Health Sciences Laboratory Safety Handbook

University of Saskatchewan

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1 Purpose

Ensure appropriate health, safety and environmental stewardship in Health Sciences laboratories.

2 Scope

The *Health Sciences Laboratory Safety Handbook* applies to all faculty, staff, students and visitors working in Health Sciences laboratories.

3 University Regulatory Requirements

The D-Wing Health Sciences laboratories have been designed and constructed to meet the:

- National Building Code of Canada;
- National Fire Code of Canada;
- Public Health Agency of Canada Canadian Biosafety Standards and Guidelines containment level 2 design and operational requirements;
- Canadian Nuclear Safety Commissions, GD-52: Design Guide for Nuclear Substance Laboratories and Nuclear Medicine Rooms.

Faculty, staff, students and visitors working in Health Sciences must adhere to all university, and applicable regulatory requirements in occupational health and safety. These include, but are not limited to:

- University health, safety and environmental policies (http://policies.usask.ca/);
- Saskatchewan Employment Act and Occupational Health and Safety Regulations;
- Public Health Agency of Canada regulations and Canadian Biosafety Standards and Guidelines;
- Canadian Food Inspection Agency regulations and containment/operational requirements;
- Canadian Nuclear Safety Commission regulations;
- National Fire Code of Canada;
- Federal and provincial environmental protection regulations.

For information and assistance on university and regulatory requirements, contact Safety Resources at 306-966-4675.

4 Roles and Responsibilities

Faculty, staff, students and visitors are responsible to:

- Take reasonable care to protect his or her health and safety and the health and safety of other workers who may be affected by his or her acts or omissions;
- Follow safe work practices and procedures required by the colleges and university;
- Comply with health and safety regulatory requirements; and

- Report unsafe conditions and incidents to management.

Supervisors are responsible to:

- Provide leadership and support in the development and implementation of health and safety procedures and processes;
- Ensure faculty, staff and students are informed and understand the hazards in their work and learning environment and receive appropriate training in health and safety;
- Ensure faculty, staff and students follow safe work practices and procedures required by the colleges and university;
- Comply with health and safety regulatory requirements;
- In collaboration with Laboratory Managers, resolve identified health and safety hazards and issues;
- Investigate reported unsafe conditions and incidents; and
- Cooperate with Laboratory Managers and Safety Resources in the administration of best practices in health, safety and environmental protection.

Laboratory Managers are responsible to:

- Work collaboratively with faculty to provide leadership and support in the development and implementation of health and safety procedures and processes that support faculty, staff and students;
- Orient new staff to the hazards in the work area and ensure they receive appropriate training in health and safety;
- Support faculty, staff and students to follow safe work practices and procedures required by the colleges and university;
- Comply with health and safety regulatory requirements;
- Assist in the investigation of reported unsafe conditions and incidents; and
- Cooperate with Safety Resources in the administration of best practices in health, safety and environmental protection.

Safety Resources is responsible to:

- Provide leadership and support for best practices in health, safety and environmental protection;
- Assist in the development of locally relevant health and safety programs and services;
- Provide training and awareness in health, safety and environmental protection;
- Support emergency preparedness and response; and
- Ensure compliance with university and regulatory requirements.

5 Health and Safety Hazard Identification and Control

5.1 Hazard Inventory

A summary of common hazards routinely encountered in laboratory environments is presented in Table 1.

Table 1: Common health and safety hazards in laboratories

Hazard Class	Hazard Type	Hazard Information
Physical hazards of chemicals	Flammable, combustible and explosive solids, liquids and gasses	Flammable, combustible, and explosive materials can vaporize and form flammable mixtures with air when in open containers, when leaks occur or when heated, or become flammable with certain catalysts.
	Oxidizing solids, liquids and gases	An oxidizer in itself may not necessarily be combustible, it may, generally by yielding oxygen cause or contribute to the combustion of other material.
	Gases under pressure	Compressed gases can be toxic, flammable, oxidizing, corrosive, inert or a combination of hazards. In addition to the chemical hazards, compressed gases may be under a great deal of pressure.
	Self-reactive (unstable) substances	Self-reactive substances are thermally unstable liquids or solids liable to undergo a strongly exothermic thermal decomposition even without participation of oxygen (air).
	Water reactive materials	Water reactive substances are dangerous when wet because they undergo a chemical reaction with water. This reaction may release a gas that is either flammable or presents a toxic health hazard.
	Pyrophorics	A pyrophoric is liable to ignite after coming into contact with air, even in small quantities.
	Organic peroxides	An organic peroxide may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulations (mixtures). Such substances and mixtures may be liable to explosive decomposition; burn rapidly; be sensitive to impact or friction; react dangerously with other substances. Peroxides can occur in virtually any kind of organic chemical, however, certain chemicals are particularly prone to peroxide formation and pose special hazards. May also be light sensitive.
	Corrosive	A corrosive material is a highly reactive substance that causes obvious damage to living tissue or to metal. Corrosives act either directly, by chemically destroying the part (oxidation), or indirectly by causing inflammation.
	Cryogens	A cryogenic is a substance used to produce very low temperatures. A synonym is "refrigerant". Contact with cryogens can cause frost bite to exposed skin.

Hazard Class	Hazard Type	Hazard Information
Health hazards of chemicals	Respiratory, eye, skin damage or irritation	Exposure to chemicals may arise from inhalation, contact with skin and eyes, ingestion or injection. Exposure to chemicals, can damage the respiratory track if inhaled, and damage the skin or eyes if in direct contact.
	Toxicity	Certain organs or systems can be affected by either single or multiple exposures to a substance. These include nephrotoxins, neurotoxins, hematoxins, etc..
Health hazards of chemicals	Mutagens	A mutagen is a substance or agent that causes an increase in the rate of change in genes (subsections of the DNA of the body's cells). These mutations can be passed along as the cell reproduces, sometimes leading to defective cells or cancer. Examples of mutagens include certain biological and chemical agents as well as exposure to ultraviolet light or ionizing radiation.
	Asphyxiants	An asphyxiant is a substance that can cause unconsciousness or death by suffocation (asphyxiation) or aspiration. Aspiration is the entry of a liquid or solid directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system. Aspiration toxicity includes severe acute effects such as chemical pneumonia, varying degrees of pulmonary injury or death following aspiration.
	Carcinogens	Carcinogen means a chemical substance or a mixture of chemical substances which induce cancer or increase its incidence.
	Reproductive toxins	Reproductive toxicity includes adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in offspring.
	Sensitivities	Working with some chemicals can increase the risk of developing sensitivities.
Biological hazards	Pathogenical/Infectious	Work with infectious materials, pathogens or toxins can result in illness and disease.
	Laboratory animals	Work with animals can result in physical hazards as well as risk of exposure to infectious materials and pathogens, and the development of sensitivities.
	Sensitivities	Allergies and sensitivities can develop from the direct handling of animals, working in spaces where animals are housed and through the handling of contaminated materials such as bedding and cages. Exposure occurs through direct skin contact with animal dander, saliva and urine, and through the inhalation of allergens that become airborne.

Hazard Class	Hazard Type	Hazard Information
Radiation hazards	Exposure	Work with nuclear substances and/or radiation devices can result in an internal and/or external exposure to radiation. Exposure to radiation can cause adverse health effects ranging from immediate and severe symptoms from high level acute exposures to elevated risks of other health effects such as cancers or reproductive effects from chronic low level exposures.
	Magnetic fields	Exposure to strong magnetic fields may cause adverse health effects for individuals with medical devices. In strong magnetic fields, metal materials, tools or devices can be attracted presenting physical hazards.
	Microwaves	Microwaves present heat and burning hazards.
	Lasers	Lasers can cause damage to the eyes and burns to the skin.
Laboratory equipment hazards	Cuts, punctures, scrapes, bruises	The most common laboratory injuries come from contact with sharp equipment or tools (needles, scalpals), slips, trips, falling objects, broken glass, etc.
	Electrical hazards	Electrical hazards include use of high-voltage equipment, wet environments, harsh environments that may deteriorate insulation, automatically starting equipment, malfunctioning or improperly maintained equipment, or improper use of power cables.
	Mechanical hazards	Some equipment has moving parts that may present pinching or crushing hazards, may catch loose clothing, or may vibrate or move while running.
	Burns	Fires, hot plates, extreme cold, and hot equipment are common in labs and may cause burns without proper precautions.
	Flying particles	Flying particles and chemicals may occur frequently and without warning from various lab equipment and operations.
	Intense light	UV and laser light may cause burns or eye damage.
	Vacuum/pressure	Containers placed under high vacuum or pressure can implode or explode in certain circumstances.
	Noise	Equipment may generate enough noise to cause damage to hearing or prevent communications in an emergency situation. Also, high frequency sound or sustained exposure to noise may cause hearing damage.
	Electric and magnetic fields	Electric and magnetic fields (EMFs) are invisible lines of force associated with the use of high-voltage electric power. Health effects are uncertain, but individuals with pacemakers or metallic implants should take precautions.
	Batteries	Some batteries contain corrosive liquids or may generate hydrogen gas while charging. Others can explode if overcharged or contain heavy metals.

Hazard Class	Hazard Type	Hazard Information
	Radiation	Equipment capable of producing ionizing (i.e. X-ray) or non-ionizing (i.e. lasers) radiation. High doses or long duration of exposure may cause biological effects such as cancer.
Workplace environmental hazards	Ergonomics	Certain tasks in the laboratory may involve heavy lifting or repetitive motions that, over time, may lead to musculoskeletal disorders.
	Hot/cold environments	Work in refrigerated environments or field work may present certain safety hazards from exposure to temperature extremes.

5.2 Hazard Identification Techniques

When identifying, and assessing hazards in a laboratory environment, it is important to engage faculty, staff and students wherever possible in the process. Those individuals exposed to the hazards are well positioned to provide good information and advice as well as protective and preventative measures that will work. Engaging stakeholders in the process also supports a collective ownership in health and safety. Workplace hazards may be identified through a number of formal and informal processes summarized in Table 2.

Table 2: Hazard identification techniques

Technique	Process
Hazard assessment	A hazard assessment involves examining the work environment, processes, equipment and activities to identify hazards for the purposes of determining appropriate safety control measures. A common form of hazard assessment is the job safety analysis (JSA). In a JSA work activities are broken down into their functional steps and hazards associated with each step are identified together with appropriate safety control measures. During the development and implementation of new (or existing) research protocols, health and safety hazards should be considered in the development process.
Routine workplace inspections	Routine workplace inspections performed by faculty and staff is an effective technique for identifying hazards, safety issues, and behaviours of staff working in the laboratory environment.
Incident/non-conformance investigations	Faculty, staff and students should be encouraged to report identified hazards, safety issues/concerns, and gaps in procedures or processes within the laboratory environment. Reported incidents and reported non-conformances in the laboratory work environment can serve as way to assess workplace conditions, hazards, and practices towards minimizing a recurrence of the incident or non-conformance.
Regular safety meetings	Routine safety meetings provide faculty and staff an opportunity to talk about safety in their work areas and to raise issues or concerns related to their work environment.

5.3 Hierarchy of Hazard Control

Hazards in the workplace may be addressed using a combination of methods summarized below in order of effectiveness:

Elimination – The process of removing a hazard from the workplace. This is the preferred method of controlling a risk because the hazard has been removed.

Substitution – The process of substituting a hazardous chemical or substance with a less hazardous one effectively reducing the hazard associated with the initial chemical or substance. An example is substituting organic solvents with water-based solutions.

Engineering Controls – Methods that are built into the design of a facility, equipment or process to minimize/eliminate the hazard. Engineering controls are a very reliable way to control worker exposures as long as the controls are designed, used, and maintained properly. The basic types of engineering controls include process control, enclosure and/or isolation of emission source, and ventilation.

Administrative Controls – Controls that are put into place to direct activities in a workplace. Administrative controls typically take the form of worker training, policies, operational rules, practices, and procedures.

Personal Protective Equipment (PPE) – Refers to clothing or equipment a worker can wear to protect against injury from chemicals, cuts, heat, flying debris, and inhalation. PPE is worn to protect against exposures from workplace hazards when engineering and/or administrative controls are unable or insufficient alone in providing protection from these hazards. It places a barrier between the hazardous material and the individual.

5.4 Risk and Prioritization

Once hazards have been identified, hazards and risks should be managed according to a risk priority process. This process should take into account the relative severity of the hazard occurring, as well as the relative probability of the hazard occurring. Highest risk activities must be appropriately managed immediately, and other activities should be managed according to the risk they present on a priority basis.

Whenever possible, the hazard should be managed at the highest level possible on the hierarchy of hazard control list. For example, if the hazard cannot be eliminated entirely (elimination), then substitution with other materials, processes or equipment should be considered. If substitution is not effective at managing the hazard, then engineering controls should be established if possible, etc. This hierarchy approach to instituting preventive and protective measures should continue until a suitable solution is achieved. In most cases, a combination of measures will be necessary to effectively manage the hazard.

6 Laboratory Requirements

6.1 Standard Operating Procedures

Laboratory research and activities within Health Sciences should be, to the extent possible, governed by established and documented standard operating procedures (SOPs).

Standard operating procedures serve to ensure consistency and quality of work procedures, and that health and safety hazards are adequately managed during the work activities. Standard operating procedures also serve as a training tool for faculty, staff, and students tasked with performing the work.

Safety Resources provides templates for the development of SOPs. For assistance, contact Safety Resources at 306-966-4675.

6.2 Access and Security

To ensure appropriate security for Health Sciences laboratories faculty, staff, students, and visitors shall adhere to the following requirements.

- Only authorized individuals are permitted to access Health Sciences laboratories;
- Laboratory doors must be closed and locked at all times;
- Laboratory access cards and/or keys are not to be shared with other staff, students, or visitors;
- Immediately report to your supervisor and to the laboratory manager if you have lost your access card/keys;
- Report unauthorized access, or suspicious individuals or activities to your supervisor and the laboratory manager;
- Immediately report missing hazardous materials and/or equipment to your supervisor, laboratory manager, and to the respective safety specialist (i.e. BioSafety, Radiation Safety Officers).

6.3 Laboratory Safety Equipment

6.3.1 First Aid Kits

Stocked first aid kits are available in all laboratories. First aid kits must be inspected regularly and restocked as required. All faculty, staff, and visitor should know the location of the first aid kit in the laboratory before commencing work.

6.3.2 Fire Extinguishers

Hand held fire extinguishers are provided in all Health Sciences laboratories. The type of fire extinguisher that is used on campus, exclusively, is the ABC dry powder extinguisher. This will extinguish a type A (combustible materials), B (flammable/combustible liquids) or C (energized

electrical equipment) fire, any one of which could occur in a laboratory or general office spaces in Health Sciences.

Fire response procedures including building evacuation procedures are provided in the Health Sciences Emergency Response Plan. Faculty, staff and students should become familiar with the location of their nearest fire extinguishers and the emergency response plan.

Fire extinguishers are inspected annually by Safety Resources.

For information regarding fire safety training or questions regarding fire extinguisher maintenance and/or replacement, please contact Safety Resources at 306-966-4675.

6.3.3 Eyewashes and Safety Showers

Where there may be a risk of exposure to the eyes of a worker from corrosive or other harmful substances or where there may be a risk of substantial contamination of a worker or of a worker's clothing from corrosive or other harmful substances, an approved emergency eyewash and safety shower must be provided by the employer.

Approved eyewashes and safety showers are provided in the Health Sciences laboratories where the need for them has been identified.

Under the provincial health and safety regulations, emergency eyewashes and showers must be function tested weekly to confirm their operation. Weekly function tests are expected to be performed by laboratory personnel and recorded. Refer to the *Emergency Eyewash and Safety Shower Function Testing Procedure* for detailed procedures. Safety Resources will supply procedures, equipment and training for staff to perform the function tests. If an emergency eyewash or shower is suspected or determined to not be working, the Facilities Management Division Zone Manager should be contacted.

Safety Resources performs annual comprehensive function tests of all emergency eyewashes and showers in the Health Sciences Buildings. If you require assistance, please contact Safety Resources at 306-966-4675.

6.3.4 Fume Hoods

Fume hoods are a ventilated enclosure designed to capture and contain hazardous vapours, gases and fumes and exhaust them from the building. Fume hoods are designed to protect the worker. When a fume hood is used properly, only about 0.0001% to 0.001% of the material released in the hood actually escapes and enters the laboratory. Fume hoods provide no protection to the products being used in the fume hood or to the environment (unless exhausted vapours are filtered). Refer to Section 8.1 for guidelines that should be adhered to while using a fume hood.

Fume hoods at either end of the large laboratories are constant flow hoods. This means that a constant flow of air is provided regardless the position of the sash. The fume hoods in the side

rooms of the various labs are variable flow hoods where the phoenix valve increases or decreases the air flow depending on the position of the sash. There is no on-off switch.

Some fume hoods have an on-off switch to shut off the air flow controlled by the phoenix valve, but not the fan motor.

6.3.5 Snorkels

Some Health Sciences laboratories are equipped with snorkel ducts, which consist of a bell mouth and an articulated connection to the exhaust system. The main difference between your laboratory fume hood and the snorkel is that the latter does not fully surround the reaction at the point of release. For this reason, snorkels are not a substitute for a fume hood when handling toxic chemicals. Snorkels are far less effective in capturing dusts, mists, or fumes, and can typically only capture contaminants released within 15 cm (6 inches) of the unit. Snorkels are extremely susceptible to cross drafts.

A good use for laboratory snorkels is the capture and removal of thermal updrafts from bench top heated processes, or as local ventilation for bench top apparatuses such as gas chromatographs. Snorkels generally operate at 45 feet per minute (fpm).

6.3.6 Biosafety Cabinets

The Health Sciences laboratories are equipped with biosafety cabinets and used when working with biohazardous materials. Biosafety cabinets are designed to provide personnel, environmental and product protection when appropriate practices and procedures are followed.

The elements outlined in Section 8.2 for the proper use of a BSC should be incorporated into the applicable standard operating procedures that are to be followed by facility personnel.

6.3.7 Autoclaves

Infectious material and toxins, together with associated waste (e.g., petri dishes, pipettes, culture tubes, and glassware), can be effectively decontaminated in an autoclave. The effectiveness of decontamination by steam autoclaving is dependent on the temperature to which the material is subjected as well as the length of time it is exposed. Proper operation, loading, and monitoring of autoclaves are critical to ensure decontamination is achieved. Particular attention should be given to packaging, including the size of the containers and their distribution in the autoclave. Items should be arranged in a manner that allows the free circulation and penetration of steam.

Autoclaves can also be used to sterilize various materials for tissue cultures, etc.

The elements outlined in Section 8.3 for the proper use of autoclaves should be incorporated into the applicable standard operating procedures that are to be followed by facility personnel. Personnel should receive training prior to using the autoclaves.

6.3.8 Safety Equipment Maintenance and Testing

Safety equipment needs to be maintained on a regular basis to ensure its proper operation. Equipment maintenance schedules and responsibilities are summarized in Table 4.

Table 4: Safety equipment maintenance and testing requirements

Engineered Control/Safety Equipment	Frequency of Inspection/Testing/Maintenance	Party Responsible
Fume hoods	Annually	Safety Resources
Fire extinguishers	Annually	Safety Resources
Eyewash and Safety Showers (flush testing)	Weekly	Laboratory personnel
Eyewash and Safety Showers (full function test)	Annually	Safety Resources
Autoclaves (maintenance and permitting)	Annually	Facilities Management Division
Radiation contamination monitors	Annually	Safety Resources
First Aid kits	Annually	Laboratory personnel

All equipment or devices undergoing repair or maintenance must be decontaminated before being released from the laboratory. Complete the appropriate paperwork (e.g. Equipment/Area Release Form).

If you have questions or require assistance with safety equipment, please contact Safety Resources at 306-966-4675.

6.4 Personal Protective Equipment (PPE)

Personal Protective Equipment, while an important protective measure is essentially the “last line of defense” between you and the hazard. As such, it is very important to clearly assess and establish what the PPE requirements are for the laboratory, and to ensure faculty, staff and students have access to or are assigned required PPE, and finally, that they are appropriately trained on its use and care.

Health Sciences faculty, staff and visitors working with hazardous materials in laboratory spaces shall wear long pants, fully enclosed shoes, socks, eye protection, gloves, and a laboratory coat. Shorts, dresses, or sandals are not permitted when working in laboratory spaces.

Laboratory coats or gloves are not to be worn outside laboratory spaces. If required in multiple locations, coats should be removed and placed in a plastic bag for transportation between laboratories if it is not practical to keep a coat in each work location.

Each laboratory has a laundry basket where users can place their soiled laboratory coats. The lab coat must be labelled with the room number and Supervisor’s name. Every Tuesday, of every second week, the laundry baskets are emptied by the wash up technician. In order for the lab coat to be laundered, the Supervisor must have a CFOAPAL on file with the wash up technicians; otherwise they are left in the basket and returned.

Faculty, staff, Facilities Management Division (FMD) and Safety Resources personnel entering laboratories and not handling or near hazardous substances shall adhere to the minimum PPE requirements of wearing long pants and fully enclosed shoes.

For assistance or questions regarding PPE requirements, contact the Laboratory Manager or Safety Resources.

6.5 Procurement

The Health Sciences Supply Centre (HSSC) is located in the Health Sciences Facility on the ground floor in room B18. The HSSC provides a variety of services for occupants of the Health Sciences facility as well as other customers on campus.

The HSSC stocks a supply of common laboratory products at competitive prices, most products are priced at or below what you would pay if ordering yourself.

The HSSC can often source products at or below the cost an individual would be able to get due to our ability to combine orders on a daily basis so that suppliers deal with fewer orders but in larger quantities which provides everyone with the best prices and often with free shipping.

The online HSSC Order Form (http://healthsciences.usask.ca/) is to be used for all orders whether they are for stocked items that will be picked up at the window or for items you will need to order in. Using the form ensures accuracy of your order and billing information with less mistakes and less time required on both ends.

The HSSC receives all deliveries to the Health Science facility. With all laboratories being containment level 2, couriers and other shipping agents cannot deliver directly to the laboratories so the HSSC receives all deliveries whether they have placed the order or individual researchers or departments have placed the order.

To ensure timely delivery to your laboratory or office please provide the supplier with your contact information so all items shipped have your contact information clearly marked on the outside of all containers.

6.6 Safety Precautions

Faculty, staff, students and visitors are expected to adhere to the following general operational rules when handling hazardous materials in Health Sciences laboratories.

- Only authorized individuals should be permitted to work in the laboratory;
- Laboratory doors shall be kept closed and locked;
- Follow standard operating procedures for the work being performed;
- Obey posted warning signs;
- Wear appropriate PPE: laboratory coat, safety glasses, gloves, long pants, socks, and closed toed and heeled shoes;

- Keep laboratory clothing separate from street clothing;
- Personal belongings should not be used in the laboratory;
- Tie back or otherwise restrain long hair;
- Laboratory clothing shall be removed when leaving the laboratory or designated laboratory coat area;
- Do not eat, drink, or store food in the laboratory; lunches may be contained in a backpack and stored in a locker, but must be consumed outside the lab premises.
- Wash hands thoroughly with soap and water for 20 seconds after handling hazardous material and before leaving the laboratory;
- Maintain up-to-date inventories of all hazardous materials;
- Properly store chemicals (refer to the Lab Safety Manual for details);
- Adhere to WHMIS requirements;
- Use fume hoods when working with dangerous/volatile substances;
- Use snorkels to capture vapours emitted from chemicals when working at laboratory benches;
- Keep the laboratory neat and tidy; free of obstructions, and free of materials that are in excess;
- Routine cleaning is to be carried out by laboratory personnel or other staff specifically trained for the task;
- All equipment or devices, which are to be sent for repair or maintenance, must be decontaminated before being released from the laboratory. Complete the appropriate paperwork (e.g. Equipment/Area Release Form);
- Routinely inspect your workplace and address identified health and safety issues;
- Immediately report unsafe conditions to your supervisor;
- Dispose of hazardous waste on a regular basis and in accordance with the *Hazardous Waste Disposal Standard.*
- Know emergency and spill response procedures for your laboratory and building.

6.7 WHMIS

The Workplace Hazardous Material Information System (WHMIS) is the national hazardous materials classification system intended to provide workplace standards for the control, handling, storage, and disposal of controlled products which can impact the health and safety of the workplace and its employees. Controlled products is the name given to products, materials, and substances that are regulated by WHMIS legislation. All controlled products fall into one or more of six WHMIS classes.

Under the Saskatchewan *Occupational Health and Safety Act and Regulations*, all individuals handling or working with hazardous materials must receive training in WHMIS to ensure they know how to recognize hazardous materials, how to identify the hazards associated with these materials, and how to safely use, handle, store, and dispose of hazardous materials.

WHMIS training is available online through the Safety Resources website, http://www.safetyresources.usask.ca and refresher training is required every 3 years. For more

information on required safety training, or for other training needs, please contact your supervisor or Safety Resources at 306-966-4675.

Under WHMIS regulations, suppliers must provide labels on containers of all controlled products sold or imported for use in the workplace as well as Material Safety Data Sheets (MSDS).

Faculty and staff are responsible to:

- Ensure controlled products are properly labeled when working with them in Health Sciences Laboratories.
- Ensure MSDS are available, current, and readily available for all controlled products being used and stored within Health Sciences Laboratories.

Workplace labels are required on containers of controlled products stored and used in Health Sciences laboratories, and on secondary containers where the product has been transferred from the original container. Workplace labels may also be used to replace a damaged or missing supplier label on the original containers. A summary of workplace labelling requirements is presented in Table 4.

Table 4: Workplace WHMIS label requirements where a controlled product has been transferred from its original labelled container

Label Type	Label Requirements
Workplace labels	• Product identifier (product name) • Safe handling information • Reference to MSDS • May include hazard symbols • Must be in English • If the controlled product is not used right away, or if more than one person will be in control of the product, a workplace label is required
Workplace WHMIS labelling not required	• When the controlled product is poured in a container and it is used immediately • The controlled product is under the control of the person who decanted it, and is all used during the work shift; a product identifier must be attached to the container

6.8 Chemical Storage Guidelines

Following are guidelines for the safe and proper storage of chemicals in the Health Sciences laboratories:

- Adhere to manufacturer recommendations for the storage of chemicals;
- Do not store chemicals alphabetically;
- Flammable or combustible liquids, toxic chemicals, explosive chemicals, oxidizing agents, corrosive chemicals, water-sensitive chemicals, and compressed gases should be segregated from each other;
- Volatile liquids must be kept away from heat sources, sunlight, and electric switches;

- Chemicals must be stored in such a way that they will not mix with each other if a container leaks or breaks;
- Keep pressurized gases securely strapped to a wall or bench at all times and their safety caps on while not in use; and
- Keep health toxins and other especially dangerous items under added security.

More detailed chemical compatibility information for common chemicals is provided in the Appendix.
Safety Resources is available to assist in reviewing and developing a storage plan and to answer questions about storage.

6.9 Inventory Management

The *Saskatchewan Occupational Health and Safety Regulations* require that an employer develop and maintain an up-to-date list of all substances (chemical, biohazardous, nuclear) that may be hazardous (or of concern) to the health and safety of workers at the place of employment and that this list be made available for inspections or emergency situations as well as to the workers for their use. This inventory must also identify WHMIS controlled products. Inventories should be reviewed at least annually (or more frequently, if hazards dictate) to confirm inventories and to determine if substances have expired, are missing, or are no longer being actively used. Contact the Waste Management Facility at 306-966-8497 for the collection and disposal of hazardous materials.

In the Health Sciences building, *Chemoventory,* web-based software is used to manage the chemical inventory, MSDSs, and chemical users. Each faculty is responsible for ensuring their chemical inventory is inputted into the software system and current. Contact a Lab Manager for training on the *Chemoventory* software program.

6.10 Decontamination

Decontamination is the process by which materials and surfaces are rendered safe to handle and reasonably free of microorganism, toxins or nuclear substances. Decontamination procedures represent a critical containment barrier; failure in the procedures can result in occupational exposures, or the unintentional release of infectious materials, toxin or nuclear substances.

Faculty and staff are responsible to adhere to strict decontamination procedures in accordance with the work being performed.

Biosafety permit holders should refer to their biosafety plan for the specific chemical disinfectant(s), contact time, and concentration required to render the particular biohazardous materials harmless and for the appropriate method of disposal of associated chemical waste. Nuclear substance permit holders must adhere to their operational, contamination monitoring, and decontamination procedures.

Hazardous waste generated during decontamination processes must be disposed of in accordance with the university's *Hazardous Waste Management Standard*.

6.11 Hazardous Waste Disposal

Effective management of hazardous materials necessitates understanding the hazards, use, storage, emergency response, and disposal requirements for their safe use. Core to hazardous materials management is knowing what hazardous materials you have in the laboratory environment, immediate work area, and storage areas.
Hazardous waste generated through the course of research, academic or other activities within Health Sciences shall be managed and disposed of in accordance the university's *Hazardous Waste Disposal Standard*.

The *Hazardous Waste Disposal Standard* specifies the processes and minimum requirements for the safe disposal of biological, chemical, and radiological waste generated from research, academic or other activities at the university.

It is the responsibility of the supervisor and all individuals generating hazardous waste to properly manage hazardous waste to ensure safe and environmentally responsible disposal in accordance with federal, provincial, and municipal regulations as well as university standards. Hazardous waste shall not be released to the environment through regular garbage or through the sanitary or storm sewer system. It must be collected and disposed of according to the processes and requirements outlined in the *Hazardous Waste Disposal Standard*.

Hazardous waste disposal forms for the disposal of chemical and biohazardous material through the Waste Management Facility are available online on the Safety Resources website, http://safetyresources.usask.ca/. Hazardous waste disposal forms for radioactive waste are available at the Safety Resources office. Contact the Waste Management Facility at 306-966-8497 for the collection and disposal of hazardous materials, or if you have questions about hazardous waste management.

Individuals disposing of biological waste disposed of through an external company should complete the Biowaste Training course to ensure they follow proper protocol.

6.12 Transportation of Dangerous Goods

6.12.1 Off Campus

Individuals who package and/or complete shippers declarations for the transportation of dangerous goods (TDG) on or off campus must have received training and hold a valid training certificate. Training and certificates are obtained through Safety Resources.

6.12.2 On Campus

All substances being transported to or between laboratories must be in a secondary container that shall be capable of containing all of the substance (i.e. absorbent material) in the event it is

dropped or the primary container leaks for any reason. The primary container should be WHMIS labelled and the secondary container should have the contact person's name and telephone number or room number printed on the outside.

If transporting biohazardous material, ensure all packaging is done inside the biosafety cabinet and the package surface is decontaminated with the appropriate disinfectant and contact time prior to removing it from the biosafety cabinet.

When transporting hazardous materials within the same building or between buildings, the transport should take place when pedestrian traffic will be at a minimum.

Personal modes of transportation (vehicles, bicycles) cannot be used to transport hazardous goods on campus. If the amount of chemicals to be transported cannot be done by walking or using a push cart (with side rails) contact Safety Resources for guidance.

For transportation outside of buildings, it is recommended that an Emergency Response Plan be included with the package in case the carrier is unable to respond in the event of a spill.

6.13 Facility and Equipment Maintenance and Decommissioning

The *Facility Decommissioning Standard* has been developed to ensure faculty, staff, students, and visitors understand their responsibilities and the minimum requirements when vacating research spaces, teaching areas, or facilities that involve hazardous materials and/or activities that have known health, safety or environmental implications.

Under the *Facility Decommissioning Standard*, decommissioning of space is required when:

- The individual (faculty, staff, students, visitors) is no longer working in the space(s);
- The individual is leaving the university;
- The individual is ceasing to use hazardous materials in the space(s);
- The individual is relocating instruments or equipment that pose hazards, or that have been used for research, academics, storage or other activities involving hazardous materials;
- The individual is cancelling a university issued biosafety and/or nuclear substance permit(s);
- The individual is cancelling a licence, permit or certification granted by a federal or provincial regulatory body;
- The individual is relocating to another space on campus; or
- The space is being renovated or is to be demolished.

Following is the general process to be followed to clean and decontaminate equipment and tools that are to be removed from a laboratory space and/or undergo maintenance or repair.

1. Place all sharps (e.g. blades, needles, syringes) in an approved sharps container in accordance with the *Hazardous Waste Disposal Standard*.

2. All equipment and tools contaminated or potentially contaminated with hazardous materials (chemical, biological, nuclear) shall be decontaminated using appropriate techniques before removal from the space(s). This includes equipment destined for disposal or relocation to another space(s) or to another institution. Any vacated benches or work surfaces including fume hoods must be cleared of all debris such as broken glass or pipette tips and washed with soap and water or decontaminated appropriately. This is the responsibility of the users, not the custodial staff.

   Decontamination of some equipment such as biosafety cabinets and autoclaves shall be confirmed through the use of bio-indicators. Decontamination of equipment contaminated or potentially contaminated with nuclear materials shall be verified through radiation contamination monitoring techniques such as wipe tests.

3. An *Equipment Release Form* must be completed for each piece of equipment in the work space even if the equipment is to remain in the space. On the form, indicate the known hazards associated with the equipment and work area, the processes used to decontaminate the equipment, and any personal protective equipment and safety precautions that must be adhered to when working in the area and/or on the equipment.

4. Hazardous waste generated in the process of cleaning, disinfecting or decontaminating equipment and tools shall be disposed of in accordance with the *Hazardous Waste Disposal Standard*.

Laboratory and equipment maintenance, repairs or changes should be coordinated in consultation with the laboratory manager. For assistance with facility decommissioning, contact Safety Resources at 306-966-4675.

6.14 Inspections

Regularly scheduled inspections should be conducted of Health Sciences laboratories to monitor work activities and behaviours and to identify health, safety or environmental hazards.

Inspections may be conducted by Laboratory Managers and/or faculty and staff within the laboratory spaces. The frequency of inspections should be based on the type of risks present in the work space. Based on best practices, self-inspections should be conducted at a minimum of four times a year.

Identified hazards and issues should be addressed in consultation with Laboratory Manager, faculty and staff in the laboratory, and Health Sciences administration.

Self-inspection checklists are customized for Health Sciences laboratories. Contact the Lab Manager for a copy.

For assistance with self-inspection processes or to address identified hazards, contact Safety Resources at 306-966-4675.

7 Safe Work Practices

7.1 Housekeeping

Cluttered work areas can lead to incidents, so work areas must be kept tidy and organized. Chemicals and equipment are to be properly stored when not in use. Clean work surfaces regularly. Use bleach or other appropriate disinfectants to clean work surfaces that may have come in contact with biological or biohazardous materials.
Personal items (i.e. cell phones, ipods) should not be used in areas where hazardous substances are handled or stored.

Floors, walkways, hallways, and doorways must be kept clear at all times to eliminate slipping and tripping hazards.

Access routes to emergency equipment (emergency showers and eyewash facilities, fire extinguishers, first aid kits) must be kept clear of obstruction.

Keep floors dry and clean up any liquids, refuse, or waste materials that spill or accumulate on the floors in laboratory spaces.

7.2 Personal Hygiene

Personal hygiene is a very important way of protecting personnel working in a laboratory environment and with hazardous materials. Following are general hygiene practices that should be followed by all faculty, staff, students and visitors working/learning in laboratory environments.

- Follow laboratory access procedures and PPE requirements;
- Do not smoke, drink, chew gum, eat or store food or drinks;
- Avoid touching personal belongings (i.e. cell phones) and exposed skin with contaminated hands;
- Wash hands regularly with soap and water for 20 seconds, after handling hazardous materials, before leaving the laboratory, and before eating, drinking, or smoking;
- Practice good housekeeping; regularly wash/decontaminate work surfaces;
- Do not wear laboratory coats or protective clothing outside laboratory areas; and
- Remove and clean contaminated clothing before wearing it again, or dispose of it in accordance with the university's *Hazardous Waste Disposal Standard*.

For further information or assistance on personal hygiene in a laboratory environment, contact Safety Resources at 306-966-4675.

7.3 Ergonomics

Laboratory tasks and equipment can be widely varied and highly specialized. Common laboratory tasks with associated muscular skeletal injury (MSI) hazards and possible controls are presented in the following sections.

Common MSI hazards in a laboratory environment include:

- Awkward postures;
- Sustained postures;
- High forces;
- Contact stress;
- Precision movements; and
- Extended and sustained reach;

Laboratory work today has the characteristics of high intensity, precision work, fast paced, repetitive work, and difficult techniques in a high pressure and competitive environment.

Following, are safe work practices to minimize ergonomic hazards associated with laboratory environments.

- Ensure computer workstation is properly setup. Refer to the *Office Ergonomics Self Help Manual* to help identify and control hazards associated with computer workstation use.
- Practice safe lifting techniques when lifting materials, containers, and equipment. The *Materials Handling Ergonomics Manual* is available to help identify and control hazards associated with lifting;
- Ensure you have proper laboratory task seating and that it is adjusted to a height that allows the shoulders to relax and provides enough knee and leg space to prevent contact pressure and awkward leg position (knee flexed greater than 90 degrees);
- Provide an adjustable height footrest if seated for a long period of time and if space allows;
- If standing for long periods, use anti-fatigue matting;
- Sit/stand as close as possible to your work;
- Alternate or rotate repetitive and/or prolonged tasks to vary the stress on muscles and joints; plan daily tasks to increase variation in body posture;
- Use ergonomically designed pipettes; alternate other activities with pipetting tasks as is practical;
- When working in fume hoods/biosafety cabinets, work 15 cm (6 inches) inside the enclosure; position work supplies in the their order of use, with most frequently used items near the front of the enclosure;
- For microscopy, use adjustable eyepieces or eyepiece extensions or mount the microscope at a 30 degree angle to reduce awkward neck positions; an adjustable microscope stand can help; avoid long continuous periods of microscope use; use a video display system when appropriate for the sample; rotate tasks and take adequate breaks away from the microscope;
- Avoid storing heavy or frequently accessed items over shoulder height or on low-level shelves; and
- Take short breaks to stretch muscles and relieve forearm and wrist pressure.

For further information on laboratory ergonomics, refer to the university's *Laboratory Ergonomics Manual*. For further assistance with ergonomics, contact Safety Resources at 306-966-4675 or Wellness Resources at 306-966-4580.

7.4 Electrical Safety

Following are general electrical extension cord, power strips and power cords safety considerations when working in a laboratory:

- Extension cords should be a minimum 16 gauge (AWG);
- Extension cords are for temporary use only. For permanent applications, request installation of additional electrical outlets from FMD;
- Using only approved (e.g. UL approved) electrical power strips with surge protection;
- Use polarized extension cords with polarized equipment, instruments and appliances. Polarized plugs have one blade slightly wider than the other and can only be inserted one way into the outlet. Polarization and grounding ensure that certain parts of appliances that could have a higher risk of electric shock when they become live are instead connected to the neutral, or grounded, side of the circuit. Such electrical products should only be used with polarized or grounding type extension cords;
- Routinely inspect power and extension cords. The plug should be molded to the cord or have a clamping mechanism that fits snugly around the cord without pinching. The cord should not be frayed or have exposed wiring. Even a small nick in the insulation of a power cord or extension cord can be deadly. Electrical tape is not an acceptable repair for a damaged cord, replace the entire cord;
- Power cords must have grounding plugs or be double insulated. Never remove the third (round or U-shaped) ground prong from electrical cords. The ground prong is a safety feature designed to reduce the risk of shock and electrocution;
- Do not daisy extension cords (connecting multiple cords or power strips together);
- Carefully place power and extension cords so they don't come in contact with water or chemicals. Contact with water is a shock hazard. Corrosives and solvents can degrade the cord insulation;
- Do not allow cords to dangle from counters or hoods in such a manner that equipment could be unplugged, fall, or cords could be tripped over;
- Do not use staples or nails to attach extension cords to a baseboard or to another surface. This could damage the cord and present a shock or fire hazard;
- Do not allow cords to contact hot surfaces to prevent melting insulation;
- Do not lift a piece of electrical equipment by the cord or pull the cord to disconnect it from the outlet in order to prevent damage;
- Never use an extension cord while it is coiled or looped;
- Never cover any part of an extension cord with newspapers, clothing, rugs, or any object's while the cord is in use;
- Extension cords may be plugged into cord connected ground fault circuit interrupters (GFCI) if the permanently attached cord on the GFCI device is less than six feet in length;
- Insert plugs fully so that no part of the prongs are exposed when the cord is in use;
- Check the plug and the body of the extension cord while the cord is in use. Noticeable warming of these plastic parts is expected when cords are being used at their maximum rating. However, if the cord feels hot or if there is a softening of the plastic, this is a warning that the plug wires or connections are failing and that the extension cord should be discarded and replaced; and

- Check for hot or discolored outlet wall plates that may indicate dangerous heat buildup at the connections.

8 Laboratory Safety Equipment

8.1 Fume hoods

To ensure maximum protection, the following guidelines should be adhered to while using a fume hood.

- Check the Safety Resources inspection sticker on the hood to ensure it has been inspected within the past 12 months. Safety Resources measures the face velocity of all hoods annually, notes any deficiencies, and refers them to the Facilities Management Division for correction. Recommended face velocities are between 80-140 feet per minute (fpm).

- Cease using a fume hood if it alarms. Most fume hoods will display the face velocity flow rate and will alarm should the face velocity fall outside acceptable operational limits.
- Do not store chemicals/materials in the hood. Using a fume hood for storage can disrupt the airflow within the hood that is vital for containing hazardous vapours.

- Wear a laboratory coat, eye protection, and gloves when working with a fume hood. The use of a laboratory fume hood does not negate the need to wear appropriate personal protective equipment.

- Never remove the airfoil or modify the hood. Altering a fume hood in any fashion will affect the hoods performance to contain hazardous vapours, putting the worker using the hood at risk.

- Always position the fume hood sash at the indicated height between you and your work. The sash should always be kept at the indicated height to ensure that the airflow across the sash opening will always be sufficient as well as provide some protection to the worker from splashes and splattering.

- Open/position the fume hood sash slowly. Opening a sash rapidly can cause the vapours to be expelled from the fume hood into the immediate vicinity of the room.

- Move slowly within the fume hood. When working in a fume hood, moving your arms and hands in a quick or fast manner can affect the containment of the hood and vapours may escape out of the hood and into the room.

- Never put your head in the hood when in use. Inserting ones head into a fume hood while in use will result in an exposure to the worker.

- Work only within the dished (recessed) area of the fume hood surface. In this area of the fume hood, the potential to capture and contain vapours is the greatest. As well, small spills will be contained in this area.

- Remove electrical units or other spark sources from the fume hood when flammable liquids or gases are present. Do not place power strips or surge protectors in the hood. Plug in all electrical equipment outside of the hood.

- Minimize pedestrian traffic in front of the fume hood. Excess traffic in front of a fume hood can affect air flow around the fume hood and subsequently containment, allowing hazardous vapours to escape from the fume hood and into the room.

- In a power outage, lower the fume hood sash to within 5 cm (2 inches) of the airfoil. Lowering the sash will help keep fumes/vapours within the fume hood while still allowing for airflow through the hood via the chimney effect.

8.2 BSC procedures

The elements outlined below for the proper use of a BSC should be incorporated into the applicable standard operating procedures that are to be followed by facility personnel.

Start-Up Considerations

- Ensure that the BSC sash is at the appropriate height. Adjust stool height so that underarms are level with the bottom of the sash.
- Check the pressure gauges to ensure that readings are within the acceptable range.
- If present, test the airflow alarm and ensure it is switched to the “on” position.
- Confirm inward airflow by holding a tissue at the middle of the edge of the sash to ensure that it is drawn in.
- Disinfect the interior surfaces with a disinfectant and proper contact time effective against the infectious material and toxins in use in the laboratory.
- If a corrosive disinfectant must be used, the surface should be rinsed with water after disinfecting.
- Assemble all materials required for manipulation and place them into the BSC.
- Care should be taken not to overcrowd or block the front or rear grilles to ensure that the appropriate airflow patterns are not compromised.
- When there is significant potential for splatter or splashes to occur during manipulations of infectious material or toxins, the work area should be lined with a plastic-backed absorbent pad.
- Place aerosol generating equipment (e.g., mixers, vortex) towards the back of the BSC, without blocking the rear grille.
- After placing the material in the BSC, allow sufficient time (5 minutes) for the airflow to stabilize before initiating work.

Working in the BSC

- Perform operations as far to the rear of the work area as possible.
- Ensure that elbows and arms do not rest on the grille or work surface.

- Avoid excessive movement of hands and arms through the front opening, which can disrupt the air curtain.
- Arms should enter/exit the BSC slowly and perpendicular to the front opening.
- Keep a bottle of an appropriate disinfectant in the BSC while work is performed to avoid having to move hands outside of the BSC.
- Segregate non-contaminated ("clean") items from contaminated ("dirty") items.
- Work should always flow from "clean" to "dirty" areas (see Figure 1).

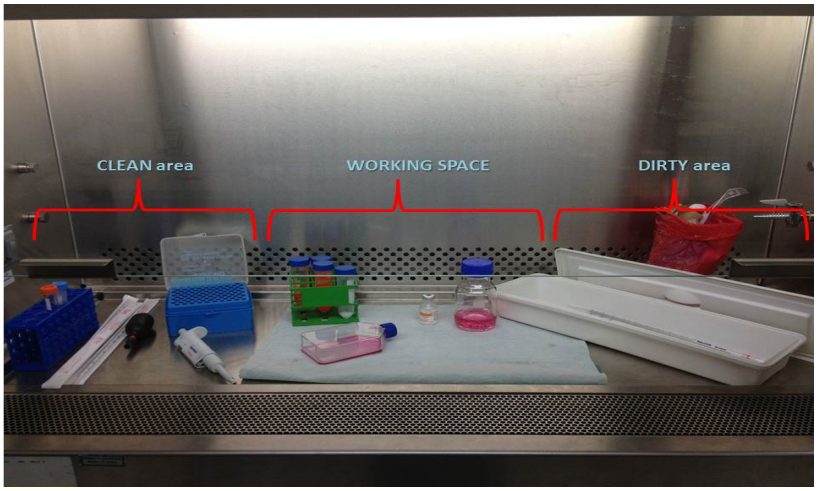

Figure: Proper setup when working in a BSC.

- Material should be discarded in a waste container located towards the rear of the cabinet workspace.
- **Do not** discard materials in containers **outside** of the cabinet.
- The work area should be decontaminated while the BSC is still in operation.
- Sustained open flames in the BSC are prohibited (e.g. bunsen burners, ethanol burners, etc.). On-demand open flames (e.g., touch-plate microburners) may be used as the duration of time for which the flame is produced can be controlled and limited. Non-flame alternatives (e.g. microincinerators, sterile disposable inoculation loops) should be used whenever possible.
- Natural gas and propane are prohibited from use in a BSC and any gas installed within the BSC is prohibited.
- Work in a BSC should only be conducted by one person at a time.
- Equipment creating air movement (e.g., vacuum pumps, centrifuges) may affect the integrity of the airflow and should not be used within the BSC.
- In the event of a spill, decontaminate the surface of all objects in the BSC.

Completion of Work in the BSC

- Upon completion of work, allow sufficient time for the air in the BSC to pass through the filter before disrupting the air curtain by removing hands or unloading material from the BSC.
- Close/cover all containers.

- Surface decontaminate items before removing them from the BSC.
- Disinfect the interior surfaces of the BSC, including sides, back, and interior of the glass, with a disinfectant effective against the agents in use.
- If a corrosive disinfectant is used, the surface should be rinsed with water after disinfection to avoid corrosion of the stainless steel surfaces.
- Routinely remove the work surface and disinfect the tray beneath it.
- Routinely wipe the surface of the lights within the BSC with ethanol.
- Ensure the user log is signed once work is complete.

Ultraviolet Light (UV) Considerations

Use of UV irradiation germicidal lamps is not recommended.

Personnel wishing to use UV irradiation in BSCs should receive training on the safe work practices required and the hazards of UV radiation beforehand, including the following elements:

- A liquid chemical disinfectant must be the primary method of cleaning and disinfecting the interior of a BSC.
- UV irradiation of the work area should only be used as a secondary method of maintaining the disinfected status of a cabinet. Never rely on UV irradiation alone to disinfect a contaminated work area.
- UV irradiation is ineffective if a microorganism is protected by dust, dirt, or organic matter.
- UV irradiation does not penetrate into cracks or through the grilles of a BSC.
- UV irradiation can cause deterioration of various materials, including certain plastic and tubing.
- Never touch a UV bulb with bare hands as the natural oils from hands may leave a fingerprint and create dead space on the bulb's surface.
- UV bulbs should be cleaned frequently with an appropriate disinfectant.
- The UV lamp should be routinely tested with a UV meter to ensure that the proper intensity (40 $\mu W/cm^2$) is being delivered at the appropriate wavelength (254 nm) in the centre of the work area.

For more information refer to the Biosafety Cabinet Guideline available on Safety Resources website www.safetyresources.usask.ca.

8.3 Autoclave

The elements outlined below for the proper use of autoclaves should be incorporated into the applicable standard operating procedures that are to be followed by facility personnel.

Personnel should receive training from a qualified users prior to using the autoclaves.

Before Loading the Autoclave

- Check inside the autoclave for any items left by the previous user that could pose a hazard (e.g. sharps).
- Clean the drain strainer.
- Confirm that any plastic materials used, including bags, containers and trays, are compatible with autoclaving. Some bags can impede steam penetration while others may melt during the cycle.
- Autoclave bags should be loosely open to allow adequate steam penetration.
- Loosen the caps of liquid containers to prevent bottles from shattering during pressurization. This should be done immediately prior to loading in order to minimize the risk of exposure/contamination if the container is tipped. Vented caps may be a suitable alternative.

Loading the Autoclave

- Load autoclave as per manufacturer recommendations.
- Avoid overloading containers and bags (should never be more than 3/4 full).
- Arrange containers, bags and trays in a manner that allows steam to circulate freely around all items. Avoid stacking or crowding containers, bags and/or trays.
- Consider placing all containers and bags in trays, with a solid bottom and walls, to contain spills.
- Avoid placing individual containers on the floor of the autoclave.
- Make sure the door of the autoclave is fully closed (i.e., latched) and that the correct cycle has been selected.

Unloading the Autoclave

- Don PPE, including eye protection (e.g. face shield), heat resistant long-cuff gloves, rubber apron, rubber sleeve protectors, and, when handling sharps, cut resistant gloves.
- Visually check the pressure gauge to ensure that the pressure has decreased inside the chamber prior to opening the door.
- Materials removed from the autoclave after effective decontamination, should be placed in disposal bags that clearly indicate that the waste has been decontaminated.
- Verify the autoclave cycle log to ensure decontamination parameters have been achieved.

Effective operating parameters for autoclaves must be established by using represenative loads and determing their processing times through the use of paremetric monitoring devices and/or biological indicators.

9 Safety Training

Faculty, staff and students working in Health Sciences laboratories require the minimum training and awareness as presented in Table 3.

Table 3: Safety training requirements

Training Course	Applicable To	Training Provider	Course Delivery Mode	Retraining Frequency
Employee Safety Orientation	New employees	Safety Resources	In-class	None
Job Specific Safety Orientation	New employees	Supervisors	Workplace specific	None
Laboratory Orientation	New employees	Lab Manager	In-laboratory	None
Supervisor Safety Orientation	Supervisors	Safety Resources	In-class	None
Laboratory Safety	All faculty, staff and students	Safety Resources	Online	3 years
WHMIS	All faculty, staff and students	Safety Resources	Online	3 years
Biosafety	All faculty, staff and students under a biosafety permit	Safety Resources	Online	3 years
Radiation Safety	All faculty, staff and students under a nuclear substance permit	Safety Resources	In-class	3 years
Transportation of Dangerous Goods	Faculty, staff and students shipping, receiving dangerous goods	Safety Resources	In-class	2 years (air) 3 years (ground)
Biowaste Training	Faculty, staff and students generating biological waste	Safety Resources	In-class	3 years
Emergency Response Training	All faculty, staff and students	Safety Resources	In-class	Annual

Training course offered by Safety Resources may be registered for on the Safety Resources website, http://www.safetyresources.usask.ca. For more information on required safety training, or for other training needs, please contact your supervisor or Safety Resources at 306-966-4675.

Safety Resources maintains training records for all training it provides. Workplace specific training records should be maintained by lab managers.

10 Control of Specific Hazardous Materials and Activities

10.1 Biohazardous Materials

In accordance with the University of Saskatchewan *Biosafety Policy* and *Biosafety Code of Practice*, individuals intending to acquire, possess, use, store, transport, or dispose of biohazardous materials must obtain a biosafety permit. A biosafety permit is only granted when all university, legislative, and granting agency requirements have been met.

Individuals working with Risk Group 1 biological material shall complete a *Biological Materials Declaration Form* and submit to the Biosafety Officer prior to work commencing. This form is available on Safety Resources' website www.safetyresources.usask.ca.

The Public Health Agency of Canada (PHAC) and the Canadian Food Inspection Agency (CFIA) regulate the importation of organisms and biological materials that pose a health risk to humans and to animals. The CFIA also regulates the importation of live animals, animal products and by-products, semen, embryos, pets, veterinary biologics, and plant pests.

University faculty, staff, students or visitors wishing to acquire organisms, biological materials, and known biohazardous materials (human, animal, plant) or other prescribed organisms and biological materials from sources outside of Canada may require an import permit from PHAC and/or the CFIA.

Currently, organisms, biological materials or biohazardous material obtained or purchased from sources within Canada do not require import or other permits from PHAC or the CFIA.

The procurement of risk group level 4 biohazardous materials from domestic or foreign sources is not permitted at the University of Saskatchewan.

The *Procurement of Organisms and Biological Materials Procedure* is a supplemental procedure supporting the procurement of new organisms, biological materials or biohazardous materials which may require a permit amendment. For further information on biosafety permit requirements, please refer to the *Biosafety Code of Practice*, *New Biosafety Permit Application Procedure*, and *Biosafety Permit Amendment Procedure* (http://safetyresources.usask.ca).

Safety Resources staff are available to assist clients at all stages in the procurement process. Contact Safety Resources at 306-966-4675.

10.1.1 Handling Biohazardous Materials

Faculty, staff, students and visitors are expected to adhere to the following general operational rules when handling biohazardous materials:

- Adhere to all requirements under issued biosafety permit;
- Adhere to the requirements of the *Canadian Biosafety Standards and Canadian Biosafety Handbook (2nd Edition, 2015)*;
- A Biosafety Cabinet (BSC) is to be used for procedures that:
    - May produce infectious aerosols or aerosolized toxins, when aerosol generation cannot be contained through other methods;
    - Involve high concentrations of infectious material or toxins;
    - Involve large volumes of infectious materials or toxins; and/or
    - Require aseptic techniques such as tissue cultures.
- All activities involving open vessels of infectious materials or toxins are to be conducted in a BSC;
- Gloves are to be removed before exiting a BSC;

- Centrifugation of infectious material where inhalation is the primary route of infection, shall be carried out in sealed safety cups that are unloaded in a BSC;
- Sharps are to be discarded in assigned sharps containers;
- Personal protective equipment must be decontaminated prior to disposal or laundering;
- Disinfectants effective against the infectious material in use and neutralizing chemicals effective against the toxins in use are to be used to decontaminate work areas and laboratory equipment.

10.2 Nuclear Substances

In accordance with the University of Saskatchewan *Radiation Safety Policy* and *Radiation Safety Code of Practice*, the University of Saskatchewan requires that all individuals intending to possess, use, store, transport, or dispose of any sealed, unsealed nuclear substance or radiation device obtain a nuclear substance permit.

The procurement of nuclear substances is managed in accordance with the *Procurement of Nuclear Substances and Radiation Devices Procedure* (http://safetyresources.usask.ca).

The Radiation Safety Officer authorizes the procurement of all nuclear substances and radiation devices. Safety Resources together with Purchasing Services shall manage the procurement and logistics for the nuclear substance or radiation device. Contact Safety Resources at 306-966-4675 for assistance.

10.2.1 Handling Nuclear Substances

- Only persons properly trained to work with nuclear substances, informed of the hazards involved, and are listed on a nuclear substance permit are permitted to work with nuclear substances or operate devices containing nuclear substances;
- Refer to Section 5 of the Radiation Safety Manual for safety precautions to be used when handling nuclear substances or radiation devices.

10.3 Laboratory Animal Service Unit

Laboratory Animal Services Unit (LASU) supports and services the research and academic needs of the Health Sciences community at the University of Saskatchewan through a commitment to excellence in animal care and welfare.

All individuals accessing the facility and/or ordering animals, must adhere to the policies and procedures as specified in the LASU *Health Sciences Vivarium Research Handbook*. (http://healthsciences.usask.ca/services/lasu/).

11 Working Alone

Working alone in certain circumstances, situations, or environments can increase the risk to the health and safety of the worker.

Supervisors shall review each work area under their control to identify individuals who do/may work alone and ensure all reasonably practicable steps are taken to protect the health and safety of those workers. Working alone in laboratories after regular work hours while handling hazardous materials is generally not recommended.

In instances where individuals are permitted to work alone, supervisors must ensure:

- Individuals are fully trained in the tasks they are to perform and know the hazards and protective measures;
- Individuals are aware of what activities they are not permitted to perform when working alone;
- There exists a communications plan/mechanism to confirm that the individual is safe and/or if the individual needs assistance; and
- The individual is familiar with the laboratory emergency response procedures.

For assistance in developing work alone procedures, contact Safety Resources.

12 Emergency Preparedness and Response

Local emergency plans will ensure colleges and units are prepared to respond to emergencies at the local level. All personnel should become familiar with the local emergency response plan for the Health Sciences Building.

In the event of a major emergency, the University of Saskatchewan Institutional Emergency Management Plan supersedes all local emergency response plans. Local emergency plans do not govern the actions of civic emergency services or supersede any applicable legislation relating to emergency measures.

For assistance regarding local emergency plans, please contact either Health Sciences Building Operations at 306-966-2637, Protective Services at 306-966-2404, or Safety Resources at 306-966-4675.

12.1 Incidents

Faculty, staff or students involved in an incident, spill or near miss incident while engaged in activities at, or conducting work for the university shall adhere to the following incident response and reporting processes.

The individuals involved in the incident are responsible to:

- Seek appropriate medical attention. In a medical emergency, call 911 (9-911);
- Notify their supervisor as soon as possible;
- Complete an incident report via the university's online incident reporting system at http://safetyresources.usask.ca/. For assistance in completing an incident report, please contact Safety Resources at 306-966-4675.

- Participate and cooperate with their supervisor and Safety Resources representatives on the review of the incident, and the determination and implementation of appropriate corrective and preventative measures to minimize a recurrence.
- If professional medical attention was sought, complete a Saskatchewan Workers' Compensation Board (WCB) Employee Initial Report of Injury (W1) form.

The individual's supervisor is responsible to:

- Discuss the incident with the individual who reported the incident and perform an investigation to determine the cause of the incident and corrective and preventative measures to minimize a recurrence;
- If professional medical attention was sought by the individual,
    - Complete a WCB Employer Initial Report of Injury (E1) Form.
    - Assist the individual in the completion of a WCB W1 form.
    - Fax the completed E1 and W1 forms to the WCB at 1-888-844-7773 and to Wellness Resources at 306-966-2882.

WCB E1 and W1 forms are provided electronically to the supervisor by Wellness Resources upon receipt of an online incident report. WCB E1 and W1 forms are available upon request by Wellness Resources. For assistance with the completion of WCB forms, please call Wellness Resources at 306-966-4580.

Safety Resources will follow up on reported incidents, provide advice, and support to ensure that appropriate corrective and preventative actions have been taken. For assistance, please contact Safety Resources at 306-966-4675.

Safety Resources also maintains incident statistics which are available to the campus community.

Detailed emergency procedures are provided in the *Health Sciences Local Emergency Response Plan*.