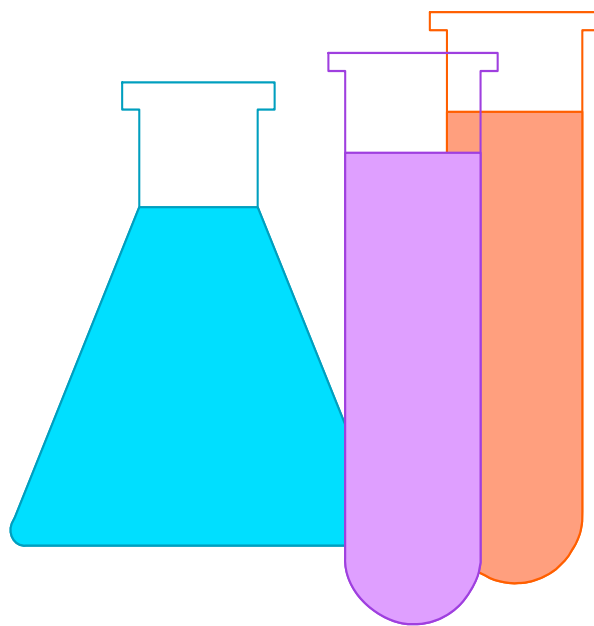


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CHEMICAL HYGIENE PLAN

2007

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I. INTRODUCTION

It is the policy of The Scripps Research Institute to protect the health and well being of all its employees. Toward that end, the institution has developed this Chemical Hygiene Plan governing the receipt, use, and disposal of chemicals. The requirements established in the Chemical Hygiene Plan are in addition to other Scripps Research Institute policies and procedures, inclusive of but not limited to those found in the institutional Safety Manual, the institutional Radiation Safety Manual, the Human Resource Policy and Procedure Manual, and the institutional Injury and Illness Prevention Program.

II. GENERAL PRINCIPLES FOR WORK WITH LABORATORY CHEMICALS

- A. Minimize all chemical exposure.
- B. Assume all chemical materials are potentially hazardous.
- C. Ensure adequate ventilation.
- D. Conform to established permissible exposure limits (PEL) of CAL/OSHA and the threshold limit values (TLV) of the American Conference of Governmental Industrial Hygienists; if there is a conflict, the CAL/OSHA PELs shall govern.

III. CHEMICAL HYGIENE RESPONSIBILITIES

Responsibility for the Chemical Hygiene Program rests with the following:

- A. Senior Vice President/COO, The Scripps Research Institute, who has the ultimate responsibility for the organization and who shall provide continuing support for the Chemical Hygiene Program.
- B. Administrators, department chairpersons, department heads, managers, and supervisors who are responsible for chemical hygiene in their respective units.
- C. Director, Environmental Health and Safety, staff Industrial Hygienist, or other individual designated by the Director of Environmental Health and Safety shall serve as the institutional Chemical Hygiene Officer. The Chemical Hygiene Officer or his/her designee shall be responsible for the following:
 - 1. Work with and assist administrators, department chairpersons, department heads, managers, and supervisors to develop appropriate chemical hygiene policies, practices, procedures, and protocols.
 - 2. Review laboratory records of procurement, use, and disposal of chemicals.
 - 3. Conduct appropriate audits.

4. Perform appropriate environmental monitoring.
 5. Administer the Occupational Medicine Program (OMP) which provides medical consultations and examinations in the event a laboratory employee is exposed to a hazardous chemical.
 6. Know the current legal requirements concerning regulated substances and communicate these requirements and standards to appropriate administrators, department chairpersons, department heads, managers, and supervisors.
 7. Seek ways to improve the Chemical Hygiene Program.
- D. Administrators, department chairpersons, department heads, managers, and supervisors shall have overall responsibility for chemical hygiene and safety in their respective laboratories and shall designate in writing a laboratory chemical hygiene/safety officer.

The designated individual shall have the responsibility to assure that all safety protocols, policies, procedures, and regulations are followed and shall be accountable for the following:

1. Ensure that employees follow the requirements of the Chemical Hygiene Plan.
2. Provide regular, formal, chemical hygiene and housekeeping inspections including routine inspections of emergency equipment.
3. With the guidance of the institutional Chemical Hygiene Officer, become familiar with the current legal requirements concerning regulated substances.
4. With the guidance of the institutional Chemical Hygiene Officer, determine the required levels of protective apparel and equipment.
5. Ensure that appropriate protective apparel and equipment are utilized and maintained.
6. Ensure that facilities and training for use of any material being ordered are adequate.
7. Ensure that laboratory employees receive medical attention in the event of a hazardous chemical exposure.
8. Provide EH&S with a complete and accurate chemical inventory; this inventory must be available when requested and must have been updated within the last twelve months.

9. Ensure that all containers are appropriately labeled as to the contents and the physical and/or health hazards.
- E. Laboratory workers including faculty, fellows, department heads, managers, and other employees are responsible for the following:
1. Planning and conducting each experiment or chemical usage in accordance with the institution's Chemical Hygiene Plan.
 2. Developing good personal chemical hygiene habits.
 3. Reporting any signs or symptoms associated with exposure to a hazardous chemical in the laboratory and seeking medical attention, as applicable.

IV. THE LABORATORY FACILITY

- A. Design. Each laboratory facility shall have the following:
1. An appropriate general ventilation system (see C and D below) with air intakes and exhausts located so as to minimize the likelihood of the intake of contaminated air.
 2. Appropriately ventilated stockrooms/storerooms and storage cabinets. Note, some cabinet spaces located under chemical fume hoods are not approved for storage of flammable materials. If flammable materials are to be stored in these spaces they must be placed in metal secondary containers deep enough to hold the entire contents of the flammable material container.
 3. Laboratory hoods and sinks.
 4. Other safety equipment including eyewash stations and drench showers.
 5. Arrangements for waste disposal.
- B. Maintenance. Chemical-hygiene-related equipment (hoods, equipment, etc.) shall be subject to continuing appraisal and will be modified when found inadequate.
- C. Usage. Laboratory work will be appropriate for the physical facilities available and the quality of ventilation.
- D. Ventilation.
1. General laboratory ventilation. This system will provide a continuous source of air to ensure that laboratory air is continually replaced.

- a. Performance. Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control.
 - b. Evaluation. Quality (temperature, humidity, etc.) and quantity of ventilation shall be evaluated by Engineering at installation, regularly monitored (at least annually), and reevaluated whenever a change in local ventilation devices is made.
 - c. Modifications. Any alteration of the ventilation system shall be made only after determination that worker protection from airborne toxic substances will continue to be adequate and only after approval by the Engineering Department. Engineering should consult Environmental Health and Safety.
2. Local Exhaust Ventilation - This type of system will exhaust air directly at the source of contaminant generation. This type of ventilation system is recommended for operations which may result in hazardous airborne exposures. As a rule of thumb, use local exhaust ventilation when working with any appreciably volatile substance with a strong odor or a Threshold Limit Value (*TLV*) of less than 50 ppm.
- a. Chemical Fume Hoods
 - 1) Researcher Use Criteria
 - a) Quantity - It is strongly recommended that at least one hood per two employees be provided. Each employee should have at least 2.5 linear feet as measured at the hood face of work space most of his or her time working with chemicals.
 - b) Evaluation of Performance - Confirm adequate hood performance before use. Each hood shall have a continuous monitoring device to allow confirmation of adequate hood performance.
 - c) Sash Height Restriction - While work is being performed inside the hood, *maintain the sash at a level no higher* than indicated at the "hood certification" level. Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off."
 - d) Storage of chemicals - Keep materials stored in hoods to a minimum and do not allow them to block vents or air flow.

2) Engineering Use Criteria

- a) Performance - General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas; airflow into and within the hood shall not be excessively turbulent; hood face velocity shall average no less than 100 linear feet per minute (LFM), with a minimum of 70 LFM at any one point. All hoods shall have a means to indicate operation. Additionally, all hoods shall meet CAL/OSHA requirements as established in Section 5154.1 of Title 8.
- b) Evaluation - A quantitative evaluation is conducted on all chemical fume hoods by EH&S personnel on an annual basis.
- b. Biological Safety Cabinets - Hazardous chemicals can only be used in EH&S-approved styles of biological safety cabinets. TSRI currently does not have any biological safety cabinets which meet the criteria as being safe for use with chemicals.
- c. Glove Boxes/ Cold and Warm Rooms - Exhaust air from glove boxes shall be passed through filters before release into the regular exhaust system. Cold rooms and warm rooms shall have provisions for rapid escape.
- d. Other ventilation devices. Ventilated storage cabinets, canopy hoods, snorkels, etc., shall be provided as needed. Each canopy hood and snorkel should have a separate exhaust duct. Canopy-style hoods are only to be used to exhaust heat, not hazardous chemicals.

V. COMPONENTS OF THE CHEMICAL HYGIENE PLAN

A. Basic Rules and Procedures

All laboratory users shall be familiar with the basic rules and procedures for working with chemical materials as specified in V below.

B. Chemical Procurement, Distribution, and Storage

- 1. Procurement. Before a substance is received, information on proper handling, storage, and disposal must be known and understood by those who will be involved. No container shall be accepted without an adequate identifying label. All substances shall be received in a central location. For each hazardous substance, a current Material Safety Data Sheet shall be readily available (Appendix E specifies the locations of Material Safety Data Sheets).

2. Distribution. When chemicals are hand carried, the container shall be placed in an unbreakable, secondary container.
3. Chemical storage
 - a. General - Storage in the laboratory shall be in certified/approved storage cabinets. The quantity of chemicals stored in the laboratory should be kept to a minimum. Storage on bench tops and in hoods is to be discouraged. All chemicals whose containers have been opened shall be in unbreakable, secondary containers.
 - b. Chemical Inventory - Chemical inventories are to be conducted at intervals not to exceed six months. Unneeded items are to be removed from the laboratory for redistribution or disposal.
 - c. Compatibility - Storage of chemicals must be in accordance with compatibility; incompatible chemicals must be properly separated. Reactivity class (flammable liquids, acids, bases, oxidizers, water reactives, etc.) shall be the basis for separation. Separation shall be maintained by utilizing separate storage cabinets or where appropriate, secondary containment.
 - d. Criteria for Flammable liquids - Flammable liquids shall be restricted to a total of 10 gallons per laboratory unless said liquids are in an approved flammable cabinet. Flammable liquids shall be kept closed unless adding to or extracting from the container. Flammable materials not in immediate use and in glass containers of four liters or more must be contained within a bottle jacket or in a Safe Cote® bottle.

C. Environmental Monitoring

Environmental monitoring shall be conducted as deemed appropriate by the Director of Environmental Health and Safety or the Industrial Hygienist.

D. Housekeeping, Inspections, and Maintenance

1. Housekeeping. All floors will be cleaned regularly and routinely inspected by the Environmental Services supervisor.
2. Inspections. Formal chemical hygiene inspections shall be performed at least quarterly throughout research facilities by a member of Environmental Health and Safety.

Eyewash stations and safety showers shall be inspected and activated at monthly intervals by a member of the Engineering Department.

3. Maintenance. Procedures to prevent restarting of out-of-service equipment shall be established by the Director of Engineering. Passageways, stairways, and hallways should not be used as storage areas, and access to exits, emergency equipment, and utility controls shall never be blocked.

E. Medical Program

Chemical and biological research involves the daily use of a wide range of chemicals and circumstances can arise which may result in exposure incidents. Personnel trained in first aid and/or medical professionals are available during operating times. TSRI provides an Occupational Medical Program (OMP) through an agreement with the Sharp Rees-Stealy Occupational Medicine (SRS-OM) group to address exposure incidents. The physicians at SRS-OM are licensed in the State of California and many are board certified in occupational medicine. Medical consultations and/or examinations as a result of a lab exposure or potential exposure are provided at no cost or loss of pay to the employee.

Medical consultations, examinations, and follow-ups occur through the OMP for employees who work with hazardous chemicals in laboratories and may be exposed under the following circumstances:

1. Signs or symptoms develop associated with hazardous chemical exposure.
2. When exposure monitoring reveals an exposure above the action level (or in the absence of an action level, the exposure limit) occurs for a Cal/OSHA regulated substance where exposure monitoring and medical surveillance are required.
3. Whenever an event occurs (spill, leak, explosion, or other occurrence) resulting in the likelihood of a hazardous exposure.

In the event of an exposure, TSRI provides SRS-OM with the following information:

1. The identity of the hazardous chemical(s);
2. A description of the conditions under which the exposure occurred including quantitative sampling or monitoring data, if available; and
3. A description of the signs and symptoms of exposure that the employee is experiencing, if any.

When an employee is sent to SRS-OM for a consultation or examination, TSRI will receive a written opinion from SRS-OM. This opinion shall not reveal

specific findings of diagnoses unrelated to the chemical exposure. This written opinion shall include the following:

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

F. Protective Apparel and Equipment

Each laboratory (where hazardous chemicals are utilized) shall have the following available:

1. An easily accessible, drench-type safety shower.
2. An eyewash station.
3. A fire extinguisher.
4. Fire alarm and telephone for emergency use.
5. Personal Protective Equipment and Apparel appropriate for substances being handled.
 - a. Eye Protection, Gloves, Laboratory Coats - Assure that appropriate eye protection, gloves, and suitable lab coat is worn.
 - 1) Laboratory coats - Personnel in the Department of Chemistry, The Skaggs Institute for Chemical Biology, or other laboratories designated by Environmental Health and Safety will be equipped with Indura® lab coats. These coats provide employees greater protection from flammable hazards.
 - b. Respiratory Protective Devices - The use of a respirator is prohibited unless specifically authorized in writing by the TSRI Industrial Hygienist. Requests permitting the use of respirators shall be evaluated on a case-by-case basis. Individuals shall not be authorized to utilize/wear respirators

until they have successfully completed Employee Health's respirator fitness evaluation.

When authorized, respirators shall be used, maintained, stored, etc., in accordance with an approved, written respiratory protection program. It is the policy of The Scripps Research Institute to minimize and/or prevent the inhalation of hazardous substances by engineered and administrative controls; the use of respirators shall be a last resort.

G. Records

1. Accident records shall be written and retained by the Human Resources Department.
2. Chemical Hygiene Plan records shall be maintained by the Office of the Director of Environmental Health and Safety and/or the Director of Engineering. The records shall document that the facilities and the precautions taken were compatible with current knowledge and regulations.
3. Inventory and usage records will be retained by the institution in accordance with the requirements of applicable regulations.
4. Each laboratory chemical hygiene/safety officer shall maintain a complete and accurate inventory of all hazardous chemicals.

H. Signs and Labels

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

1. Emergency telephone numbers of emergency personnel.
2. Containers of hazardous chemicals (including hazardous waste receptacles) shall be appropriately labeled to include but not limited to the contents and associated hazard(s).
3. Location signs for safety showers, eyewash stations, fire extinguishers, other safety and first-aid equipment, and exits.
4. Warnings at areas or equipment where special or unusual hazards exist.
5. Storage cabinets shall be appropriately labeled, i.e., flammable materials, acid, highly toxic materials. Letters shall be at least one inch high.

I. Spills and Accidents

1. It is the goal of the institution to prevent chemical spills by the following:

- a. the use of secondary containment.
 - b. utilizing nonbreakable containers whenever possible.
 - c. maintaining containers closed except when adding or extracting material.
 - d. utilizing the smallest possible chemical quantity.
 - e. minimizing clutter.
 - f. providing appropriate training.
2. A written, emergency plan (disaster manual) has been established and communicated to all personnel; it includes procedures for evacuation, medical care, reporting, and drills.
 3. All spills shall be cleaned up in accordance with the Material Safety Data Sheet or other published information. It is the responsibility of each user to clean up his or her own spill. Environmental Health and Safety is available to provide assistance and for remedying situations requiring the use of a respirator.
 4. All accidents or near-accidents must be reported to the laboratory safety officer and/or appropriate supervisor for analysis and reporting. As appropriate, the incident/accident reports are distributed to all individuals who may benefit.

J. Information and Training Program

Administrators, department chairpersons, department heads, managers, and supervisors shall provide appropriate information and training to their staff to assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs.

1. All employees (inclusive of stockroom/storeroom personnel) are aware of the location and proper use of available protective apparel, equipment, and relevant regulations.
2. All employees (inclusive of stockroom/storeroom personnel) are aware of the location of the Safety Manual, Material Safety Data Sheets, and other pertinent information.
3. Training and education programs shall be a regular and continuing activity.
4. Literature and consulting advice concerning chemical hygiene is readily available to laboratory personnel. Personnel are encouraged to use these informational resources.

K. Waste Disposal Program

1. Aim. To assure that hazardous (chemical) waste is handled and disposed of in full compliance with all applicable rules, regulations, and laws.
2. Content. The waste disposal program specifies how waste is to be collected, segregated, stored, and transported. Transport from the institution is in accordance with DOT regulations.
3. Discarding Chemical Stocks. Unlabeled containers of chemicals and solutions and chemicals which are no longer of use undergo prompt disposal.
4. Frequency of Disposal. Waste is removed from laboratories on an as-needed basis and taken to central waste storage areas. Waste in the central storage area is packaged and transported in accordance with applicable regulations. Removal from the site is by a commercial vendor. Unlabeled chemicals are analyzed prior to packaging and off-site disposal.
5. Method of Disposal. Disposal by pouring waste chemicals down the drain is prohibited unless specifically authorized by the Director of Environmental Health and Safety and/or the institutional Chemical Hygiene Officer. The adding of liquid wastes to mixed refuse for landfill burial is also prohibited. Hoods are not to be used as a means of disposal for volatile chemicals.
6. Written guidance for handling chemical waste is provided.

VI. BASIC RULES AND PROCEDURES FOR WORKING WITH CHEMICALS

All employees are expected to adhere to the recommendations on the material safety data sheet, container label, and all applicable policies and procedures.

A. General work practices

1. Avoidance of "routine" exposure. Develop and encourage safe habits; avoid unnecessary exposure to chemicals by all routes. Do not smell or taste chemicals. Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices. Do not allow the release of toxic substances in cold rooms and warm rooms since these have recirculated atmospheres.
2. All gloves (inclusive of glove boxes) should be inspected for holes, tears, discoloration, or deterioration prior to use and shall be replaced when integrity has been compromised.
3. Choice of chemicals. Use only those chemicals for which the quality of the available ventilation system is appropriate.

4. Eating, smoking, etc. Eating, drinking, smoking, gum chewing, application of cosmetics, etc., in areas where laboratory chemicals are used or stored is not permitted; wash hands before conducting these activities. Do not store, handle, or consume food or beverages in areas utilized for hazardous material storage or use. With concurrence from the Director of Environmental Health and Safety, the institutional Chemical Hygiene Officer, or designee, a "clean area" may be designated within laboratory facilities. Clean areas must be posted as a clean area and no use, storage, handling, etc., of hazardous (chemical, biologic, radioactive) materials may occur within six (6) feet of this area. Sealed containers of food/beverage may be taken through the laboratory to reach the clean area. Clean areas are a privilege and are subject to revocation by the Director of Environmental Health and Safety and/or the institutional Chemical Hygiene Officer if the conditions mentioned above are violated or if the "clean area" is deemed to be a safety hazard or in violation of any regulatory requirement.
5. Mouth suction. Mouth suction for pipetting or starting a siphon is prohibited.
6. Equipment and glassware. Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks, lyophilizer flasks, rotary evaporation flasks, and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur. Immediately and appropriately dispose of or repair chipped, cracked, or broken glassware. Use equipment only for its designated purpose.
7. Exiting. Prior to exiting the laboratory, wash your hands and all other areas of exposed skin that may have come into contact with chemicals. Wash exposed skin well before leaving the laboratory.
8. Horseplay. Horseplay, practical jokes, or other behavior which might confuse, startle, or distract another worker is prohibited.
9. Personal apparel. Confine long hair, loose clothing, and jewelry. Wear closed-toe shoes at all times in the laboratory.
10. Personal housekeeping. Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area at the completion of an operation and at the end of each day.
11. Planning. Seek information and advice about hazards, plan appropriate protective procedures, and plan the positioning of equipment prior to initiating any laboratory operation.
12. Off-hour operation. During off hours, when operations must be left unattended, leave lights on, place an appropriate sign (the process, chemical emergency contact, and phone number) on the door, and provide for

secondary containment of toxic substances in the event of failure of a utility service (such as cooling water) when operations are left unattended.

13. While work is being performed inside the hood, maintain the sash at a level no higher than indicated at the "hood certification" level. Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off."
14. Vigilance. Be alert to unsafe conditions; notify your supervisor or laboratory safety officer of these situations. If the situation goes uncorrected or assistance is needed, contact Environmental Health and Safety.
15. Waste Disposal. Assure that the plan for each laboratory operation includes plans and training for waste disposal. Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan.
16. Working Alone. Avoid working alone; do not work alone in a laboratory if the procedures being conducted are hazardous.

VII. WORKING WITH CAL OSHA-REGULATED CARCINOGENS

<u>Cal/OSHA Regulated Carcinogens (5209)</u>	<u>CAS#</u>	<u>Percent*</u>
2-Acetylaminofluorene	53963	1.0
4-Aminodiphenyl	92671	0.1
Benzidine (and its salts)	92875	0.1
3,3' -Dichlorobenzidine (and its salts)	91941	1.0
4,-Dimethylaminoazobenzene	60117	1.0
alpha-Naphthylamine	134327	1.0
beta-Naphthylamine	91598	0.1
4-Nitrobiphenyl	92933	0.1
4-Nitrosodimethylamine	62759	1.0
beta-Propiolactone	57578	1.0
Bis-Chloromethyl ether	542881	0.1
Methyl chloromethyl ether	107302	0.1
Ethyleneimine	151564	1.0

*By weight or volume

1. Scope. Applies to an area in which these regulated carcinogens are manufactured, processed, used, repackaged, released, stored, or handled in concentrations equal to or greater than the percents listed above.
2. This standard does not apply to solid or liquid mixtures with content less than the percentage specified above or to transshipment in sealed containers.

3. These applications require the establishment of a Regulated Area. **A regulated area is one in which entry and exit is restricted or controlled.** Only Authorized Personnel may enter the Regulated Area.
4. Laboratory Work General Rules for working with these Regulated Carcinogens. Follow the "Basic Rules and Procedures for Working with Chemicals" found in this document. In addition to those rules, follow the rules listed below:
 - Experiments, procedures, and equipment that could produce aerosols must be confined to a closed system, a laboratory type hood or an isolated system (glove box). Hazardous waste must be transferred to waste containers within a laboratory hood or glove box. Work cannot be performed on the open lab bench or other open vessel system.
 - Air pressure where the carcinogen is handled shall be negative in relation to pressure in surrounding areas.
 - Laboratory work surfaces on which a carcinogen is handled should be protected from contamination, for example, by chemical absorbent paper liners or bench coat, etc.
 - Personal Protective Equipment (PPE). Employees are required to wear a daily change of clean, protective lab clothing, such as a solid-front gown, a surgical scrub suit, or a fully buttoned lab coat.
 - All PPE must be removed or disposed of and left in the regulated area (carcinogen working area).
 - All equipment must be decontaminated prior to removal from a regulated area.
 - Decontamination procedures must be established and followed.
 - Dry sweeping and dry mopping are prohibited.
 - Contaminated wastes must be collected in impervious sealed containers and labeled appropriately. Follow the waste guidelines for disposal of Extremely Hazardous materials and call the waste line for disposal.
5. Emergencies. Emergency procedures must be posted.
 - Evacuate affected areas. Follow the emergency spill procedures posted.
 - Call EH&S for the cleanup of leaks or spills where there is direct contact with a carcinogen.

- Medical surveillance and/or treatment and emergency incident reports must be reported within 24 hours to EH&S.
- Where an employee has a known contact with a regulated carcinogen, the employee is required to shower, including the washing of hair, as soon as possible unless contraindicated by physical injuries.
- Emergency eyewashes and showers must be located on the same level and within sight of a location when there is possible exposure to beta-propiolactone or ethyleneimine.

6. Signs.

- Signs and instructions must be posted at entrances to and exits from regulated areas informing employees of procedures to follow when entering and leaving the regulated area.
Entrance Posting: Cancer-Suspect Agent
Authorized Personnel Only
- Containers shall display the following warning immediately under or adjacent to the contents identification.
CANCER-SUSPECT AGENT
- Containers that have regulated carcinogen contents with corrosive or irritating properties must have label statements warning of such hazards, noting, if appropriate, particularly sensitive or affected portions of the body.

7. Medical Surveillance.

- A preassignment medical exam by a licensed physician is available through Employee Health free of cost for all employees prior to entrance into a regulated area.
- An Annual Examination is required for "authorized employees" (anyone entering into a "regulated area").
- The physician must furnish the supervisor with a statement of the employee's suitability for employment. This is specific for each potential carcinogen exposure.
- Employee Health also recommends that employees covered by this standard also be provided an exit physical examination. **Notify EH&S prior to conducting the physical examination.**

8. Training. Training must be provided prior to initial assignment and at least annually thereafter and must include the following:

- The nature of the carcinogenic hazard--both local and systemic toxicity.
- Specific operations that could result in exposure (training by Supervisor*).
- Medical surveillance program.
- Decontamination practices and procedures.
- Emergency practices and procedures.
- Employee's specific role in emergencies (training by Supervisor*).
- Specific information to recognize and evaluate a condition that may release the carcinogen (training by Supervisor*).
- The purpose for and application of first-aid procedures.

* Supervisor or knowledgeable person provides this training.

9. Reporting requirements. Regulated areas must be reported to Cal/OSHA. Supervisors are required to fill out the enclosed "Cal/OSHA Notification of Carcinogen Use" form and return a copy to EH&S.

VIII. WORKING WITH OSHA SELECT CARCINOGENS

This Summary applies to the following specific chemicals:

4-4' -Methylenedianiline	Acrylonitrile
Ethylene Oxide	Inorganic Arsenic
1,3-Butadiene	4,4'-Methylenebis (2-chloroaniline)
Methylene Chloride	Lead
Cadmium	Formaldehyde
Asbestos	Benzene
Vinyl Chloride Arsenic	Ethylene Dibromide
1,2 -Dibromo -3 -chloropropane	

1. Read the specific informational sheets that apply to each of the regulated carcinogens that you use (available from EH&S). Fill out all of the required forms and return the "Cal/OSHA Notification of Carcinogen Use" form to Environmental Health and Safety, BCC 078.
2. MSDS. Become familiar with the MSDS from the manufacturer of the regulated carcinogens you are using.
3. Worker Protection Guidelines

- High exposures can occur during the transfer of a carcinogen. These operations should be performed in a hood or other local exhaust ventilation. Fume hoods or glove boxes may be used.
- Limit the time spent working with the material; avoid contact and inhalation; and implement chemical substitution, if possible, etc.
- Wear your appropriate personal protective equipment (PPE). Examples include respirators, gloves, aprons, and shoe covers. EH&S can assist you with the selection of appropriate PPE.
- A fully buttoned lab coat must be worn at all times when working with carcinogens. Limit all exposure to the hands by wearing appropriate gloves. Contact EH&S for glove selection. Appropriate eye protection must also be worn.
- The Scripps Research Institute must clean, dispose, maintain or replace all necessary PPE. Do not take home equipment or clothing that is contaminated. Follow the hazardous waste guidelines for disposal of carcinogen-contaminated PPE.

4. Spills/Emergencies

- Operations where exposure may occur: laboratory experiments; unplanned events, e.g., spills, equipment failure, leaks, etc.
- If a spill occurs, leave the area quickly unless you have specific emergency duties. Follow the emergency posting and contact EH&S. Report the incident to your supervisor and seek medical attention. Do not touch the spilled material. Designated persons may stop the leak and shut off ignition sources if this can be done safely. Secure the area until EH&S arrives.
- Small spills in a hood may be contained using absorbent material. Place the waste in a properly labeled container and call the waste pickup line. Spills must not be cleaned with compressed air, vacuuming, or sweeping.
- An emergency eye/face wash must be available in a work area where carcinogens that are corrosive, severely irritating, or toxic by absorption may splash the eyes and/or face. An emergency shower must be available where there may be skin exposure.
- **All emergencies involving carcinogens must be reported to EH&S within 24 hours of occurrence.** Eye and skin contact to arsenic trichloride, tribromide, or trifluoride must also be reported to EH&S.

Emergency--Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which results in an unexpected massive release of a carcinogen. May also apply when there is employee skin and/or eye exposure to the carcinogen.

5. Hygiene Practices

- The workplace should be kept clean, orderly, and in a sanitary condition. A surface coating or covering may be used in order to keep work surfaces clean.
- Methods to detect leaks and spills (gas or liquid) from equipment, storage containers and/or apparatus, including regular visual inspections, must be established. Leaks must be repaired promptly. Provisions for immediate spill response are also required and must address spill containment, decontamination of the work area, and waste disposal.

6. Exposure Limits

Exposure limits will be explained further in Exposure Monitoring.

7. Exposure Monitoring

- The purpose of exposure monitoring is to identify airborne concentrations that may result in adverse health effects (generally defined by regulatory levels).
- EH&S will supervise all air sampling performed and notify you of the need for additional monitoring and any follow-up required.

8. Medical Surveillance

- Medical surveillance programs (performed under the direction of a licensed physician) are instituted in order to help protect employee health. The medical examination (requirements and contents) will vary depending on the regulated carcinogen used and its associated health effects.
- After the exposure monitoring, you will be notified of the requirement for medical surveillance.
- Medical examination shall also be provided for any person who develops signs or symptoms that may be associated with exposure to the carcinogen. Signs and symptoms can be found in the informational sheets for each individual carcinogen (available from EH&S). **It is therefore imperative that employees immediately report to their supervisor the development of any adverse signs or symptoms that the employee suspects are attributable to carcinogen exposure.**

- Employees splashed with a carcinogen during an emergency (spill) may also be provided with a medical examination.
- Initial and termination physical examinations are recommended by Employee Health for anyone who works with Cal/OSHA-regulated carcinogens.
- **Prior to visiting Employee Health, please contact Human Resources so that the appropriate information can be provided to the physician.**
- The physician's written opinion must be provided to both the employer and the affected employee.

9. Work Place Evaluation

- In your work area you must know the quantity, location, manner of use or storage of the carcinogen, and the specific nature of operations that could result in exposure, as well as any protective steps that are taken to reduce or prevent exposure.

IX. WORKING WITH CHEMICALS OF MODERATE CHRONIC OR HIGH ACUTE TOXICITY

Examples: diisopropylfluorophosphate, hydrochloric acid, hydrogen cyanide

1. Aim to minimize exposure to these toxic substances by any route using all reasonable precautions.
2. Use and store these substances only in areas of restricted access with special warning signs.
3. Always use a hood or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance; trap released vapors to prevent their discharge with the hood exhaust.
4. Always avoid skin contact by using gloves and long sleeves. Always wash hands and arms immediately after working with these materials.
5. Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.
6. Be prepared for spills and accidents.
7. Ensure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity.
8. Store breakable containers of these substances in chemically resistant trays.

X. WORKING WITH CHEMICALS OF HIGH CHRONIC TOXICITY

Examples: formaldehyde, acrylamide, benzene, nickel carbonyl, benzo-a-pyrene, carbon tetrachloride, other human carcinogens, or substances with high carcinogenic potency in animals.

Further supplemental rules to be followed in addition to all those mentioned above for work with substances of known high chronic toxicity (in quantities of a few milligrams to a few grams, depending on the substance).

1. Access. Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions.
2. Disposal. Follow the Chemical Handling Guidelines for disposal of chemicals.
3. Noncontamination/Decontamination. Protect vacuum pumps against contamination by utilizing appropriate filter devices. Minimize exposure by venting the exhaust into the hood; decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area. Decontaminate the controlled area before normal work is resumed there.
4. Exiting. On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck.
5. Personal protection. Always avoid skin contact by use of appropriate gloves and long, disposable sleeves; use other protective apparel as appropriate. Always wash hands and arms immediately after working with these materials.
6. Housekeeping. Use a wet mop or a vacuum cleaner equipped with an HEPA filter instead of dry sweeping if the toxic substance is a dry powder.
7. Medical surveillance. Prior to using toxicologically significant quantities of a substance, consult with Employee Health and Environmental Health and Safety regarding medical surveillance.
8. Records. Appropriate records of these substances must be maintained inclusive of the amount, storage, use, disposal, dates of use, and names of users.
9. Signs and labels. Assure that the controlled area is conspicuously marked with warning and restricted access signs and that all containers of these substances are appropriately labeled with identity and hazard warnings.

10. Spills. To minimize exposure of people and property, it is necessary to assure that contingency plans, equipment, and materials are readily available.
11. Storage. Store containers of these chemicals only in a well-ventilated, limited-access area in appropriately labeled, unbreakable, chemically-resistant, secondary containers.
12. Glove boxes. For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water. For a positive pressure glove box, thoroughly check for leaks before each use. In either case, trap or appropriately filter the exit contaminants and then release them into the hood.
13. Waste. Whenever possible, chemical decontamination should be the last step of the procedure; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel.

XI. WORKING WITH ALLERGENS AND EMBRYOTOXINS

1. Allergens (examples: diazomethane, isocyanates, bichromates). Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity.
2. Embryotoxins (examples: organomercurials, lead compounds, formamide). Handle these substances only in a hood whose satisfactory performance has been confirmed; use appropriate protective apparel and gloves to prevent skin contact. Prior to use, review these materials with the principal investigator and/or laboratory chemical hygiene/safety officer and review continuing uses annually or whenever a procedural change is made.

Store properly labeled substances in an adequately ventilated area in an unbreakable, secondary container.

Notify your supervisor of all incidents of exposure or spills; consult Employee Health, Urgent Care, and Environmental Health and Safety.

XII. ANIMAL WORK WITH CHEMICALS OF HIGH CHRONIC TOXICITY

1. Access. For large-scale studies, special facilities with restricted access are required.
2. Administration of the toxic substance. When possible, administer the substance by injection or lavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward appropriate filters.

3. Aerosol suppression. Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use appropriately filtered vacuum equipment for cleaning; moisten contaminated bedding before removal from the cage; mix diets in closed containers in a hood).
4. Personal protection. When working in the animal room, wear chemical-resistant gloves, appropriate eyewear, fully buttoned laboratory coat or jumpsuit and, if needed because of incomplete suppression of aerosols, other apparel and equipment, shoe and head coverings, and respirator, (if deemed appropriate and approved in writing by the Director of Environmental Health and Safety).
5. The above requirements do not supersede the requirements imposed by Animal Resources.

XIII. WORKING WITH PERCHLORIC ACID

Perchloric Acid

Concentrated perchloric acid (>72%) is a powerful oxidizer and can produce potentially explosive compounds when reacted with many different materials including transition metals, reducing agents, organic compounds, etc.

1. Concentrated perchloric acid must not be handled in a regular laboratory hood. The use of "fume eradicators" or similar vapor-capturing devices are recommended when heating concentrated perchloric acid.
2. Storage. Perchloric acid must be stored separately from all materials except nitric acid. Perchloric acid must not be stored near heat sources. As with all acids, secondary containment must be compatible with the material stored. Secondary containment made of glass, ceramic, or porcelain is recommended.
3. Spills. If perchloric acid is spilled, immediately dilute the area with water. Special precautions should be taken if the spill comes in contact with organic material (paper, wood, etc.) as these materials are readily oxidized. Ignition is likely if contaminated materials are subjected to heat or spark. If the spill contaminates organic materials, the material should be tested for perchlorates prior to disposal. If the test reflects that perchlorates are present, continue to rinse the material with water until testing results in a negative reading.
4. Testing for perchlorates.
 - Collect a 10-20 ml sample of wash water flushed from a surface or material contaminated with perchloric acid.
 - Add 2-5 drops of a 0.1% solution of methylene blue in water.
 - A violet precipitate indicates that perchlorates are present.

- The material or surfaces must be flushed until the water tests are negative. The waste water may be disposed of via the sanitary sewer system if the pH is greater than 2.

XIV. WORKING WITH DANGEROUS REAGENTS/PROCEDURES

Special care must be taken when dealing with reagents that have the potential to explode or cause runaway reactions. Some reagents, chemical groups, and procedures which fall into this category include, but are not limited to, the following:

Alkali metals (sodium, potassium, lithium, etc.)

Boranes (trimethylborane, triethyl borane, etc.)

Catalytic hydrogenations

Grignard reagents (butylmagnesium chloride, ethylmagnesium bromide, etc.)

Metal hydrides (sodium hydride, lithium hydride, calcium hydride, potassium hydride, lithium aluminum hydride, etc.)

Organic azides

Scaled up reactions (Larger than 10 grams)

When performing these procedures or dealing with the listed reagents, personnel must have the proper shielding protection in place. Even though the hood sash does provide adequate shielding, it can leave personnel vulnerable if it is used as the sole shield. This is seen when the sash is raised to manipulate materials or equipment within the hood. For this reason, a safety/blast shield must be used when working with the above materials/procedures. These weighted shields provide personnel added protection from spattering chemicals, flying glass, splashes, and other hazards. These shields come in a variety of sizes and are available through vendors such as Ace Glass or Instruments for Research and Industry.

XV. WORKING WITH PEROXIDE-FORMING CHEMICALS

Organic peroxides are a special class of compounds with unusual stability problems which make them among the most hazardous chemicals normally handled in laboratories. With extreme sensitivity to shock, sparks, or other forms of accidental ignition, many of these compounds are far more sensitive to shock than most primary explosives such as TNT (Trinitrotoluene). Improper handling and storage of peroxide-forming chemicals have caused many accidents, including a number that resulted in injuries and death. These accidents and applicable regulatory requirements make it very important that special care be taken when handling these materials.

Recommendations for Safe Handling of Peroxide-Forming Chemicals

1. To minimize the rate of decomposition, the exposure of peroxide-forming chemicals to air and light should be kept to a minimum.

2. Peroxides should be stored at the lowest possible temperature consistent with their solubility or freezing point. Liquid or solutions of peroxides should not be stored at or lower than the temperature at which the peroxide freezes or precipitates because peroxides in these forms are extremely sensitive to shock and heat.
3. The sensitivity of most peroxides to shock and heat can be reduced by dilution with inert solvents, such as aliphatic hydrocarbons; however, toluene is known to induce the decomposition of peroxides. Also, solutions of peroxides in volatile solvents should not be used under conditions in which the solvent might be vaporized because this will increase the peroxide concentration in the solution.
4. Open flames and other heat sources, such as heat guns or hot plates, should not be used around peroxides.
5. Metal spatulas should not be used to handle peroxides because contamination by metals can lead to explosive decomposition. Ceramic or wooden spatulas are the tools of choice.
6. To ensure chemicals are free of peroxides, materials which have the potential to form peroxides must be tested on a regular basis. TSRI policy on testing and detection is detailed in the next section.
7. If containers of peroxide-forming chemicals are identified with crystals around the lid or appear corroded, **the containers must not be moved**. Please call Environmental Health and Safety so the situation can be further investigated.

Testing for the Presence of Peroxides

The Scripps Research Institute *Laboratory Standards* requires that peroxide-forming chemicals be managed by the following requirements.

1. All peroxide-forming chemicals listed in Appendix A must be dated upon receipt and opening.
2. Materials shall be tested for peroxides three months after opening. If tests indicate peroxide concentrations in excess of 25 ppm, EH&S should be notified so appropriate disposal may be arranged. If tests indicate levels below this level, the container must be labeled with the test date. The container must be tested again after three months with the same procedure followed.
3. If the material has not been opened after one year and the container is not corroded or identified with crystals, the container should be opened and tested with procedures from above followed.

Labels specifically designed for documenting these requirements are available through Central Stores. An example of this label is illustrated in Appendix C.

Detection of Peroxides

The recommended method of detecting peroxides in common solvents is to use EM Quant® strips which are semi-quantitative and give readings in the range from 0 to 25 ppm. Used the same way as pH paper, these strips are available through Lab Safety Supply.

APPENDIX A

CHEMICALS WHICH FORM PEROXIDES

The chemicals listed below are common monomers which *have* been reported to develop hazardous levels of peroxides in normal use and storage, even though the monomers are convertible to peroxides under controlled conditions.

- Acetal
- Cyclohexene
- Decahydronaphthalene (Decalin)
- Diacetylene
- Dicyclopentadiene
- Diethylene glycol dimethyl ether (uninhibited)
- Dioxane
- Divinyl acetylene
- Ethyl ether (Diethyl ether)
- Ethylene glycol dimethyl ether (uninhibited)
- Glycol ether acetates (uninhibited)
- Glycol monoethers (uninhibited)
- Isopropyl ether (Diisopropyl ether)
- Methyl acetylene
- Methyl cyclopentane
- Methyl isobutyl ketone
- Tetrafluoroethylene
- Tetrahydrofuran (uninhibited)
- Tetrahydronaphthalene (Tetralin)
- Vinyl ethers
- Vinylidene chloride

APPENDIX B

CHEMICALS WHICH DO NOT FORM PEROXIDES

The chemicals listed below are common monomers which *have not* been reported to develop hazardous levels of peroxides in normal use and storage, even though the monomers are convertible to peroxides under controlled conditions.

Acrylic acid
Acrylonitrile
Butadiene
Chloroprene
Chlorotrifluoroethylene
Methyl Methacrylate (uninhibited)
Styrene
Vinyl acetylene
Vinyl chloride
Vinylpyridine

APPENDIX C

LABELING FOR PEROXIDE-FORMING CHEMICALS

This is an example of the label that is available. There are two sizes of this label.

WARNING!
Forms Peroxides

Date Received: _____
Date Opened: _____

Test Date: _____
Results: _____

Test Date: _____
Results: _____

Test Date: _____
Results: _____

Test Date: _____
Results: _____

*Test for peroxides 3 months after opening and every 3 months thereafter.
Call 4-4093 to discard if results are greater than 25 ppm.

References

"Chemical Safety in the Laboratory," Hall, Stephen, 1994
"Laboratory Safety and Health," Steere, Norman, 1994
"Prudent Practices," National Research Council, 1981

APPENDIX D
INVENTORY SHEET - CAL OSHA CARCINOGENS

PI: _____

Safety Officer: _____

Lab#: _____

Date: _____

Cal-OSHA Regulated Carcinogens

Please fill out this form completely if the regulated carcinogens listed below appear on your chemical inventory.

<u>Carcinogen</u>	<u>Cas #</u>	<u>Carcinogen</u>	<u>Cas#</u>
2-Acetylaminofluorene	53-96-3	4-Nitrobiphenyl	92-93-3
4-Aminodiphenyl	92-67-1	N-Nitrosodimethylamine	62-75-9
Benzidine (and salts)	92-87-5	beta-Propiolactone	57-57-8
3,3'-Dichlorobenzidine (and salts)	91-94-1	Bis-Chloromethyl ether	542-88-1
4-Dimethylaminoazobenzene	60-11-7	Methyl chloromethyl ether	107-30-2
alpha-Naphthylamine	134-32-7	Ethyleneimine	151-56-4
beta-Naphthylamine	91-59-8		

Carcinogen	# of Containers	Amount	Description of Use

*Indicate amounts in units, i.e., grams, liters, etc.
 Return form to EH&S BCC078
 Direct Questions to:
 fs:\users\common\carcuse.047

page ____ of ____
 Make additional copies as needed.
 Please post a completed copy in lab.

APPENDIX E

MATERIAL SAFETY DATA SHEETS

Material safety data sheets are available at the following locations:

- I. Torrey Pines Facilities
 - A. Environmental Health and Safety Office (Master File)
 - B. Immunology Building/Department - Reception Desk
 - C. Molecular Biology Building/Molecular Biology Department - Office of the Assistant to the Department Chairman, MB106
 - D. Stein Research Center - Photocopy Room, first floor
- II. Miscellaneous
 - A. CVN - Maintained by each laboratory (subject to change)
 - B. Calbiochem - Maintained by each laboratory (subject to change)
 - C. Sorrento Valley - Room 215 (Reagent Room)
 - D. Nexus - Maintained by each laboratory (subject to change)

APPENDIX F

CONTACTS AND APPROVALS

Environmental Health and Safety 858.784.8240

Emergencies 77

This Chemical Hygiene Plan has been reviewed, modified and approved as follows:

Carolyn Keierleber, Director
Environmental Health and Safety

July 11, 2007
Revision Date

Laboratory Room# _____

Principal Investigator _____

