do *not* open the door. If door is cool, open it a crack to see if the fire is still confined and small; if not, close door and leave immediately.
- If the fire is small, enter the room and try to extinguish the flames. Direct the extinguisher at the *base* of the fire. Be careful to keep yourself between the fire and the door. *Do not allow the fire to block your exit from the room.*
- If you are able to put out a fire successfully, remain at the site to make a report to the Fire Department or UCPD.

NOTE: Fire extinguisher training is offered periodically without charge to LSA occupants. Announcements will be sent to labs and offices when a demonstration has been scheduled. Any lab that wishes to buy its own extinguisher should do so through Campus Physical Plant (2-1032). If an extinguisher is installed in this way, it will be scheduled automatically for an annual inspection and will be refilled when necessary.

BOMB THREATS

1. REPORT ANY BOMB THREAT TO THE BUILDING COORDINATOR (Barbara Duncan 3-8121) AFTER CONTACTING CAMPUS POLICE (911 or 642-3333 from a cell phone).

2. EVACUATE IMMEDIATELY IF DIRECTED TO DO SO BY EMERGENCY PERSONNEL. FOLLOW EVACUATION PROCEDURES CITED ABOVE. TAKE PERSONAL BELONGINGS WITH YOU. *NOTE: In accordance with standard campus procedures, building fire alarms will not be sounded in the event of a bomb threat. Door-to-door notification will be carried out by members of an LSA emergency response team. Labs and offices must assume responsibility for clearing their own rooms once their unit has been alerted.*

3. CHECK WORK AREA FOR UNFAMILIAR ITEMS AS YOU LEAVE.
   Do not touch suspicious items; report them to campus authorities.

EARTHQUAKES

1. SEEK SHELTER UNDER A DESK, TABLE, COUNTER, OR DOOR FRAME. If possible, move away from lab experiment setups, tall bookcases, and glass windows. If outside, move into open areas away from overhead power lines.

2. DO NOT ATTEMPT TO LEAVE BUILDING WHILE TREMOR IS OCCURRING. (If outside, remain outside.)

3. WHEN TREMOR STOPS, LEAVE BUILDING IMMEDIATELY. FOLLOW EVACUATION PROCEDURES CITED ABOVE. In case of possible gas leaks, do *not* light matches and do *not* operate electrical switches or appliances.

4. DO NOT TIE UP PHONE LINES EXCEPT TO REPORT EXTREME EMERGENCIES. Help keep phone lines from being overloaded by replacing any receivers that have been knocked off their hook. There are two emergency phones located outside the building: one outside the north entrance to LSA and another on the loading dock on the south side.

OTHER EMERGENCIES

1. **Injuries.** For life-threatening emergencies, CALL **911** or **642-3333** from a cell phone for medical aid and for transportation to hospital. For less serious injuries or illness, first-aid can be obtained at University Health Service at the Tang Center (2222 Bancroft Way, 2-2000). *Report all injuries to CSS HR Department* and complete an injury report form.

2. **Power Failures.** In the event of a building-wide power failure, contact one of the following for information and further instructions:

Barbara Duncan	3-8121 or	Derek Apocada	2-2467
Campus Police	2-6760		
Physical Plant	2-1032		

During the outage, turn off any computers and other equipment that may be in use to avoid damage caused by power surges when power is restored. LABS: stabilize any experiments in process; cap all open containers of chemicals and close sash in fume hoods (there is no exhaust in fume hoods when the power goes out). Evacuation procedures will be initiated by the Building Coordinator if the shutdown affects ventilation and causes a serious deterioration of air quality.

3. **Elevator Failures.** Report elevator problems to the Facilities Office (Barbara Duncan, 3-8121) During non-business hours, report emergencies directly to Physical Plant, 2-1032. If there are people trapped inside the elevator, try to communicate to them that help is on the way. If *you* are trapped inside, call for help by pressing the alarm or using the emergency phone in the elevator.

4. **Gas Leaks and Other Utility Failures.** Report immediately to one of the following:

Barbara Duncan	3-8121
Derek Apacada	2-2467
After Hours:	2-1032 (Physical Plant)

If necessary, evacuate building by pulling fire alarm and notify Police by calling 9-911 or 2-6760. In the event of gas leaks, do not operate any electrical switches as this may produce sparks.

5. **Flooding/Plumbing Failure.** Call for help immediately.

Barbara Duncan	3-8121
Derek Apacada	2-2467
After Hour:.	2-1032 (Physical Plant)

If flooding occurs on an upper floor, ***IMMEDIATELY NOTIFY THE LAB OR OFFICE BELOW.*** (Labs should post the phone number of the lab below them next to their own telephone.) The floors in this building are not sealed for liquid spills of any kind, and even small amounts of liquid leak through very quickly. If flooding occurs around energized electrical devices, do not touch equipment.

6. **Hazardous and Toxic Spills.** Call EH&S (2-3073) for help with spills involving any of the following:
   -- carcinogens and mutagenic materials
   -- radioisotopes
   -- bio-hazardous materials
   -- highly toxic chemicals such as Osmium Tetroxide and Nickel Tetracarbonyl
   -- concentrated acids and bases

If the spill occurs on an upper floor, ***IMMEDIATELY NOTIFY THE LAB OR OFFICE BELOW.*** If the spill presents an *extreme* hazard, evacuate the building. Pull the fire alarm, dial 9-911 and give exact location and nature of spill. If you are unfamiliar with the toxicity of the substance you are working with, contact your supervisor. Minor spills should be cleaned up promptly. A chemical spill cart equipped with clean-up supplies is available in the corridor outside rm. 301. Emergency supplies for soaking up spills can be found in the spill locker next to rm.155 LSA or the spill carts located in the North West corridors of floors 2 through 5 .

LABORATORY INFORMATION

III. LABORATORY SAFETY

PERSONALSAFETY.

1. Smoking is not allowed in any indoor areas on campus. Food and beverages are not allowed in research areas and are allowed only in designated rooms in laboratories.
2. Wear safety glasses or face shields when working with hazardous materials and/or equipment.
3. Wear gloves when using any hazardous or toxic agent. *These should be removed before leaving the lab, using phones, opening refrigerators, or entering common areas.*
4. Use of chemical and fire resistant laboratory coats is recommended. Shorts and sandals are not permitted in laboratories.
5. Do not use any equipment unless you are trained and approved as a user by your supervisor and signed the Standard Operating Procedure for that equipment.
6. Pregnant women should take special care with exposure to radiation and certain chemicals which can be harmful to fetal development. Call EH&S at 2-1550 for further information or contact your physician.
7. Wash hands before leaving the lab and before eating.
8. Tie back medium-length and long hair when working near flames or entangling equipment.
9. If leaving a lab unattended, turn off all burners and lock the doors.
10. Working alone in laboratories is not recommended. If you must work alone, notify someone of your location.
11. Never mouth pipette.

GENERALLABORATORYSAFETY.

1. Maintain aisles at least 32" wide and keep them clear.
2. Maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eye washes.
3. Do not use corridors for storage or work areas.
4. Make sure all cabinets, bookcases, etc., taller than 42" are anchored.
5. Shelves 48" or higher and all shelves with chemicals should have restraining straps or lips.
6. All highly toxic materials should be stored in secondary containers to avoid hazardous leaks. Consult the EH&S hazardous materials storage guide for compatibility and storage recommendations. (When purchasing new supplies of toxic materials, request safety containers whenever possible.)
7. Do not store heavy items above table height. Never store corrosives above eye level. Any overhead storage of supplies on top of cabinets should be limited to lightweight items only. *Also, remember that a 36" diameter area around all fire sprinkler heads must be kept clear at all times.*
8. Spills should be cleaned up immediately. A cart equipped with clean-up supplies is located in the corridor outside 301 LSA. Spill pillows are also available in spill lockers located at the northwest corner of each floor.
9. Areas containing biohazards, radioisotopes, and carcinogens should be posted accordingly. However, do not post areas unnecessarily and be sure that signs are removed when hazards are no longer present.
10. Post shut-down instructions next to any piece of equipment that may run unattended. List clear instructions and name and phone numbers of person to contact regarding that piece of equipment in an emergency.
11. Make sure all chemical reagents are clearly and currently labeled with substance name, concentration, date, and name of responsible individual.

12. When leaving a research group, review all solutions you have made and either dispose of them or assign them to another member of the laboratory. The name on the label should reflect this change.
13. All electrical outlets with breaker box number and switch number, do not over load circuits.
14. Avoid using extension cords whenever possible. If you must use one, get a heavy-duty one that is electrically grounded, preferably with its own fuse, and install it safely. Extension cords should not go under doors, across aisles, or be hung from the ceiling.
15. Use volatile and flammable compounds only in a fume hood. Procedures that produce aerosols should be performed in a hood to prevent inhalation of hazardous materials.
16. To avoid hazardous spills, use plastic carriers when transporting bottles of dangerous chemicals (such as acids) through corridors. Plastic carriers are available from the LSA Storeroom.
17. Gas burners and hot plates should never be left unattended when in use.
18. For safety reasons, waste containers should be emptied on a daily basis. If this is not done, notify the Building Manager (3-8121).

STORAGE.

1. Arrange storage by chemical compatibility. (Do not use traditional A-B-C method.) Store strong acids and bases away from organic compounds, and segregate incompatible chemicals. Useful information on chemical compatibility can be found in Dangerous Properties of Industrial Materials, by N.I. Sax (copy available in rm. 165), the Merck Index, and the Aldrich Chemical Catalog.
2. Secure all pressurized containers (e.g., CO_2 tanks). Install restraining lips on shelves.
3. Date chemicals at time of purchase, and make sure all containers are properly labeled.
4. Maintain up-to-date inventory records for radioisotopes, carcinogens, chemicals, and any biohazardous substances. State law requires that the University maintain a complete chemical inventory as part of a Hazardous Materials Management Program. All labs must submit a chemical inventory to EH&S and update it annually.
5. Do not store food in laboratories, or in refrigerators or cold rooms containing dangerous substances such as radioactive compounds, etc. All refrigerators and microwaves in labs must be properly labled as research only or food only. All research refrigerators and freezers must be rated and labeled for flammable storage use. Do not store flammables in unapproved equipment.
6. In areas where combustibles are used and stored, remove all open flame devices and use grounded electrical devices in good service condition.
7. Use only metal or approved containers to store combustible waste. A list of containers approved by the State Fire Marshal is available from EH&S (2-3073).
8. STORAGE OF FLAMMABLE LIQUIDS:
   A maximum of 20 gallons of flammable liquids may be stored outside of a flammable storage cabinet in any one location, provided the following rules are observed:
   -- containers are no larger than 1-gallon (*safety* containers may be up to 2-gals.);
   -- no more than ten 1-gallon non-safety containers may be kept outside storage cabinets;
   -- anything beyond the first ten gallons must be stored in *safety* containers (the number of 2-gallon safety cans shall not exceed five).
   Quantities exceeding the above totals shall be stored in approved metal flammable liquid storage cabinets. The total amount of flammable liquids stored in approved cabinets within labs or classrooms shall not exceed 30 gallons. The responsibility for following these requirements rests with the faculty investigator or project manager.

IV. WASTE DISPOSAL

Recent laws now regulate the disposal of many kinds of waste, and there are new restrictions on what may be put in public landfill or poured down the drain. Be aware of the various policies cited below and THINK before you dispose of anything.

University of California, Berkeley (UC Berkeley)'s hazardous waste is divided into four categories: **1)chemical, 2) biological (e.g., recombinant DNA and biohazardous), 3) radioactive, and 4) sharps.**

The attached Hazardous Waste Management Fact Sheet will help you understand how to use the Office of Environment, Health & Safety (EH&S) online "Hazardous Waste Program" (HWP) to manage your hazardous wastes, and find other related guidance on the EH&S web site. (Hyperlinks are used frequently so it is best to read this fact sheet online at http://ehs.berkeley.edu/images/ehs/pubs/52hazwaste.pdf

(1) MEDICAL WASTE:

Biohazardous waste management is described in the attached EH&S fact sheet, "Biohazardous Waste and Recombinant DNA Waste Management in Biosafety Level 2 and 3 Laboratories." In general, store biohazardous waste in red bags inside closed, rigid containers. Both the bags and outer container must be marked with the words "Biohazardous Waste" (or "BIOHAZARD" and the international biohazard symbol). The designated disposal room in LSA is room 161. All items must be transported in rigid,sealed leak proof containers. Disposal bins are available in 161 and appropriate disposal labels are ordered through EH&S (643-7195) or through the main office number (642-3073).

(2) DRAIN DISPOSAL:

If you determine that your aqueous waste is not hazardous, it still might be legally prohibited from drain disposal. You need to understand the drain disposal restrictions prior to disposing of chemicals in the drain. Please read the Guidelines For Drain Disposal Of Chemicals at University of California, Berkeley. Drain disposal of laboratory and shop waste is limited to occasional disposal of small amounts of non-hazardous waste chemicals.

(3) BUILDING TRASH:

Only non-hazardous materials are allowed in building trash containers. Disposal of hazardous chemicals or medical waste in the building trash is strictly prohibited. Absolutely no bags or containers which are labeled MEDICAL WASTE, BIOHAZARD, INFECTIOUS, or SHARPS WASTE may be put in the regular building trash.

Also, many laboratory chemicals which you may consider non-hazardous are in fact regulated by the EPA or the California Department of Health Services and are considered hazardous by them. Therefore, unless you are absolutely sure that a chemical is not classified as hazardous, do not put it into the building trash. Package it for pickup and hazard determination by EH&S, or consult EH&S before putting it into the trash.

(4) DISPOSAL PROCEDURES: *Information on the EH&S hazardous waste management program (Chemical, Radioactive, Medical) is available on-line at the new EH&S web site: http://www.ehs.berkeley.edu*

How to Request EH&S Pickups for Waste: All tracking, accumulation labels must be done on line at the EH&S Hazardous Waste link. The first time you access the HWP, you will be directed to a **one time required 15-minute online training on hazardous waste.** Once you have completed the training you can begin creating hazardous waste labels. http://www.ehs.berkeley.edu/component/content/article/136-hm/hazardous-waste-program-hwp/279.html

Biotechnology/Biological Waste: Solid biotechnical waste which is not defined as "medical" must be put in white bags specifically labeled "NON-MEDICAL". These should be autoclaved to kill any biological organisms and taken directly by the lab to the building dumpster. (Custodians will not pick up these bags.)

Animal Waste (Non-Medical): For disposal sites, contact the Office of Laboratory Animal Care (OLAC), 2-9232. Animal waste must be well wrapped to prevent leakage.

Radioactive Waste: Contact EH&S (3-8765) for pick-up of liquid radioactive waste in your lab. You may also take radioactive dry waste and Liquid Scintillation Counter (LSC) vials and to rm. 155 LSA, where there are central collection receptacles you must call ahead of time for access to the room (3-8121). For more information on radioactive waste, see Section K of your Radiation Safety Logbook.

Guidelines for Disposal of Chemical Waste (Non-Radioactive):

You are required to label your container of chemical hazardous waste just before you add any amount to the container. Go to www.ehs.berkeley.edu and enter your Cal Net ID. Click on "Create Label" and select "Chemical Waste." Enter the required data fields for your container of waste. Enter the type of chemical using the drop down menu (preferred), or type in the name of the chemical.

If your waste is in the drop down, the HWP will automatically select the hazard property. You should revise the selection if you know it to be inaccurate. If you don't select a hazard, the HWP by default selects "toxic."

Print a copy of your label. Fold the label as instructed and place it inside a label holder so the phrase "Hazardous Waste" is clearly visible.

Peel the backing off of the adhesive and affix the label to the container.

1. Store chemical waste in containers that are compatible with the waste, that are in good condition, and are kept closed.
2. To avoid spills due to overfilling or chemical expansion, please fill waste containers no more than 80% of their capacity.
3. Segregate incompatible chemicals to minimize the risk of dangerous reactions (see the EH&S Safe Storage of Hazardous Chemicals Booklet) and segregate unknown chemicals from all other chemicals.
4. Place containers of compatible chemicals in secondary containment, such as plastic tubs.
5. Store chemical waste as "close as practical" to where it is being generated. The expectation that the container is being routinely monitored by the person generating the waste, and so moving the container too far from the laboratory may be a violation.
6. Store chemicals that off-gas (e.g., piranha waste) in containers with vented caps to avoid high pressure build up in the container over time. Containers and vented caps are made available upon request from the HWP. Store containers with vented caps in a fume hood.
7. Request a pickup of your chemical waste before reaching the quantity and time limits.

Glass Disposal: All glass (e.g., broken glass, unwanted glassware, empty bottles) must be collected in a separate container, sealed securely, and labeled "GLASS ONLY". Empty chemical bottles should be triple rinsed with labels defaced and caps removed before putting in glass disposal boxes. (Don't forget to save any generated rinsate which may be considered hazardous waste, and dispose of it appropriately.)

Gaseous Waste: Be cautious with gaseous wastes. If not noxious or hazardous, release them in an operating fume hood. If waste is hazardous, contact EH&S (2-3073). Do not deliberately dispose of liquid chemical waste by evaporating in a fume hood unless you are sure it is not hazardous. (Chemical waste can be more safely disposed of by EH&S through the use of special incinerators.)

V. SPECIAL HAZARDS

This section covers items which require special precautions:

1. Radioactive Materials
2. Biohazardous Agents (Recombinant DNA, Oncogenic Viruses, Etiological Agents)
3. Tissue Culture
4. Teratogens
5. UV Light
6. Aerosols
7. Exceptionally hazardous chemicals

RADIOACTIVE MATERIALS.

Radioactive isotopes commonly used in LSA are ^{3}H, ^{32}P, ^{14}C, ^{35}S, ^{125}I. To order, receive, possess, and use radioactive materials, a valid Radiation Use Authorization (RUA) must be on file with EH&S. Following is a summary of guidelines for working with radioactive materials. (For further information, refer to the UCB Radiation Safety Manual.)

1. Do NOT mouth-pipette radioactive solutions. Use disposable pipettes and propipettes.

2. Wear a lab coat, safety glasses, and disposable gloves when handling anything radioactive. Most inadvertent contamination of laboratory surfaces is caused by contact with contaminated work gloves. Nearly all isotope work will involve some direct handling of open isotope containers. Whenever this occurs, assume that your gloves are contaminated. Change them immediately if a "clean" item is to be handled. Never wear the gloves away from the immediate work area after direct handling and check them frequently with a survey meter. A dry run will show when gloves should be changed, and preliminary assembly of all equipment will cut down on movement away from the work area to open drawers, refrigerators, etc.

3. Label all potentially contaminated equipment or materials. Contaminated, unlabeled material can lead to spread of surface and personnel contamination.

4. Cover bench areas with absorbent paper, and define radioactive work area with radiation label tape.

5. Keep radioactive material in secondary containers (e.g., plastic beakers, trays, rubber dish pans) to prevent contamination caused by spills and breakage. Label these secondary containers with radiation tape.

6. Wear a film badge and ring, and work with plastic shields while handling high energy beta radioactive materials such as ^{32}P. Use lead shielding for ^{125}I.

7. Minor Spill (i.e., spill involves no immediate health hazard)
   a. Contain spread of activity if possible.
   b. Delineate contaminated area at once, cover shoes, and keep all persons away.
   c. Call Office of Radiation Safety (ORS) immediately (3-8414). Stay in the area until EH&S arrives. (After 5:00 p.m., call Campus Police, 2-6760).
   d. Do not attempt decontamination except as expressly directed by EH&S.

8. Major Contamination (i.e., spill involves potential health hazard)
   a. Vacate the immediate area, leaving behind clothing and other articles which may be contaminated, and remain in the vicinity.
   b. Turn off all ventilation systems.
   c. Keep all persons out of the area, except monitoring and rescue teams.
   d. Call ORS immediately (3-8414) or Campus Police (2-6760) if after 5:00 p.m. Stay in adjacent area until EH&S arrives.

e. Do not attempt decontamination except as expressly directed by EH&S.

9. Radioactive Waste Disposal -- Refer to the Radiation Safety Manual for more complete information.
   a. Liquid waste must be contained in 1-gallon narrow-necked, screw top glass containers. It should be placed in a plastic bag and stored in a spillover container. The label must include isotope type, activity, date, building, and room number. In the remarks you must designate all chemical components percentage by volume. No chemical formulas. Contact EH&S for pick-up, 3-8765. (NOTE: Some low-level liquid radioactive waste may also be disposed of by drain, but only if permission is specifically given on the lab's RUA.)
   b. Scintillation vials must have all caps secured tightly and be removed from flats, double bagged and labeled. Gently place them in the appropriate drum in 155 LSA, and log onto drum card. These steps are necessary to avoid contamination and to keep solvent levels at a minimum in the drums and in room 155.
   c. Dry waste should be contained in plastic bags, labeled and placed in dry waste drums in 155 LSA, and recorded in log.
   d. Sort waste by isotope as indicated in 155 LSA.

10. Radioactive liquids (with the exception of liquid scintillation vials) must be kept in spillover containers when being transported through hallways and other public spaces.

11. Any radioactive materials put in core rooms (e.g. cold rooms, warms rooms) or in core equipment (e.g. centrifuges, freezers), must be recorded on room log or equipment log sheet. Never leave unidentified samples in core areas.

BIOHAZARDOUS AGENTS.

Biohazardous agents which require special precautions fall into three categories:

(1) Recombinant DNA: Molecules resulting from the recombination in cell-free systems of segments of DNA from two or more species. Experiments with these molecules are assigned, on the basis of potential hazard, to increasing levels of physical containment (P1, P2, P3, P4) and increasing levels of biological containment (EK1, EK2, EK3). Biological containment levels are based on the ability of the host organism to survive outside the laboratory.
(2) Oncogenic Viruses: Viruses that are known to induce cancer after infecting susceptible animals. These are classed as low, moderate, or high risk on the basis of their potential hazard.
(3) Etiological Agents: Organisms (bacteria, viruses, fungi, etc.) known to cause disease in humans, other animals, or plants. These are classified as Class 1-5 on the basis of their potential hazard.

For guidelines on handling biohazardous agents, refer to the UCB Biohazard and Carcinogen Safety Manual. This manual incorporates regulations, standards, and recommendations from federal and state agencies. All work involving the handling of Recombinant DNA or etiological agents designated Class 2 or higher requires a currently valid Biohazard Use Authorization.

TISSUE CULTURE.

Before undertaking the in vitro culture of eucaryotic, especially mammalian, cells and deciding on containment restrictions, consider the following points:

1. What was the original source of the tissue or cell line and did the tissue exhibit diseased or other abnormal properties? What was the etiology of the disease?

2. Is the culture known to harbor or be particularly susceptible to any viruses? Are they oncogenic in nature? Are they infectious to humans or any other cultures in your lab? Are they able to recombine with other viruses and are they inducible with physical or chemical mutagens?
3. If you are culturing viruses, have you considered antibody tests for your laboratory personnel?
4. Are any of your techniques likely to cause aerosols of culture material? How will the personnel and environment be protected?
5. How do you plan to dispose of liquid/solid waste material?
6. Are you taking immuno-suppressive drugs such as anti-allergy pills?
7. Are any pregnant women going to be in the working area?
8. Never work with cell cultures originating from your own body tissues.

TERATOGENS.

A wide spectrum of reagents commonly encountered in laboratories have been shown to have teratogenic properties (substances that cause birth defects). Women who are pregnant or attempting to conceive should take particularly strong precautions to avoid contact with these agents.

UV LIGHT.

Eyes should be protected by UV safety glasses with side shields. Remember that UV light is reflected from light surfaces such as filter paper. In prolonged exposure of high intensity, the additional protection of UV face shields, gloves, and long sleeves is necessary. UV blocking covers are also available (e.g. from Fotodyne Inc.) for most models of transilluminators.

AEROSOLS.

Aerosols are particularly dangerous because toxic chemicals in this form can be inhaled and ingested with alarming ease and rapidity. Avoid aerosols whenever possible, or use only in a hood. Procedures that produce aerosols include pipetting, homogenizing, and, in some cases, centrifuging. Aerosol generating procedures with biohazardous agents should be confined to biological safety cabinets.

EXCEPTIONALLY HAZARDOUS CHEMICALS.

The following list, although not exhaustive, cites some chemicals which are especially hazardous. Read bottle labels and research the hazards and proper handling procedures of the compounds that you use. Material Safety Data Sheets (MSDS) for most substances are available on line from EH&S provided links.

1. Ether: Extremely flammable. Forms highly explosive peroxides on contact with air (especially true of anhydrous ether). Date ether container when received and when opened. Be very careful when handling old ether containers as peroxides may decompose explosively.
2. Nitric Acid and Nitrogen Oxides (except nitrous): Gases are given off by heating HNO_3 or whenever HNO_3 reacts with organic compounds (also some present at room temperature). Inhalation can cause fatal pulmonary edema which may show up within 6-24 hours. Since the bases are not so water-soluble as to be immediately irritating in the upper respiratory tract, a considerable amount may be inhaled before it is noticed. Anyone exposed should remain under observation for 48 hours.
3. Trichloracetic Acid: Acute local effects: burns skin, mucous membrane, etc. No chronic effects described. When heated, gives off toxic chloride fumes.
4. Benzene: Worst effects are chronic in nature. In low concentrations, destroys blood-forming tissues. (See Biohazard & Carcinogen Safety Manual -- Class B.)

5. Mercury: Spills can be a hazard because Hg is very difficult to clean up completely. It clings to many kinds of surfaces. EH&S will monitor Hg level before and after clean-up. Fumes are toxic. Heat can produce enough vapor to give symptoms in a few hours.
6. Perchloric Acid and Perchlorates: Potentially explosive, especially at high temperature (greater than 60°C) when $HClO_4$ becomes a potent oxidizing and dehydrating agent. Concentrations above 72% are dangerous. Anhydrous perchloric acid is particularly dangerous because it is unstable at room temperature and can decompose spontaneously with violent explosions when triggered by contact with oxidizable material (reducing agents). Combustible material and organic compounds are dangerous when contaminated with perchloric acid. They are a fire hazard and explosive, especially simple alkyl esters. Therefore, alcohol extractions following $HClO_4$ treatment are to be avoided.
7. Acrylamide: Acrylamide and bisacrylamide monomers are neurotoxins. Care should be taken to avoid skin contact with the monomer. Mouth pipetting of solutions is forbidden. If any is spilled on the skin, immediately wash the area with soap and water. The disease syndrome is characterized by loss of coordination (seen as unsteadiness and stumbling), ataxia (irregularity of muscular action), and weakness in the extremities (particularly the legs). Initially the complaints are drowsiness, fatigue and tingling in the fingers. The effects of these compounds are *cumulative* and can be produced by all routes of entry: oral, skin contact, and inhalation.
   Polymerized gels probably retain large quantities of unpolymerized monomer, and should be handled carefully. Further, it is thought that a noxious, volatile component reported to cause severe headaches is liberated from the gels while they sit in the destaining acetic acid bath. All staining and destaining should, therefore, be done in a hood and the solutions should be discarded (or stored for future use) in the hood. People who use staining mixtures employing methanol, should be aware of its toxicity, and perform all operations in the hood.

SAFETY PERSONNEL

BUILDING COORDINATOR

Building Coordinator:	**BARBARA DUNCAN**	165 LSA	3-8121
Alternate Bldg. Coordinator:	**DEREK APOCADA**	3072 VLSB	2-2467

SAFETY COMMITTEE

The Safety Committee is the key piece of the BDS safety program and an important part of the campus overall safety structure. The purpose of the Safety Committee is to maintain a healthy and safe environment for the occupants of the Life Sciences Addition. It attempts to identify hazards and to prevent accidents and illnesses that are avoidable. The Safety Committee serves in an advisory capacity for the BDS Department which has the authority to establish building policy.

department	***name***	***phone***	***address***	***Email***
BDS	**Derek Apocada**	2-2467	3072 VLSB	dapocada@berkeley.edu
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ENVIRONMENT, HEALTH & SAFETY REPRESENTATIVE.

The Office of Environment, Health & Safety has trained staff who are available to help interpret and implement EH&S policies. The EH&S area representative for the Life Sciences Addition is:

Phil Maynard
EH&S, 317 University Hall
643-6562
EH&S web site: http://www.berkeley.edu

LAB & OFFICE SAFETY OFFICERS.

A Safety Officer is designated for each laboratory and administrative office in LSA. Safety Officers are responsible for establishing an emergency meeting site for the unit in the event of a building evacuation and ensuring that all members of the lab or office know the location of the meeting site. He/she is also responsible for clearing all rooms in the unit and reporting to the Emergency Checkpoint during an evacuation. Other responsibilities include training new employees; monitoring the unit for safety hazards; carrying out safety policies; and, in a laboratory setting, maintaining a Chemical Hygiene Plan.

Floor	ROOM	Lab/Office	Safety Officer	Phone	eMail
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Dangerous Properties of Industrial Materials. 7th Ed., edited by N. Irving Sax and R. J. Lewis. New York: Van Nostrand Reinhold, 1988, 3600 pp.

Ethidium Bromide. *(Copies of various papers on the decontamination and destruction of ethidium bromide solutions are available in room 171.)*

Foundations of Laboratory Safety. A Guide for the Biomedical Laboratory. Stephen R. Rayburn, 1990.

Safety Data Sheets. *(Copies of MSDS are available ON LINE. Manufacturers are required to provide an MSDS for every chemical product in order to identify its various properties, to disclose any known hazards, and to give instructions for appropriate responses in the event of an emergency.)*

http://www.ucmsds.com

The MSDS database can be accessed using most common browsers, however, **to access this UC MSDS database you must be connected through a recognized UC campus computer.**

The University of California's Offices of Environment, Health & Safety have combined efforts and resources to create a source for Material Safety Data Sheets and chemical safety information.

TOMES — Chemical Hazard Information
http://csi.micromedex.com

A commercial database providing Toxicology, Occupational Medicine and Environmental Series Consolidated Point Solution information. The University of California, Environment, Health & Safety Offices offer this excellent resource to all UC campus sites with a UC internet provider address.

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