

CHEMICAL HYGIENE PLAN

Collegium of Natural Sciences

Eckerd College

St. Petersburg, FL 33711

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PURPOSE

The purpose of the Chemical Hygiene Plan (CHP) is to establish procedures, equipment, personal protective equipment and work practices that will protect employees from health hazards presented by hazardous chemicals used in their particular workplace. This plan is intended to comply with OSHA Standard 29 CFR 1910.1450. A copy of the standard is attached to this plan (Attachment 1).

SCOPE

This plan applies to all Eckerd College employees within the Collegium of Natural Sciences who are engaged in laboratory work that may expose them to hazardous chemicals. This includes faculty and staff, and student employees.

DEFINITIONS

Action Level: a concentration designated in 29 CFR 1910 for a specific substance, calculated as an eight-hour time-weighted average, which initiated certain required activities such as exposure monitoring and medical surveillance.

Chemical Hygiene Officer: employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

Designated Area: area that may be used for work with "select carcinogens," reproductive toxins, or substances that have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a hood.

Employee: an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his/her assignments.

Glove Box: a device for providing an inert atmosphere in which to work with air-sensitive chemicals. This application is contrary to the typical application of glove boxes, in which the device is used to handle dangerous samples or biohazards. When used in this application, the exhaust air from the glove box shall be vented through scrubbers or other treatment before being released into the regular exhaust system.

Hazardous Chemical: chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute and chronic health effects may occur in exposed employees. This includes chemicals that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, and agents which damage the lungs, skin, eyes, or mucous membranes.

High Acute Toxicity Chemical: chemical that may be fatal or cause damage to target organs as a result of a single exposure or exposures of short duration.

Laboratory: workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Scale: work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily manipulated by one person.

Laboratory-type Hood: rectangular enclosure with a moveable sash or fixed partial sash enclosed on the remaining side. It is constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory. It allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the body other than hands and arms. Sashless canopy exhaust hoods located over laboratory benches allow the exhaust of bench generated air contaminants from laboratory spaces. They shall be operated only when chemical fumes are present on the work bench area and not on a continuous basis. If few workers are using the space, they must use standard wall hoods rather than workbench canopy hoods, as a matter of practice.

NAS Chemical Hygiene Coordinator: employee who is designated by the employer, and who is qualified by training or experience, to oversee and supervise the activities of the Chemical Hygiene Officers.

Reproductive Toxin: chemicals that affect human reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select Carcinogen: substance that meets one of the following criteria:

- listed regulated by OSHA as a carcinogen under the category "known to be a carcinogen" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP).
- listed under Group 1 (carcinogenic to humans) by the International Agency for Research on Cancer Monographs (IARC).
- listed in either Group 2A or 2B in IARC or under the category "reasonably anticipated to be carcinogens" by the NTP and causes statistically significant tumor incidence in experimental animals.

RESPONSIBILITIES

NAS Chemical Hygiene Coordinator—Collegial Chair

- Will be responsible for oversight of the NAS Chemical Hygiene Program and coordination of the (Disciplinary) Chemical Hygiene Officers. Will Chair the NAS Laboratory Safety Committee.
- Ultimately responsibility for chemical hygiene for the Collegium of Natural Sciences and must, with other administrators, provide continuing support for collegial chemical hygiene.
- Appoints the NAS (Disciplinary) Chemical Hygiene Officers.

Chemical Hygiene Officer (CHO)

- Biology: Jennifer Gilkey, Chemistry: Fawn Crotty, Marine Science: Dave Bennett
- Works with NAS Chemical Hygiene Coordinator (i.e., NAS Collegial Chair) and other employees to review and revise or develop, and implement appropriate chemical hygiene policies and practices.
- Maintains, in a centrally accessible location, volumes of current MSDS sheets for the chemical inventory in held in their discipline.
- Conducts monthly checks of safety equipment in all teaching and research labs.
- Seeks ways to improve the chemical hygiene plan.

Natural Sciences Laboratory Safety Committee (NAS LSC)

Works with the chemical hygiene officer, administrators, and other employees to develop and implement appropriate chemical hygiene policies and practices.

Laboratory Supervisors/Laboratory Instructors/Research Advisers

- Responsible overall for chemical hygiene in their particular laboratory.
- Ensures 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.
- Knows the current legal requirements for regulated substances used in their laboratory.
- Determines the required levels of protective apparel and equipment.
- Ensures that the facilities and proper training for the use of hazardous materials being ordered/used in the laboratory are adequate.

Laboratory Workers

- Responsible for planning and conducting all operations in accordance with the departmental chemical hygiene plan.
- Develops good personal chemical hygiene habits.

PERMISSIBLE EXPOSURE LIMITS

For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits (PEL) specified in 29 CFR part 1910, Z tables (Attachment 2).

EMPLOYEE EXPOSURE DETERMINATION

Initial Monitoring: Initial employee exposure monitoring shall be conducted when there is reason to believe that exposure levels for OSHA-regulated substances routinely exceed the action level (or in the absence of an action level, the PEL).

Periodic Monitoring: If the initial monitoring discloses employee exposure over the action level (or PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

Termination of Monitoring: Monitoring may be terminated in accordance with the relevant standard.

Employee Notification of Results: The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing by posting results in the departmental office.

Records: Records of exposure monitoring results shall be maintained by employer (Office of Human Resources) for 30 years and be accessible to employees or their representatives.

CONTROL MEASURES AND EQUIPMENT

Laboratory Design:

Each laboratory shall have:

- (1) An appropriate general ventilation system with air intakes and exhausts so as to avoid the intake of contaminated air that exceeds PEL/TLV levels.
- (2) Adequate, well-ventilated storage areas.
- (3) Laboratory hoods and sinks.
- (4) Access to safety equipment including eyewash fountains, safety showers, and fire extinguishers. Respiratory protection, a fire alarm and telephone for emergency use shall be available nearby.
- (5) Arrangements for waste storage and disposal.

Ventilation:

Laboratory ventilation shall:

- provide a source of air for breathing and for input to local ventilation devices,
- not be relied on for protection from toxic substances released into the laboratory, and
- provide four to 12 room changes per hour.

Laboratory-type hoods shall:

- be used for work with hazardous chemicals, especially toxic chemicals that have low air concentration limits, or that have high vapor pressures,
 - provide 2.5 linear feet of space per person for every 2 workers that spend most of their time working directly with hazardous chemicals,
 - provide a hood face velocity of 80-120 fpm,
 - not be used as storage areas for chemicals, apparatus or other materials,
 - not to be used to evaporate solvents (except small quantities of volatile materials)
 - Work inside the hood shall be conducted at least six inches from the front edge of the hood.
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- Hood sashes shall be lowered at all times except when necessary to raise them to adjust the apparatus inside the hood.

- The hood fan shall be kept "on" whenever a chemical is inside the hood, whether or not any work is being done in the hood.
- Do not allow solid objects to enter the hood's exhaust duct. Hood ducts and fans shall be inspected semi-annually by maintenance personnel at frequent intervals to be sure they are clean and clear of obstructions.
- Fume hoods shall be maintained in satisfactory operating condition at all times. Performance levels shall be monitored annually or whenever a change in local ventilation devices is made. Any hood with inadequate performance shall be repaired immediately.
- Canopy hoods and snorkels shall be provided as needed. Each canopy and snorkel shall have a separate duct.
- Exhaust air from vacuum pumps and glove boxes shall be vented directly into the building exhaust system.
- Cold rooms (Galbraith) shall have provisions for rapid escape in the event of electrical failure.

Safety Equipment

- All laboratories shall be equipped with eyewash fountains and safety showers. These shall be located so that they can be reached from any point in the laboratory.
- Access to eyewash fountains and safety showers shall not be restricted or blocked in any way.
- Fire extinguishers shall be of the multi-purpose, dry chemical type.

STANDARD OPERATING PROCEDURES

General Safety Rules

- Never work alone in a laboratory or chemical storage area.
- Minimize all chemical exposures.
- Appropriate eye protection shall be worn at all times.
- Skin contact with chemicals shall be avoided.
- Do not smell or taste chemicals.
- Use protective safety equipment to reduce potential exposure to hazardous chemicals.
- Do not run in the laboratory.
- Avoid distracting or startling other workers. Horseplay shall be avoided.
- Prior approval shall be obtained from the supervisor/instructor whenever a new laboratory procedure, test or experiment is carried out; or when there is a change in an existing procedure, test or experiment.

All laboratory workers shall know:

- the hazards of a chemical as stated in the MSDS and other appropriate references.
- the location and proper use of emergency equipment.
- how and where to properly store chemicals when not in use.
- the proper method for transporting chemicals within the department.
- the appropriate procedures for emergencies, including evacuation routes, spill cleanup procedures and proper waste disposal.

Personal Hygiene Guidelines:

- Do not eat, drink, smoke, chew gum or apply cosmetics in the laboratory.
- Avoid inhalation of chemicals. Never sniff chemicals directly; always waft the odors to your nose using your hand.
- Do not pipet by mouth. Use a pipet bulb or other appropriate device.
- Wash promptly after a chemical has contacted the skin.
- Wash hands and other areas of exposed skin before leaving the laboratory.
- Do not store or handle food or beverages in laboratory areas (including refrigerators used for chemical storage).

Protective Clothing and Equipment:

- Eye protection must be worn at all times. Eye protection shall meet the requirements of ANSI Z87.1.
 - When working with hazardous chemicals, wear gloves made of material known to be resistant to permeation by that chemical. A table of Chemical Resistance of Common Glove Materials is attached to the CHP (Attachment 3). Inspect gloves before each use, wash them before removal and replace them periodically.
 - A laboratory coat or apron shall be worn when working with hazardous chemicals.
 - Full foot coverage is required at all times.
- Where the use of respirators is necessary to maintain exposure below PEL's, the Collegium of Natural Sciences shall provide, at no cost to the employee, the proper respiratory equipment.
- Respirators shall be selected and used in accordance with the requirements of ANSI Z88.2 (Attachment 4).
 - Confine long hair and loose clothing.

Personal Housekeeping

- Keep work area clean and uncluttered.
- Properly label and store all chemicals and equipment. All chemicals (including solutions and chemicals transferred from their original containers) shall be labeled with their names, concentrations and hazards.
- Clean up work area on completion of work or at the end of the day.
- Do not block access to emergency equipment or exits.
- All chemicals and wastes shall be placed in their proper storage area at the end of the day.
- All working surfaces and floors shall be cleaned regularly.

Glassware

- Do not use broken, chipped, starred or cracked glassware.
- Clean all glassware after use.
- Do not pick up broken glassware with bare hands. Use gloves or sweep it up. Deposit broken glass in a special "Broken Glass" box for disposal.
- Handle hot glassware with proper size and type of tongs or hot mitts.

Syringes

- Syringes are intended for dispensing reactive and/or hazardous chemicals that cannot be safely handled in any other manner. Syringes and needles will be stored in a central, secure location and will be issued to departmental faculty, staff, and students as needed by the

Chemical Hygiene Officer. Following use, syringes are to be placed intact in a puncture-resistant, leak-proof container specified for sharps disposal.

Vacuum/Pressure Equipment

- Use a safety shield whenever an implosion might occur.
- Shield or wrap Dewar flasks or other evacuated glass apparatus in case implosion occurs.
- Relieve vacuum in all parts of system before opening apparatus. Relieve vacuum slowly. Avoid sudden pressure changes that could cause breakage or spattering of contents. Do not relieve vacuum on heated apparatus until apparatus has cooled.
- Use steam, heating mantles, or oil bath to heat vacuum distillation flasks.
- Do not apply pressure to glassware.

Compressed Gases

- Prior to delivery to the site of use, all compressed gas cylinders will be kept in a locked tank storage facility where cylinders will be secured upright.
- Store and transport compressed gas cylinders with the safety caps on.
- Transport large cylinders on a hand truck to which the cylinder is secured.
- Cylinders shall be securely clamped to a firm support with an appropriate cylinder clamp or chains.
- Always use a reducing valve.
- Never lubricate, modify or tamper with a cylinder valve.
- Do not heat cylinders or store near a heat source.

CHEMICAL-SPECIFIC SAFETY PROCEDURES

Reproductive Toxins

- Reproductive toxins shall be handled only in a hood, using appropriate protective apparel (especially suitable gloves) to prevent skin contact.
- Reproductive toxins shall be properly labeled and stored in well-ventilated areas in unbreakable secondary containers, if possible.
- Notify supervisor/instructor of all incidents of exposure or spills.

High Acute Toxicity Chemicals

- Use and store these chemicals in areas of restricted access. These areas shall include a hood (with a face velocity of at least 60 linear feet/minute) or other containment device for procedures that may generate aerosols or vapors containing the substance.
- Use gloves, long sleeves and other protective apparel as needed to avoid skin contact. Always wash hands after working with these chemicals.
- Maintain records of the amounts of these materials on hand, amounts used and the names of the workers involved.
- Assure that at least two people are present at all times if a compound in use is highly toxic or of unknown toxicity.
- Be prepared for accidents and spills. Store breakable containers of these substances in chemically resistant trays. Cover work and storage surfaces with removable, absorbent, plastic backed paper.
- If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment.

- Thoroughly decontaminate or incinerate contaminated clothing or shoes. If possible, chemically decontaminate by chemical conversion.
- Store contaminated waste in closed, suitably labeled, secondary containers (for liquids, plastic bottles half-filled with vermiculite).

Select Carcinogens

- Conduct all transfers and work with these substances in a designated 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 substance being used and necessary precautions. The designated area shall be conspicuously marked with warning and restricted access signs.
- Prepare a plan for use and disposal of these materials and obtain approval of the appropriate lab supervisor or instructor.
- All containers of these substances shall be properly labeled with identity and warning labels.
- Store containers of these chemicals in ventilated, limited access areas in appropriately labeled, unbreakable, chemically resistant, secondary containers.
- If using toxicologically significant quantities of a select carcinogen on a regular basis (3 times per week or more), consult a physician concerning desirability of regular medical surveillance.
- Use a wet mop instead of dry sweeping if the toxic substance was a dry powder.
- When using a positive pressure glove box, thoroughly check for leaks before each use. Trap exit gases or filter them through a HEPA filter and then release into the hood.
- Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in secondary container under the supervision of the laboratory supervisor/instructor.
- Decontaminate any equipment, including glassware, in the hood before removing them from the controlled area. Decontaminate the controlled area before resuming normal work there.
- On leaving the area, remove protective apparel and wash hands, forearms, face and neck.

Flammables

- Never heat flammable liquids with an open flame. Use a heating mantle, steam bath, sand bath, or hot water bath.
- Never use or store flammable chemicals near any source of ignition, spark or open flame.
- Handle solvents in an exhaust hood or a well-ventilated area.
- Ground containers when transferring from one container to another if the potential for sparking exists.
- Do not store large quantities of flammable reagents in the laboratory.
- Store flammable liquids in appropriate safety cabinets and/or safety cans.

EMERGENCY PROCEDURES

Accidents

- Eye contact: promptly flush eyes with water at the nearest eyewash station for 15 minutes and seek medical attention.
- Skin contact: promptly remove any contaminated clothing and flush area with water for 15 minutes.
- Seek medical attention if necessary.

- If medical attention is needed, call the emergency rescue squad (9-911) and notify Campus Safety (8260). Contact the Department of Human Resources to file a Workers Comp Accident Report.
- Report all accidents/injuries to your supervisor and the CHO.

Fires

- For small fires, try to suffocate the fire or use a fire extinguisher. If in doubt, exit the space, initiate the evacuation of the area and activate the manual pull fire alarm upon exiting. Contact Campus Safety (8260) immediately to report the fire.
- In cases of large fires, evacuate the immediate area, and activate the manual pull fire alarm located near the exits. Contact Campus Safety (8260) to report the fire. Evacuate the building.

Spills

- Using best judgement and knowledge, promptly contain and clean up all chemical spills, properly disposing of spilled chemical and cleanup material. Report the spill to the CHO.
- Consult *Hazards in the Chemical Laboratory* or *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals* for specific cleanup recommendations (available in the chemistry stockroom).
- For chemical spills of volatile or toxic material, immediately evacuate the area. Call 9-911 to mobilize the HazMat Team of the St. Petersburg Fire Department (893-7694) and then Campus Safety (8260) to report the spill.

Evacuation:

- When the building fire alarm sounds, turn off all sources of heat, electricity and gas, and stabilize any reaction processes. Evacuate the building immediately.
- Evacuate by the stairwells.
- Laboratory workers shall become familiar with evacuation routes before an emergency occurs.
- Supervisors/instructors/research advisers shall arrange for place to meet with students in case of emergency evacuation. After evacuation, supervisors/instructors/research advisers shall meet at the designated place and make sure all students are accounted for. A report shall then be made to the Collegial Chair.

CHEMICAL PROCUREMENT, DISTRIBUTION AND STORAGE

Procurement

- Before a chemical is ordered, the person who will use it will know the proper handling, storage and disposal procedures for the chemical.
- No container shall be accepted without an adequate identifying label.
- All substances will be received in the Biology, Chemistry, or Marine Science Stockrooms.
- All substances must be entered into the Chemical Inventory System and must be issued a barcode.

Distribution

Chemicals shall be put on a tray and transported on a cart. Single bottles shall be placed in a rubber bucket for transport to another room or building. Unprotected bottles or other containers shall not be transported between rooms or buildings.

Storage

- Hazardous chemicals shall be stored in an area with proper ventilation.
- Chemicals that are highly toxic shall be in unbreakable secondary containers.
- Stored chemicals shall be examined annually for deterioration, container integrity and possible replacement.
- Do not store incompatible reagents together (Attachment 5).

The chemical storeroom shall:

- not be used as preparation or repackaging areas.
- be open during normal working hours.
- be controlled by a designated individual.
- have a designated and properly labeled area for the storage of waste awaiting disposal.

Laboratory Storage

- The amount of chemicals stored in laboratory areas shall be as small as possible.
- Chemicals shall not be stored on bench tops or hoods in order to avoid inadvertent spills or breakage.
- Exposure of chemicals to heat or direct sunlight shall be avoided.
- Unneeded items shall be discarded or returned to chemical storeroom.

WASTE DISPOSAL

- See: Collegium of Natural Sciences Hazardous Waste Management Plan.

RECORDS

The Office of Human Resources shall maintain an accurate record of any measurements taken to monitor employee exposures and any medical consultations/examinations including tests or written opinions required by this plan. This office will assure that such records are kept, transferred and made available in accordance with 29 CFR 1910.20.

EMPLOYEE INFORMATION AND TRAINING

Information

Each laboratory supervisor, instructor or research adviser is responsible for ensuring that the following information is communicated and made available to their employees:

- the contents of the OSHA Laboratory Standard (29 CFR 1910.1450) and its appendices (Attachment 1).
- the location and availability of the department's CHP.

- the permissible exposure limits for OSHA-regulated substances (or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard) used in the work area.
- signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.
- location and availability of known reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals. Reference materials may include, but not be limited to, material safety data sheets received from chemical suppliers.

Training

Each laboratory supervisor, instructor or research adviser is responsible for ensuring that laboratory employees receive adequate training. This training shall include the following:

- methods and observations that may be used to detect the presence or release of a hazardous chemical (such as employee exposure monitoring, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.).
- physical and health hazards of chemicals in the work area.
- measures employees can take to protect themselves from such hazards, including specific procedures that have been implemented to protect laboratory employees from exposure to hazardous chemicals. These include appropriate work practices, emergency response procedures and personal protective equipment to be used.
- applicable details of the CHP.

Information and training shall be 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. The individual laboratory supervisor, instructor or research adviser may determine the frequency of refresher information and training.

MEDICAL CONSULTATION AND MEDICAL EXAMINATIONS

Laboratory employees who work with hazardous chemicals shall be given an opportunity to receive medical attention, including any follow-up examination that the examining physician determines to be necessary, under the following circumstances:

- Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.
- Where exposure monitoring reveals an exposure level routinely above the action level (or PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirement, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
- Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.
- All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

The employer shall provide the following information to the physician:

- identity of the hazardous chemical(s) to which the employee may have been exposed.

- description of the conditions under which the exposure occurred including quantitative exposure data, if available.
- description of the signs and symptoms of exposure that the employee is experiencing, if any.

For medical consultations required under OSHA Laboratory Standard 29 CFR 1910.1450, the employer shall obtain a written opinion from the examining physician which shall include the following:

- any recommendation for further medical follow-up.
- results of the medical examination and any associated tests.
- any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
- 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. The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

HAZARD IDENTIFICATION

- Stockroom personnel who unpack and distribute incoming chemicals shall ensure that labels on containers of hazardous chemicals are not removed or defaced.
- The stockrooms within Biology, Chemistry, and Marine Science will maintain material safety data sheets that accompany incoming shipments of hazardous chemicals and make the MSDS readily accessible to employees.

Laboratory-Generated Chemical Substances:

- If the composition of a chemical produced exclusively for the laboratory's use is known, available hazard information will be provided to employees exposed to the substance.
- If the chemical produced is a byproduct whose composition is not known, the substance shall be assumed to be hazardous and handled according to the CHP.
- If the chemical substance is produced for another user outside of the laboratory, the laboratory shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.

REFERENCES

Muir, G.D. ed. Hazards in the Chemical Laboratory, London: The Chemical Society, 1977.

National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories,
Washington: National Academy Press, 1981.

National Research Council, Prudent Practices in the Laboratory, Washington: National Academy Press, 1995.