Bucknell
UNIVERSITY

Chemical Hygiene Plan

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TABLE OF CONTENTS

INTRODUCTION

Bucknell University has developed a Chemical Hygiene Plan to explain the policies and procedures that will promote the safe operation of the institution's teaching and research laboratories. In addition, the Chemical Hygiene Plan satisfies the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910.1450, Occupational Exposures to Hazardous Chemicals in Laboratories. This regulation is known as the "Laboratory Standard"; the objective of the "Laboratory Standard" is to protect employees from the physical and health hazards associated with hazardous chemicals in the laboratory.

"The Laboratory Standard" is a regulation developed for the protection of employees. Since students are not employees, they are not officially covered by provisions of the "Laboratory Standard". However, Bucknell University extends the provisions of the Chemical Hygiene Plan to our students in addition to our employees. "What is good for faculty and staff is good for students!"

Many policies and practices observed in a specific laboratory may not be part of the Chemical Hygiene Plan. Additional policies may be developed for specific departments or laboratories. These policies and practices may be crucial for maintaining a safe environment for employees and students.

I. Standard Operating Procedures

A. General Procedures

1. The design of the laboratory facility will provide sufficient space for safe work by the number of persons to be in the laboratory. Exit doors will be clearly identifiable and free of obstructions to permit quick, safe escape in an emergency.

2. Laboratory facilities will be used only by persons with proper qualifications and training.

3. Staff and students should follow the Chemical Hygiene Plan to minimize their health and safety risks.

4. It is prudent to minimize all chemical exposures, because most laboratory chemicals present hazards of one type or another. Employees will follow general precautions for handling all laboratory chemicals. Specific guidelines for some chemicals, such as those found in the appropriate Safety Data Sheets (SDS), will also be followed.

5. Employees should not underestimate the risk, and exposure to hazardous substances should be minimized. The decision to use a particular substance will be based on the best available knowledge of each chemical's particular hazard and the availability of proper handling facilities and equipment. Substitutions, either of chemicals or experiments, will be made where appropriate to reduce hazards without sacrificing instructional objectives. When the risk outweighs the benefit and no substitute is available, then the experiment, procedure, or chemical should be eliminated.

6. Chemicals should not be accepted from a supplier unless it is accompanied by the corresponding SDS, or a SDS from that supplier for that chemical is already on file. All SDSs should be accessible to employees at all times. Employees should be trained to read and use the information found on SDSs.

7. Generally, textbooks, laboratory manuals, and other instructional materials designate the safety precautions needed for a particular laboratory activity. However, total reliance on such publications to provide complete and accurate information is not advisable. Employees should consult additional references, including SDSs, before undertaking an unfamiliar activity.

B. Laboratory Procedures

1. Eating, drinking, gum chewing, application of cosmetics, manipulation of contact lenses, or other such activities are not permitted in the laboratory while chemical manipulations or lab work is being performed.

2. Conduct yourself in a responsible manner at all times in the laboratory. This means that horseplay, throwing items, and pranks are prohibited.

3. You should not work alone in the lab or chemical storage area if using hazardous materials or performing hazardous procedures unless other employees are in the vicinity and are aware that someone is in the laboratory.

4. "Wafting" to test chemical odors should only be done with extreme caution. Also, chemicals should never be tasted.

5. Never pipette by mouth. Always use a bulb or other device for suction.

6. Do not force glass tubing into rubber stoppers.

7. Proper Bunsen burner procedures shall be followed. Never leave a flame unattended.

8. Dress appropriately for laboratory work. Avoid loose or baggy clothing and dangling jewelry. Confine or tie back long hair. Sandals or any open toed shoes should not be permitted in the laboratory.

9. Should a fire drill or any other evacuation occur during a lab activity, turn off all Bunsen burners and other heat sources. Leave the room as directed.

10. Careful storage and handling procedures should be used to avoid glassware breakage. In the event of breakage, protection for the hands should be worn when picking up the broken pieces. Small pieces should be swept up with a brush and pan. Broken glass should be separated from other waste by placing it in a special container marked Broken Glass.

11. The quantities of flammable liquids used in the laboratory should be minimized and stored in appropriate labeled containers.

12. Students should read lab directions ahead of time and follow all verbal and written instructions.

13. Students shall only perform authorized experiments.

14. All accidents or injuries in the laboratory must be documented no matter how trivial it may seem. An accident report, which can be located on myBucknell on the Environmental Health & Safety (EH&S) website, must be completed and sent to EH&S. The instructor and student can determine if further treatment is needed. Students may report to Bucknell Student Health if needed.

C. Housekeeping Procedures

1. All laboratory areas must be kept clean and contain only those items needed for the task at hand.

2. Place all wastes in appropriate, segregated receptacles that are properly labeled.

3. Sinks are to be used only for disposal of water and those solutions designated by the instructor. Other solutions must be placed in the appropriate labeled waste container.

4. If there is a possibility that tabletops are contaminated with hazardous substances, they should be swept clean and washed at the end of the lab activity.

5. Clean up all chemical spills as soon as they occur. Chemicals and cleanup materials should be disposed of correctly.

6. Never block access to emergency equipment, showers, eyewashes, or exits.

7. Store chemicals and equipment properly. Chemicals should not be stored in aisles, on the floor, in stairwells, on desks, or laboratory tables.

8. Before leaving the laboratory, turn off services (gas, electricity, water).

9. Keep all cabinets and drawers closed when not in use to avoid catching and bumping hazards.

10. Bring only your lab instructions, calculators, appropriate computing equipment, and writing instruments to the laboratory area.

11. Leave backpacks and other books in the classroom area or other designated area. Examples of designated areas include non-experimental bench space in the lab or shelving/hooks inside the door

D. Chemical Procurement Procedures

1. The purchasing of chemicals should be guided by the guideline that less is better. The lower the chemical inventory, the fewer the problems associated with storage, and the less likely that the university will face excessive costs to dispose of outdated or surplus chemicals.

2. Chemicals should normally be ordered in quantities that are likely to be consumed in one year and should be purchased only in the quantity sufficient for the declared

use.

3. All chemicals should be in tightly closed, sturdy, and appropriate containers.

4. A chemical should not be accepted without the safety data sheet and an adequate identifying label.

5. When a chemical is received, proper handling, storage, and disposal should be known.

6. The chemical container should be logged into the Chemical Environmental Management (CEMS) system and marked with a CEMS barcode on the date it is received. The SDS should be uploaded to CEMS if it is not already in the system.

7. It should be established that donated chemicals are in excellent condition, that an appropriate SDS is available, and that there is a specific use for the donated material.

E. Storage and Distribution Procedures

1. All chemicals should be in tightly closed, sturdy, and appropriate containers.

2. If the chemical has been transferred to a secondary container, the new container must be appropriately labeled with the chemical name and if possible, the associated hazards.

3. Chemicals should be stored based on the reactive nature and compatibility group of the chemical.

4. Peroxide formers should be dated upon receipt, again dated upon opening, and stored away from heat and light with tight fitting, non-metal lids.

5. Flammable chemicals shall be stored in approved storage containers and in approved flammable chemical storage cabinets.

6. Combustible packaging material should not be stored near flammable chemical storage cabinets.

7. All storage areas should be securely locked when not in use. Storage and preparation areas should be accessible only to those persons authorized to use the chemicals.

8. Laboratory-grade, flammable-rated refrigerators and freezers should be used to store sealed chemical containers of flammable liquids that require cool storage. Do

not store food or beverages in the laboratory refrigerator.

9. Compressed Gases

    a. Gas cylinders should only be moved from one location to another with the protective cap securely in place.

    b. Both full and empty cylinders should only be stored where they may be securely restrained by straps, chains, or a suitable stand.

    c. A cylinder should be considered empty when there is still a slight positive pressure.

    d. An empty cylinder should be returned to the supplier as soon as possible after having been emptied or when it is no longer needed.

    e. Cylinders should not be exposed to temperatures above 125 °F.

    f. Store flammable gases separately from oxidizer gases. They shall be separated from each other by a distance of at least 20 feet, or by a non-combustible barrier at least 5 feet high having a fire resistance rating of at least one-half hour.

F. Waste Disposal Procedures

1. Bucknell University and the Chemical Hygiene Officer shall ensure that the disposal of laboratory chemicals is in compliance with the Federal and State environmental regulations.

2. Bucknell University and the Chemical Hygiene Officer shall ensure that drain disposal of laboratory chemicals is in compliance with the local environmental regulations.

3. Bucknell University is designated as a large quantity generator and follows regulations appropriate for that classification.

4. Guidelines for waste minimization:

    a. Reduce waste sources. Employees shall minimize generation of hazardous wastes (microscale labs, selecting less hazardous materials, etc.).

    b. Reuse surplus materials. Only the amount of material necessary for an experiment should be purchased, and, if possible, materials should be reused.

    c. Avoid the inadvertent accumulation of hazardous waste. Potential waste materials are surplus, old, and/or unnecessary chemicals. Every attempt must be

made to avoid accumulating such chemicals.

d. Prior to ordering new chemicals, using existing chemicals, or creating products from reactions, employees shall determine if the material will need to be treated as hazardous waste.

5. Guidelines for hazardous waste disposal:

a. Flammable, combustible, water-immiscible materials or water soluble solutions of toxic substances shall not be poured down the drain.

b. Separate waste containers should be provided for heavy metal compounds, chlorinated hydrocarbons, nonchlorinated hydrocarbons, and any other categories recommended by the University's hazardous waste transporter company. Separation of wastes in this manner will make disposal less costly.

c. Waste chemicals should be stored in appropriately labeled containers, inside secondary containment.

d. Hazardous wastes should never be placed in the common solid trash container.

e. All waste containers should have an up-to-date log of the material that is in the container. When any material is added to the container, the chemical name, the amount of the chemical, the date, and the initials of the individual adding the hazardous chemical, shall be recorded in the log for that container. Alternatively the contents can be directly transcribed on the waste container.

f. When the waste containers become full, the containers shall be transferred to a designated waste storage area within three (3) days. This can be completed by contacting EH&S, the lab director, or other authorized transporter. To become an authorized transporter, completion of the hazardous waste course in Moodle or Edge is required.

G. Spill Procedures

1. If the chemical involved in the spill is judged to present an immediate hazard:

a. Evacuate the area.

b. Call Public Safety 570-577-1111.

c. Notify the Principal Investigator for the area.

d. Contact EH&S Carol Pavlick 570-204-4010 or Gregg Rokavec 570-412-1156.

2. If hazardous vapors are present, the area should be isolated. Only persons trained in the use of respirators may enter the area.

3. If a volatile, flammable material is spilled, immediately extinguish flames and evacuate the area. Consult the SDS for appropriate cleanup procedures. If the quantity exceeds the employee's ability or training to handle the spill, seal the area until appropriately trained personnel arrive.

4. If there is no immediate danger (flammability, toxicity, reactivity, corrosivity) to personnel, containment should be accomplished by use of spill pillows, towels, rolls, or other devices that will keep the spill from spreading.

5. If there is no immediate danger, cleanup procedures listed on the SDS should be followed. Appropriate personal protective equipment shall be used.

6. A spill kit should be accessible for each science laboratory. The kit might include:

    a. Spill control pillows.

    b. Inert absorbents such as vermiculite, clay, sand, or kitty litter.

    c. Neutralizing agents for acid spills such as sodium carbonate and sodium hydrogen carbonate.

    d. Neutralizing agents for alkali spills such as sodium hydrogen sulfate and citric acid.

    e. Quantities of cleanup materials sufficient for the largest anticipated spill.

    f. Large plastic scoops and other equipment such as brooms, pails, bags, and dust pans.

    g. Appropriate personal protective equipment.

7. If the spill material was a hazardous chemical, all of the materials involved in the cleanup will usually be considered to be hazardous waste and must be disposed of as such.

8. If a major spill occurs, cleanup shall only be undertaken by individuals who are trained in HAZMAT procedures.

II. Control Measures

A. Personal Protective Equipment

1. It is the responsibility of the university to provide appropriate safety and emergency equipment for employees and students.

2. Protective apparel shall be compatible with the required degree of protection for the substances being handled.

3. Eye protection and non-permeable gloves are considered standard equipment for laboratory programs and should be readily available to employees and students. Shoes that expose the top of the foot are not recommended in laboratories. Laboratory aprons or coats should be used when appropriate.

4. All eye protection devices should conform to ANSI Standard Z87.1-1989.

5. Safety glasses with side shields or indirectly vented safety goggles should be used as the standard protective eyewear for work in which hazardous materials are used. Goggles are preferred when there is a risk of splashing hazardous materials. Such goggles should fit the face surrounding the eyes snugly to protect the eyes from a variety of hazards.

6. Full face shields protect the face and throat. They must be worn for protection when there is a greater risk of injury from flying particles and harmful chemical splashes. A full face shield should also be worn when an operation involves a highly pressurized system that may explode. Face shields should also be worn when handling large volumes of cryogenic gases in open containers. Safety glasses or safety goggles must be worn with the face shield.

7. Standing shields should be used when there is a potential for explosions, implosions, or splashes, or when corrosive liquids are used. Goggles should be worn whenever using a standing shield.

8. Lab coats or aprons worn in the laboratory should offer protection from splashes and spills, and should be easy to remove in case of an accident, and should be the appropriate lab coat for the task to be done.

9. When gloves are required, it should be remembered that no one kind of glove is suitable for all situations. The SDS should be consulted for information regarding the proper type of gloves to be used.

B. Administrative Controls

1. Inventory Control

    a. A chemical inventory in CEMS (Chemical Environmental Management System) should be updated each time a chemical is received or consumed. The list should be audited for accuracy on at least an annual basis. The CEMS database can be located on myBucknell on the Environmental Health & Safety webpage.

    b. The chemical inventory list should contain the following information about each chemical found in storage: the chemical name, location, the date purchased, the amount present, the CAS number, and the examination date for possible disposal of relevant chemicals such as peroxidizables.

    c. Every area in which chemicals are used or stored should have an up-to-date inventory.

2. Hazard Identification and Labels

    a. Labels on incoming containers of hazardous chemicals are not to be removed or defaced.

    b. Laboratory chemicals should be properly labeled to identify any hazards associated with them for the employee's information and protection.

    c. If a chemical is stored in its original bottle, it should have the manufacturer's original label identifying potential hazards.

    d. If a chemical has been transferred to a secondary container, the new container should be appropriately labeled with the chemical name, concentration (if in solution), solvent (if in solution) or appropriate reference to a lab notebook.

    e. Unlabeled bottles should not be opened, and such materials should be disposed of promptly, as outlined in the section on disposal procedures.

3. Signs and Posters

    a. Emergency telephone numbers shall be posted in all laboratory areas outside the door.

    b. Signs shall be used to indicate the location of exits, evacuation routes, safety showers, eyewash stations, fire extinguishers, fire blankets, first aid kits, and other safety equipment.

c. Warnings at areas or equipment where special or unusual hazards exist.

d. Posters to reinforce laboratory safety procedures should be displayed in the laboratory and the classroom.

4. Safety Data Sheets (SDS)

a. Each SDS received with incoming shipments of chemicals should be maintained and made readily available to laboratory employees and to students.

b. The safety data sheets for each chemical in the laboratory usually give recommended limits or OSHA - mandated limits, or both, as guidelines to exposure limits. Typical limits are expressed as threshold limit values (TLVs), permissible exposure limits (PELs), or action levels. When such limits are stated, that limit, along with any other information about the hazardous characteristics of the chemical, should be used to set laboratory guidelines. These laboratory guidelines may be used in determining the safety precautions, control measures, and personal protective equipment that apply when working with the toxic chemical.

c. A safety data sheet for each compound on the chemical inventory should be available in CEMS, except for those chemicals that predate the laboratory standard. Safety data sheets can often be obtained by requesting them from companies that currently sell the chemicals. Chemical manufacturers and suppliers are required to supply one copy of a material safety data sheet the first time the chemical is purchased by the university.

5. Records

a. Chemical Inventory Records

i. An inventory of all chemicals should be conducted annually and chemical usage determined.

ii. The chemical hygiene officer shall retain a copy of the chemical inventory which is managed by the CEMS system

b. Inspection Records

i. Lab inspections must be completed and retained by the chemical hygiene officer.

ii. Safety equipment such as fume hoods, fire extinguishers, eye washes, etc. should be tagged to indicate the date and the results of the last inspection.

iii. Records indicating the dates of repairs and regular maintenance of safety equipment should be maintained.

c. Training Records

The university should maintain records of employee training.

d. Accident Records

Accident reports must be completed for any incident. Copies are to be retained by the chemical hygiene officer.

e. Medical and Exposure Records

Records of air concentration monitoring, exposure assessments, medical consultations, and medical examinations must be kept for at least 30 years after the employee ceases employment with the University.

f. Waste Disposal Records

The university shall retain records of disposal of hazardous waste. The records shall conform to the requirements of the EPA and state environmental agency.

g. Safety Data Sheets

Bucknell University should maintain a file of SDSs and should make them accessible to employees. If an SDS is not available when a new chemical is received, that chemical should not be used until a SDS is obtained.

6. Exposure Monitoring Records

a. If there is reason to believe that exposure levels for a regulated substance have exceeded the action level or permissible exposure limit, the chemical hygiene officer should ensure that the employee or student exposure to that substance is measured.

b. Factors which may raise the possibility of overexposure and therefore warrant an initial measurement of employee or student exposure include:

i. The manner in which the chemical procedures or operations involving the particular substances are conducted.

ii. The existence of historical monitoring data that shows elevated exposures to

the particular substance for similar operations.

iii. The use of a procedure that involves significant quantities or is performed over an extended period of time.

iv. There is reason to believe that an exposure limit may be exceeded.

v. Signs or symptoms of exposure (e.g., skin or eye irritation, shortness of breath, nausea, or headache), which are experienced by employees or students. (Some of these symptoms are very general and can be due to many other causes including emotional stress or hysteria.)

c. If the substance in question does not have exposure monitoring or a medical surveillance requirement, exposure monitoring and medical surveillance shall be continued until exposure levels are determined to be below the action level or 50% of the PEL. In the absence of PELs, the ACGIH TLVs should be referenced.

d. If a substance has an exposure monitoring requirement and if there is reason to believe that exposure levels for that substance routinely exceed the action level or in the absence of the action level, the PEL, the employer shall measure the employee or student exposure to the substance.

e. If the initial monitoring (described in d. above) discloses employee exposure over the action level or in the absence of an action level, the PEL, the employer shall immediately comply with the exposure monitoring provisions of the relevant standard for that substance.

f. The employer shall, within 15 working days after the receipt of any monitoring results notify the employee or student of these results in writing either individually or by posting the results in an appropriate location that is accessible to employees.

g. The following substances are regulated by OSHA standards and require monitoring: lead, benzene, 1,2-dibromo-3-chloropropane, acrylonitrile, ethylene oxide, formaldehyde, asbestos, vinyl chloride, and inorganic arsenic.

III. SAFETY / EMERGENCY FACILITIES AND EQUIPMENT

A. Equipment

1. The university should ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. All employees should be properly trained in the use of each item.

2. Emergency equipment items that should be available include: eyewash station, fire extinguisher of the appropriate type, safety shower, telephone for emergencies, fire blanket, and signage to indicate emergency equipment location.

3. Each laboratory should have a standard first aid kit.

4. Multipurpose fire extinguishers should be available in the laboratory. A multipurpose, ABC, fire extinguisher, can be used on all fires EXCEPT for class D fires (combustible metals). Extinguishers should be visually checked monthly and inspected and tested annually.

5. Every eye wash station will be capable of supplying a continuous flow of aerated, tepid, potable water to both eyes for at least 15 minutes. The valve should remain in the open position without the need to hold the valve.

6. Safety showers should be capable of supplying a continuous flow of tepid potable water for at least 15 minutes. The shower should have a quick - opening valve requiring manual closing.

7. Eye wash stations and safety shower stations shall be located so they will be accessible within 10 seconds.

8. Safety equipment will be tagged following an inspection, showing the date and inspector.

9. Laboratories in which hazardous substances are being used should have spill control kits tailored to deal with the potential risk associated with the materials being used. If there is no immediate danger to employees or students, containment should be accomplished by spill pillows, towels, rolls, inert absorbents, neutralizing agents, or other devices.

10. Each storeroom shall be equipped with a heat sensor and smoke alarm.

B. Facilities

1. Fume hoods

    a. Laboratory fume hoods are the most important components used to protect laboratory employees and students from exposure to hazardous chemicals and agents used in the laboratory. Functionally, a standard fume hood is a fire and chemical resistant enclosure with one opening (face) in the front with a movable window (sash) to allow user access into interior. Large volumes of air are drawn through the face and out the top to contain and remove contaminants from the laboratory.

b. Laboratory fume hoods are not meant for either storage or disposal of chemicals. If a hood must be used to store large quantities of chemicals or waste it must not be used for laboratory experiments or transfer of chemicals. Small amounts of chemical or waste storage are permissible as long as it doesn't decrease the airflow to less than 80 feet per minute.

c. Laboratory activities that may release airborne contaminants above the Permissible Exposure Limit (PEL) or Thresholds Limit Value (TLV) concentrations must be carried out in the fume hood. Also, if laboratory activities produce potentially hazardous vapors or gaseous substances, the laboratory activities should be conducted in the fume hood.

d. In most cases, the recommended face velocity is between 80 and 100 feet per minute (fpm).

e. Fume hoods should be positioned in the laboratory so that air currents do not draw fumes from the hood into the room.

f. The exhaust stack from a fume hood shall be in a vertical-up direction at a minimum of 10 feet above the adjacent roof line and so located with respect to openings and air intakes of the laboratory or adjacent buildings to avoid reentry of the exhaust into the building.

g. Fume hoods or other local ventilation devices should be used when working with any volatile substance with a TLV of less than 50 ppm.

h. All biohazard and fume hoods shall be inspected annually and certified by EH&S or a designated 3rd party. Any hood not passing inspection must be taken out of service immediately and not be used until such time as the hood has passed inspection. It is the responsibility of the employer to purchase the parts and replace the unit in a timely fashion so as not to endanger the health and well-being of the employee or place the facility at risk.

i. Fume hood air velocity should be tested one time per year by the EH&S Dept. Facilities is responsible for maintaining the fume hoods.

2. Ventilation

a. General laboratory ventilation should not be relied on for protection from exposure to hazardous chemicals. A rate of 4 - 12 room air exchanges per hour should be the accepted standard when local exhaust systems, such as hoods, are used as the primary method of control.

b. Laboratory airflow should not be turbulent and should flow continuously throughout the laboratory.

c. Any alteration of the ventilation system should be made only if thorough testing indicates that employee and student protection from airborne toxic substances will continue to be adequate.

d. Exhaust from the fume hoods should be vented directly to the outside.

3. Flammable Storage

a. Chemicals with a flash point below 93.3 ° C (200 ° F) should be considered “fire hazard chemicals”. Any chemical whose SDS or label states “Flammable” is in this category.

b. No more than 25 gallons of flammable liquids shall be stored in a room outside of an approved storage cabinet.

c. Flammable materials should be stored in a flammable liquid storage cabinet or other appropriate location. No more than 60 gallons of flammable liquids can be stored in a storage cabinet.

d. When transferring significant quantities of flammable liquids from one container to another, it is particularly important that they be properly grounded to prevent accidental ignition of flammable vapors and liquids from static electricity or other sources of ignition. Large quantities of flammable chemicals stored outside cabinets should be in flame-proof storage cans which conform to NFPA guidelines. NFPA 30, Flammable and Combustible Liquids code, and NFPA 45, Fire protection for Laboratories Using Chemicals, and/or the applicable local fire codes should be followed.

4. Electrical

a. All electrical outlets should have a grounding connection accommodating a three prong plug.

b. All laboratories should have circuit breakers readily accessible. Employees should know how to cut-off electricity to the laboratory in case of emergency.

c. Laboratory lighting should be on a separate circuit from electrical outlets.

d. All electrical outlets should be checked for continuity after initial occupancy or whenever electrical maintenance or changes occur.

e. If electrical equipment shows evidence of undue heating, it should be immediately unplugged.

f. Install ground-fault circuit interrupters (GFCIs) as required by code to protect users from electrical shock, particularly if an electrical device is hand held during a laboratory operation.

IV. Training and Information

A. Training for Employees

1. The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

    a. Such information shall be provided at the time of the employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving to exposure situations. The frequency of refresher information and training shall be determined by the employer.

        i. Faculty and staff should receive training annually or as needed via an Edge course on the Chemical Hygiene Plan.

        ii. Student workers such as TAs or graduate students should receive training upon initial job assignment via a Moodle course on the Chemical Hygiene Plan

2. The objective of the employee training and information program is to assure that all individuals at risk are adequately informed about: the physical and health hazards associated with hazardous chemicals present in the laboratory; the proper procedures to minimize risk of exposure; and the proper response to accidents.

3. The university shall provide training opportunities for all individuals at risk. These training opportunities should include information about the hazards of chemicals present in the laboratory and sources of information concerning hazards in the laboratory. In particular, the training program should cover the laboratory standard, safety data sheets, the chemical hygiene plan, and the responsibilities of the University and the employee.

4. Employees should be trained on the potential chemical hazards in the employees' work areas and on appropriate sections of the chemical hygiene plan. This training should be provided to all employees who work in the laboratory as well as to other employees whose assignments may require that they enter a laboratory where exposure to hazardous chemicals might occur. Employees who are responsible for

receiving and handling shipments of new chemicals or chemical wastes should also be informed of the potential hazards and appropriate protective measures for chemicals they may receive.

5. Laboratory employees should be trained on the applicable details of the chemical hygiene plan, including a review of the general rules of laboratory safety. The training program should describe appropriate sections of the standard operating procedures, particularly those procedures that require prior approval of the chemical hygiene officer.

6. The training an employee receives should be determined by the nature of the work assignment in the laboratory.

7. Employees should be trained in measures they may take to protect themselves from exposure to hazardous chemicals, including the location and proper use of protective equipment and emergency equipment. In addition, the training must also include a discussion of inventory procedures to be followed, proper storage and ordering rules, and hazardous waste disposal procedures.

8. All laboratory employees should be trained to read and understand SDSs.

9. All employees shall be trained in labeling and storage practices as outlined in the chemical hygiene plan. The training requirements will be determined by EH&S, the department, and by the individual hazards present in each lab, i.e. laser safety.

10. All employees should be trained in the methods and observations that may be used to detect the presence or release of hazardous chemicals.

B. Training for Students

1. Instruction in laboratory safety shall be provided to all students involved in laboratory activities. This training can be conducted during pre-lab, during class, or immediately prior to conducting the experiment.

2. The extent of student training should be based on their course of study, the laboratory facility, university policies, the chemical hygiene plan, and the level of chemical handling and potential exposure to hazardous chemicals.

3. Safety training should include the importance and the content of the label and of safety data sheet. As appropriate, the student should also be introduced to other sources of chemical safety information in upper level courses and research.

4. At the beginning of the semester and prior to laboratory activities, class time shall be devoted to safe laboratory practices and to the student safety agreement.

C. Information

1. Employees shall be informed of the content of the "Laboratory Standard", 29 CFR Part 1910.1450 which is spelled out in this document.

2. Employees shall be informed of the location and availability of the chemical hygiene plan. It is located on myBucknell on the Environmental Health & Safety page.

3. Employees shall be informed of the permissible exposure limits for OSHA regulated substances on site or recommended exposure limits for other hazardous chemicals on site where there is no applicable OSHA standard.

4. Employees shall be informed of the location and availability of known reference material and SDSs on the hazards, safe handling, storage and disposal of hazardous chemicals where there is no applicable OSHA standard.

5. Employees shall be informed of the location of personal protective equipment and of emergency equipment as outlined in the chemical hygiene plan.

6. Employees shall be informed of the signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

V. Environmental Health and Safety Consultation

A. Consultation with the chemical hygiene officer whenever a new laboratory experiment or test is to be carried out is recommended. This consultation should also be sought for experiments that have not been performed recently or for which the potential for harm is present. The potential for harm may be affected by a change in the amounts of materials being used, the conditions under which the experiment is to be conducted, or the substitution, deletion, or addition of a chemical.

B. Consult EH&S as needed before doing any procedure should be where one or more of the following conditions exist:

1. Potential for a rapid rise in temperature.

2. Potential for a rapid increase in pressure.

3. Potential for a chemical explosion

4. Potential for spontaneous combustion

5. Potential for the emission of toxic gasses that could produce concentrations in the

air that exceed toxic limits.

6. Involves the use of highly toxic substances.

VI. Medical Consultation and Medical Examinations

A. University laboratory employees do not regularly handle significant quantities of materials that are acutely or chronically toxic. Therefore, regular medical surveillance is not justified.

B. In the event that an employee is exposed to levels of a hazardous chemical exceeding the established PEL or TLV, or should the employee exhibit signs or symptoms of such exposure, the employee shall be provided an opportunity to receive an appropriate medical examination.

1. Physician - Mid-State Occupational Health Services, Inc.
   Tel. (570) 523-7774
2. Hospital Evangelical Community Hospital
   Tel. (570) 522-2000

C. 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.

D. The employer shall provide the following information to the physician conducting the examination. The following information is contained in the Exposure Assessment Form located on myBucknell

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

2. A description of the conditions under which the exposure occurred, including quantitative exposure data if available.

3. A description of the signs and symptoms of exposure that the employee is experiencing

4. A copy of the SDSs for the chemicals(s) involved.

E. A written opinion from the examining physician for any consultations or examinations performed under this standard should include:

1. Any recommendation for further medical attention

2. The results of the medical examination and any associated tests.

3. Any medical condition revealed during the examination which might compromise employee safety during, or as a result of, exposure to hazardous chemicals found in the workplace

4. A statement that the employee has been informed by the physician of the results of the consultation or examination and any medical condition that may require further examination or treatment.

5. A copy of the physician's report to be retained by the employer.

6. The written opinion from the physician should not reveal specific diagnoses unrelated to the occupational exposure.

VII. Responsibilities

A. University President, John Bravman

The University President has the ultimate responsibility for chemical hygiene within the university. The President should, with other administrators, provide continuing support for the chemical hygiene programs.

B. Assistant Director of Risk Management and EH&S, Gregg Rokavec

The Assistant Director of Risk Management and EH&S has the knowledge, authority, and overall responsibility for compliance with the Chemical Hygiene Plan.

C. EH&S Program Manager/ Chemical Hygiene Officer, Carol Pavlick

EH&S Program Manager shall act as the Chemical Hygiene Officer (CHO). The CHO should be qualified by training and experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

The CHO has the responsibility to:

1. Develop and implement the chemical hygiene plan and the safety plan for the university, including training, reporting, and other functions.

2. Work with administrators and faculty to develop and implement the safety program.

3. Assure that inspections in the laboratory are performed when appropriate and that records of inspections are maintained.

4. Assure that the chemical hygiene plan is reviewed annually and revised as needed, so that it is always in compliance with current legal requirements.

5. Make decisions regarding requests to use chemicals identified as explosive, carcinogenic, mutagenic, highly toxic, or otherwise unsuitable for general university laboratories.

6. Determine the need for personal protective equipment beyond that specified for general laboratory use.

7. Implement appropriate training with regard to chemical hygiene for all employees whose normal work locations include laboratory areas.

8. Ensure that employees have received appropriate training.

9. Ensure that employees have access to the chemical hygiene plan, SDSs, and other suitable reference materials.

D. Department Chair

1. Ensure compliance with the Chemical Hygiene Plan through enforcement with department faculty and staff.

2. Assign adequate representation to the Laboratory Safety Committee.

3. Enforce recommendations from the Laboratory Safety Committee within their department.

E. Faculty and Lab Directors

Faculty and lab directors are responsible for conducting their teaching and research activities in compliance with the chemical hygiene plan.

F. Lab Safety Committee

The Lab Safety Committee is comprised of various members of faculty and staff. The committee discusses best practices, reviews procedures and helps develop the rules regarding lab safety.

G. University Employees and Independent Research Students

University employees and independent research students, who work in a laboratory, are responsible for:

1. Participating in training programs provided by the university.

2. Maintain an awareness of health and safety hazards.

3. Planning and conducting each operation in accordance with university's chemical hygiene plan procedures.

4. Consulting reference materials, including SDS's, related to chemical safety where appropriate.

5. Using and modeling good personal chemical hygiene habits.

6. Reporting accidents, injuries, unsafe practices, and unsafe conditions.

H. Students

Students should practice good safety habits. They should report accidents and maintain an awareness of health and safety hazards. Students should conduct all activities according to the chemical hygiene plan procedures.

VIII. Particularly Hazardous Substances (PHS)

A. General

This section of our plan describes the specific and general control measures which are designed to reduce the exposure of instructors, students, and other employees to especially hazardous substances. Employees should read and understand these practices before commencing a procedure using particularly hazardous substances.

1. PHSs include highly toxic chemicals, reproductive toxins, and select carcinogens. In addition, our university includes highly flammable chemicals, highly reactive chemicals, and highly corrosive chemicals.

2. PHSs shall be stored in designated areas.

3. PHSs shall be used in designated areas and in fume hoods.

B. Highly Toxic Chemicals

1. When a PEL or TLV value is less than 50 ppm or 100 mg/m3, the user should use it in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none is available, no work should be performed using the chemical.

2. If a PEL, TLV, or comparable value is not available, the animal or human median inhalation lethal concentration information, LC 50, should be used as a guideline. If that value is less than 200 ppm or 2000 mg/m3 when administered continuously for one hour or less, then the chemical should be used in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none are available, no work should be performed using that chemical.

3. Examples of highly toxic chemicals (acute or chronic) that were commonly used in the past are benzene, chloroform, formaldehyde, bromine, carbon disulfide, carbon tetrachloride, cyanide salts, and hydrofluoric acid.

C. Highly Flammable Chemicals

1. Our university will define Class 1A liquids as highly flammable chemicals. Class 1A liquids have a flashpoint of less than 73 ° C and a boiling point of less than 100 ° C.

2. Examples of highly flammable chemicals are diethyl ether, acetone, pentane, petroleum ether, acetaldehyde, and ligroines.

D. Highly Reactive Chemicals

1. Reactivity information may be given in manufacturers' SDSs and on labels. The most complete and reliable reference on chemical reactivity is the current edition of Bretherick's Handbook of Reactive Chemical Hazards.

2. A reactive chemical is one that:

    a. Is described as such on the label, in the SDS, or by Bretherick.

    b. Is ranked by the NFPA as 3 or 4 for reactivity.

    c. Is identified by the Department of Transportation (DOT) as an oxidizer, an organic peroxide, or an explosive (Class A, B, or C).

    d. Fits the Environmental Protection Agency definition of reactive in 40 CFR 261.23.

    e. Is known or found to be reactive with other substances.

3. Reactive chemicals should be handled with all proper safety precautions, including segregation in storage, and prohibition of mixing even small quantities with other chemicals without prior approval and appropriate personal protection and precautions.

4. Examples of commonly encountered highly reactive chemicals are ammonium dichromate, nitric acid, perchloric acid, hydrogen peroxide, and potassium chlorate, azides, organic nitrates, and acetylides.

Highly Corrosive Chemicals and Contact Hazard Chemicals

5. Corrosivity, allergen, and sensitizer information is provided in manufacturers' SDSs and on labels.

6. A corrosive chemical is one that:

    a. Fits the OSHA definition of corrosive in 29 CFR 1910. 1200 – (Is known to be reactive to living tissue, causing visible destruction, or irreversible alterations of the tissue at the site of contact.)

    b. Fits the EPA definition of corrosive in 40 CFR 262.22 (has a pH greater than 12 or a pH less than 2.5)

3. A contact - hazard chemical is an allergen or sensitizer that:

    a. Is so identified or described in the SDS or on the label.

    b. Is so identified or described in medical or industrial hygiene literature.

    c. Is known to be an allergen or sensitizer.

4. Corrosive and contact hazard chemicals will be handled with all proper safety precautions, including wearing safety goggles, using gloves tested for the absence of pinholes and known to be resistant to permeation or penetration by the chemical, and wearing a laboratory apron or laboratory coat.

5. Examples of highly corrosive chemicals are hydrochloric, sulfuric, nitric, phosphoric, and perchloric acids (all acids in greater than 1 Molar concentration), and potassium hydroxide (either solid or in aqueous solution greater than 1 Molar concentration).

F. Reproductive Toxins

1. A reproductive toxin refers to chemicals which affect reproductive capabilities including chromosomal damage (mutations) and which effect fetuses (teratogenesis).

2. A reproductive toxin is a compound that is described as such in the applicable SDS or label.

3. If such chemicals are used,

    a. They should be handled only in a hood and when satisfactory performance of the hood has been confirmed.

    b. Skin contact should be avoided by using gloves and wearing protective apparel.

    c. Persons using such substances should always wash hands and arms immediately after working with these materials.

    d. Unbreakable containers of these substances should be stored in a well-ventilated area and will be labeled properly.

4. Examples of reproductive toxins are organomercurial compounds and ethidium bromide, carbon disulfide, xylene, toluene, benzene, mercury, lead compounds, ethyl ethers, vinyl chloride.

G. Select Carcinogens

1. Select carcinogen means any substance which meets one of the following criteria:

    a. It is regulated by OSHA as a carcinogen

    b. It is listed under the category, “known to be carcinogens,” in the National Toxicology Program (NTP) Annual Reports on Carcinogens.

    c. It is listed under Group 1 “carcinogenic to humans” by the International Agency for Research on Cancer Monograms (IARC).

    d. It is listed in either Group 2 A or 2 B by IARC or under the category “reasonably anticipated to be carcinogens” and causes statistically significant tumor incident in experimental animals under set criteria of exposure.

2. All work with these substances should be conducted in a designated area, such as a fume hood, glove box, or a portion of a laboratory designated for use of chronically toxic substances. Such a designated area should be clearly marked with warning and restricted access signs.

3. Any procedure that may result in a generation of aerosols or vapors should be performed in a hood whose performance is known to be satisfactory.

4. Skin contact should be avoided by using gloves and other protective apparel as appropriate. Any protective clothing should be removed before leaving the

designated area and placed in a labeled container. Hands, arms, and neck should be washed after working with these materials.

5. Select carcinogens should be stored in unbreakable containers in a ventilated area with controlled access. All containers should be labeled with the identity and hazard of the substance. Immediately upon completion of the project, all unused reproductive toxin should be disposed of following standard hazardous waste disposal procedures.

6. Examples of select carcinogens are benzene, nickel metal dust, vinyl chloride, and formaldehyde.