



Title: CHEMICAL HYGIENE PLAN

Principle:

The chemical hygiene plan is a written program developed and implemented by the laboratory which sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in the laboratory. The procedures and policies described here and in the associated laboratory safety manual are compatible with current knowledge and regulations. It is our intent to review and evaluate the effectiveness of this plan annually and update as necessary.

Procedure:

A. General Principles for Work with Laboratory Chemicals

1. **Minimize all chemical exposures.** Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals are adopted as the standard of practice. (See Section E of this chemical hygiene plan). Skin contact with chemicals is avoided at all times.

2. **Avoid underestimation of risk.** Even for substances of no known significant hazard, exposure is minimized; for work with substances which present special hazards, special precautions are taken, including use of a designated area, use of containment devices, and procedures for removal of waste and for decontamination. Criteria used to determine and implement control measures to reduce employee exposure to hazardous chemicals are outlined in this chemical hygiene plan, in the laboratory safety manual, and in the MSDS.

3. **Provide adequate ventilation.** The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other protective devices.

4. **Institute a chemical hygiene plan.** The chemical hygiene plan is designated to minimize exposures. It represents an on-going effort by the laboratory.

5. **Observe the PELs, TLVs.** Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists are not exceeded.

B. Chemical Hygiene Responsibilities

Responsibilities for chemical hygiene rest at all levels in the laboratory including the following:

Medical School Administration and the Laboratory Directors. Provide continuing support for appropriate laboratory chemical hygiene.

Laboratory Supervisors and safety officer. Work with administrators and employees to develop and implement appropriate chemical hygiene practices; monitor procurement, use, and disposal of chemicals used in the lab; carry out safety audits as needed; help develop adequate procedures and facilities; know current legal requirements concerning regulated substances. The Anatomic Pathology Safety Officer, Gail Zander is designated the chemical Hygiene officer for the department of Anatomic Pathology.

Supervisors. Ensure that employees know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided; provide regular, formal chemical hygiene and housekeeping inspections, including routine inspection of safety equipment; know the current legal requirements concerning regulated substances.

Laboratory employee. Develops good personal chemical hygiene habits; follows all chemical hygiene procedures of the laboratory.

C. The Laboratory Facility

The laboratory has an appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air; adequate, well-ventilated storage areas; laboratory hoods and sinks; other safety equipment including eyewash fountains and drench showers; and arrangements for waste disposal.

D. Components of the Chemical Hygiene Plan

1. Chemical procurement, distribution, and storage.

a. **Procurement.** Before a substance is received, information on proper handling, storage, and disposal is known to those who will be involved. No container is accepted without an adequate identifying label. Purchase of reproductive toxins, substances with a high degree of acute toxicity, and chemical carcinogens requires prior approval of the laboratory

manager and implementation of appropriate control measures before procurement. The laboratory maintains material safety data sheets (MSDS) for all hazardous chemicals and ensures that they are readily available to employees.

- b. **Stockrooms/storerrooms.** Toxic substances are segregated in a well-identified area with local exhaust ventilation. Chemicals which are highly toxic are stored in unbreakable secondary containers. Stored chemicals are examined periodically for replacement, deterioration, and container integrity.

Stockrooms/storerrooms are not used as preparation or repackaging areas and are open during normal working hours.

- c. **Distribution.** When hazardous chemicals are hand carried, the container is placed in an outside container or bucket. Freight-only elevators are used if possible.
- d. **Laboratory storage.** Amounts stored are as small as is practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight is avoided. Periodic inventories are conducted, with unneeded items being discarded or returned to the storeroom/stockroom.

2. **Environmental monitoring.**

Regular instrumental monitoring of airborne concentrations is not done. Specific monitoring is done for highly toxic substances as covered by regulation. Specific monitoring includes initial monitoring to determine employee exposure and periodic monitoring if required. Records of any measurements taken to monitor employee exposures are maintained.

3. **Housekeeping, maintenance, and inspections.**

- a. **Cleaning.** Floors are cleaned regularly.
- b. **Inspections.** Formal housekeeping and chemical hygiene inspections are held at least quarterly for sections which have frequent personnel changes and semi-annually for others. Informal inspections are done on an on-going basis.
- c. **Maintenance.** Eye wash fountains are inspected every month. Safety showers are inspected every six months. Other safety equipment is inspected regularly (e.g., every 3-6 months).

- d. **Passageways.** Stairways and hallways are not used as storage areas. Access to exits, emergency equipment and utility controls are never blocked.

4. **Medical program.**

- a. **Compliance with regulations.** Regular medical surveillance is established to the extent required by regulation.
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Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee was exposed, the employee is provided an opportunity to receive an appropriate medical examination. When monitoring reveals an exposure level routinely above the action level for an OSHA regulated substance, medical surveillance is established for the affected employee as prescribed in the standard.

Whenever a spill, leak or other accidental exposure occurs, the affected employee is provided an opportunity for a medical consultation.

All medical examinations are provided by Employee Health Service or the hospital emergency room.

- b. **Routine surveillance.** Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule or medical surveillance is desirable.
- c. **First aid.** Personnel trained in first aid and emergency procedures are available from Employee Health Service and the hospital emergency room. A first aid kit is maintained in each laboratory area.

5. **Protective apparel (PPE) and equipment.**

Each laboratory has available protective apparel compatible with the required degree of protection for substances being handled, an easily accessible drench-type safety shower, an eyewash fountain, a fire extinguisher, fire alarm, and telephone for emergency use. Respiratory protection is provided as necessary to maintain exposure below permissible exposure limits.

6. **Records.**

- a. **Accident records** are written and retained.
- b. **Chemical hazard inventory** is maintained.

- c. **Medical records** are retained by the institution in accordance with the requirements of State and Federal regulations. Medical records include the results of consultation or examination done in relation to monitoring requirements or accidental exposure.

7. **Signs and labels.**

In the laboratory, prominent signs and labels of the following type are posted:

- a. **Emergency telephone numbers** of emergency personnel/facilities, supervisors and laboratory employees.
- b. **Identity labels** showing contents of containers (including waste receptacles) and associated hazards. Labels on incoming hazardous chemicals are not removed or defaced.
- c. **Location signs** for safety showers, eyewash stations, other safety and first aid equipment, exits and areas where food and beverage consumption and storage are (or are not) permitted.
- d. **Warnings** at areas or equipment where special or unusual hazards exist.

8. **Spills and accidents.**

- a. A **written emergency plan** is established and communicated to all personnel; it includes procedures for ventilation failure, evacuation, medical care, reporting, and drills.
- b. There is an **alarm system** to alert people in all parts of the facility including isolation areas such as cold rooms.
- c. A **spill control** policy is developed which includes prevention, containment, cleanups, and reporting.
- d. All **accidents** are analyzed and reported to the lab safety committee and each laboratory area.

9. **Information and training program.**

The purpose of the training program is 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. This information is provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. Refresher training is provided at the discretion of the laboratory safety officer

and safety committee.

- a. **Information.** Employees are informed of the contents of this standard; the location and availability of the laboratory chemical hygiene plan; the permissible exposure limits for OSHA regulated substances or the recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard; signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and the location and availability of known reference material or hazards - including MSDS.
- b. **Training.** Employees are trained on methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employee, visual appearance or odor of hazardous chemicals being released). Employees are trained on the physical and health hazards of chemicals in the work area and the measures they can take to protect themselves from exposure (such as appropriate work practices; emergency procedures, and personal protective equipment to be used). Employees are trained on applicable portions of the chemical hygiene plan.

10. Waste disposal program.

The purpose of the waste disposal program is to assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals.

- a. **Content.** The waste disposal program specifies how waste is collected, segregated, stored, and transported. It includes what materials can be incinerated.
- b. **Discarding chemical stocks.** Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used they should not be opened.
- c. **Frequency of disposal.** Chemical waste should be removed from laboratories to a central waste storage area at least once per week.
- d. **Method of disposal.** Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste. Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable. Hoods should not be used as a means of disposal for volatile chemicals. Disposal by recycling or chemical decontamination should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals

1. General rules for all chemicals.

a. Accidents and spills.

Eye contact. Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.

Ingestion. Encourage the victim to drink large amounts of water.

Skin contact. Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention.

Clean-up. Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal.

- b. **Avoidance of "routine" exposure.** Use of safe work habits avoids unnecessary exposure to chemicals by any route. It includes not smelling or tasting chemicals, inspecting gloves before use, and venting toxic chemicals properly.
- c. **Choice of chemicals.** Use only those chemicals for which the quality of the available ventilation system is appropriate.
- d. **Eating, smoking, etc.** Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present. Wash hands before eating, drinking, etc. Do not store, handle, or consume food in areas which are also used for laboratory operations.
- e. **Equipment and glassware.** Handle and store glassware with care. Do not use damaged glassware, i.e., cracked, chipped or broken glassware.
- f. **Exiting.** Wash areas of exposed skin well before leaving the laboratory.
- g. **Horseplay.** Avoid behavior which might confuse, startle or distract another worker.
- h. **Mouth suction.** Do not use mouth suction for pipetting or starting a siphon.
- i. **Personal apparel.** Confine long hair and loose clothing. Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or

sneakers.

- k. **Personal protection.** Assure that appropriate eye protection is worn when hazardous chemicals are handled. Avoid use of contact lenses in the laboratory. Wear gloves when the potential for contact with toxic materials exists. Remove lab coats immediately on significant contamination.

- l. **Use of hood.** Use the hood for operations which might result in release of toxic chemical vapors or dust. As a rule of thumb, use a hood when working with any appreciably volatile substance with a TLV of <50 ppm. Confirm hood performance before use. Keep hood closed at all times except when adjustments within the hood are being made. Keep materials stored in hoods to a minimum and do not allow them to block vents or air flow. Leave hood "on" when it is not in active use if toxic substances are stored in it.
- m. **Vigilance.** Be alert to unsafe conditions and see that they are corrected when detected.
- n. **Waste disposal.** Assure that the plan for each laboratory operation includes plans for waste disposal. Follow waste disposal procedures outlined in the chemical hygiene plan and the safety manual. Do not discharge into the sewer concentrated acids or bases, substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage, or obstruct flow.
- o. **Working alone.** Avoid working alone in a building. Do not work alone in a laboratory if the procedures being conducted are hazardous.

Written by: David Davis HT (ASCP), 12/21/1992

Updated by: Gail Zander, CT (ASCP), 8/25/14

References: GEN.76000

Approval of Procedure:

Medical Director Signature: *m. Scott Zander, MD*

Date: 8/26/14

APPENDIX B

Chemical Hygiene Standard and Program Background of the OSHA Regulation on Occupational Exposure to Hazardous Chemicals in Laboratories

The Occupational Safety and Health Administration (OSHA) enacted the Occupational Exposure to Chemicals in Laboratories Standard in 1990. This regulation applies to all employees engaged in the laboratory use of hazardous chemicals at Tufts University. Refer to the Tufts Chemical Hygiene Plan for additional details.

Requirements of the OSHA Regulation on Occupational Exposure to Hazardous Chemicals in Laboratories

Responsibility for the implementation of this policy falls primarily upon the laboratory supervisor/research scientist.

Compliance of individual laboratories with this policy is monitored by Tufts Environmental Health and Safety, the Internal Auditor and, externally, by OSHA, EPA, the Massachusetts Radiation Control Program and other local, state and federal regulatory agencies.

Exposure Reduction

Environmental Monitoring

Regular instrumental monitoring of airborne concentrations of chemicals is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices or when a highly toxic substance is stored or used regularly (e.g., 3 times/week).

If a laboratory meets these testing criteria or the laboratory supervisor has reason to believe that a laboratory area is chemically contaminated, contact Tufts Environmental Health and Safety to perform air and surface environmental monitoring.

Inspections, Maintenance, and Housekeeping

Laboratory Safety inspections are conducted by Tufts EHS Staff annually and are scheduled. Unscheduled inspections by regulatory agencies should be expected periodically throughout the year. Informal inspections should be continual and should be performed by the laboratory supervisor.

Eye wash fountains should be tested by lab staff at intervals of not less than once per week to purge and clear the system, assuring operation and clean water. Lab personnel are also responsible for maintaining dust-caps. Facilities shall test the eyewashes for proper temperature, delivery volume and angle of water flow at intervals of not less than 6 months. A written record of these inspections shall be maintained on inspection tags attached to the eye wash fountain.

Safety showers should be tested at intervals of not less than once per year. A written record of these inspections shall be maintained.

Other safety equipment, such as reusable gloves, face shields, liquid waste cans, etc., should be inspected regularly (e.g., every 3-6 months) by the laboratory supervisor.

Stairways and hallways shall not be used as storage areas. Access to exits, emergency equipment (fire extinguishers, eyewash fountains, etc.) and utility controls should never be blocked.

Floors and laboratory benches should be maintained free of unused supplies and equipment and cleaned to remove contamination regularly.

Protective Apparel and Equipment

Protective apparel compatible with the required degree of protection for substances being handled should be purchased by the department or Principal Investigator and used in the laboratory.

There should be at least one easily accessible drench-type safety shower within 10 seconds and not more than 100 feet away from laboratories using chemicals in concentrations that pose skin hazards. The delivered water flow should be a minimum of 30 gallons per minute at a temperature range of 15° to 35°C.

An eyewash unit should be available within each laboratory using chemicals in concentrations that present an eye hazard. The eyewash should deliver a continuous flow of at least 3 gallons per minute (preferably 6-9 gal/min) of water for 15 minutes at a temperature range of 15° to 35°C.

A fire extinguisher compatible with the fire hazards in the laboratory should be available near each laboratory. Multipurpose dry chemical extinguishers, featuring an ammonium phosphate base, can be used on Class A:B:C fires and are generally preferred for installation in laboratories.

A fire alarm and telephone for emergency use should be available near or in each laboratory.

Other items designated by the laboratory supervisor or by Tufts Environmental Health and Safety should be provided.

Signs and Labels

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

On the laboratory entrance, post names and emergency telephone numbers of laboratory supervisors and names and telephone numbers of emergency personnel/facilities. Names of supervisors are kept on file by Tufts Environmental Health and Safety and the Department of Public Safety. This list is maintained by Tufts Environmental Health and Safety and updated annually.

Identity labels, showing contents of chemical containers (including waste receptacles) and associated hazards should be on all chemical containers. Labels on incoming containers of hazardous chemicals shall not be removed or defaced.

Post location signs for safety showers, eyewash stations, fire extinguishers, other safety and first aid equipment, exits and areas where food and beverage consumption and storage are permitted or prohibited.

Post warnings at areas or equipment where special or unusual hazards exist (e.g., biohazards, lasers, radioisotopes, high voltage equipment, etc.).

Accidents and Spills

A University-wide emergency plan has been established and is regularly reviewed. A copy is maintained in the files of Tufts Environmental Health and Safety and is available to all individuals wishing to use it to develop their own laboratory plan to be reviewed by Tufts Environmental Health and Safety.

A written emergency plan shall be established and communicated to all personnel by the supervisor of each laboratory; it should include procedures for ventilation failure, evacuation, medical care, reporting, and drills. Appropriate portions of this plan shall be posted in each laboratory.

There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms.

A University-wide spill control policy has been developed. See the Emergency Procedures section of this guide.

All accidents or significant near accidents should be communicated to the Risk Management and Insurance Department by the Laboratory Supervisor to be carefully analyzed as appropriate with the results distributed to all who might benefit.

Employee Information and Training Program

An employee safety information and training program is in existence at the University and is reviewed regularly. The purpose of this training is to assure that employees covered under this program are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs.

The laboratory supervisor shall provide this training at the time of an employee's initial assignment to a work area where hazardous chemicals or equipment are present and prior to assignments involving new exposure situations.

The training and education program should be a regular, continuing activity.

Every laboratory worker should know the location and proper use of available protective apparel, emergency equipment and procedures.

Literature and consulting advice concerning chemical hygiene are readily available from Tufts Environmental Health and Safety. Laboratory personnel should be encouraged to use these information resources.

Review of Laboratory Activities

Certain laboratory operations, procedures, or activities require approval from the laboratory supervisor prior to implementation. This includes working with particularly hazardous substances including reproductive toxins, chemicals that have a high degree of acute toxicity and chemicals considered as select carcinogens. A select carcinogen is a chemical (1) regulated by OSHA as a carcinogen, or (2) listed as a known carcinogen in the latest edition of the Annual Report on Carcinogens published by the National Toxicology Program, or (3) listed in groups 2A or 2B of the International Agency for Research on Cancer Monograph.

The laboratory supervisor is invited to ask for assistance from the Chemical Hygiene Officer in instances where there are questions about the safety of conducting high-risk operations and experiments. When necessary, the Chemical Hygiene Officer will seek assistance from the Laboratory Safety Committee.

Chemical Hygiene Responsibilities

Specific responsibilities are as follows.

University Provost

The University Provost has the ultimate legal responsibility and accountability for chemical hygiene within the institution. The University Provost or designee shall:

- Appoint a chemical hygiene officer.
- Designate a signatory person for the University in safety, health, and environmental matters relating to proposals for funds from an outside agency for sponsored work.
- Provide University legal counsel to the Chemical Hygiene Officer and other University employees who have need to consult with counsel on matters related to chemical hygiene.
- Include provisions for appropriate storage and disposal of chemicals in the long-range plans for facilities development.
- Inform the University community of the chemical hygiene plan.
- Provide adequate support for the Tufts chemical hygiene plan and its implementation.
- Respond to reports and or requests regarding matters of chemical hygiene.

Deans and Department Chairpersons

In University departments or buildings containing laboratories where potentially hazardous chemicals are used, the Deans and Department Chairpersons shall:

- Provide list of supervisors to the Tufts Environmental Health and Safety staff on request.
- Develop plans, in consultation with the Tufts EHS staff for the appropriate storage of chemicals within the Department/Building.
- Ensure that all new faculty members, researchers, student employees and other departmental employees as appropriate are provided with a copy of the Tufts Chemical Hygiene Plan.
- Ensure that the supervisors of all undergraduate students be informed of and knowledgeable in basic rules of chemical safety and that these rules be followed in all undergraduate laboratory courses.
- Inform the Tufts Environmental Health and Safety staff of all chemically-related facility deficiencies which are known to him/her.
- Ensure that all common areas of the building are free of chemical hazards.

Laboratory Supervisor/Research Scientist

The laboratory supervisor/research scientist has overall responsibility for chemical hygiene in the laboratory which includes the responsibility to:

- Ensure that laboratory workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided;

- Provide regular, chemical hygiene and housekeeping inspections including routine inspections of emergency equipment;
- Be aware of the current legal requirements concerning regulated substances used in her/his laboratories;
- Determine the required levels of protective apparel and equipment and ensure that workers utilize the equipment and wear the apparel, including eye protection.
- Ensure that facilities and training for use of any material being ordered are adequate.
- Ensure that appropriate signs and notices of hazards and restricted activities are posted in the laboratory.

Laboratory Worker

The laboratory worker shall review the Tufts Chemical Hygiene Plan, and:

- Plan and conduct each operation in accordance with the applicable chemical hygiene procedures;
- Develop protective personal chemical hygiene habits.
- Inform his/her supervisor of any incident involving any chemical.

Chemical Hygiene Officer (Tufts Environmental Health and Safety Office)

The Chemical Hygiene Officer shall:

- Work with the Laboratory Safety Committee, administrators and other employees to develop and implement appropriate chemical hygiene policies and practices;
- Monitor procurement, use, and disposal of chemicals used in the laboratories;
- See that appropriate audits are conducted and records maintained;
- Assist Principal Investigators, Lab Supervisors and other scientists in the preparation of Safety Plans for High Toxicity Chemicals;;
- Know the current legal requirements concerning regulated substances;
- Continuously improve the chemical hygiene program;
- Ensure that appropriate sections of the Tufts Chemical Hygiene Plan are reviewed annually.

