

BURRELL COLLEGE OF OSTEOPATHIC MEDICINE

STANDARD OPERATING PROCEDURES

Chemical Hygiene Plan		SOP #: RSP.002.00
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1. Purpose

OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450), referred to as the Laboratory Standard, provides the mandatory requirements of a Chemical Hygiene Plan (CHP) to protect laboratory workers from harm due to hazardous chemicals. The CHP is a written program stating the policies, procedures and responsibilities that protect workers from the health hazards associated with the hazardous chemicals used at BCOM.

This Chemical Hygiene Plan applies to all personnel who work in BCOM laboratories who handle and/or may be exposed to hazardous chemicals and other hazards in research laboratories. Work is defined as physically performing experiments or otherwise using laboratory equipment or materials.

2. Related Policy/Authority

29 CFR 1910.1200, [Hazard Communication Standard \(§1910.1200\)](#)

29 CFR 1910.1450, [Occupational Exposure to Hazardous Chemicals in Laboratories](#)

3. Faculty/Staff Responsibilities

3.1 Assistant Dean for Research

- Provides budget oversight for the BCOM Chemical Hygiene Program
- Provides resources to ensure institutional compliance with federal, state and local laws and regulations

3.2 Chemical Hygiene Officer

- Acts as a resource to lab personnel regarding safe handling of chemicals, personal protective equipment (PPE), spill cleanup, and safety for experimental set-ups.
- Monitors and approves the procurement, use and disposal of chemicals used in the laboratory.
- Works with Laboratory Directors to develop and implement chemical hygiene practices and policies in the laboratory as needed.
- Conducts annual inspections of the laboratory space
- Aids in determining the proper level of PPE required in a laboratory.
- Ensures that appropriate training is available to laboratory personnel.
- Provides environmental monitoring when exposure levels may exceed regulatory limits.
- Stays up to date on legal requirements concerning regulated substances in the laboratory.
- Reviews the CHP annually to ensure that it is up to date with applicable regulatory requirements.

3.3 Laboratory Director or Associate Laboratory Scientist

- Responsible for chemical hygiene in the BCOM Research Laboratories.
- Informs all employees and students of safety and health policies, rules and regulations applicable to the laboratory.
- Ensures lab specific training is provided to lab personnel as required. Ensures this training is documented.
- Ensures lab specific safety protocols are available and have been made available to laboratory personnel.
- Ensures there is a chemical inventory available.
- Assigns the designated area(s) for working with carcinogens and/or reproductive hazards in his/her laboratory.

3.4 Laboratory personnel (i.e., Faculty, staff, students, volunteers and other authorized individuals)

- Plans and conducts all operations in accordance with established chemical hygiene procedures
- Successfully completes laboratory safety training
- Are aware of the hazards associated with chemicals they are working with and methods for safe storage, handling and disposal procedures.
- Uses appropriate safe work practices, personal protective equipment and engineering controls.
- Follows laboratory SOPs
- Reports unsafe conditions or incidents to their PI, Lab Manager, Lab Director, Chemical Hygiene Officer, or Assistant Dean for Research.

4. Definitions/Abbreviations

- ACGIH – American Conference of Governmental Industrial Hygienist.
- Action level - A concentration designated in the OSHA (29 CFR) Part 1910 (or in the absence of an action level, the PEL) for a specific substance, calculated as an eight-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.
- Associate Laboratory Scientist – A BCOM employee that reports to the Laboratory Director and may act on behalf of the Laboratory Director by delegation.
- Biohazardous Agents – Biohazardous agents include bacteria, viruses, fungi, other microorganisms and their associated toxins, and recombinant and synthetic nucleic acids.
- Chemical Hygiene Officer - The Chemical Hygiene Officer (CHO) is an 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.

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- Chemical Hygiene Plan - The Chemical Hygiene Plan (CHP) is a written program developed and implemented by the employer which (1) 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 that particular workplace, and (2) meets the requirements of OSHA's Laboratory Safety Standard; 29 CFR 1910.1450(e).
- Hazardous chemical - Any chemical which is classified as health hazard or simple asphyxiant in accordance with the Hazard Communication Standard (29 CFR 1910.1200).
- Health hazard - Any chemical that is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration hazard or simple asphyxiant.
- Laboratory - OSHA defines a laboratory as "a workplace where relatively small quantities of hazardous chemicals are used on a non-productive basis".
- Laboratory Director - A BCOM employee responsible for managing laboratory operations.
- Laboratory use of hazardous chemicals - the handling or use of such chemicals in which all of the following conditions are met:
 - Chemical manipulations are carried out on a "laboratory scale;"
 - Multiple chemical procedures or chemicals are used;
 - The procedures involved are not part of a production process, nor in any way simulate a production process; and
 - "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.
- Laboratory Personnel - The Laboratory Personnel referred to in the Lab Standard are employees, students, and visiting scientists who may be exposed to hazardous chemicals in the course of his or her assignments.
- OSHA - Occupational Safety and Health Administration.
- Oxidizer - A chemical, other than a blasting agent or explosive as defined in 29 CFR 1910.109(a) that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.
- Particularly Hazardous Substances - Chemicals that are a select carcinogen, a reproductive toxin, or a chemical having a high degree of acute toxicity.
- PEL - Permissible Exposure Limit. PELs are the regulatory limit or maximum concentration of a substance in the air that personnel can be exposed to without personal protective equipment or engineering controls (such as a fume hood). These chemicals may also have a "skin designation" that prohibits skin contact.
- Physical hazard - Any chemical which is classified as posing one of the following hazardous effects: explosives, flammables (gases, aerosols, liquids, or solids), oxidizers (liquid, solid, or gas), self-reactive; pyrophorics (gas, liquid or solid), self-heating, organic peroxides, chemicals corrosive to metal, gases under pressure, water reactives that emit flammable gases, or combustible dusts.
- PPE - Personal Protective Equipment. Principal Investigator (PI) - The lead scientist that plans and/or conducts the laboratory research and assumes the overall supervisory responsibility for laboratory operations and project completion.

- Radioactive Materials - any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.
- Reproductive Toxin - Chemicals that affect the reproductive capabilities including adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring including but not limited to those that damage chromosomes (mutagens) or the fetus (teratogens).
- Select Carcinogen - Any substance which meets one of the following criteria: (1) it is regulated by OSHA as a carcinogen; or (2) it is listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or (3) it is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or (4) it is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria: (a) after inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³; (b) after repeated skin application of less than 300 (mg/kg of body weight) per week; or (c) after oral dosages of less than 50 mg/kg of body weight per day.
- TLV - Threshold Limit Value. The maximum average airborne concentration of a hazardous material to which healthy adult workers can be exposed during an 8-hour workday and 40-hour workweek – over a working lifetime – without experiencing significant adverse health effects.
- SOP - Standard Operating Procedure.

5. Procedural Steps

5.1 Exclusions

The CHP does not apply to activities that do not fit the term "laboratory use", such as a production processes.

The CHP does not apply to work exclusively with radioactive or biological materials. BCOM does not currently allow work with radioactive materials. Procedures for work with biohazardous agents are addressed in the BCOM Biosafety Manual.

5.2 Training and Hazard Information Communication Requirements

Employees and students have the right to be informed about the known physical and health hazards of the chemical substances in their work areas and to be properly trained to work safely with these substances.

Laboratory personnel must receive both general and laboratory-specific safety training to work with hazardous chemicals in BCOM laboratories. The Laboratory Director is responsible for ensuring laboratory personnel complete the appropriate required safety training and receive relevant safety information before authorizing personnel to use hazardous chemicals or perform hazardous operations in the laboratory. Relevant safety information and training must be provided to workers:

- At the time of initial assignment to the laboratory;

- Before working with new hazardous chemicals or performing new hazardous processes;
- Before working with an OSHA Particularly Hazardous Substance (PHS) or other highly hazardous chemical or process; and
- Prior performing any hazardous operation or using unfamiliar equipment in the laboratory.

5.2.1 General Safety Training

Under State and Federal law and BCOM policies, laboratory personnel working with hazardous chemicals must receive training on and be familiar with the requirements of the BCOM Hazard Communication Program and the BCOM Chemical Hygiene Plan. BCOM ORSP has developed training programs designed to meet these training requirements. At a minimum, all personnel working with a hazardous chemical in a BCOM laboratory must successfully complete the BCOM ORSP training offerings listed below or complete ORSP-approved equivalent training:

- Hazard Communication (HazCom) training
- Laboratory Safety training (requires annual refresher training)

Additional safety training may also be required for laboratory personnel working with special hazards such as hazardous biological material or blood. Please contact BCOM ORSP for additional training information.

Documentation of the training is required as noted below. At a minimum, the following needs to be documented:

- Worker name;
- Training date;
- Brief description of the training;
- Name of the trainer name or person certifying that the training was completed.

ORSP maintains employee safety training records. These records are available upon request.

5.2.2 Communication of Required Hazard Information

Relevant safety information must be readily available to laboratory personnel while working in laboratories. At a minimum, the Laboratory Director must inform laboratory workers where and how they can access the following information:

- [OSHA Laboratory Standard](#) (29 CFR 1910.1450)

This regulation mandates that BCOM protect laboratory personnel engaged in the use of hazardous chemicals.

- BCOM Chemical Hygiene Plan

Workers must have access to the BCOM CHP. The OSHA Lab Standard requires employers with laboratories that meet the definition of a “laboratory” to have a written CHP. This plan fulfills this regulatory requirement for BCOM. The latest revision of the BCOM CHP is located on the ORSP website.

- [OSHA Permissible Exposure Limits \(PELs\)](#)

Workers must be provided information on the regulatory exposure limits for any hazardous chemicals they will be handling and could be potentially exposed to while performing their work in the laboratory. Chemical Safety Data Sheet (SDS) are one of the best sources for obtaining this information.

If an OSHA PEL has not been established for a specific chemical, then additional resources such as The American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs) should be followed. Contact BCOM ORSP for guidance, if necessary.

- [Chemical Safety Data Sheets \(SDSs\)](#)

Access to the chemical manufacturer / distributor SDS must be readily available for all hazardous chemicals that are used or stored in the laboratory. Chemical SDSs must be reviewed by workers before they handle a hazardous chemical in the laboratory. BCOM utilizes [MSDS Online](#) to manage SDSs for all chemical present in research laboratories.

- Standard Operating Procedures (SOPs)

The Laboratory Director is responsible for writing Standard Operating Procedures (SOPs) for any operation involving the use of hazardous chemicals such as OSHA Particularly Hazardous Substances (PHS), highly reactive or explosive chemicals, and other high-risk laboratory procedures.

Laboratory workers who work autonomously or perform independent research are responsible for developing written SOPs for their own work. These SOPs shall be available to the Chemical Hygiene Officer upon request.

5.3 Minimizing the Risks of Exposure to Hazardous Chemicals in Laboratories

5.3.1 Required clothing in a laboratory setting or when using chemicals is long pants or skirts/dresses that cover the entire leg and closed toe shoes. Sandals, open-toed or perforated shoes and shorts leave exposed skin vulnerable to chemical contamination and are not permitted when working in the BSRL.

5.3.2 General Safety Rules for Working in a Laboratory

- Do not work alone if using hazardous materials or performing hazardous procedures without prior approval of the Laboratory Manager.
- Do not perform unauthorized experiments.
- Pre-plan work and ensure all necessary safety equipment and controls are in place before beginning any hazardous operation.
- Do not deviate from standard operating procedures without prior approval of the Laboratory Manager.
- Always review the chemical SDS and container label before using a hazardous chemical for the first time.

- Wear all required personal protective equipment (PPE) for the operation to be performed. The minimum PPE for working with a hazardous chemical in a laboratory is:
 - Laboratory apron or coat
 - Eye protection (safety glasses or goggles)
 - Gloves appropriate for the chemical being handled
- Inspect all gloves for holes or other defects before using.
- Do not eat, drink, use tobacco or apply cosmetics in areas where hazardous chemicals are used or stored.
- Do not use water from laboratory sinks for drinking or use laboratory sinks to wash eating utensils.
- Do not store food or drink in laboratory refrigerators or freezers.
- Do not prepare food using laboratory microwave ovens or other household appliances used for laboratory purposes.
- Use appropriate ventilation such as a laboratory chemical hood when working with volatile chemicals or chemicals that pose an inhalation exposure risk (i.e., fine powders or aerosols).
- Contact the Chemical Hygiene Officer if you have questions about the adequacy of safety equipment available or safety of the chemical procedures to be performed.
- Know the location and proper use of the emergency safety equipment available in the laboratory (i.e., chemical spill kit, emergency eyewash, safety shower, fire extinguisher, first-aid kit, emergency telephone / telephone numbers, fire alarm pulls).
- Maintain situational awareness. Be aware of the hazards posed by the work of others in the laboratory and any additional hazards that may result from contact between materials and chemicals from different work areas
- Make others in the laboratory aware of the hazards associated with your work.
- Notify your Laboratory Manager of any chemical sensitivities or allergies.
- Report all injuries, accidents, incidents, and near misses as directed by this plan.
- Do not allow unauthorized persons in the laboratory for liability, safety, and security reasons.
- Make sure hazardous chemicals are secure at all times.
- Report any unsafe conditions in the laboratory to the Laboratory Director, Laboratory Manager, Chemical Hygiene Officer and/or the Office of Research & Sponsored Programs.
- Properly dispose of all hazardous chemical waste.
- Immediately clean up any chemical spill using appropriate chemical spill procedures.

5.3.3 Laboratory Safety Controls

- The use of engineering controls is the preferred method for reducing exposure to hazardous chemicals. The primary engineering control used in BCOM laboratories is the chemical fume hood.
 - Laboratory fume hoods or similar engineering control must be used whenever handling hazardous chemicals that meet one or more of the following conditions

- Have a high degree of acute toxicity, are carcinogens, or are reproductive toxins, except where there is very low risk of exposure (e.g., use of minimal quantities in a closed system).
- Have an OSHA PEL of less than 50 ppm (or 0.25 mg/m³ for particulate matter).
- Are appreciably volatile (e.g., solvents) or are easily dispersible in air (powders).
- [OSHA's Annotated Table of PELs Including ACIGH Limits](#)
- Administrative controls (or work practice controls) are procedures or administrative rules and practices such as written safety procedures, SOPs, supervision of laboratory staff, work schedules restrictions, and worker training requirements. As with engineering controls, administrative controls are put into place with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or hazardous situations in the laboratory. Examples of administrative controls for minimizing exposures to hazardous chemicals include:
 - Substitution - Substituting less hazardous chemicals when possible. For example, using proprietary detergents instead of chromic acid for cleaning glassware; or, using toluene instead of benzene for liquid-liquid extraction or chromatography.
 - Isolating or enclosing an experiment within a closed system (i.e., glove box, sealed chamber).
 - Scaling down the size of the experiment to reduce the amount of chemical needed and reduce the exposure hazard to workers.
 - Proper housekeeping. Reducing clutter reduces the chances for an accident and minimizes the effects if an accident does occur.
- Personal Protective Equipment
 - In addition to engineering and administrative controls, personal protective equipment (PPE) is necessary to ensure there is an adequate margin of safety for the laboratory worker in case of an incidental / accidental chemical release or contact when working with hazardous chemicals.
 - Examples of PPE include gloves, eye protection, respirators and other protective clothing
 - Hygiene Practices shall be used to reduce the likelihood of accident or chemical exposure. Personnel will wash hands after removing gloves and before leaving the laboratory area or as soon as reasonably possible.

5.4 Hazardous Chemical Labeling, Storage and Inventory

5.4.1 The BCOM Hazard Communication Program requires that all containers of hazardous chemicals in the workplace are properly labeled. There is specific information that must be included on both the original (manufacturer) label and on secondary container labels. Information on chemical container labeling requirements are available on the BCOM ORSP web site.

5.4.2 Safety Data Sheets (formerly known as Material Safety Data Sheets – MSDS)

- Safety Data Sheets are maintained as a component of the BCOM Chemical Inventory through [MSDS Online](http://mybcom.org/) available via link at <http://mybcom.org/>
- SDSs are sometime difficult to interpret. For more information about using an SDS, see [OSHA's Quick Card on Hazard Communication Safety Data Sheets](#).
- If a desired SDS is not available or cannot be located, contact the manufacturer or distributor at the number listed on the container label and request an SDS.

5.4.3 Inventory

- The Chemical Hygiene Officer will ensure a chemical inventory is maintained in MSDS Online and updated annually. The inventory must include all chemicals in the laboratory. Specifically, the inventory will:
 - Note the location of the chemical (i.e., building and room number)
 - The name of the chemical and synonyms (if referenced in the lab) and if needed, any other information that reveals the precise chemical designation and composition of the substance.
 - The quantity of the chemical purchased and whether the container is full, empty or waste.

5.4.4 Chemical Storage

- Hazardous chemical and liquids must be stored at a height not to exceed 6 feet.
- Chemical must be easily accessible and not stored in hard to reach locations.
- Chemical must be placed on shelving or in cabinets with labels facing forward. Labels will be legible in English.
- Consult MSDS Online for storage recommendations.
- Whenever possible, chemicals will be segregated by hazard class.
- Avoid stockpiling chemicals. Purchase the minimal amount necessary to complete the planned work, use older chemicals first, and discard chemicals that are no longer needed or that have expired.
- Hallways must not be used for chemical storage.
- Ventilation hoods should not be used for storage of chemicals, unless they are part of the experiment being conducted in that ventilation hood at that time.

5.4.5 Chemical Handling

- Prior to use, laboratory personnel should be familiar with the safety and health hazard data of all the chemicals that will be used by consulting the pertinent SDSs as needed.
- Close caps securely.
- Never use unlabeled chemicals.
- Add acid or strong bases to water.
- Be sure all labels are securely attached and legible.
- Keep chemicals in their original container if possible.
- Label all secondary containers to avoid unknown chemicals and/or inadvertent reaction.

5.4.6 Compressed gases

- Compressed gas cylinders must be secured in an upright position away from excessive heat, highly combustible materials and areas where they might be damaged or

knocked over. A chain, bracket or other restraining device shall be used at all times to prevent cylinders from falling. .

- Cylinders of oxygen and other oxidizers must be stored at least 20-feet from fuel-gas or other combustible materials unless separated by a noncombustible wall, not less than 5-feet high, having a fire-resistance rating of ½-hour.
- Cylinders must have valve protection caps on at all times except when containers are secured and connected to dispensing equipment. Empty gas cylinders must also be stored securely with the valve protection cap in place.
- All hazardous materials must be labeled with the name of the chemical and the primary hazard associated with that chemical (flammable, oxidizer, etc.).
- The cylinder status as to “full”, “in-use”, or “empty” must be indicated on the cylinder.
- Flash arrestors should be used to prevent a flash-back, should it occur, in a line containing a flammable gas.
- All tubing and fittings should be checked for integrity when used. If tubing is damaged, cracked or missing, it should be removed from service until properly repaired or replaced.
- Cylinders must be stored in dry, well-ventilated areas. Closets and lockers are not acceptable storage locations.
- Cylinders must not be stored in hallways.
- Unobstructed access must be maintained around the cylinders.
- All compressed gases must be recorded in the chemical inventory via MSDS Online.

5.5 Working with Particularly Hazardous Substances

5.5.1 Under the OSHA Laboratory Standard, certain types of chemicals are defined as Particularly Hazardous Substances (PHS) and are subject to special precautions and restrictions. These include:

- Chemicals with a high degree of acute toxicity: Chemicals that are considered to have a high degree of acute toxicity are those substances which are highly toxic or toxic as defined under the [Hazard Communication Standard \(§1910.1200\)](#) and may be fatal or cause damage to target organs as a result of a single exposure or exposures of short duration.
 - For the purpose of this plan, on GHS-compliant Safety Data Sheets (SDSs) highly acutely toxic chemicals can be identified via the following hazard statements:
 - H300: Fatal if swallowed
 - H310: Fatal in contact with skin
 - H330: Fatal if inhaled
- Select carcinogens defined as a chemical that meets at least one of the following criteria:
 - It is [regulated by OSHA as a carcinogen](#)
 - It is listed as known to be carcinogenic in the latest [Annual Report on Carcinogens](#) issued by the Department of Health and Human Services, National Toxicology Program (NTP)

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- It is listed under [Group 1 \(carcinogenic to humans\) by the International Agency for Research on Cancer Monographs \(IARC\)](#)
- It is listed in either [Group 2A or 2B by IARC](#) or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
 - After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;
 - After repeated skin application of less than 300 (mg/kg of body weight) per week; or
 - After oral dosages of less than 50 mg/kg of body weight per day.
 - Reproductive Toxins (Mutagens and Teratogens): Chemicals that affect the reproductive capabilities including adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on the development of the offspring. Chemicals classified as reproductive toxins in accordance with the [Hazard Communication Standard \(§1910.1200\)](#) shall be considered reproductive toxins.

5.5.2 When working with a PHS, the Laboratory Supervisor must evaluate, assess, and, when appropriate, implement additional provisions and precautions. Unless a formal hazard assessment shows otherwise, the basic requirements for working with a PHS include:

- Establishment of designated use and storage area(s);
- Use of containment devices such as chemical fume hoods or glove boxes;
- Written standard operating / safety procedures;
- Procedures for safe handling and disposal of contaminated wastes; and
- Equipment and personnel decontamination procedures.

5.5.3 Designated area(s) for use of PHSs must be formally established and access to the area limited to authorized personnel who are informed of the hazardous substances used in the area and trained to work with the materials.

- Designated use areas may be an entire laboratory, a specific lab bench, or a single chemical fume hood / glovebox. When a PHS is in use, access to the designated area must be restricted to only authorized personnel.
- Use of the PHS must be limited to the designated area(s).
- Hazard warning signs must be posted at designated work areas and chemical storage location. The wording must indicate the specific hazard listed below (or words with similar intent):
 - WARNING, CANCER HAZARD – SELECT CARCINOGEN
 - WARNING, REPRODUCTIVE TOXIN
 - WARNING, HIGHLY ACUTELY TOXIC CHEMICAL

5.5.4 Particularly Hazardous Substances (PHS) must be stored in designated, marked storage areas:

- PHSs should be stored in a ventilated storage area, if possible;
- Primary chemical containers must be tightly capped and stored in unbreakable, chemically resistant secondary containment;
- Limit access to the stored PHS to only authorized personnel by using:
- Lockable storage cabinets, boxes, refrigerators, drawers, etc. or,
- Restrict access to the laboratory and keep the laboratory locked whenever no authorized personnel are present.

- Post PHS storage (rooms, cabinets, refrigerators, etc.) with specific hazard warnings (see PHA warning sign wording under bullet 3 of section 5.5.3);
- Remove PHSs from storage only when it is needed and return the container to storage as soon as practical; and
- Follow any special storage requirements listed on the manufacturer instructions or chemical SDS.

5.5.5 Particularly Hazardous Substances (PHS) should generally be handled in a ventilated containment system such as a designated chemical fume hood, glovebox, or other closed ventilated system. Working with PHSs on an open lab bench is discouraged unless a hazard assessment has been performed demonstrating that the work can be done safely and the likely exposure risk to workers and/or the environment will be below established regulatory limits.

- Using PHSs in a manner, which may produce vapors, dusts, mists, gases or other easily disburseable particulate and become an airborne hazard must be done in an appropriate ventilated containment system.
- When a PHS is used outside of an established containment system, the general room ventilation must be maintained at negative pressure with respect to public areas.
 - Exhaust air from ventilation containment systems must be vented externally; recirculation back into the lab or general building ventilation system is not permitted.
 - Laboratory access doors leading to public areas must be kept closed when the chemical is in use.
- PHS work surfaces should be stainless steel, chemically resistant epoxy, or other chemically impervious, material that is easy to clean / decontaminate.
 - When possible, work should be performed in a spill tray lined with dry absorbent plastic backed paper or other chemically compatible disposable lining.
 - If contaminated, liners should be replaced with a clean liner and the contaminated liner disposed of as hazardous waste.
- Mechanical pipetting aids must be used for all pipetting procedures (no mouth pipetting).
- Experiments using a PHS must be designed and performed in a manner that will safely maintain control of the PHS at all times.
 - Written SOPs which include safe handling and hazard control information must be developed and laboratory staff trained to the specific procedures prior to performing the work.
 - Additional safety controls may be required if there are additional hazards are involved (i.e., the PHS will be under pressure during part of the process).
- Laboratory personnel should immediately stop work and consult their Laboratory Supervisor if an unexpected result or reaction occurs at any point in a process and they are uncertain of the potential hazards.
- Personnel working in a PHS-designated area or laboratory must remove their PPE and wash their hands and forearms before leaving the laboratory.

- Laboratory equipment used to work with a PHS must be decontaminated before being removed from the designated area.
- Spill-proof secondary containment must be used whenever transporting a PHS outside of the designated use area or laboratory.

5.5.6 Follow all waste storage and disposal requirements listed on the manufacturer instructions or chemical SDS. Include any special requirements in the written SOPs for handling the PHS.

5.5.7 Review and follow any special spill cleanup and decontamination procedures listed on the manufacturer instructions or chemical SDS. Include any special requirements in the written SOPs for handling the PHS. General chemical spill response and decontamination procedures are available on ORSP web site.

5.6 Prior Approval Requirements

5.6.1 There are hazardous situations and processes that may occur in laboratories that require the Laboratory Director to formally approve the activity prior to it being performed. The following are examples of situations that require formal approval. Consult with the Laboratory Director if you are unsure whether your process fits into one of the following categories:

- New work or new processes using high hazard materials
- Performing an operation on an open lab bench, when the process is normally performed inside a chemical fume hood.
- Making a change to an established process or procedure where the impact of making the change is not completely known.
- Tours of laboratory facilities or hazardous areas.
- Experiment or process that impacts building or laboratory design.
- Installation, removal, moving or changes to a laboratory exhaust ventilation unit
- Purchase of refrigerators or freezers for chemical storage.

5.6.2 The operation of laboratory equipment or processes involving the use of hazardous chemicals overnight or otherwise unattended is generally discouraged and must be avoided, if possible. However, those laboratory procedures that do need to run overnight, on weekends or at other times when no personnel are present to monitor the process must be carefully planned out to avoid hazards and mishaps caused by unexpected events such as utility failure, disruption of supply water or failure of laboratory equipment. For these reasons, the Laboratory Supervisor must review and approve all unattended operations in the laboratory that use hazardous chemicals or where an equipment failure could pose a danger to building personnel or damage to the facility. At a minimum, the following precautions must be followed when running unattended operations in the laboratory:

- Obtain prior approval from the Laboratory Supervisor
- Post a sign on laboratory entrances that includes information on:
 - The nature of the experiment
 - Hazards posed by the process
 - Types and approximate quantities of hazardous materials in use (if applicable)

- Emergency Contact Information for the responsible individual

5.6.3 Working alone, after hours in the BCOM BSRL is generally discouraged. Working with hazardous chemicals, performing a hazardous operation or working with hazardous laboratory equipment when alone in a laboratory, especially after regular hours, poses a significant risk to life and property. If an accident occurs, the ability of a worker to respond appropriately can be severely impaired which could result in injury, death or catastrophic property damage. If the timing of the task cannot be changed and the work must be accomplished during a time when the laboratory is empty, the following requirements must be met:

- The Laboratory Supervisor must review the activity and approve the activity prior to it being performed;
- A “buddy system” must be used where arrangements are made to have someone (e.g., BCOM or site security) periodically check in with the worker either in person or by phone or radio;
- The BCOM BSRL is under 24-hour video surveillance; however, the video feed is not monitored between midnight and 6:30am. Working alone with hazardous materials during these times is not allowed.

5.6.4 Demonstrations Involving Hazardous Materials and Tours of Laboratory Facilities

The safety of participants during demonstrations involving hazardous materials and tours of laboratory facilities is paramount. The sponsor of the demonstration or tour is responsible for safety of the individuals involved and must assure that the following requirements are met:

- The sponsor of the demonstration or tour must notify the Office of Research & Sponsored Programs and receive approval from the Laboratory Director.
- The visitors and participants must be advised of the hazards present in the laboratory. This information shall include the types of physical and chemical hazards, procedures to follow should an emergency occur, signs and symptoms of a potential chemical exposure and any other pertinent safety information.
- All unnecessary experiments and procedures must be stopped and the laboratory or area be made safe for the duration of the tour or visit.
- All participants in the demonstration or tour must be provided and don all necessary personal protective equipment. The participants must wear the PPE at all times while in the laboratory or hazardous area.
- Participants in the tour or demonstration shall be monitored and supervised at all times. Sufficient departmental staff shall be on hand to effectively control the group involved in the tour.
- All demonstrations involving hazardous materials or hazardous chemicals shall be reviewed and approved by the Chemical Hygiene Officer. The demonstration shall be presented in a safe manner, following the applicable aspects of the Chemical Hygiene Plan. Based on the audience, it may be necessary to add additional safety measures. The Chemical Hygiene Officer will assure that the safety of the participants is maintained.
- Demonstrations for minors require the approval of the Chemical Hygiene Officer and ORSP.

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- Demonstrations performed to any audience off campus or in an area, on or off campus, not designed for hazardous chemicals or a hazardous operation requires the approval of the Chemical Hygiene Officer and ORSP. If the demonstration is off-campus, site approval by an authorized official for the demonstration site is also required.

5.6.5 Volunteer Workers involved in Laboratory Research at BCOM

College Volunteers are individuals who are uncompensated by the College and who perform services directly related to the business of the College to support the research, teaching or public service activities of the College or to gain experience in specific endeavors.

- BCOM does not allow volunteer workers under the age of 18.
- Tours and visitors to laboratories are covered under Section 5.6.4 of this Chemical Hygiene Plan and are not subject to section 5.6.5 of this Chemical Hygiene Plan.
- Under no circumstances shall individuals unable to understand safety training be permitted in BCOM laboratories except as research study participants in an approved research protocol
- Volunteer workers are permitted to perform research and teaching activities at BCOM provided the following requirements are met:
 - Faculty Members or Principal Investigators must notify the Office of Research and Sponsored Programs and receive documented approval from the Director of the Laboratory.
 - The volunteer worker must attend all applicable safety training sessions, including but not limited to:
 - Laboratory Standard/Hazard Communication
 - Any or all of the following, based on work performed:
 - Biosafety
 - OSHA Bloodborne Pathogen
 - NIH Recombinant DNA Guidelines
 - Any other training as required by ORSP
- The volunteer is under the responsibility of a faculty member in the laboratory or area where the work will occur.
- The volunteer is provided with written copies of relevant SOPs.
- The volunteer must use all required personal protective equipment. BCOM shall provide or otherwise make available to each volunteer required to wear personal protective equipment the devices appropriate for the activity and hazard involved.
- The volunteer must be monitored and supervised at all times by a knowledgeable and experienced employee until the principal investigator is comfortable that the volunteer can work independently. They must not work alone while performing hazardous operations or while working with hazardous materials.
- The volunteer must follow all College safety procedures and policies.
- The Chemical Hygiene Office should perform spot inspections of the work and assure that all training is complete.
- The volunteer must follow all applicable state and federal requirements and guidelines and BCOM policies

5.7 Laboratory Inspections

5.7.1 ORSP will ensure that an annual safety inspection is conducted in BCOM Research Laboratories and will document any safety deficiencies.

5.7.2 To ensure that primary engineering controls and safety equipment are working as designed, ORSP will ensure that performance verification and operational checks are performed on a routine basis for the following equipment:

- Annual check and certification of chemical fume hood performance.
- Annual check and certification of emergency safety showers and emergency eyewashes.

5.7.3 Any problems encountered with laboratory control and safety equipment between the annual checks should be immediately reported to the Laboratory Manager or Director.

5.8 Management of Laboratory Hazardous Waste

5.8.1 Waste Containers:

- All waste containers shall be labeled with the chemical name or constituents, percentage of chemicals if mixture, and the word Waste or Hazardous Waste (e.g., Waste Acetone, Waste mixed acids, Hazardous Waste Mixed Solvents 10% halogenated).
- Chemical containers shall be covered/closed at all times unless directly adding waste. (Open funnels cannot be left in open bottles.)
- Waste containers shall not be stored in the sink.
- Waste containers stored on the floor shall be placed in secondary containment.
- Do not use containers that are old, dented, damaged, leaking or cracked.
- The container must be compatible with the waste streams that will be placed in it. For example, do not use a metal container to store acids, do not use glass or metal containers to store organic peroxides and do not use metal containers to store picric acid and solutions of picric acid.
- Do not use containers that can be confused with consumer commodities like soda bottles or milk jugs.
- Do not use metal containers for flammable liquid waste, unless proper bonding and grounding precautions are taken.

5.8.2 ORSP will arrange for hazardous waste disposal by a commercial waste company. Contact the Laboratory Manager or ORSP when a waste container has reached capacity.

5.8.3 Laboratory Clean Out of Reagent Chemicals

- All laboratories must on an annual basis inspect all of their reagent chemicals and identify chemicals that are no longer needed, old and out of date or unusable.
- Contact the Laboratory Manager or ORSP to dispose of chemicals that are unusable.

5.8.4 Labeling Chemical Waste

- All chemical waste containers must be labeled as soon as waste is added.
- Chemical waste labels must include the following information:

- The generator is the person who is filling out the waste label, not the lab group or Principal Investigator (PI) unless the PI is filling out the waste label.
- Date the label with the date that the waste is first added.
- Fill in building, room number and telephone number where the person who is filling out the waste label can be reached.
- List each waste constituent down to 1%; heavy metals must be listed down to the parts per million range. Label contents must add up to 100%. Volumes are acceptable.
- Use only common chemical names or IUPAC nomenclature when listing the chemical constituents on the label. Do not use abbreviations, chemical symbols or trade names.

5.8.5 Adding waste to a container

- All personnel working with chemical waste must wear safety glasses, splash goggles if working with liquid waste, lab coat, and gloves specific for the compounds in use.
- Perform chemical waste management in a fume hood. Mixing of liquid waste may generate toxic or corrosive chemicals.
- Check the container label to assure that waste is being added to the correct container.
- The container must be in secondary containment (i.e., a large plastic tub or bin).
- Uncap the container.
- Use a funnel sufficient for the size of the container and volume of waste being added.
- Slowly add the waste, watching for any unintended reactions. If you observe a reaction, immediately stop adding the waste, close the fume hood sash and contact the Laboratory Manager.
- After the waste has been added, remove the funnel and seal the container with the cap. It is a regulatory requirement for the container to be closed when not actively adding waste.

5.8.6 Storing liquid chemical waste

Proper storage of chemical waste is extremely important. Explosions have occurred on campus that was caused by improper storage of chemical waste. If you improperly label a container, other laboratory personnel unknowingly may add incompatible material to the container.

Adhere to the following procedures on chemical waste storage to protect the health and safety of others, protect the University's facilities and to keep the University in compliance with all federal, state and local regulations:

- Waste containers must remain closed or sealed at all times, except when waste is being added or removed from the container.
- Liquid waste containers must be stored in secondary containment systems according to hazard class.
- Store all bulk liquid waste containers in appropriate cabinets. DO NOT store bulk liquid chemical waste containers in fume hoods that have active experiments or reactions occurring.
- Do not allow excess accumulation of chemical waste to build up in the lab.

- Containers can only be filled to a maximum of 75% full. Head space is needed for expansion and/or ease of dispensing.

5.9 Laboratory Emergencies

5.9.1 Required Emergency Contacts and Area Postings for Laboratories

- Each entrance into a laboratory must be posted with emergency contact information. The primary and secondary contacts listed must have knowledge about the chemical and physical hazards in the laboratory as well as general knowledge about the type of processes performed in the laboratory.
- Entry doors are also required to be posted with words and/or pictograms showing the general type of chemical and physical hazards that may be encountered in the area. In addition, any special entry or exit requirements (i.e., PPE donning / doffing requirements) must also be posted.

5.9.2 General Emergency Procedures

- A site-specific Emergency Action Plan will be available to all laboratory personnel. The EAP includes general emergency procedures and emergency contact information:
 - Laboratory Emergency Coordinators contacts and other emergency contacts
 - Building escape/evacuation route maps and evacuation procedures
 - Evacuation assembly sites
 - Personnel evacuation verification and reporting methods
 - Procedures for assisting disabled personnel in an emergency
 - General emergency assembly procedures for laboratories and other hazardous materials areas
- The EAP must be available to and reviewed by all laboratory personnel

5.9.3 Chemical Exposure and Spill Response Procedures

- An accidental release of a hazardous chemical can occur in a laboratory at any time. The BCOM Chemical Exposure and Spill Response Procedure describes the proper response if a person exposed to a hazardous chemical and procedures for handling different types and sizes of chemical spills in a laboratory. The procedure also includes recommendations on the type of supplies that should be in a standard laboratory chemical spill kits.

5.9.4 Emergency Eyewashes and Safety Showers

- All laboratories using hazardous chemicals must have immediate access to safety showers and eyewash stations. All lab personnel must be aware of the emergency shower and safety shower locations and know how to properly use them.
- Laboratory personnel should flush eyewash stations at least weekly. This will keep the system free of sediment and prevent bacterial growth from reducing performance. The areas around and paths leading to emergency eyewashes and showers must be free of obstructions and have highly visible signs indicating their location.
- If lab personnel are exposed to a hazardous chemical, they should dial 911 (or someone else in the lab not exposed should dial 911) and use the safety shower and/or eye wash unit for 15 minutes or until emergency responders arrive and begin

treatment. If an uninjured individual is present, this person should assist with the decontamination of the affected individual.

- If a safety shower or eyewash unit becomes inoperable at any time, notify the Laboratory Manager immediately so a repair work order can be submitted.

5.9.5 Laboratory Incident Reporting

- Laboratory personnel must report all occupational injuries or illness to the Laboratory Manager as soon as possible.

5.10 Chemical Exposure Assessments

5.10.1 Consistent adherence to general safe laboratory practices in conjunction with appropriate use of engineering and administrative controls are expected to keep exposures to laboratory chemicals at safe levels. The risk of exposure risk is more likely to increase when handling hazardous chemicals outside of a lab hood, especially those chemicals that:

- Have a high degree of acute toxicity, are carcinogens, or are reproductive toxins, except where there is very low risk of exposure (e.g., use of minimal quantities in a closed system);
- Have a permissible exposure limit of less than 50 ppm (or 0.25 mg/m³ for particulate matter);
- Are volatile or easily dispersible in air (i.e., fine powders); and
- Are used in large volumes (e.g., greater than 1 liter).

5.10.2 Contact the BCOM Chemical Hygiene Officer for assistance with chemical exposure assessments or any concern involving hazardous chemicals usage, including the above scenarios, or with help verifying adequate controls.

5.10.3 BCOM will measure an employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for the regulated substance could routinely exceed the action level or PEL. Examples where personal monitoring may be warranted include:

- Handling volatile or acutely toxic chemicals outside of a chemical fume hood or other ventilated containment system.
- Laboratory personnel develop signs or symptoms associated with a possible hazardous chemical exposure.
- If initial monitoring indicates an employee exposure may be over the action level or PEL, exposure monitoring will be conducted and continue until it may be terminated per the provisions of the relevant regulatory standard. For more information about personal exposure monitoring, contact ORSP at (575) 674-2338.
- BCOM will, within 15 working days after the receipt of any monitoring results, notify the employee of the monitoring results in writing either individually or by posting results in an appropriate location that is accessible to employees. BCOM maintains copies of employee exposure monitoring records per applicable regulatory requirements.

5.11 Medical Consultations, Examinations and Surveillance

5.11.1 Laboratory personnel who work with hazardous chemicals will be provided the opportunity to receive medical attention/consultation when:

- A worker develops symptoms or signs of exposure to a hazardous chemical;
- Exposure monitoring reveals a potential overexposure;
- A spill, leak, explosion or other occurrence results in a potential overexposure; and
- A regulatory standard triggers a medical surveillance requirement.

5.11.2 If a medical follow-up or surveillance is necessary because of one or more of the conditions listed above, the medical examination(s) will be conducted by a licensed medical provider, at a reasonable time and place, at no cost to the worker.

- BCOM employees will receive an occupational medical consultation and examination at WorkMed (2525 S Telshor Blvd ste 16-108, Las Cruces, NM 88011).
- BCOM Students will receive a medical consultation and examination at the New Mexico State University Student Health Center (3080 Breland Dr, Las Cruces, NM 88003)

5.11.3 If the medical evaluation is for a suspected exposure, the worker, Laboratory Director and/or BCOM Office of Human Resources will provide the following information to the physician:

- Identity of hazardous chemical(s) and a copy of the appropriate chemical Safety Data Sheets, if available;
- Conditions of the exposure, including exposure or monitoring data, if available; and
- Signs and symptoms of the exposure.

5.11.4 The medical provider will document and provide, as appropriate, a written report with the following information to BCOM HR:

- Examination and test results;
- Any medical condition that may place employee at an increased risk from exposures to hazardous chemicals in the workplace;
- Statement that employee has been informed of the results; and
- The written report shall not reveal any specific findings or results of diagnoses that are unrelated to occupational exposure.

5.11.5 The worker and BCOM HR are responsible for informing the Laboratory Director and department administration of any work modifications ordered by the clinician as a result of exposure.

5.11.6 Employee medical records will be available for the duration of the employee's employment with BCOM plus 30 years. Employees will be provided access to their medical records within 15 days of making the initial request.

6. Reports/Charts/Forms/Attachments/Cross References

6.1. Resources

6.1.1. BCOM Safety Datasheets – <https://msdsmanagement.msdsonline.com/f13f530e-d3d5-400e-9c2c-87afb0697617/ebinder/?nas=True>

6.1.2. Occupational Safety and Health Administration References

BURRELL COLLEGE OF OSTEOPATHIC MEDICINE

STANDARD OPERATING PROCEDURES

- Laboratory Standard - 29 CFR 1910.1450 –
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106
- National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory) – 29 CFR 1910.1450 App A –
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10107
- References (Non-Mandatory) – 29 CFR 1910.1450 App B –
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10108
- OSHA Permissible Exposure Limits (PEL) – 29 CFR 1910.1450 subpart Z –
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992
- Limits for Air Contaminants – 29 CFR 1910.1000 –
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9991
- TABLE Z-2 – 29 CFR 1910.1000 TABLE Z-2 –
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9993

6.1.3. List of Substances Known to be Human Carcinogens, Reasonably Anticipated to be Human Carcinogens and Highly Toxic Substances

- National Toxicology Program (NTP)(latest edition) –
<https://ntp.niehs.nih.gov/index.cfm>
- International Agency for research on Cancer Monographs (IARC) (latest editions) –
<http://monographs.iarc.fr/ENG/Classification/index.php>

6.1.4. ACGIH Guide to Occupational Exposure Values – order online at <http://acgih.org/store/>

6.1.5. Prudent Practices in the Laboratory – available from ORSP or online at

http://www.nap.edu/openbook.php?record_id=12654&page=R1

6.2. Attachments

6.2.1. BCOM Chemical Exposure and Spill Response Procedure

7. Maintenance

Office of Research and Sponsored Program; reviewed annually or by May 1st of each year.

8. Signature

Signature on File

Joseph Benoit, Assistant Dean of Research

9/3/19

Date

BURRELL COLLEGE OF OSTEOPATHIC MEDICINE

STANDARD OPERATING PROCEDURES

9. Distribution List

Internal/External

10. Revision History

Revision Date	Subsection #	Summary of Changes	New/Cancellation/Replacement Procedure? (if applicable)	Approval Date
1	[e.g., 3.1]			