EVERY PERSON INTENDING TO WORK IN A RESEARCH LABORATORY, MUST READ THIS DOCUMENT BEFORE BEGINNING WORK.

Laboratory Safety Operating Procedures

Orillia Campus

Revised September 2025

Lakehead UNIVERSITY | Health and Safety

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1. Health and Safety at Lakehead University

The Ontario Health and Safety Act, Regulations and Lakehead University Safety Policy requires all employees, faculty, volunteers and students to be:

- responsible for complying with the legislation, standards and programs, and with the instructions of their supervisors.
- responsible for working safely, and for reporting all unsafe and unhealthy conditions to their immediate supervisors, in the interest of their own health and safety and that of other employees, students and visitors; and
- held individually accountable for fulfilling their responsibilities.

The Lakehead University Health and Safety Policy hold all students, faculty, staff, employees and volunteers equally responsible for safety, and compliance with their departmental safety policy, guidelines and procedures. *Each laboratory must have customized procedures based upon the minimum standard set by Ontario legislation, Lakehead University policy and best practices or published procedures.*

1.1 Associated Policies/Documents

A short list of lab related policies, procedures and guidelines are provided, for full documents including approved and draft policies, guidelines and procedures, visit the Lakehead University Health & Safety website: https://www.lakeheadu.ca/faculty-and-staff/departments/services/hr/health-safety/tb

- Joint Health and Safety Committee
- New Hire Orientation Policy
- Ethanol Use Standard
- First Aid Training
- Emergency/Crisis Response Policy
- Building Fire Plan
- Hazard Reporting Procedure
- Work Order Procedure
- Workplace Inspections
- Accident Investigation Procedure
- WHMIS Policy
- Compressed Gas and Cryogenic Liquids Policy
- Hazardous Materials Signage Requirements
- Decommissioning of Laboratories and Laboratory Equipment Policy

- Hazardous Waste Disposal Procedure
- Chemical Storage Procedure
- Biosafety Policy
- Housekeeping Instructions
- Workplace Violence

2. Goal

The goal of these operating procedures is to present the minimum standards set by the University in an effort to promote the health and safety of laboratory workers. These operating procedures may be supplemented or amended as new guidelines and standards are developed or legislated.

3. Introduction and Scope

Lakehead University is responsible for the safety of its employees, visitors and students. Through all members of the University Community, the University strives to provide safe working conditions and everyone on campus is expected to cooperate by complying with existing government legislation and regulations, University policies, guidelines and safe work procedures. Laboratory equipment design and safe-work procedures have improved over the years to be more sophisticated and provide increased safety; however, safe operation is dependent on trained and safety conscious personnel.

The manual has been developed to assist supervisors in the development of lab specific safety protocols and to augment in the training of all new laboratory personnel. This manual does NOT cover all aspects of laboratory safety. It is the ultimate responsibility of every supervisor to ensure that safe practices are developed and followed fortheir specific laboratory.

It is not the intent of the University to impede any laboratory activities, especially research. It is hoped that pre-planning will be an integral part of any project undertaken so that applicable legislative requirements will be met. The H&S Office is available to assist in pre-planning.

3.1 Associated Federal, Provincial and Municipal Law

- Reg.851 – Industrial Establishments
- Reg.860 – WHMIS
- Reg.833 – Control of Exposure to Biological or Chemical Agents
- Designated Substances Regulations (mercury, lead, asbestos, etc.)
- Reg. 67/83 – Health Care & Residential Facilities

- First Aid Requirements – Regulation 1101
- Workplace Safety and Insurance Act
- Ontario Building Code
- Ontario Fire Code
- CSA standards
- Human Pathogen and Toxin Act and Regulations
- Canadian Biosafety Guidelines
- Health of Animals Act
- Company Safe Work Procedures

4. Responsibilities

Any person who is involved in laboratory work is responsible to meet all legislated requirements, and those set by the University. It is expected that adherence to this manual and all associated guidelines, procedures and policies is an acceptable start for the establishment of a well-rounded laboratory safety program. Every supervisor is strongly encouraged to develop written health and safety protocols for all laboratory procedures that are hazardous.

It is the responsibility of every person that steps into the lab to be familiar with the requirements for entry, personal protective equipment requirements, emergency procedures, location of safety equipment and exit routes.

4.1 Internal Responsibilities and Health & Safety

The Ontario Occupational Health and Safety Act defines the minimum standards acceptable for health and safety in the workplace. Additionally, the rights and responsibilities of all workplace parties are presented. It is the unconditional right and obligation of every member of the University Community to report any health and safety related concern to their supervisor, Office of Human Resources – Health and Safety, or to the joint health and safety committee. The supervisor should be informed in all cases prior to the complaint being lodged elsewhere.

4.2 Summary of duties and responsibilities of Workplace Parties

Specific duties are assigned to the three workplace parties established in the Ontario Occupational Health and Safety Act. A summary of these duties are presented below.

The EMPLOYER must:

Ensure that equipment, materials and protective devices provided by the employer are maintained in good condition;

Supervise, instruct and inform workers in order to protect their health and safety;

Appoint competent supervisors;

Acquaint the worker, or a person of authority over the worker, with any hazard to which the worker may be exposed;

Take every reasonable precaution to protect the worker; and

Prepare and post a written health and safety policy and review the policy annually.

The SUPERVISOR must:

Ensure that workers comply with the act and use protective devices as required;

Ensure that workers use or wear protective equipment, clothing or devices as required;

Advise the worker of any actual or potential danger to which that worker may be exposed;

Provide written instructions including the measures and procedures for protection of health and safety;

Take every reasonable precaution to protect the worker;

Provide adequate supervision until new personnel have demonstrated adequate proficiency in lab procedures to be left to minimal supervision;

Document all training provided to personnel, including date of proficiency;

Forward a copy of training records to the Office of Human Resources – Health and Safety; and

Ensure that all personnel participate in required training (see Appendix 1 and 2)

The SUPERVISOR should:

Conduct regular inspections to ensure that laboratory personnel are working safely.

Supervisors are **strongly** encouraged to document all inspections in writing, noting compliance issues/discipline and especially when workers are working IN compliance (no issues noted).

The WORKER must:

Work in compliance with the Act and Regulations;

Wear all protective equipment, devices or clothing that is required by the employer;

Report any defects in the in protective devices, that may endanger the worker or another worker;

Not remove or alter any protective devices;

Not operate or use any equipment in a manner that endangers him/herself or others; and

Participate in all training required (See Appendix 1 and 2).

4.3 Right to refuse unsafe work

As granted by the Ontario Occupational Health and Safety Act, workers have the right to refuse to perform work which they believe poses a danger to themselves or others. There are specific procedures that must be followed when evoking the right to refuse. For further information, employees and supervisors should refer to Section 43 of the Act.

It is important to note; workers cannot be penalized or punished for invoking their rights under the Occupational Health & Safety Act.

5. Health and Safety Committees

5.1 Joint Health and Safety Committee – Labs and Studios

Workplaces which employ 20 or more workers are required by the Occupational Health and Safety Act to have a Joint Health and Safety Committee. At Lakehead University, all health and safety related concerns in labs fall under the review of the Labs and Studios Joint Health and Safety Committee. The Committee is made up of elected worker members and management members who meet regularly. Proceedings of the meetings can be found on the health and safety website: https://www.lakeheadu.ca/faculty-and-staff/departments/services/hr/health-safety/tb

Membership of the committee is at a minimum of three designate worker members and three alternate worker members. A designated member and an alternate member will be selected by each of the following groups and unions:

CUPE
Lakehead University Technicians
LUFA
Physical Plant

Research Services.At least two designated management members will be appointed.

5.1.1 Workplace inspections

Representatives of the Committee conduct regular monthly inspections. Inspected areas include laboratories, laboratory storage areas and laboratory offices. Any substandard conditions, or untrained personnel observed will be reported to the Chair of the Department. Departments have 21 days to respond to any recommendations made by the Committee.

See Appendix 3 for items inspectors will be evaluating in your lab.

5.2 Biosafety Committee

Overall management of biosafety program at Lakehead University is coordinated through the Lakehead University Biosafety Committee. The committee will:

- Assist with biological risk assessments, classification and control of biological hazards
- Evaluate the suitability of laboratory design and equipment
- Evaluate the safety aspects of research and teaching proposals involving biohazards
- Assess training needs for biohazardous work and arrange for its delivery. Distribute new biosafety and biohazard information
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5.2.1 Biosafety Inspections

Biosafety inspections are typically scheduled at a different time than JHSC inspections and are conducted twice a year by the Biosafety Officer (Appendix 4).

6. Emergency Response Procedures

Detailed emergency procedures are outlined in the Lakehead University Emergency Procedures & Information Flipbook. This document must be available in all laboratories and accompany all telephones on-campus. These documents are available by request through the Office of Human Resources – Health and Safety.

Safety must be an intrinsic part of each laboratory operation; work must be planned so that exposure to potentially hazardous material does not occur. Despite planning, accidents do occur. Accidents may involve spills of potentially hazardous agents in the laboratory or failure of equipment and facility safeguards that may place the laboratory worker at higher risk of exposure. The probability of severe injury or infection can be significantly reduced if emergency plans are established and are familiar to laboratory workers.

Lakehead University Emergency Procedures & Information flipbook must be accessible in ALL labs. New laboratory personnel must be oriented to its location.

It is not possible to recommend a single plan of action that would be applicable in all situations. The following basic principles, however, may be useful in developing specific procedures for dealing with an accidental spill of potentially infectious material:

Evacuate the affected area Notify

Security extn **3911** or **2009**

Do not re-enter the affected area until the extent of the hazard is determined

Determine the need to treat persons exposed to the hazardous agent

Decontaminate the affected area

All incidents **MUST** be reported to your supervisor and to Office of Human Resources – Health and Safety as quickly as possible after the injured party has received appropriate treatment.

For emergencies involving failure of equipment or facility safeguards, the most important action should be to stop work with the hazardous agent and safely contain the material until corrective action has been taken. In cases of serious injury or sudden illness, the supervisor should determine whether to override containment. Emergency response personnel should also be alerted to the potential of infectious hazards.

Specific emergency procedures relative to the particular hazard shall be documented by the supervisor.

The SUPERVISOR shall:

ensure that everyone in the laboratory is thoroughly familiar with the emergency plan to be followed in the event of an incident;

ensure that all project participants receive refresher emergency plan training on a regular basis; such training shall be documented; and

ensure that all incidents involving biohazardous materials that could result in exposure, contamination, etc. are reported immediately to the supervisor.

ensure that all incidents involving biohazardous materials that could result in exposure, contamination, etc. are reported immediately to the Biosafety Officer (BSO).

6.1 Reporting accidents, injuries or near-misses

It is vital that all accidents, injuries and near misses are reported promptly to your supervisor and human resources Health & Safety.

When required, accidents will be reported to the Workplace Safety & Insurance Board (WSIB) or the Ministry of Labour. In those cases where an employee does not have an immediate supervisor or is unable to contact the supervisor, the employee must contact human resources directly (after hours Security Services). All lab related accidents, injuries and near misses will be discussed at Labs and Studios Joint Health and Safety Committee meetings.

The following incidents must be reported to the BSO immediately:

Loss or theft of any biohazardous materials

Inadvertent possession of any biohazardous materials

Potential exposures to or suspected laboratory acquired illnesses attributed to biohazardous materials

Release or spills of biohazardous materials

6.2 Medical emergency

If an over-exposure to hazardous material has occurred, always contact Security before attempting rescue. If safe to do so, remove casualty from exposure as quickly as possible. Use personal protective equipment as necessary.

All injuries that occur in laboratories must be reported to the lab supervisor/instructor. and Human Resources – Health and Safety extn 2011.

Specific response procedures are found in the Emergency Procedures & Information Flipbook.

6.2.1 Laboratory First Aid

The emphasis in any laboratory must be accident prevention.

If an accident does occur and there is exposure to a poisonous or toxic substance only a qualified medical practitioner should administer an antidote or give medical treatment. The only exception to this is administering topical calcium gel when an exposure to hydrogen fluoride has occurred.

The chemical SDS must always be available for information regarding treatment.

Hazards common to chemical laboratories require specialized first-aid such as:

Burns

All burns should be evaluated by a qualified first aider or the campus nurse.

Thermal Burns:

Immerse burned areas in cold water as quickly as possible.

Loosen any tight clothing and remove any jewelry.

Never remove clothing, jewelry etc. that is stuck to the burn!

After the pain has subsided, cover the burn loosely with sterile gauze.

If the burn is extensive or severe, shock may follow. Call extension 3911 or 2009 immediately before administering first aid steps listed above.

Chemical Burns:

Remove the casualty from contact as quickly as possible.

Remove contaminated clothing under an emergency shower, if possible.

Copious flushing of the affected skin with water is necessary to remove the cause of the burn. When burns are caused by a dry chemical, excess should be brushed away prior to flushing with water.

Do not use neutralizing or buffering agents.

If casualty was wearing chemical goggles, leave them in place until the head and face have been thoroughly flushed.

Do not apply antidotes – leave this to the attending physician, unless instructed by your supervisor.

Eye Injuries

Contact lenses should not be worn in a chemical laboratory as they may cause difficulty with eye irrigation.

Chemical exposure to the eye

Splashes of irritant chemicals or exposure to the vapour or mist of some chemicals can lead to serious eye injury. Protective glasses, goggles or face shields must be worn to protect the face and eyes from chemical hazards. SDS for the chemical in use will recommend the appropriate protective eyewear.

If a chemical splash occurs in the eyes the following steps must be followed:

Immediately flush the eye using an eyewash fountain.

Contact Security at extn **3911** or **2009** as soon as possible.

Forcibly hold the eyelids open so that the entire surface of the eye is flushed.

Continue flushing for a minimum of 15 minutes.

Seek medical attention.

Foreign body in the eye

Loose, unattached foreign bodies, under or on the eye lid can often be removed with a wet piece of clean cotton on an applicator.

Do not try to remove a particle on the cornea, attached to the surface of the eye, or embedded in the eye. Seek medical attention and request the services of a physician, preferably an ophthalmologist.

Poisoning

> ***To eliminate risk of poisoning, food and beverages must never be stored or consumed and cosmetics should never be applied in a laboratory, Occupational Health and Safety Act Reg. 851, S131.***

Poisoning by swallowing is a rare occurrence in a laboratory, provided that good hygiene is maintained by laboratory workers. Nearly all chemicals handled in a laboratory are “poisonous” if swallowed. All chemicals should be treated with due respect, but the term “poison” should be reserved only for those which are highly toxic.

DO NOT induce vomiting; DO NOT give the casualty any food or drink.

Inhalation Poisoning

This type of poisoning can occur through inhalation of gases, vapours, fumes, mists or dusts. Such substances include:

chlorine	bromine
hydrochloric acid	sulfur dioxide
formaldehyde	acrolein
ammonia	

Some of these have warning properties which make dangerous exposure unlikely, unless the exposed person is physically unable to leave the area

of exposure. The serious effects caused by these are essentially extreme local irritation of the mucus membranes, most importantly the lungs.

Other compounds may be present in dangerous concentrations before it is realized. Among these are:

Halogenated hydrocarbons	Tetrachloroethane
Carbon tetrachloride	Methyl bromide
Ethylene chlorohydrin	Oxides of nitrogen
Carbon disulfide	Benzene

Others may have a very slight odour or no odour at all, even in dangerous concentrations, as in the case of:

Carbon monoxide	Methyl chloride
Aniline	Arsine
Mercury	

Carbon monoxide, hydrogen sulfide and hydrogen cyanide can cause almost immediate unconsciousness in higher concentrations. Others may have delayed symptoms due to dangerous over-exposure, such as:

Oxides of nitrogen	Phosgene
Cadmium fumes	Aniline
Hydrochloric acid	Chlorine

Many compounds are dangerous due to long-term exposures to concentrations too low to cause acute symptoms, for example:

Benzene	Carbon tetrachloride
Chlorinated hydrocarbons	Mercury
Lead	some dusts

Poisoning by Skin Contact

Skin contact with various chemicals may result in:

A defatting action from solvents

A rapid and deep destruction of tissues from strong acids and

alkalis Contact dermatitis

Toxicity by skin absorption is a definite hazard from a considerable group of chemicals, such as:

Acrylonitrile	Ethylenimine
Allyl chloride	Hydrofluoric Acid
Allyl alcohol	Nitroaniline

Aniline	Nitrobenzene
Antimony trichloride	Phenol
Arsenic trichloride	Oxylidine
Cresols	Tetrachloroethane
Cyanides	Tetraethyl lead
Ethylene chlorohydrin	Toluidine

Many of these chemicals present little or no evidence of local skin effects but are undoubtedly hazardous because of toxicity through skin absorption. Cresol and phenol have severe local as well as systemic effects.

For some chemicals the effects of absorption through the skin are approximately as severe, dose by dose, as they are from inhalation or swallowing. Such chemicals include:

Allyl alcohol	Aniline
Ethylene chlorohydrin	Ethylenimine
Hydrofluoric acid	

6.3 Fire/Explosion Emergencies

Upon discovery of fire or smoke:

1. Activate the closest fire alarm.
2. Notify others in the area of the danger.
3. Evacuate the area to a safe location, closing doors as you exit.
4. From a safe location, phone Security Services using **extn 3911 or 2009**.

Report your name and the exact location of the fire/smoke, including building, floor level and room number.

Do not attempt to fight fires! Leave fire fighting to the professionals!

Visit the Health and Safety website to review the fire safety plan for your building:

https://www.lakeheadu.ca/faculty-and-staff/departments/services/hr/health-safety/tb/emergencies/fire-safety

6.4 Chemical spill

General procedures for responses to minor or major chemical spills are given below. It is at the discretion of the Supervisor to determine what constitutes a minor or major chemical spill given the hazards of the chemical and

concentration. Any spills of hazardous materials that cannot be contained, e.g. down a sink, outside, in a hallway or public area must be reported immediately to Security at **extn 3911 or 2009**.

6.4.1 Minor Chemical Spills in a Lab

Respond to minor chemical spills which pose no immediate threat to health, environment or damage to property, as follows:

1. Notify occupants in the immediate area of the spill.
2. Use spill kits to absorb/contain spill.
3. If unpleasant odours are generated, call **3911 or 2009.**
4. Place waste in a sealed container in a secure, well-ventilated area.
5. Contact HR Orillia (extn 2011) and Technical Staff to arrange for chemical waste disposal.

6.4.2 Major Chemical Spills in a Lab

Major spills include all chemical spills which occur in areas which cannot be easily decontaminated or contained, such as in sinks, drains, outside of the laboratory, or in large quantities. Respond to major spills as follows:

1. Evacuate the immediate area, turning off spark-producing equipment and extinguish flames if flammable chemicals were spilled.
2. Assist contaminated personnel with use of emergency eyewash or shower.
3. From a safe location, call extn **3911** or **2009.** Identify the chemical involved, quantity spilled and hazards.
4. Wait in a safe location and keep unauthorized staff out of the contaminated area.
5. Provide SDS to responders.

6.5 Biohazardous spill

If potentially infectious biological material is spilled, it is essential to avoid inhaling any airborne material by holding your breath and leaving the area immediately. Advance preparation for management of a spill is essential. A "spill kit" must be readily available in the lab, and during transport. Specific spill procedures are given below.

6.5.1 Spills in the Laboratory

These are situations where a culture, specimen or container with microorganisms, blood or other potentially infectious material has breached its containment on a bench, in a biological safety cabinet, or on the floor. This could be associated with manipulations in a centrifuge, grinder, or shaker or simply with losing control of the container. The primary step in any loss of control incident is to contain the material to prevent its spread. A general response to a spill is as follows but specific variations are required depending on the location.

If potentially infectious biological material is spilled in the laboratory, it is essential is to avoid inhaling any airborne material by holding the breath and leaving the laboratory. Advance preparation for management of a spill is essential. A "spill kit" must be readily available.

Spill kit contents:

Two pairs of gloves

Spill warning signs (minimum two signs)

Tape

Tongs

Absorbent materials (can be paper

toweling) Disinfectant

Disposal bags or containers

General Spill Response Procedure

Alert others and place a sign on the entry door that a spill has occurred (This sign is to stay in place till the area is fully decontaminated)

Remove all contaminated clothing, laboratory coat, gloves for decontamination or appropriate disposal. **Leave the laboratory for at least 30 minutes.** Wash all potentially contaminated skin thoroughly.

Report the spill to your supervisor **and BSO**

Wear appropriate clothing or protection when re-entering the laboratory to isolate and clean the spill.

Put on two pairs of gloves

Cover spill carefully with paper towel to avoid

splashing Do not lift the towels

Soak the towel in disinfectant, again avoiding splashing. This should be done from the outside edges working in.

Discard gloves

Leave a minimum of 30 minutes

Put on two pairs of gloves

Place material into a container and autoclave before disposing in the appropriate waste system (i.e. broken glass is autoclaved then placed in glassware disposal).

Discard outer pair of gloves and put on a new second pair

Clean up the spill again with disinfectant, discard paper towels and outer pair of gloves

Rinse area with ethanol or water (if using bleach) and dry the floor/surface

If on exposed skin, clean with antiseptic and wash thoroughly.

Decontaminate the area, the equipment in that work area with washing, soaking and autoclaving where possible.

6.5.2 Spill in a Biological Safety Cabinet

A spill that is confined in a biological safety cabinet presents minimal hazard to personnel in the area. However, chemical disinfection procedures should be initiated immediately to prevent escape of contaminants from the cabinet or cross contamination of items within the cabinet.

Alert others and isolate the spill

Leave the biological safety cabinet turned on for 15 minutes to filter any aerosols. Remove your gloves and discard them inside the cabinet. Remove your lab coat if you suspect it has been contaminated.

Place a sign on the piece of equipment that a spill has occurred (This sign is to stay in place till the piece of equipment is fully decontaminated)

Report the spill to your supervisor **and BSO**

Put on two new pairs of gloves

Cover spill carefully with paper towel to avoid

splashing. Do not lift the towels

Soak the towel in disinfectant, again avoiding splashing. This should be done from the outside edges working in

Discard gloves

Leave a minimum of 30 minutes

Put on two pairs of gloves

Place material into a container and autoclave before disposing in the appropriate waste system (i.e. broken glass is autoclaved then placed in glassware disposal)

Discard outer pair of gloves and put on a new second pair

Clean up the spill again with disinfectant, discard paper towels and outer pair of gloves

Rinse area with ethanol or water (if using bleach) and dry the surface If

on exposed skin, clean with antiseptic and wash thoroughly

Decontaminate the work area, the equipment in that work area with washes and autoclaving where possible

Let the biosafety cabinet run for 10 minutes before resuming your work

6.5.3 Spill while in transport

If potentially infectious biological material is spilled while in transport, it is essential to avoid inhaling any airborne material by holding the breath and leaving the area.

Alert others to the spill and place a sign at a safe distance from area notifying “NO ENTRY” and that a spill has occurred (This sign is to stay in place till the area is fully decontaminated)

From a safe distance contact security at extn **3911 or 2009**. Security will contact BSO immediately.

Leave the spill area for at least 30 minutes, or until it is safe to return. Ensure you’re present to respond with Security Officers or the BSO.

Report the spill to your supervisor.

Wear appropriate clothing or protection when re-entering the area to

isolate and clean the spill.

Put on two pairs of gloves

Cover spill carefully with paper towel to avoid

splashing Do not lift the towels

Soak the towel in disinfectant, again avoiding splashing. This should be done from the outside edges working in.

Discard gloves

Leave a minimum 30 minutes

Put on two pairs of gloves

Place material into a container and autoclave before disposing in the appropriate waste system (i.e. broken glass is autoclaved then placed in glassware disposal).

Discard outer pair of gloves and put on a new second pair

Clean up the spill again with disinfectant, discard paper towels and outer pair of gloves

Rinse area with ethanol or water (if using bleach) and dry the floor/surface. If

on exposed skin, clean with antiseptic and wash thoroughly.

Decontaminate the area, the equipment in that work area with washing, soaking and autoclaving where possible.

6.6 Radioactive material spill

Spill response procedures are outlined in the Lakehead University Radiation Safety Manual.

6.7 Emergency procedures for exposure to blood or body fluids

The following emergency procedures shall be followed by a worker exposed to blood or body fluids, infectious or communicable disease agents resulting from a needlestick, cut, puncture wound, contact with mucous membranes, or contact with non-intact skin.

1. Immediately wash the exposed site

If needlestick, cut, puncture wound, wash with soap and water after allowing the wound to bleed freely.

If mucous membrane (eyes, nose, mouth) or non-intact skin contact (cuts, rash, acne or dermatitis), flush with water at the nearest faucet or eye wash station.

2. Inform Supervisor

All accidents are reported to the Office of Human Resources – Health and Safety.

3. Seek prompt medical attention

7. Guidelines for Working in Laboratories

7.1 Know the hazard

It is vital that all laboratory workers can identify the chemical hazards around them. It is therefore the policy of the University that all personnel working with or near hazardous materials in labs must have annual workplace hazardous materials information system (WHMIS) training. All hazardous materials must be labeled in accordance with WHMIS regulations and all laboratory workers must be familiar with hazard symbols and or Safety Data Sheets (SDS).

WHMIS 2015 Symbols

	**Exploding bomb** (for explosion or reactivity hazards)		**Flame** (for fire hazards)		**Flame over circle** (for oxidizing hazards)
	**Gas cylinder** (for gases under pressure)		**Corrosion** (for corrosive damage to metals, as well as skin, eyes)		**Skull and Crossbones** (can cause death or toxicity with short exposure to small amounts)
	**Health hazard** (may cause or suspected of causing serious health effects)		**Exclamation mark** (may cause less serious health effects or damage the ozone layer*)		**Environment*** (may cause damage to the aquatic environment)
	**Biohazardous Infectious Materials** (for organisms or toxins that can cause diseases in people or animals)				

* The GHS system also defines an Environmental hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.

7.2 Biosafety

At Lakehead University, the use of biohazardous materials is overseen by the Lakehead University Biosafety Committee, in order to safeguard the health of all members of the university community. It is requirement of Tri-Council granting agencies of Canada that all activities involving biohazardous materials in use at Lakehead University are controlled to ensure compliance with applicable federal legislation, guidelines and regulatory documents. Regulatory documents and guidelines for dealing with biological hazards in laboratories have been developed by the Public Health Agency of Canada (PHAC) and Canadian Food Inspection Agency (CFIA).

Work with biohazardous materials is prohibited at Lakehead University except under the following conditions:

Proposed work has been approved by the Lakehead University Biosafety Committee,

An internal Permit has been granted,

Location of the proposed work is adequate for the level of biohazardous work proposed,

The Permit Holder and all Individual Users have completed the appropriate training.

The work can be safely handled in a Containment Level 2 Laboratory.

Unauthorized persons must not use, store, or distribute biohazardous materials

7.3 General Lab Safety Operating Procedures (All Labs)

The following points must be observed at all times in ALL Lakehead laboratories:

Laboratory Access

Access to laboratory and support areas is limited to authorized personnel.

The laboratory doors are closed and locked when the lab is unoccupied.

Children under the age of sixteen should not be permitted in the laboratory. Pregnant women and immune-compromised persons should be advised of the potential risks and documented.

Post hazard warning signs on every outside door indicating the nature of the hazard contained in the laboratory. If the hazardous materials in use require special provisions for entry, this information must be included on the sign. The name and contact information of the lab supervisor must also be listed. (Visit the Health and Safety website to order signs).

General Considerations

The storage or consumption of food or drink in laboratories is prohibited.

Storing utensils, applying cosmetics, and inserting or removing contact lenses are all prohibited in any laboratory.

The wearing of contact lenses is permitted only when other forms of corrective eyewear are not suitable.

Wearing jewelry is not recommended in the laboratory.

Storage of personal belongings is permitted in designated areas only.

Use of cell phones, tablets, ear buds in labs is strongly discouraged. If their use is necessary, consider decontamination options prior to leaving the laboratory.

Smoking is prohibited in all laboratories and all areas on-campus except for marked designated smoking areas.

Pranks, horseplay and unauthorized experimentation are not permitted.

Personal Protective Equipment

Protective laboratory clothing (uniforms, coats, gowns) must be correctly worn by all personnel including visitors, trainees, and others entering or working in the laboratory.

Protective laboratory clothing must not be worn in non-laboratory areas.

Lab coats with snaps, cotton content and cuffed sleeves are highly recommended in all labs and required for all new lab coat purchases in biosafety labs.

Loose clothing must be restrained when performing work in a laboratory.

Long hair is to be tied back or restrained so that it cannot come into contact with hands, specimens, containers or equipment.

Sandals or open-toed, or open heeled shoes must not be worn in laboratories. Feet must be completely enclosed.

Gloves must be worn for all procedures that might involve direct skin contact with chemicals, biohazardous material or infected animals.

Reusable gloves (insulated, chemical resistant, etc.,) may be used only where necessary and must be appropriately decontaminated.

Gloves are to be removed carefully (Appendix 6) when leaving the laboratory and decontaminated with other laboratory wastes before disposal.

Gloves must be removed before using lab computers, telephone, cell phones.

Hands must be washed thoroughly:

- before donning gloves,
- anytime they are believed to be contaminated with chemical or biological hazards,
- any time after handling materials known or suspected to be contaminated.
- before touching non-lab equipment (e.g. telephone, cell phone, computers etc.),
- after gloves have been removed,

- before leaving the laboratory.

Open wounds, scratches, and grazes should be covered with waterproof dressings.

Eye and face protection must be worn when it is necessary to guard against splashing, flying particles, and harmful light or other electromagnetic radiation.

Housekeeping

Laboratories are to be kept clean and tidy.

Laboratory floors, entrances and exits must be kept clear of obstructions at all times.

Laboratory benches and other laboratory furniture should be arranged such that the path to any emergency exit is not impeded and may be reached easily from any point in the lab.

Instructions for housekeeping staff must be posted on all exterior doors to labs containing hazardous materials. Forms are available from Health and Safety.

Spills must be cleaned up immediately.

Electrical cords (or other tripping hazards) must not traverse work areas. Extension cords must not be used as permanent wiring.

Extension cords and power bars must be CSA or UL approved.

Storage

The laboratory must be kept neat, orderly and clean. Minimize storage of materials not pertinent to the work. Storage of materials that are not pertinent to the work and cannot be easily decontaminated (e.g., journals, books, correspondence) should be minimized; paperwork and report writing should be kept separate from such hazardous materials work areas.

All storage containers holding chemicals or other hazardous materials as defined by WHMIS legislation must be appropriately labeled. The labels must include:

- The contents of the container,
- Information on safe handling including:
  - date of purchase and expiry (if appropriate),
  - storage requirements,
  - known hazards,
  - special first aid instructions,
  - chemical compatibility,

- PPE requirements,
- Reference to an SDS.

Labels that become damaged or unreadable must be replaced immediately.

Storage areas must be locked when unattended. Storage areas should not be visible or readily available to public areas of the University.

Discarded chemical containers must be free of hazards and labels

defaced. Incompatible chemicals must never be stored together.

Containers used in a laboratory must be compatible with their contents.

Chemical containers should be inspected periodically for deterioration.

Chemical containers must be kept securely closed, unless venting is necessary to prevent a potential build-up of gases.

Only dilute or low hazard reagents should be stored on working benches or on shelving above them.

Cupboards or low shelving (below the eye level of the user) are strongly recommended.

The proper organization of work supplies is of paramount importance in a working area. Excessive storage in individual laboratories wastes space and presents unnecessary hazards due to the flammable, toxic or corrosive nature of the chemicals stored.

Corrosive chemicals should be stored in plastic trays as near to floor level as possible.

Chemicals requiring storage in a freezer or fridge must be stored in such a facility which is spark and explosion proof.

Toxic chemicals should be stored in a fume hood that is designated for storage only.

Chemicals that are no longer required should be submitted for disposal.

The quantity and size of compressed gas cylinders should be kept to a minimum.

Compressed gas cylinders and low-boiling liquids should not be stored near sources of heat.

Air or light sensitive chemicals that form dangerous peroxides require strict record keeping.

Chemicals stored in each laboratory should be kept to the minimum required for current use.

Inventory control is essential to chemical storage. At minimum, chemical stocks should be reviewed on an annual basis and deteriorated or expired

stock must be disposed of appropriately. Paper inventories will no longer be accepted after July 2014, The Lakehead Llumin portal must be used.

Chemicals that degrade over time and pose a risk of shock sensitivity, explosion, or evolution of hazardous gas must have expiry dates listed in the Lakehead Llumin portal inventory. This includes picric acid, peroxide-forming chemicals or any other chemicals known to produce increased hazards after degrading due to time/storage conditions.

Biohazardous stock materials in storage for longer than thirty (30) days must be inventoried by their location and number of containers. Inventories must be maintained on the Lakehead Llumin portal.

Operational Practices

Working with immediately toxic chemicals must be conducted in accordance with the best practices and must have antidote (if available) within easy access in all areas were used and/or stored. Specific training in working with these compounds must be documented.

Oral pipetting of any substance is prohibited in any laboratory.

A pipette bulb or pump must be used when pipetting substances. Care must be taken to avoid aspiration. **Do not mix by suction and expulsion.**

Limit the use of needles and other sharp objects.

Caution should be used when handling syringes with needles to avoid auto inoculation and the generation of aerosols during use and disposal.

Needles must not be bent, sheared, recapped or removed from a syringe.

After use, needles must be promptly placed in a puncture-proof container (in accordance with Canadian Standards Association [CSA] standard Z316.6-95(R2000)) and be decontaminated, by incineration.

Hazardous or infectious materials must never be placed in sinks or floor drains.

7.4 Standard Microbiological Practices and Operating Procedures

In addition to the requirements of the previous section, the BSL 1 laboratory, must comply with the requirements listed below.

A documented procedural (safety) manual must be available for all staff, and its requirements followed; it must be reviewed and updated regularly.

A copy of the Biosafety Containment Permit and the approved biosafety

procedures are contained in the Biosafety Binder.

Personnel must receive training on the potential hazards associated with the work involved, and the necessary precautions to prevent exposure to infectious agents and release of contained material; personnel must show evidence that they understood the training provided; training must be documented and signed by both the employee and supervisor; retraining programs should also be implemented.

When specified as a condition of a biohazard project, the Supervisor shall advise all personnel of the approved medical surveillance program. Such surveillance may include medical examinations, immunizations, and/or medical monitoring programs.

A woman who knows herself to be pregnant or is planning a pregnancy is advised to inform the Supervisor and her family physician before commencing work with biohazardous agents.

Protective laboratory clothing, properly fastened, must be worn by all personnel, including visitors, trainees and others entering or working in the laboratory; suitable footwear with closed toes and heels must be worn in all laboratory areas.

Protective laboratory clothing must not be worn in non-laboratory areas; laboratory clothing must not be stored in contact with street clothing.

If a known or suspected exposure occurs, contaminated clothing must be decontaminated before laundering (unless laundering facilities are within the containment laboratory and have been proven to be effective in decontamination).

All contaminated materials, solid or liquid, must be decontaminated before disposal or reuse; the material must be contained in such a way as to prevent the release of the contaminated contents during removal; centralized autoclaving facilities are to follow the applicable containment level 2 requirements.

Doors to laboratories handling biohazards must not be left open (this does not apply to an open area within a laboratory).

Disinfectants effective against the biohazardous agents in use must be available at all times within the areas where the biohazardous material is handled, stored, and transported.

Work surfaces in biohazard labs must be cleaned and decontaminated with a suitable disinfectant at the end of the day and after any spill of potentially biohazardous material. Work surfaces that have become permeable (i.e. cracked, chipped, loose) to biohazardous material must be replaced or repaired.

Contaminated materials and equipment leaving the laboratory for servicing or disposal must be appropriately decontaminated and labeled or tagged out as such.

Where chemical disinfection procedures are practiced, ensure that effective concentration and contact times are used.

All contaminated liquid or solid materials must be decontaminated before disposal or reuse. Contaminated materials that are to be autoclaved or incinerated at a site away from the laboratory must be double-bagged or placed into containers. Disinfect the outside surface if necessary.

Biologically contaminated glassware must not leave the facility. Decontaminate using procedures demonstrated to be effective. If the autoclave is outside the laboratory, contaminated materials must be disinfected chemically or double bagged and transported to the autoclave in durable, leak-proof containers that are closed and the outside surfaces treated with an appropriate disinfectant before leaving the laboratory.

Leak-proof containers are to be used for the transport of infectious materials within facilities (e.g., between laboratories in the same facility).

Efficacy monitoring of autoclaves used for decontamination with biological indicators must be done regularly and the records of these results and cycle logs (i.e., time, temperature and pressure) must also be kept on file.

Four (4) consecutive weekly passed efficacy tests must be conducted annually, with passed monthly tests being acceptable for the remainder of the year.

Any failed efficacy tests must have four (4) consecutive passes before ANY waste is to be disposed.

An emergency plan for handling spills of infectious materials must be developed and be ready for use whenever needed.

Animals or insects that have been experimentally infected must remain in the laboratory or appropriate containment facility.

Spills, accidents or exposures to infectious materials and losses of containment must be reported immediately to the laboratory supervisor and BSO; written records of such incidents must be maintained, and the results of incident investigations should be used for continuing education.

All technical procedures involving infectious materials must be performed in a manner that minimizes the creation of aerosols.

Special servicing of facilities by the maintenance and custodial services departments shall be co-coordinated by the supervisor at times when the facility and equipment can be declared free from contamination.

Work involving hazardous agents of biological origin outside controlled environments such as laboratories shall fall under the scope of the Risk Management Office.

7.5 Additional Practices for BSL 2 Laboratories

In addition to the requirements of the previous two sections, BSL 2 labs must also adhere to the following requirements:

Good microbiological laboratory practices intended to avoid the release of infectious agents are to be employed.

Appropriate signage indicating the nature of the hazard being used (e.g., biohazard sign, containment level) must be posted outside each laboratory; if infectious agents used in the laboratory require special provisions for entry, the relevant information must be included on the sign; the contact information of the laboratory supervisor or other responsible person(s) must also be listed.

All people working in the containment area must be trained in and follow the operational protocols for the project in process. Trainees must be accompanied by a trained staff member. Visitors, maintenance staff, janitorial staff and others, as deemed appropriate, must also be provided with training and/or supervision commensurate with their anticipated activities in the containment area.
BSCs must be used for procedures that may produce infectious aerosols and that involve high concentrations or large volumes of biohazardous material. Laboratory supervisors, in consultation with the Biological Safety Officer/Institutional Biosafety Committee, should perform a risk assessment to determine which procedures and what concentrations and volumes necessitate the use of a BSC.
Emergency procedures for spill clean-up, BSC failure, fire, animal escape and other emergencies must be written, easily accessible and followed. A record must be made of other people entering the facility during an emergency.

Vacuum lines used for work involving Level 2 agents must be protected from contamination by HEPA filters or equivalent. Centrifugation of biohazardous materials must be carried out in closed containers, which are opened only in a biological safety cabinet.

An autoclave must be located in or near a biohazard level 2 laboratory and operators must be instructed in its use and record keeping requirements.

7.6 Universal Blood and Body Fluid Precautions

Human blood and biological fluids are considered to be Risk Group 2 agents, regardless of their known or unknown blood borne infection status. "Universal Blood and Body Fluid Precautions" or "Universal Precautions" must be employed when handling these agents. Under these precautions, blood and body fluids of all patients are considered potentially infectious for human immunodeficiency virus (HIV), hepatitis B (HBV) and other blood borne pathogens. In addition to the requirements listed above (BSL 1 or BSL 2 as appropriate), labs handling human blood and bodily fluids must follow the requirements below.

5 Steps of Universal Precautions

1. Education
2. Hand washing
3. Use of protective barriers (Personal Protective Equipment (PPE))
4. Cleaning of contaminated surfaces

Safe handling/disposal of contaminated material

7.6.1 Education

The employer must provide training to protect the health and safety of the worker and provide for the safe handling and disposal of biological agents. Workers using human blood, fluids or tissues in the lab must complete training in blood borne pathogens. To arrange training contact health and safety, Orillia at extn 2011.

7.6.2 Hand Washing

Frequent hand washing is one effective way to prevent the spread of infectious diseases in a workplace.

Wash hands frequently and thoroughly, especially after contact with any body fluid or a contaminated surface.

Wet, soap and lather hands for at least ten seconds.

Wash and scrub under fingernails and cuticles with a small

brush. Rinse hands thoroughly and dry.

7.6.3 Protective Barriers

Always wear a protective barrier (surgical gloves) when in contact with blood, body fluids or feces. Protective barriers reduce your risk of exposure to potentially infectious material through contact with broken skin or mucous membranes.

Gloves

Surgical quality latex, nitrile or vinyl gloves must be worn for all contact with blood, body fluids and feces.

Gloves are also necessary for disinfecting contaminated surfaces and disposing of used materials and biological waste.

Wash hands thoroughly with warm water and soap after removing gloves.

Change gloves after each task or exposure and dispose as contaminated waste.

Personal Protective Equipment

Protective eye glasses and a mask must be used where blood, body fluids or feces are likely to splash on the mucous membranes of the eyes, nose or mouth.

Gowns, lab coats or aprons must be worn where clothing is likely to be soiled.

7.6.4 Cleaning and disinfecting of contaminated areas

Wear gloves and use disposable towels or other means of cleaning that will ensure against direct contact with blood, body fluids or feces.

Decontaminate the area with an appropriate disinfectant.

All used equipment must be thoroughly washed and disinfected.

7.6.5 Safe handling and disposal of contaminated material

Follow Lakehead University Biohazardous Waste Disposal Procedures including the following steps:

Dispose of biological waste in a puncture-resistant container lined with a leak-proof plastic bag. Post a biological waste symbol on the container.

Consider all biological waste as infectious.

Handle all contaminated wastes carefully to prevent body contact.

Hold only the outside of the container when emptying it. Never reach into the container.

Do not load the container beyond its capacity or compact the contents. Compaction may lead to additional contamination of the work area.

Never mix biological waste with regular trash.

Any object that could cut or puncture the skin such as needles or broken glass may carry infectious material and should be handled with caution using tongs or a broom and dustpan, never your hands. Dispose of 'sharps' in unbreakable, non-pierceable containers that have a lid. Never place 'sharps' in the regular trash.

7.7 Radiation Safety

Currently, there is no radio-isotope work being conducted at Lakehead University. The Lab Safety Officer must be contacted at labsafety@lakeheadu.ca if any work is being considered.

7.8 Equipment and Electrical Safety

Some laboratory equipment can pose serious risk if used improperly. When laboratory duties include use of hazardous equipment, safe-use training must be provided by the Supervisor.

All heat producing devices including space heaters must have automatic shut off switches.

All electrical equipment including extension cords and power bars must be CSA or UL approved.

All electrical equipment must be kept in good repair, including power cords and outlets, must be inspected often for electrical shock hazards.

Any electrical equipment in poor repair must be taken out of use until repairs can be made.

All electrical work on campus must be completed or authorized by a licensed electrician with Physical Plant.

Review the manufacturer's documentation. Keep for future reference.

Use and service equipment according to the manufacturer's instructions.

Ensure that anyone who uses a specific instrument or piece of equipment is properly trained in setup, use and cleaning of the item.

Decontaminate equipment before it is sent out for repairs or discarded. When purchasing new equipment, preference should be given to equipment that

- Limits contact between the operator and hazardous material, and mechanical and electrical energy
- Is corrosion-resistant, easy to decontaminate and impermeable to liquids.
- Has no sharp edges or burs. Meets relevant Provincial standards. Prior to purchase, contact Physical Plant and/or Health and Safety Office to review requirements.

7.8 Compressed gases and cryogenic liquids

Compressed gas cylinders and cryogenic liquids present several safety hazards:

- A falling cylinder may cause injuries.
  - The cylinder may become a dangerous projectile, if the valve is sheared off.
- Damaged or faulty valves may cause the release of dangerous gases.
  - Elevated temperatures, i.e. in a fire, may cause sudden release of the compressed contents.
  - Pure oxygen or other oxidizing gases can present fire or explosion hazards if mishandled or improperly stored.
  - Toxic and corrosive gases can cause serious, irreversible respiratory injuries that may result in fatality.
- Cryogenic liquids can cause serious burns.

In order to work safely with compressed gases and cryogenic liquids, the following points must be observed:

- When moving cylinders **any distance**, the safety cap must be on the cylinder protecting the valve.
- When moving cylinders, a distance greater than 1 meter, a cylinder cart must be used with the cylinder restrained to the cart.
- Cylinders must be secured with a chain (non-combustible) at all times regardless of whether they are full or empty.
- When not in use, cylinders must be stored with safety valve caps and stored in an area where the ambient temperature does not exceed 52^{o}C.

Cylinders and cryogenic liquids must be stored in a secure location, and not, under any circumstances be stored in aisles, hallways, doorways, stairwells or exits.

Cryogenics may only be stored in a secure area and only in vacuum-jacketed dewar flasks designed for that purpose. All such dewars must be properly vented to accommodate the release of pressure.

7.9 Flammable liquids

Flammable liquids and gases play an important part in many laboratory operations. Accidents with flammables can be avoided by exercising a reasonable amount of care. Flammable liquids and gases present two hazards: toxicity and flammability. A fire hazard exists when a flammable liquid has sufficient volatility so that vapours will mix with the air in ignitable concentrations. The degree of hazard depends upon whether or not a material can burn, its volatility or vapour pressure, its ability to form flammable or explosive mixtures, the ease of ignition of these mixtures and the relative densities of both liquids with respect to water and also the vapour with respect to air.

Flammable or combustible liquids must be used in a fume hood when:

(a) their use releases flammable vapours which could be potentially explosive,

(b) liquids are heated to a temperature equal to or greater than their flash point, or

(c) unstable liquids are used.

When not required for immediate use, flammable and combustible liquids must be stored in a flammable solvent cabinet.

The maximum allowable quantity is **235 L** in a laboratory.

The maximum allowable container size is 5 L. Should larger containers be required, contact the Laboratory and Biosafety Specialist.

All distillations, reactions etc. involving flammables should be set-up in a metal pan, preferably in a fume hood.

Flammable liquids should be remote from equipment containing sources of ignition and/or open flames or sparks.

Glass bottles containing flammables should be protected from breakage and spill by use of a metal bucket or acid carrier when in transport.

No open flames or other sources of ignition are permitted while appreciable amounts of flammables are being poured, or otherwise exposed to the air.

Fume hood inspection and maintenance is scheduled by Physical Plant. A mark is made on the side of each unit for the sash height required for certification testing. Ensure that the fume hood sash is lowered to the lowest possible level to allow work when flammable, combustible or other toxic materials are in use.

Any fumehood in alarm must not be used. Contact physical plant immediately.

7.10 Working Alone

It is prudent to avoid working alone in a laboratory, especially outside of regular business hours. If possible, it is advisable for individuals working in separate laboratories to cross-check periodically. Working in the laboratory outside of traditional office hours or working without immediate access to a supervisor poses additional risks since there may be generally few, if any, other people around. It is necessary to be vigilant of potential health and safety problems at these times, since in the event of an emergency, assistance may not be readily available.

Experiments known to be hazardous should not be undertaken at any time by a person working alone. The Supervisor is responsible for determining if the work requires more than one person to be present. A person having to work alone must make arrangements with the Security Office (Keep In Touch K.I.T. program) to periodically check in on the laboratory when individuals are working alone.

Therefore:

• New or unfamiliar procedures should never be performed without supervision.

• Only work of relatively low risk should be performed without supervision.

• Lab supervisors must approve all after hour work in labs.

• Ensure appropriate personal protective and emergency response equipment such as first aid kit, emergency shower, eyewash and fire extinguisher is available.

• Ensure that a communication system is available and that contact numbers are known.

8. Safety Equipment

In order to comply with Provincial regulations, all persons exposed to a chemical or biological hazard shall wear the appropriate personal protective equipment. Should the particular hazard warrant, work with the agent will be conducted in an appropriate special ventilation device.

Ventilated hoods are required in laboratories for the following reasons:

to remove hazardous, toxic and/or flammable vapours or gases;

to provide a safe place in which to perform experiments and analyses.

8.1 Fume hoods

In order to function correctly, fume hoods must be kept free of unnecessary equipment and clutter.

The sash should be located at the lowest practical level.

A chemical fume hood must never be modified, nor the airfoil removed, without a full review by Physical Plant to ensure that the hood will still meet standards.

All electrical equipment that is plugged into an outlet outside of the hood should have its cord run underneath the airfoil, not over top, if possible.

Always position the sash between the operator and the work.

Don’t open the sash rapidly on a working fume hood and move slowly when working in the hood.

Never put your head into the hood while there is work in it.

Keep all work within the “dished” area of the work surface and 15 cm (6”) from the front of the hood.

Fume hoods may be used for storage of appropriate chemicals, however, if using for storage, they may not be used for active experimentation requiring ventilation.

Be aware of chemicals that are unsafe to use in a fume hood (eg. perchloric acid)

Limit unnecessary pedestrian traffic near a working fume hood.

If a hood ceases to work correctly, contact Physical Plant Orillia immediately at extension 2302 or 2303. Do not continue to use a malfunctioning fume hood.

Prescribed personal protective equipment must be worn while working in a Chemical fume hood.

When not in use lower the sash of the fume hood to protect the lab in the event of a fan failure.

8.2 Biological safety cabinets

Aerosol generating procedures/manipulations MUST be conducted in a Biological Safety Cabinet.

The procedure listed below outline operator safety; for additional instructions and safety measures speak with the area Supervisor.

Ensure that the biological safety cabinet has been certified within the last year. If it is overdue; inform your supervisor.

Office of Human Resources – Health and Safety arranges Annual Certification in September of each year. Once certified, the cabinet cannot be moved or otherwise altered without recertification at the Permit Holder's expense.

Lakehead University has only Type II Biosafety Cabinets, therefore, the cabinets must not be used in place of a chemical fume hood. Chemical reagents must never be mixed or prepared in a Biological Safety Cabinet. Use of hazardous materials in Biological Safety Cabinets (i.e. Antibiotics, DNA dyes, and ethanol) must be kept to small volumes and low concentrations.

When work is finished, disinfect the interior surfaces of the cabinet and leave running for at least two to three minutes.

Prescribed personal protective equipment must be worn while working in a Biological Safety Cabinet.

Manufacturer's instructions for the units installed in your lab must be reviewed as part of the initial lab specific safety training and must be accessible in the biosafety binder.

Prevention and control of aerosols are of paramount importance in laboratories handling biohazardous materials. The biological safety cabinet (BSC) is the primary safety equipment used to control aerosols. Biological safety cabinets are classified based on their construction, airflow velocities and patterns, and exhaust system (Table 1 Only Class II and III are appropriate for use in a BSL2 facility, unless product contamination is not a concern, in which case Class I

cabinets may be used to protect the user. All classes of cabinets contain HEPA filters and must be certified on an annual basis.

For a full review of types of Biosafety Cabinets available, please consult the Canadian Biosafety Standards and Canadian Biosafety Handbook..

8.2.1 Operating Procedures for use of a Class II Biosafety Cabinet

Before use, Verify instructions for use with manufacturer's instructions.

When not in use, the hood should contain only:

Tip discard with plastic bag (not full)

Incinerator

Vortex + Power bar (if required)

To clean/prepare hood for use:

Ensure that the UV light is off whenever someone is in the room; if it is on, ensure that all sliding windows are shut and any fixed window openings are shielded.

Clean walls and work area with ethanol or other suitable disinfectant.

Place a small biohazard bag in container for discarding tips, etc. as you work.

Turn blower ON.

Let run for 2-3 minutes to purge work environment.

Working in the hood:

Prior to placement in the hood, gently clean items (equipment, pipettes, culture flasks, pipette aids and tip boxes) with an appropriate disinfectant.

Keep cultures closed until inside the working area of the hood.

Place all containers away from the front opening of the hood, but do not block the perforated panel at the back of the work bench. Air flow must be maintained at the back of the hood.

Do not block any of the grills of the cabinet, this disrupts the air flow and may lead to work contamination and breach of containment.

Use appropriate protective clothing/equipment when working with cultures (gloves, lab coats etc.)

Limit unnecessary movement in and around the cabinet while it is being used.

If possible, only one person should work in the cabinet at one time.

The operator should be seated, armpits level with the bottom of the window.

When entering or exiting the cabinet, do so straight on and allow the air flow to stabilize before continuing work.

Anytime the air is disturbed within the cabinet, allow the unit to run for two to three minutes to re-establish air flow patterns.

When working, aspirate cultures gently to avoid generating aerosols. Eject fluids gently along the walls of tubes.

Use the alcohol flame in the hood only when necessary as the excess heat can damage the HEPA filter. Turn the burner off immediately after use, and do not leave the flame unattended - even for a moment.

Avoid using an open flame in a cabinet.

Remove gloves before exiting cabinet.

Cleaning hood after use:

Cap or seal all cultures before removing them from hood.

Discard small biohazard bag into larger biohazard bag when full. Do not leave any of your materials or equipment in the hood.

Clean walls and work surface with disinfectant.

Remove outer gloves before removing hands from the cabinet.

If a spill occurs in the hood, follow procedures for Spill Response in Section 9.

Leave blower ON and let run for 30 minutes.

Shut blower off.

Close sash to prevent and contain dust contamination.

Turn on UV sterilizer.

When opening blood collection tubes safety equipment such as a Biosafety Cabinet or a shield should be used to prevent splashing or generation of aerosols.

Regular maintenance (when lab is in operation):

Twice daily – work surfaces wiped down with suitable disinfectant.

Weekly – UV lamp should be wiped clean with suitable disinfectant (lamp off!).

Monthly – All vertical surfaces wiped down with suitable disinfectant

Annually – UV lamp intensity verified.

8.3 Showers and eyewash stations

Emergency showers and eyewash stations are required by the Occupational Health and Safety act where there is risk of exposure to eye or skin hazards. Maintenance and testing guidance and documentation can be found on the Health and Safety website.

Emergency Showers:

Shower locations must be identified with a highly visible sign; the areas must be well lit and free from obstructions.

It is the responsibility of the Department Chair or the area Supervisor to assign responsibility for the testing of the shower facilities and to ensure compliance to these standards.

The function of the shower shall be **verified every six months** and recorded on the Emergency Shower Record Tag. The tag shall be displayed in a visible location near the shower unit.

Arrangements can be made to borrow shower testing equipment from Physical Plant, Orillia extn 2302 or 2303.

Electrical equipment must never be placed near the shower. Should an electrical panel be located adjacent to a shower unit, it must be covered with a plastic panel. If the cover is missing Physical Plant Orillia must be immediately notified at extn 2302 or 2303.

Eyewash Stations:

It is the responsibility of the Department Chair or the area Supervisor to assign responsibility for the testing of the eyewash facilities and to ensure compliance to these standards.

Plumbed eyewash stations shall be **activated weekly** to verify proper operation. The check shall be recorded on the supplied record tag.

The nozzles on the eyewash unit must be protected from airborne contaminants. Dust covers are supplied with the units. Activation of the unit will remove the dust covers without a separate motion by the operator. This shall be verified as part of the weekly check.

Eyewash locations shall be identified with a highly visible sign and the areas shall be well lit and kept free from obstructions.

Personal eyewash equipment can be used as support to plumbed eyewash units or where there is no access to plumbing (i.e. Field trips). Instructions and expiration date must be affixed to the unit or bottle. Expired solutions must be disposed.

8.4 Fire safety equipment

Fire Alarms / Pull Stations:

All major campus buildings have fire alarm pull stations. Look for pull stations as you approach an exterior exit or a stairwell leading outside. The pull station will generally be located in the corridor adjacent to the exit door leading to the vestibule or the stairwell, or inside the vestibule itself.

Smoke Detectors

Smoke detectors only are located in the Lot 5 Research building. Should fire or smoke be detected in this building, occupants must alert Security Services from a safe distance by called extn **3911 or 2009**.

Emergency Exits

Emergency exits are marked by lighted signs with the word “EXIT” in red lettering. Exit signs are located high on the wall above ground level doors, or at stairwells leading to a ground level exit door.

Lighted directional signage is also provided, where required. A red outlined arrow appearing below the work “EXIT”, indicates the direction to the closest emergency exit. Following the signs will provide an exit route during a fire emergency.

Fire Extinguishers

All campus buildings are equipped with fire extinguishers. The extinguishers are either wall-mounted, or located in the fire hose cabinets located in hallways.

Extinguishers are checked monthly. If you discharge an extinguisher, or find one which has been discharged, contact Security at extn **3911 or 2009**, and request a replacement.

Fire Safety Training

Fire safety training including operation of fire extinguishers is offered in conjunction with Orillia Fire Rescue in May and August of each year. Contact the Health and Safety Office to register for the next training session.

> ***Firefighting equipment, including fire extinguishers, are to be used only by individuals who have been trained in the use of the equipment.***

Emergency Lighting

All major buildings on campus, have emergency lighting. Emergency lighting provides illumination to exits, corridors and principal exit routes in the event of the loss of power.

Use of flashlights that automatically turn on when the power fails are strongly encouraged.

8.5 Common Laboratory Equipment

8.5.1 Centrifuges

When improperly used or maintained, centrifuges can present significant hazards to the users. The high speeds created by the centrifuges can create large amounts of aerosols in a spill, leak or tube breakage occurs. The failure of mechanical parts can also create projectiles. To avoid damage and contamination of your centrifuge:

Check centrifuges regularly for stress or damage, check the o-rings and replace if dry or cracked and keep a record.

Check centrifuge tubes for stress lines, hairline cracks and chipped rims before use.

Avoid filling tubes to the rim.

Use caps or stoppers on centrifuge tubes.

Use sealed centrifuge buckets (safety cups) or rotors that can be loaded and unloaded in a biological safety cabinet. Decontaminate the outside of

the cups before and after centrifugation.

Ensure centrifuge is properly balanced.

Do not open the lid during or immediately after operation, attempt to stop a spinning rotor by hand or with an object, or interfere with the interlock safety device.

Allow time for aerosols to settle in the centrifuge after operation.

Decontaminate regularly and record.

8.5.2 Sonicating, Mixing, Grinding

When used with infectious agents, mixing equipment such as shakers, blenders, sonicators, grinders, homogenizers and vortexes can release a significant amount of hazardous aerosols. Whenever possible these should be operated inside a biological safety cabinet. The hazards associated with this type of equipment can be minimized by:

Checking the integrity of gaskets, caps and bottles before using. Discard damaged items.

Use plastic containers to avoid the possibility of glass breaking and harming the lab user.

Vortexing is used instead of tipping to mix.

Allow aerosols to settle at least 30 seconds before opening containers.

Covering the tops of blenders with a disinfectant-soaked towel during operation, when using biohazardous material.

When using a sonicator, immersing the tip deeply enough into the solution to avoid the creation of aerosols.

Decontaminate the exposed surfaces after use.

8.5.3 Inoculating Loops

Inoculating loops must be allowed to cool before they are inserted into a liquid culture.

To eliminate the splattering and aerosolization associated with flaming of inoculating loop char the material by holding the loop close to the flame before inserting the loop into the flame.

Alternatively, use disposable loops, or a microincinerator.

8.5.4 Pipettes

Good technique is needed to reduce the production of aerosols and exposure to biohazardous material

Never pipette by mouth! Use mechanical transfer devices.

All serological pipettes should be “to deliver (TD)”. The TD pipettes do not require you to “blow out” or force the last few drops of liquid out of the pipette to obtain an accurate volume. Forcing the remaining liquid out of the pipette can result in the creation of aerosols.

When transferring material from a pipette to a Petri dish or bottle, the liquid is released as close as possible to the receptacle, or allowed to run down the wall, never from a height.

Pipettes are disposed after use, or are submerged horizontally in a suitable disinfecting solution inside a biosafety cabinet.

9. Personal Protective Equipment

The quantity and types of personal protective equipment a laboratory should have available will depend on its size and the type of work being performed.

Lab personnel must be familiar with any personal protective equipment provided for their use. They must know:

Why it is needed	How to use it
When it is needed	How to maintain it
Where and how to properly store it	The limitations of each item

Protective clothing should not be worn in non-laboratory areas.

9.1 Eye/face protection

Laboratory workers must always wear suitable eye protection when working in a laboratory where risk of eye injury is involved. The minimum eye protection for laboratory activities is safety glasses. Many styles and types of safety glasses and face protectors are available. Suitable eye protection will protect the entire eye area from injury, including injury from the side of the face. Proper selection of eye protection will depend on the specific laboratory operations and the

chemical supplier's recommendations. Confirm what type of eye or face protection is required on each product's SDS.

Wearing contact lenses in a laboratory is not advised

Contact lenses must never be put in or taken out while in a laboratory

9.2 Protective clothing

Lab coats, aprons or coveralls must be worn over street clothing when working with hazardous materials.

Suitable gloves should be worn when handling hazardous materials. See the Lakehead University Chemical Safety Website for a glove selection guide.

Lab coats that snap closed, have a higher cotton content and cuffed sleeves are strongly recommended in all labs, and are the required replacements for new lab coat purchases in Biosafety Level 2 Labs.

For general laboratory work, head protection is not required. Head protection must be appropriately selected if there is a head injury hazard due to the specific lab operations.

9.3 Respiratory protection

The requirement for respiratory protection is dictated by the known hazard. All respirators in use must be of an approved type and conform to regulation.

Respiratory equipment must be regarded as emergency equipment, or equipment for occasional use. The preferred method for controlling a hazard is to remove the hazard at its source.

All users of respiratory protection must be fit tested and instructed in the proper use and care of the respirator. All users of respiratory protection must be instructed in the limitations of the respirator. Additionally, the respirator chosen must suit the known hazard.

9.4 Footwear

Shoes with closed toes and closed heels must be worn at all times in laboratories. Feet must be completely enclosed.

Shoes with slip-resistant soles are strongly recommended.

Loose fitting shoes are strongly discouraged.

Shoes with holes such as crocs or sandals are not suitable to be worn in labs.

Generally, safety shoes with reinforced toes are not required for laboratory work, however, must be worn when moving heavy materials where there is a risk of a crushing injury to the foot

10. Waste Handling Procedures

All Laboratories must properly dispose of chemicals, regardless of their size or nature of their work. Improper disposal procedures can be extremely hazardous to personnel and the environment. In accordance with Provincial and Federal legislation, Lakehead University has developed hazardous materials disposal procedures. Properly inventoried hazardous materials are disposed by the University at no cost to the generator. Hazardous waste for disposal will not be accepted without prior submission of waste inventory.

Hazardous materials must be collected by type and updated inventories must be kept

Full guidelines must be reviewed and can be found on the health and safety website. An excerpt from the procedure can be found below.

Hazardous waste includes the following substances:

Toxic agents including drugs, chemicals, natural and synthetic

products; Corrosive substances.

Flammable materials including flammable liquids, finely divided metals or powders, and flammable solids;

Oils and other petroleum

products; Explosives.

Oxidizers and organic

peroxides; Compressed gases;

Pesticides and herbicides;

Pyrophoric materials;

Materials that will leach toxic materials, e.g., contaminated soils;

Biohazardous agents;

Radioactive materials; and

Sharps (needles, blades, etc.).

All hazardous waste must be suitably contained, properly labeled and properly disposed.

Labels must identify:

The date (or range of dates) the waste was generated.

The type of waste, i.e., liquid, acid, solvent, solid, gas, etc.

If the waste is a mixture, the percentage of ingredients must be noted.

Known hazards of the waste.

Full name of the supervisor who's lab generated the waste, i.e., researcher or department.

Name of the supervisor and his/her location.

Incompatibility of waste to other chemical and/or substance.

10.1 Hazardous waste chemical disposal

In order to minimize the amount of hazardous chemicals disposed, it is important to follow these guidelines:

Avoid overstocking.

Do not accept donations of materials that you don't plan to use in the near future.

Substitute hazardous experimental materials for non-hazardous ones.

Waste chemicals must always be stored based on chemical compatibility and strict records kept of the identity of all components in a waste chemical container.

Chemical waste inventory must be submitted prior to disposal. Use Llumin portal to generate a waste request or contact the Office of Human Resources-Health & Safety at labsafety@lakeheadu.ca.

10.2 Biohazardous waste disposal

Biohazardous wastes are defined as hazardous pathological waste by the Ontario Environmental Act. This waste is to be stored in specific approved

containers available from the Office of Human Resources-Health & Safety. Biohazardous waste is disposed of in one of two waste streams.

Stream One – Deactivation by Steam Sterilization

All biohazard waste is to be autoclaved prior to disposal through the regular waste system.

Liquid cultures, biohazardous fluids and contaminated rinse fluids are collected in glass flasks and autoclaved prior to disposal via the drain.

Contaminated solids, papers, and disposable non-sharps are collected in bench-top and floor-model biohazard bag receptacles and autoclaved prior to disposal through the regular waste collection system.

Disposable plastic pipettes are returned to their sleeves following use, and autoclaved before disposal through the regular waste collection system.

In addition to the general disposal process each risk group and specific agents may have additional decontamination or disposal requirements. Refer to PSDS for specific requirements.

Risk Group 1

There are no additional requirements in Risk Group 1.

Risk Group 2

Some of the agents in risk group 2 may require specific disinfectants. Some of these agents may require inactivation with a solvent or solution other than a disinfectant prior to disposal or clean-up.

10.2.1 Large Biohazard collection for Steam Sterilization

Ensure the biohazard collection bag is of an appropriate size to fit the autoclave.

Do not seal bags completely. You may use tape to close slightly, but make sure steam can still pass through to ensure complete decontamination.

A piece of autoclaving indicator tape must be attached to each bag.

Autoclave for 90 minutes 121ºC.

Place into a black garbage bag for disposal in regular waste.

10.2.2 Small Biohazard collection for Steam Sterilization

Small plastic bags placed in clearly labeled containers should be kept at benches for collection of contaminated tips etc. When bag is full, place small bag into large orange biohazard bags for decontamination.

10.2.3 Pipette collection for Steam Sterilization

Disposable plastic pipettes should not be discarded directly in the large **biohazard bags**, as they can puncture the bag. They should be collected in small biohazard bags on the bench and placed into the large bags as a bundle.

10.3 Sharps

All sharps, including needles, glass slides and cover slips, Pasteur pipettes, capillary tubes and contaminated broken glass should be placed in biohazard sharps containers. DO NOT place sharps in orange biohazard bags.

When containers are full (up to the top of the yellow plastic) they are to be closed, sealed and stored in a safe location. The exterior of the sharps container must be disinfected (if in a biosafety lab) and placed in a biohazardous disposal box (all labs) available from Human Resources. When the box is full, contact Human Resources – Health and Safety to arrange for disposal.

All sharps require incineration regardless of whether they are contaminated or not. Technical Staff will arrange for safe disposal of the sharps waste.

10.4 Non-contaminated waste

Non-contaminated waste is discarded into regular garbage bins located in each lab. Do NOT place any gloves into these bins. When a bin is full, it will then be disposed of by housekeeping staff.

10.5 Broken glass (Non-Contaminated)

All broken glassware that is not contaminated by chemical or biological agents including, microscope slides and slide covers, and Pasteur pipettes are to be deposited into a broken glassware container, available from Human Resources. When full, these boxes can be sealed closed and marked as garbage. Technical Staff will arrange for the safe disposal of the broken glass waste.

Should decontamination of broken glass be impossible, treat as sharp biological waste.

10.6 Radioactive materials

See Radiation Safety Manual for requirements.

10.7 Decommissioning equipment and laboratories

All laboratory spaces and equipment are to be properly decommissioned and free from known hazards prior to be vacated, serviced or transported. Refer to the decommissioning of laboratories and laboratory equipment policy: https://www.lakeheadu.ca/faculty-and-staff/policies/health-and-safety/decommissioning-of-laboratories-and-laboratory-equipment.

11. Training Operating Procedures

Training is an essential part of the Health and Safety program at Lakehead University. Basic training is provided through the Office of Human Resources - Health and Safety, however, each area handling hazardous materials will have specific instructions. It is the area supervisor's responsibility under the Occupational Health and Safety Act and Lakehead University policy to provide workplace specific training to students, staff and volunteers. All personnel using hazardous materials must complete *Workplace Hazardous Materials Information System* (WHMIS) training annually. Area Supervisors are encouraged to formalize their training materials in an official document, including information related to hazards, personal protective equipment and safe-work procedures. At

minimum the Lakehead University Supervisor's Due Diligence checklist (Appendix 5) must be completed.

See training requirements for each lab/job type in Appendix 1 and 2.

Training for new personnel must be completed prior to conducting any work in the lab with hazardous materials.

All training must be documented and a copy forwarded to Health and Safety within 2 weeks of its completion.

11.1 Legislation

Introductory health, safety and law training for new personnel, employees and supervisors is offered on an ongoing basis. This training forms a portion of New Hire Orientation Training, required for all new full- and part-time employees. This training places emphasis on the duties and rights of the workplace parties.

11.2 New Hire Orientation

This in-class training introduces relevant Lakehead University policies and procedures. Relevant policies and procedures are provided in writing to all new personnel. New personnel are required to read through the package thoroughly and attest in writing that this has been completed.

11.3 Area Specific

Training must be offered by the area Supervisor detailing hazards, procedures and protocols. This training is usually offered when an employee is new to an area or task. A checklist has been developed to assist Supervisors with this training, and also serve as a record of training (Appendix 5). Training must include:

1. Familiarization with the specific laboratory manual and procedures.
2. Laboratory specific safety orientation given by the Supervisor.
3. Training in proper use of the equipment i.e. fumehoods, biosafety cabinets and autoclave, as required.
4. Spill response and emergency procedures.
5. Microbial practices and/or universal precautions (for biosafety labs).
6. Specific safe work procedures for the particular hazards in use.

7. Laboratory security practices for all labs handling chemical or biological hazards.
8. Annual retraining of emergency procedures, and pertinent updates on changes to safety program.

All training must be documented by the supervisor and the records maintained. For a guide to Lakehead University required training for new Biosafety lab employees/students, refer to appendix 1 and 2.

Supervisors must clearly indicate potential risk to the user. An example of such a document can be found in appendix 5. Its use is suggested during the training process and should be signed and dated by both the user and supervisor.

11.4 WHMIS

Lakehead University WHMIS procedure

WHMIS training is required for all personnel handling hazardous materials. WHMIS training is available year-round online.

Annual re-training is required.

A grade of 80% is required.

Contact the Office of Human Resources - Health and Safety to register for WHMIS training at labsafety@lakeheadu.ca.

11.5 Biosafety

Personnel working in BSL1, BSL2 or BSL2+ labs must complete biosafety training prior to working in the lab. An in-course portion (offered monthly) introduces the basics of biosafety, biosecurity legislative requirements etc. All personnel must complete an online quiz (Via D2L) applying these principles to explain how biosafety/biosecurity is achieved in their lab with the agents in use.

In addition, the Canadian Biosafety Standards require annual refresher training in emergency response procedures. The BSO will organize this training each year.

11.6 Transportation of Dangerous Goods

Personnel who work in labs that accept biohazardous samples or in labs where any biohazardous materials or chemicals are transported off of Lakehead campus (including public demonstrations) require TDG certification. Training is available year-round via D2L.

12. Biosafety Program

12.1 Biological Hazards

Biological agents that are capable of inducing disease present a biological hazard. Protecting laboratory workers from biological hazards is of utmost importance and can be achieved by employing standard microbiological practices, containment and barriers.

Biologically hazardous agents are classified into four Risk Groups (RGs) according to their relative pathogenicity for healthy adult humans by the following criteria:

Risk Group 1 (RG1) agents are not associated with disease in healthy adult humans.

Risk Group 2 (RG2) agents are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are readily available.

Risk Group 3 (RG3) agents are associated with serious or lethal human disease for which preventive or therapeutic interventions may be available.

Risk Group 4 (RG4) agents are likely to cause serious or lethal human disease for which preventive or therapeutic interventions are not usually available.

Federal guidelines prohibit experimentation on autologous cells.

12.2 Biosafety Approval Process

Each laboratory involved with biological hazards will develop, document and implement workplace specific procedures, following the procedures in this manual. These procedures will be evaluated and approved by the biosafety committee.

All Biohazard Facility Permits issued will be based on the Biosafety Committee's assessment of laboratory "Biosafety Protocols" and the physical aspects of the lab in relation to the proposed scientific manipulations of biohazardous material.

There are two levels of application required depending on the type of Biosafety Lab. Facility managers who are not conducting/directing any research or teaching activities, but providing a multi-user facility are only responsible for a Level A Application. Researchers or instructors who will be conducting/directing research or teaching activities must complete Level A and Level B applications if they control the space the work will be conducted in, or ONLY a Level B application if they are working in a multi-user space with an existing Biosafety Facility Permit. **Researchers using an approved biosafety facility must have biosafety approval for each funded and/or unfunded biohazardous project.**

As required by the Tri-Council Granting Agencies, research funds for projects involving biohazardous materials will not be released to the Researcher until an approved biosafety protocol is in place. Each individual project must be evaluated by the committee separately.

Level A

1) Review and understand the Lakehead University Biosafety Policy.

2) Ensure that:

a. The physical laboratory environment meets the standards required for the Biohazard Level applied (Appendix 4).

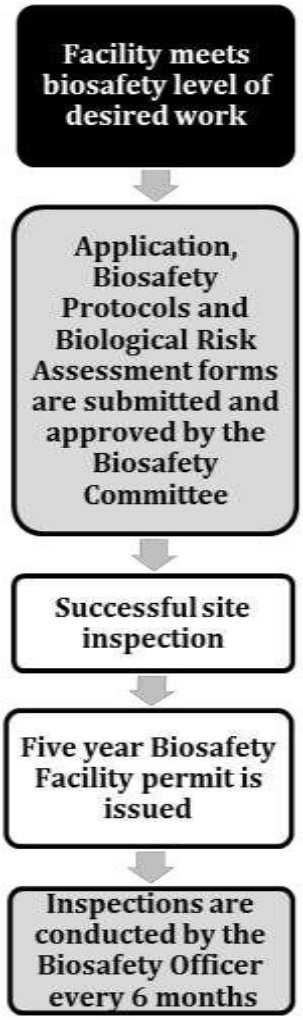
3) A laboratory specific procedure manual is available in the lab. This manual needs to meet the standards outlined in this document.

4) All personnel working in the laboratory have been trained (Appendix 1 & 2). The training has been documented (Appendix 5).

5) Applicant submits the lab specific manual as well as “Application to work with biohazards”, “Biological risk assessment” and supporting training records. These forms should cover all aspects of the biohazardous work to be conducted within the facility.

6) Once approved, a Biosafety Facility Permit will be issued for a period of up to Five (5) years. This permit must be retained in a biosafety binder available in all locations listed on the permit. Site inspections are required every six (6) months.

Level A – Facility/Protocols Application Process



Level B

1) Each project will require the submission of “Application to work with Biohazards Form”.

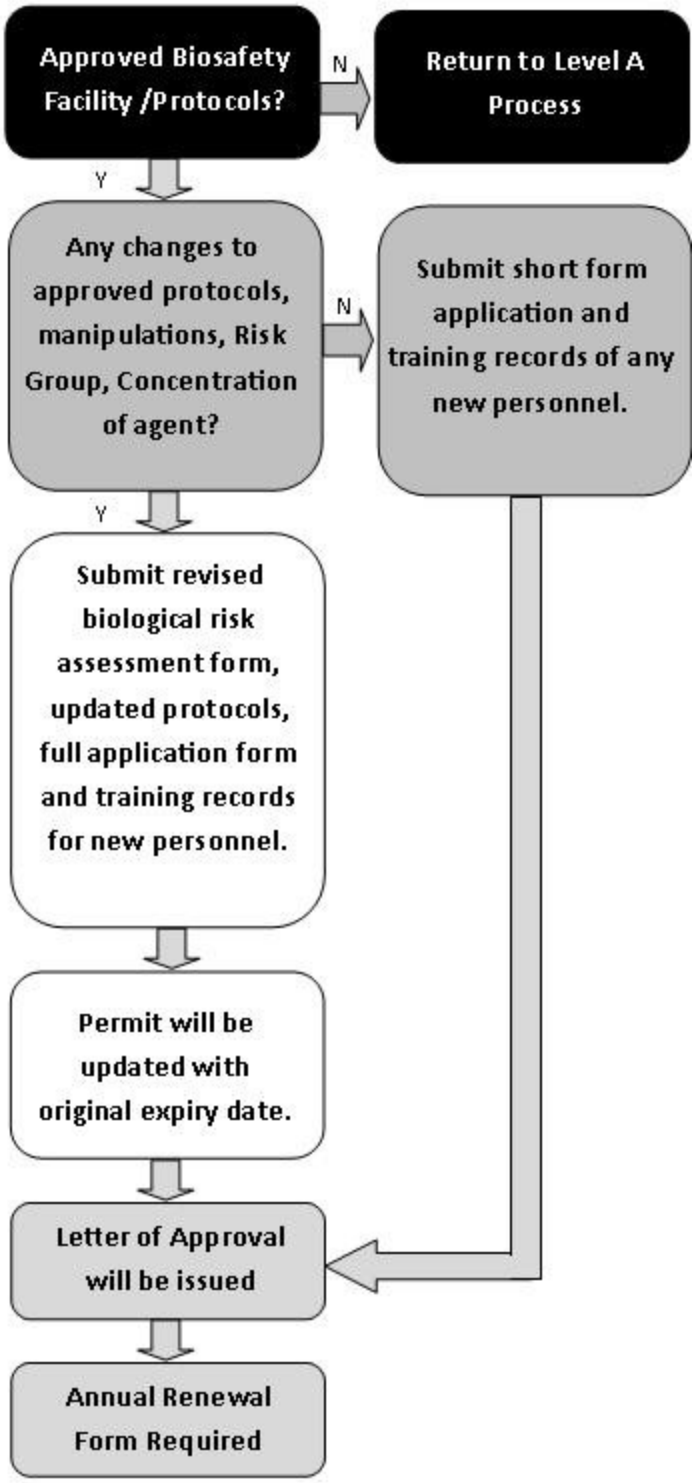
2) An updated Biological Risk Assessment Form (BRAF) outlining the specific manipulations and procedures must be submitted, IF any of the elements of biosafety protocols, biohazardous agents, manipulations, risk group of the agent, or concentration/volume is different from the BRAF as submitted for the Approved Biosafety Facility/Protocols. These changes must have revised BRAF and updated Biosafety Protocols appended to the full application.

3) Addition of New Lab Personnel only does not require a new BRAF to be submitted, only the short application and training records of new personnel appended to the application form.

4) Upon review/approval by the Committee, the existing Biosafety Facility Permit will be updated, a letter of approval issued, and funding released (if the project falls under a new grant). The original Facility Permit expiry date remains the same.

5) Annual renewal forms updating the committee on the status of the project are required.

Level B—Project Application Process (Funded and Unfunded)



Other Important Information

When composing a Laboratory specific procedure manual, review the "Biological Risk Assessment" form to ensure that all procedures used in your work are addressed in the manual

Note that permits issued by the Federal Government are required for import or transport of biologically hazardous agents into Canada. Contact the Office of Human Resources – Health and Safety for assistance. Conditions on these permits often do not allow use in another room or by another Permit Holder.

Note that sharing any biohazardous materials with another researcher/instructor/institution requires the approval of the BSO, may require a formal material transfer agreement and approval of the Federal Government.

Supervisors must ensure new personnel complete the appropriate training (Appendix 1 and 2) and that training records are up to date. Failure to provide suitable training could result in fines issued by the Ministry of Labour

You must notify the Biosafety Committee of any change in agent(s), procedure(s) or personnel, using the "Biosafety Renewal/ Amendment" form and "Biological Risk Assessment" form, as relevant

Changes to risk group or funding will require a new application to the biosafety committee

Facility inspections are required every 6 months. Facility permit holders and a staff/student representative are required to attend this inspection. Any items requiring follow-up action will be recorded on the Inspection Checklist. A copy of the checklist will be forwarded to the facility permit holder to record the actions taken and the date

Ask for help if necessary. The biosafety committee is your resource!

Materials which may assist as you compile your application can be found on the Health & Safety Website.

Biosafety Policy

Canadian Biosafety Standards – Third Edition

Pathogen Safety Data Sheets and Risk Assessment

12.3 Facilities for Containing Biohazardous Materials

Facilities that contain biological hazards are designed and must be maintained in a manner which minimizes the risk both to facility workers and to others working outside of the facility.

Biohazard containment facilities must display standard Lakehead University signage for hazardous materials, including biosafety level, as well as, instructions for housekeeping on all outer doors.

Containment facilities are classified into four Biosafety Containment Levels (BSL) according to risk group of the agent and the anticipated manipulations (see section 1.1 above). Only BSL 1 and BSL 2 facilities are available at Lakehead University.

12.3.1 Containment Level 1 – BSL 1 Laboratory

This is a basic laboratory that handles agents from risk group 1 (RG1). BSL1 labs require no special design features beyond a functional laboratory. The BSL 1 laboratory is not required to be separated from the general traffic patterns in the building. Biological safety cabinets (BSCs) are not required. Work may be completed on an open bench top, and containment is achieved through the use of practices normally employed in a basic microbiology laboratory (Section 1.5).

The following physical conditions are required for BSL1.

a. Each laboratory contains a sink dedicated for hand-washing. If a sink cannot be dedicated, Permit Holder must supply hand sanitizer gel at the lab exit and biosafety protocols must be updated to reflect the protocol change. (Handwashing is still required prior to exit, but must be followed up with use of gel at the exit).

b. The laboratory is designed so that it can be easily cleaned. A carpet in laboratories is not appropriate.

c. Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.

d. Laboratory furniture is sturdy. Spaces between benches, cabinets, and equipment are accessible for cleaning.

e. If the laboratory has windows that open, they are fitted with fly screens.

f. Biosafety binder containing all pertinent biosafety information, at minimum this will include: lab specific biosafety procedures, SOPs/User manuals for any specialized equipment, inventory, pathogen SDS, training records, copy of permit and biological risk

assessment form.

12.3.2 Containment Level 2 – BSL 2 Laboratory

This is a laboratory that handles agents from risk group 2 (RG2). The primary exposure hazards associated with organisms requiring BSL 2 are through the ingestion, inoculation and mucous membrane route. Agents requiring BSL 2 facilities are not generally transmitted by airborne routes, but care must be taken to avoid the generation of aerosols as aerosols can settle on bench tops and become an ingestion hazard.

In addition to the physical requirements for BSL 1 laboratories, the following requirements apply to BSL 2 facilities:

a. Access is limited to authorized personnel.

b. Appropriate signage is posted on outer doors.

c. Doors are lockable.

d. Laboratory surfaces are non-absorptive.

e. Laboratory surfaces are scratch, stain and chemical resistant.

f. Interior coatings are gas and chemical resistant.

g. A method of decontamination of infectious or regulated laboratory wastes is available (e.g., autoclave, chemical disinfection, incinerator, or other approved decontamination system).

h. An eyewash facility is readily available.

i. An emergency shower facility is available.

j. Properly maintained biological safety cabinets (See Section 8.2) are available and used for all:

   (1) **Procedures with a potential for creating infectious aerosols or splashes.** These may include centrifuging, grinding, blending, vigorous shaking or mixing, opening containers of infectious material whose internal pressures may be different from ambient pressure, inoculating animals intranasally, and harvesting infected tissues from animals or eggs.

   (2) **Procedures employing high concentrations or large volumes of infectious agents**. Such material may be centrifuged in the open laboratory if sealed rotor heads or centrifuge safety cups are used, and if these rotors or safety cups are opened only in a biological safety cabinet.

k. All substandard conditions are reported promptly to Physical

Plant.

12.3.3 Medical Surveillance – BSL 2 Laboratory

Laboratory acquired infections (LAI) are a risk of working with biological organisms. At present, the biohazardous materials in use at Lakehead University, do not pose a significant threat to personnel and a robust medical surveillance program is not required.

The current medical surveillance program is:

Assessment of risk for each pathogen in use, and the needs of additional medical surveillance by the Biosafety Committee

Mandatory reporting to the BSO any potential or known exposures and any known or potential LAIs

Strong recommendation that all personnel visit their health care provider annually to discuss their general health, immune status and any other conditions that may put them at risk for contracting an LAI.

13. Disinfectants and Sterilization

Standard microbiological procedures require work surface decontamination and proper destruction of cultures, stocks and biological waste. Selection of a disinfectant or sterilization process is dependent on the sensitivity of the organism to its action; therefore, knowledge of characteristics of the organism is essential to ensure adequate decontamination.

The term disinfectant is most commonly used to designate chemicals that kill growing forms of microorganisms, but not necessarily resistant spore forms of bacteria, except when the intended use is specifically against an organism forming spores or a virus. Proper use of a disinfectant is contingent upon the purpose for which it is employed. A disinfectant 1) removes infection, 2) kills, not just inhibits, microorganisms in the vegetative state, 3) does not necessarily kill spores, 4) is ordinarily a chemical but could be a physical process, and 5) is used only on inanimate objects.

Sterilization is a physical or chemical process that destroys all forms of life, especially microorganisms. To achieve sterilization, destruction must be adequate to ensure the organism is no longer detectable in standard culture media in which it had been previously found to proliferate. Physical processes include steam, heat, ultraviolet radiation, and ionizing radiation.

13.1 Typical disinfectants

Typical chemical disinfectants are: halogen compounds, phenolics, alcohols, glutaraldehyde and quaternary ammonium compounds. Selection of an effective disinfectant should be verified using the agent's SDS. See Canadian Biosafety Standards and Guidelines for further information.

All dispensing bottles of disinfectant must be marked with labels available from the BSO.

Alcohol

The most common alcohol disinfectants used are Ethanol/ethyl alcohol or isopropyl alcohol. A 70% solution in water is the most effective concentration. Alcohol disinfectants are effective against:

- Vegetative bacteria,
- Mycobacteria,
- Enveloped viruses,
- Mycoplasma,
- Fungi,

The contact time needed to ensure adequate decontamination is generally short for vegetative bacteria and enveloped viruses. Longer contact time (i.e. 10 minutes) is required for any activity against fungi and mycobacterium, which can be difficult to achieve due to loss by evaporation.

Bleach

The active ingredient in bleach is sodium hypochlorite (NaOCl). Bleach is effective against:

- Vegetative bacteria,
- Mycobacteria,
- Bacteria spores,
- Mycoplasma,
- Fungi,
- Fungal spores,
- Enveloped viruses,
- Non-enveloped viruses,
- Prions (using high concentrations).

The required contact time for bleach solution is generally short, but longer for bacterial spores (30+ minutes). Bleach is corrosive to metal; therefore a thorough rinse must follow its use. For the same reason do not autoclave bleach solutions.

A working solution of bleach is commonly 10% bleach or a 10:1 bleach/sodium hypochlorite, 9 parts water to 1-part bleach. Typical household bleach contains 5.25% sodium hypochlorite (NaOCl). Preparing a 10:1 solution, 9 parts water to

1-part bleach, will give a final concentration of 0.525% NaOCl. For most organisms 0.05% to 5.0% NaOCl is needed to ensure adequate disinfection. Check the percentage of sodium hypochlorite on your stock bleach as it will vary by supplier. Working solutions should be prepared fresh, as stock liquids lose their Chlorine concentration over time.

Selection of Chemical Disinfectants

It is difficult to make generalizations about contact times needed to disinfect specific pathogens as each has different characteristics of susceptibility. Selection of disinfectant is dependent on a variety of factors including the resistance of the infectious material or toxin, the application (eg. liquid or gaseous), the nature of the material to be disinfected (e.g. hard surface, porous material). Consideration should also be given to organic load, concentration, contact time, temperature, relative humidity, pH and stability

Alternate disinfectants are available. To utilize these, the laboratory's permit holder must demonstrate its effectiveness for the biohazards in use. Operating Procedures must be approved by the Biosafety Committee and filed in the facilities biosafety binder.

13.2 Characteristics of chemical disinfectants

Chemical Disinfectant	Commonly available form	Effective Against							Contact Time
		Bacteria			Viruses		Fungi		
		Vegetative	Mycobacteria	Spores	Enveloped	Non-	Fungi	Fungal Spores	
Chlorine	Liquid, powder and tablet	+	+	+	+	+	+	+	Generally short; longer for bacterial spores (≥30min)
Iodine	Aqueous solutions, tinctures and iodophores	+	L	L	+	L	+	L	Generally short for vegetative bacteria and enveloped viruses; contact time for other organisms is product-specific
Alcohol	Ethyl or isopropyl alcohol; 70% in water is most effective	+	+	-	+	L	+	-	Generally short for vegetative bacteria and enveloped viruses: longer for fungi and mycobacteria
Phenolics	Wide variety; generally used as	+	V	-	+	-	V	-	

	substituted phenols in combination with detergents								
Quaternary ammonium compounds	Wide variety available with built-in detergent action	+	-	-	+	-	+	-	
Glutaraldehyde	2% acidic solution supplied with a bicarbonate compound	+	+	+	+	+	+	+	≥20 min required for non-enveloped viruses and mycobacteria;>3 hours required for bacterial spores
Formaldehyde	Available as solid paraformaldehyde and liquid formalin	+	+	+	+	+	+	+	
Hydrogen peroxide	Accelerated formulations and 30% solutions in water	+	+	+	+	+	+	+	When using 6% H_2O_2, short contact time required. Higher concentrations and longer contact times required for sporicidal activity.
Chlorhexidine	4% solution of chlorohexidine in a detergent base and concentrated alcohol based solutions	+/L	-	-	+	-	L	-	*Effective against gram-positive bacteria, limited activity against gram-negative bacteria

+ effective; L limited activity; V variable activity; - no activity

Chemical Disinfectant	Disadvantages
Chlorine	Solutions are light sensitive and should be prepared fresh and stored in light protected containers Highly corrosive to metals Neutralized by organic material Concentrated solutions may be toxic to humans Reaction of chlorine with some organic molecules may lead to the production of carcinogens Not suitable for autoclaving
Iodine	Staining of treated objects Corrosive Neutralized by organic material
Alcohol	Alcohol should generally not be used to disinfect large areas of the laboratory as it may be a fire hazard Longer contact times are difficult to achieve due to evaporation Variable compatibility with certain materials (e.g., may harden rubber and deteriorate glues and some plastics)
Phenolics	Toxicity

	Pungent unpleasant smell Neutralization by hard water
Quaternary ammonium compounds	Decreased activity in hard water Reduced effectiveness in the presence of organic matter Due to detergent-like properties, they may make surfaces (including floors) slippery
Glutaraldehyde	Limited shelf life Highly irritating and toxic to skin and mucous membranes
Formaldehyde	More susceptible to inactivation by organic material than glutaraldehyde Pungent odour Extremely toxic A known carcinogen
Hydrogen peroxide	May be unstable when exposed to heat and light (some stabilized products are now commercially available) High concentrations can cause skin burns, irritation or damage to the mucous membranes (with direct exposure), and can pose a risk of explosion Equipment used in H_2O_2 disinfection may be expensive compared with other methods
Chlorhexidine	Incompatible with anionic detergents

13.2 Sterilization

Sterilization is an absolute process meaning the destruction of all life. Steam sterilization in an autoclave is a common process to destroy wastes and sterilize instruments in microbiological laboratories and clinics. The variables of temperature, time and pressure are used to achieve adequate sterilization. Biological waste may only be destroyed by steam sterilization under specific temperature, pressure and time conditions, or incinerated by an approved commercial vendor. The criteria for steam sterilization are:

1. Temperature of not less than 121° C for 90 minutes at 15 pounds per square inch;
2. Temperature of not less than 133° C for 45 minutes at 27 pounds per square inch; or
3. Temperature of not less than 160° C for 16 minutes at 80 pounds per square inch.

Operating a steam sterilizer is potentially hazardous due to the high temperature, presence of steam and pressure. It is imperative that guidelines be followed to prevent personal injury or damage to the autoclave. Familiarization with manufacturer's instructions is imperative before operating the unit. The following guidelines are provided for safe and effective operation.

1. Autoclave bags must be properly packaged, sealed and labeled identifying materials and the laboratory identification before being brought to an autoclave room. Material to be autoclaved must not be taken to the autoclave room until it is ready to be loaded in the autoclave.
2. Material to be autoclaved must never be left unattended in publicly accessible areas.
3. Autoclave bags shall be sealed by lapping the gathered open end and binding it with tape or a closing device such that no liquid can leak. Approximately 16 ounces of water may be added to generate steam if required, particularly if it contains dry material. When placing in the autoclave the bag must be re-opened so that steam can penetrate and circulate around the waste.
4. Each package shall have an autoclave tape attached that will indicate that the steam sterilization temperature has been reached.
5. The Autoclave Use Log must be completed each time the autoclave is used. The log contains the: 1) date, 2) operator name, 3) time used 4) type of material autoclaved, 5) duration of autoclave run, 6) post sterilization reading of the temperature sensitive tape.
6. Solid waste that has been steam sterilized shall be placed in an opaque plastic bag, sealed and disposed as general trash. The opaque bags may not be red or orange in color.
7. Sterilization will be confirmed regularly with biological indicators, following manufacturer's directions.

Your Supervisor or Department will have access to and provide training on safe use of your local autoclave. You must complete training prior to use.

14. Transport / Shipment of biohazardous agents

14.1 Receiving Biohazardous Shipments

Prior to ordering any biohazardous materials, the BSO must approve.

Anyone receiving biohazardous materials must have valid TDG certification.

Package must be inspected prior to accepting it. Damaged packages must not be accepted. Contact BSO.

Refuse any packages containing biohazardous materials that were not ordered by your Supervisor. Contact BSO. Wear appropriate PPE and open packages only in containment. Report any missing or incorrect items to BSO immediately. Upon receiving any biohazardous and or hazardous materials, the shipping documents should be forwarded to Lakehead University Laboratory Health and Safety @labsafety@lakeheadu.ca.

14.2 External Shipment

If any biological material is transported off-campus, the transport will be conducted under the standard shipping conditions specified by the carrier, determined by the risk group of the agent. Should transport off-campus be required, contact the Office of Human Resources, or the Biosafety Officer for transport guidelines.

To import human or animal pathogens into Canada, permits must be acquired. Contact the Office of Human Resources – Health and Safety for assistance.

14.3 Internal Transport

Transport of biohazardous material within the University performed by researchers will follow these guidelines:

Disinfectants effective against the agents in use must be available at all times and within the areas where the biohazardous material is transported.

Infectious materials must never be placed in sinks or floor drains.

Biohazardous material must be placed into a covered, leak proof, unbreakable container for transport between locations, i.e. between the lab and autoclave or the lab and another facility. Disinfect the outside surface of the container if necessary.

The container must:

- Be covered,
- Be clearly labeled with your name, organism, date,
- Be clearly labeled Biohazardous material with risk group level, and
- Not exceed a volume of 200mL.

Transport must involve a cart, or other carrying device.

A spill kit must accompany the cart and the transport of the material.

All locations biohazardous materials are transported to, must be listed on the Biosafety Certificate as an approved location.

15. Storage of Biohazardous Agents

Storage of biohazardous material within the University must follow these guidelines:

Stored in an approved location, listed on the Biosafety Permit.

Disinfectants effective against the agents in use (i.e. 70% ethanol) must be available at all times within the areas where the biohazardous material is stored.

Infectious materials must never be placed in sinks or floor drains.

All stored biohazardous material must be stored in containers provided that the container:

- Is covered,
- Is clearly labeled with your name, organism, and date,
- Is clearly labeled with biohazardous material, and
- Does not exceed a volume of 200mL per container.

If stored outside the containment zone (approved lab), the storage container must be lockable.

5.1 Inventory

Laboratories are required to keep an inventory of stored biohazardous materials (longer than 30 days). Inventories must be maintained and updated regularly on Llumin portal. An inventory of infectious materials and toxin should provide a description of the material including:

Name,

Risk group,

Quantity,

Form,

Location,

Date of receipt and/or generation,

and Pathogen Safety Data Sheet.

Contact labsafety@lakeheadu.ca for more information on Llumin portal.

16. Transfer of Biohazardous Agents

Those in possession of a biohazardous agent are responsible for its safe use and handling. This extends to other users of the agent if shared with another lab.

Biohazardous materials **must not** be transferred to another laboratory unless the following conditions are met:

The original purchase agreement allows for the purchaser to share the agent,

The Biosafety Committee must be notified of and approve the transfer,

The specific biohazardous material is listed on the Biosafety Certificate of the receiving laboratory.

For transfer of biohazardous agents OFF CAMPUS both the original importer and the Biosafety officer are responsible for ensuring the receiving party has permission to possess the biohazardous agent. Contact labsafety@lakeheadu.ca for more information.

17. Security of Laboratory Spaces and Contamination Control

It is a requirement of Lakehead University to keep all chemical, biological and physical hazards from being used inappropriately or unauthorized individuals. A security risk assessment has been conducted and the following standards must be upheld by all laboratory users and supervisors.

Inventories of biohazards and chemicals are required

Lab doors are to be closed at all times.

All laboratory doors must be closed and locked whenever the lab is unoccupied.

Supervisors are to ensure that a list of authorized personnel is filed with Security Services.

Key access must only be granted to those personnel who are authorized and have completed all relevant training and have demonstrated proficiency in lab procedures.

Personnel are expected to inquire the purpose of a visit if unknown individuals access the lab and confirm with their supervisor.

Supervisors are to alert laboratory personnel when new personnel will be accessing the lab.

Visitors may enter a lab only is they are given permission by the laboratory supervisor and are escorted by a trained lab occupant.

Security Officers will escort any unauthorized individuals from a lab, secure the lab and file a report with the Supervisor and Laboratory Safety Officer.

Inventories of all chemicals and pathogens are kept on file and are regularly maintained. See Section 15.1 for more detail.

Any incident, emergency, loss, theft, unauthorized access or breach of containment will be reported immediately to the lab Supervisor, Security Services at extn **3911 or 2009** and BSO. The Joint Health and Safety Committee-Labs and Studios and the Biosafety Committee will investigate any such occurrence.

All PPE must be removed prior to exiting laboratory areas.

PPE must be donned and doffed in an order to prevent personal and environmental contamination.

- Don (put on)
  - Hand hygiene
  - Mask/Respirator
  - Face/eye protection
  - Gown
  - Gloves

- Doff (remove)
  - Gloves
  - Gown
  - Preform hand hygiene
  - Mask/Respirator and Face/eye protection
  - Perform hand hygiene

Appendix 1: Training Required

Training Session	All Employees	Office Employees	Laboratory Employees/Researchers/Graduate Students	Physical Plant Mechanics/Electricians /Housekeepers	Security Services
New Hire Orientation	Y	Y	Y	Y	Y
H&S Awareness	Y	Y	Y	Y	Y
WHMIS Training			Y (1)*	Y (1)*	Y (1)*
First Aid		Contact HR	Contact HR	Contact HR	Y
Fire Safety		Contact HR	Contact HR	Contact HR	
Fire Extinguisher		Contact HR	Y	Contact HR	Y
Biosafety			Contact HR (1)*		
Hazardous Materials Awareness				Y	Y
Radiation Safety			Contact HR		
TDG			Contact HR	Contact HR	

* Denotes frequency of required training in years.

Appendix 2: Training Required for all New Personnel in Biosafety Labs

Biosafety Permit Level	Biohazards in Use	New Hire [a]	WHMIS [b]	Laboratory Specific[c]	Bloodborne Pathogen[b]	BSL 1[b]	BSL 2[b]	BSL 2 +[b]	Emergency Refresher	Transportation of Dangerous Goods[a]
1	Non-human tissue, bacterial, viral, fungal samples	•	•	•		•			•	**Required for all levels** if any biohazardous samples will be shipped, received or transported across any public roadway
1	Human blood or fluids	•	•	•	•				•	
1	Non-human tissue, bacterial, viral, fungal samples AND Human blood or fluids (collection)	•	•	•		•			•	
2	Non-human tissue, bacterial, viral, fungal samples	•	•	•			•		•	
2	Non-human tissue, bacterial, viral, fungal samples AND/OR Human blood or fluids (manipulation)	•	•	•			•		•	
2+	Non-human tissue, bacterial, viral, fungal samples	•	•	•				•	•	
2+	Non-human tissue, bacterial, viral, fungal samples AND/OR Human blood or fluids	•	•	•				•	•	

• denotes a required element

[a] Provided by appointment in Human Resources [b] Available at http://mycourselink.lakeheadu.ca [c] Template available from Human Resources

Appendix 3: JHSC Safety Checklist

Satisfactory (S) Unsatisfactory (U) Class (A, B, C, D) Not Applicable (NA)

1. HAZARDOUS MATERIALS

Chemicals/Reagents Y N

1.1 Proper WHMIS labels on all containers _____
1.2 Current inventory in Lab _____
Filed with H&S _____
1.3 Safely & compatibly stored _____
1.4 Acceptable quantity flammables in lab and solvent/flammable cabinet _____
1.5 No solvent storage near exit _____
1.6 Flammable cabinet condition _____
1.7 Fridge safe for solvents or sign prohibiting solvent storage _____
1.8 Chemical transport or handling equipment available _____

Compressed & Liquefied Gases Y N

1.9 Proper WHMIS labels _____
1.10 Cylinders secured _____
1.11 Protective caps used, (storage) _____
1.12 Regulators appropriate _____
1.13 Glass dewars taped _____
1.14 Cylinder number appropriate for use _____
1.15 Stored in hallway/exit _____

Waste/Surplus Chemical Disposal Y N

1.16 Contents/amounts identified _____
1.17 Containers adequate _____
1.18 Properly segregated (halogenated/non-halogenated) _____
1.19 Stored appropriately _____

Syringes & Sharps Y N

1.20 Sharps containers available _____
1.21 Identified _____
1.22 Decontamination Procedures _____

Biohazard Materials Y N

1.23 Identified _____
1.24 Containment level posted _____
1.25 Biosafety cabinets _____
1.26 Waste containers available _____
1.27 Decontamination procedures _____

Radioactive Materials Y N

1.28 Identified _____
1.29 Inventory up-to-date _____
1.30 Weekly contamination monitoring _____
1.31 Waste containment _____

2. SAFETY AWARENESS & INFORMATION

2.1 Material Safety Data sheets in lab
Hard copies available _____
2.2 Special procedures documented _____
2.3 Contact information posted, current _____
2.4 Unattended experiments identified _____
2.5 Signs appropriate (lasers, storage, etc) _____
2.6 Documentation of workplace training _____

3. LAB CONDITIONS

Lab Benches

3.1 Clean and good condition _____

Fume hoods Y N

3.2 Clean and unobstructed _____
3.3 Proper use known by users _____
3.4 Pilot light working _____
3.5 Airflow alarm tested _____

Floors, Aisles and Exits

3.6 Dry _____
3.7 Aisles, doorways, emergency exits unobstructed & marked _____

Sinks and Drains Y N

3.8 Clean _____
3.9 Water run to all drains regularly _____
3.10 Soap available _____
3.11 Paper towels available _____
3.12 Backflow preventer _____

Electrical Apparatus Y N

3.13 Wiring & cords in good condition _____
3.14 Equipment properly grounded _____

General Storage

3.15 Stored items easily accessible, not piled _____
3.16 Reasonable quantities of non-hazardous materials _____

4. EMERGENCY PREPAREDNESS

Spill Control

4.1 Bucket/gloves/bags available _____

4.2 Absorbent available _____

4.3 Neutralizing agent available:

Oxidizers _____

Flammable solvents _____

Infectious substances _____

Water-reactive _____

Air-reactive _____

Emergency Procedures

4.4 Lakehead University Emergency Procedures and Information posted _____

4.5 Fire alarm pull station accessible_____

4.6 First aid kit available/stocked/appropriate_____

4.7 Antidotes available (HF or CN) _____

4.8 Evacuation plan _____

4.9 Qualified first aider's posted _____

4.10 Personnel aware of accident reporting Procedures _____

5. PERSONAL PROTECTIVE EQUIPMENT

Eye and Face protection

5.1 Available, worn, policy posted _____

Eyewash Stations Y N

5.2 Good Condition _____

5.3 Suitable for hazard present _____

Gloves, Lab Coats and Footwear

5.4 Good condition _____

5.5 Suitable for hazard present _____

5.6 Proper footwear worn _____

General Lab Practices

5.7 No food/drink/utensils in lab _____

5.8 Chemical disposal training _____

Emergency Showers Y N

4.11 Location known and identified _____

4.12 Accessible _____

4.13 Good condition and tested _____

Fire Extinguishers

4.14 Available _____

4.15 Seal intact _____

4.16 Use instructions reviewed _____

4.17 Appropriately located _____

4.18 Tested recently _____

Maintenance Items and General Comments (Indicate line number, use additional comment page if required)**:**

Appendix 4: Biosafety Checklist

Lakehead UNIVERSITY

BIOSAFETY PROGRAM

BIOSAFETY INSPECTION CHECKLIST

PRINCIPAL INVESTIGATOR/PERMIT HOLDER:
_____

LABORATORY REPRESENTATIVES PRESENT:
_____

LABORATORY ROOM NUMBER: _____

CONTAINMENT LEVEL: ☐ 1 ☐ 2 (Shaded) RISK GROUP: ☐ 1 ☐ 2

DATE OF INSPECTION: _____

INSPECTION TYPE: ☐ APPROVAL ☐ 6 MONTH REVIEW ☐ ANNUAL ☐ RENEWAL

FOLLOW UP ACTIONS REQUIRED: ☐ NO ☐ YESFOLLOW UP INSPECTION DATE: _____

		Y	N	N/A	Comments
Access Control & Hazard Awareness					
1	Access to the laboratory is limited or restricted				
2	Proper lab hazard signs are posted. Emergency contact information is provided.				
3	All persons have met specific entry requirements and have been advised of the potential hazards in the laboratory.				

4	Persons are informed that conditions such as pregnancy or compromised immune systems may increase risk.				
5	Individuals under the age of 16 are not permitted in the laboratory.				
6	New employees/students are thoroughly trained in good laboratory practices and techniques.				
7	Employees work practices are monitored to ensure safety and adherence to protocols.				
8	Appropriate protective equipment (as per protocols) is available to lab workers and visitors.				
9	Workers are trained in post exposure protocols.				
10	Material Data Sheets are available and current.				
Laboratory Design					
11	The laboratory is designed to permit general cleaning and housekeeping and is clean, neat and organized.				
12	There is no evidence of cracked surfaces or need for general repair (leaking pipes, tiles lifted).				
13	Bench tops are impervious to liquids and resistant to alkali, acids, organic solvents and heat.				
14	The surfaces of walls, floors and ceilings are impervious to liquids and readily cleanable.				
15	Floors are slip resistant.				
16	Windows are closed and sealed (permanently or with a screen).				

17	All components of essential services requiring maintenance or replacement are located outside of the facility, (i.e. circuit breakers, gas shut off) or are easily accessible.				
18	Dedicated hand washing facility is located near each laboratory exit (hands-free preferred).				
19	Air flow is sufficient to exhaust vapours of flammable liquids and dangerous chemicals.				
20	Fume hoods are not the sole means of air exhaust. Regular maintenance program is in place.				
21	Appropriate storage areas are available for lab coats, hazardous chemicals and to prevent buildup of clutter.				
22	Alarmed equipment is identified and emergency contact information is affixed to the equipment.				
23	Office areas are located away from work area.				
24	Food and drink for consumption are stored outside of laboratory.				
25	Emergency systems are in place: fire, eyewash, and shower.				
OPERATIONAL PROCEDURES					
26	Long hair is tied back during laboratory work.				
27	Lab coats are worn, buttoned, with sleeves tucked into gloves when working with infectious material.				
28	Gloves are changed frequently when working with infectious material and before working with "clean" equipment and after possible contamination.				

29	Hands are washed after removing gloves, routinely throughout the day, after possible exposure and prior to leaving the lab.				
30	Received samples are inspected for damage, opened in the BSC, surfaces decontaminated and supporting documentation verified.				
31	All procedures with a high potential for creating aerosols or using high concentrations of an infectious agent are performed in a BSC.				
32	Before work in a BSC is initiated, startup procedures including surface decontamination, inward air flow and purging are completed.				
33	Appropriate BSC shut down procedure is in place and followed.				
34	Equipment inside a BSC is such that air flow is not impeded. Air grilles are not obstructed.				
35	All manipulations are performed at least four inches inside a BSC. Rapid movements are avoided.				
36	When rotating or moving equipment in a BSC, it is prohibited to perform any other manipulations in the cabinet.				
37	Mechanical pipetting devices are used. Mouth pipetting is never used and prohibited. All pipettes are "to deliver."				
38	Used pipettes are submerged horizontally in a suitable disinfecting solution, inside a BSC, or are disposed after use.				
39	Needles are not bent, sheared or recapped prior to disposal. Used				

	needles are not reused.				
40	When transferring infectious material from pipette to petri dish or bottle, the liquid is released as close as possible to the receptacle, or allowed to run down the wall, never from a height.				
41	Sharp containers are never filled past the marked line.				
42	When possible, capped leak proof tubes and bottles are used when working with/or storing infectious agents. The use of glass is minimized.				
43	All infectious agents are transported in unbreakable, leak proof containers suitable for decontamination.				
44	Magnetic stir bars are added before liquid.				
45	Inoculating loops are cooled before they are inserted into a liquid culture. Micro incinerators or pre-sterilized loops are used.				
46	When withdrawing a needle from a stoppered bottle, the needle and bottle are wrapped with a disinfectant soaked absorbent. Air bubbles are expelled into such absorbent.				
47	Sonicating, mixing, grinding and blending utilize equipment with gasket lids and leak proof bearings. Vortexing is used instead of tipping to mix. Aerosols are allowed to settle prior to opening.				
48	Centrifuges are: properly serviced, maintained, interlocked and balanced. Regularly checked for stress, damage and decontaminated. Checks				

	recorded.				
49	When working with cryogenic materials appropriate PPE is used: face shields, apron, insulated gloves. Samples are introduced slowly to prevent splatter, containers are not over-filled.				
50	Compressed gas cylinders are securely stored away from exits, leak tested and correct gauges used.				
51	Radioactive work is undertaken in compliance with the Radiation Safety Program and permit requirements.				
52	Animal work is approved by the Animal Care Committee. All individuals are trained to minimize exposure e.g. scrapes, bites, needle sticks and other unique hazards.				
53	Electrical hazards are identified and addressed. CSA approved, no frayed wires or use of electricity near sources of water.				
54	Appropriate waste containers are used and do not pose a tipping risk. Surfaces are decontaminated or double bagged to permit transfer for decontamination.				
55	Waste procedures are available and followed.				
56	Autoclave procedures are available. Efficacy testing is undertaken regularly and records maintained.				
57	All specimens of unknown status are autoclaved or sent for incineration.				

58	All equipment exposed to infectious materials is disinfected prior to repair or servicing.				
59	Written protocols outlining decontamination of work surfaces, spills and wastes are available and followed.				
60	All spills and accidents which result in exposures to infectious materials are immediately reported, recorded and investigated.				

Appendix 5: Training Record and Acknowledgement of Risk

Lakehead UNIVERSITY | Health and Safety

Job Specific Training Checklist for Laboratory Trainees

Employee Name: Start Date:

Department: Supervisor Name:

General Safety	**This section is to be completed for all trainees**	
	Examples	**Received**
Sharps disposal	Safe clean-up of sharps, broken glass bin, disposal procedure	
Work Order Procedure	Reporting physical deficiencies to work.orders@lakeheadu.ca	
First Aid kit location	Where to access first aid kit and designated first aider	
Telephone System	Emergency key on phone, lab emergency contact list	
Emergency exits and procedures	Closest emergency exits, pull stations, fire extinguishers, area fire warden	
Working alone policy and procedures	Which experiments are too hazardous for after-hours work and when alone, Keep In Touch program with Security	
Location and use of emergency facilities	Closest safety shower, emergency eyewash station	
Hazardous waste disposal procedures	Storage and segregation of waste, inventories and reporting requirements	
Personal Protective Equipment	Requirements for selection, use, care and how to safely remove	
Lab Safety Policy/Procedures	Lab safety manual	
Hazard Reporting Procedures	How to contact security/physical plant & your supervisor	
Security	Procedures for visitors, and keeping the lab secured	
***Trainee must complete WHMIS annually, contact H&S**		
Chemical Safety	**Trainee will be working with chemicals:** **Yes** **No (Proceed to section Biological Safety)**	
Safe chemical handling procedures	Correct use of a chemical fume hood, flammable liquids, toxic chemicals	
Chemical spill kit	Location of kit and procedure for clean-up of spills	
SDS	Location of SDS	
Specific Hazards (List)	e.g. hydrofluoric acid/machine guarding	
Inventory	Requirements for inventory maintenance	

Biological Safety	**Trainee will be working with biohazards:** **Yes No (Proceed to section Radiation Safety)**	
Biological agents	Risk groups, method of transmission, blood borne pathogens	
Universal precautions	Use of PPE, good hygiene/housekeeping practices, good microbial practices	
Biosafety cabinet	Correct use of a biosafety cabinet	
Aerosols	How to avoid aerosol generation	
Autoclave	Safe operation	
Needle sticks/sharps injuries	Safe use of needles/sharps	
Shipping and Receiving	How to correctly receive a package	
Transporting biological materials	Procedures for on-campus transport	
	On public roadways (requires TDG certificate, arranged through H&S)	
Biological Spills	Location of spill kit, how to safety clean up spills, when to report to Supervisor/Security	
Biological waste	Separation and disposal procedures	
Radiation Safety	**Trainee will be working with radiological hazards:** **No - Proceed to section Other Hazards/Risks** **Yes - Contact H&S to arrange for basic radiation safety training and complete Radiation Safety Training Form with Trainee**	
Other Hazards/Risks	**List any other hazards/training provided specific to your lab or experimental procedures or check:** **Risks are covered in the previous sections**	

As Supervisor, I attest that has both received training in all of the areas of health and safety checked above and demonstrated proficiency in the standard operating procedures required for this laboratory sufficient to enable him/her to conduct themselves safely in my laboratory without direct supervision.

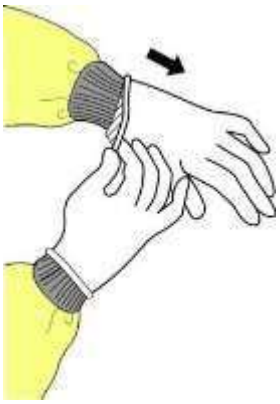
Supervisor Signature: Date:

I attest that adequate training has been provided to me in order to conduct my laboratory duties safely and that I will follow all laboratory rules as they relate to Health and Safety. I acknowledge that some medical conditions that affect the immune system may put me at increased risk of contracting an infectious disease. Should I be at increased risk, I will discuss my laboratory duties with my primary health care provider annually and should any accommodations be required to reduce my risk, I will share those with my Supervisor as soon as I am aware of them.

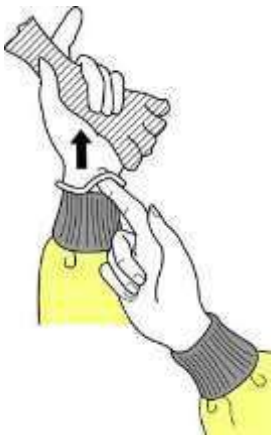
Employee Signature: Date:

Supervisors keep a copy for your records. Trainee, upload a copy into D2L Assignments (Checklist).

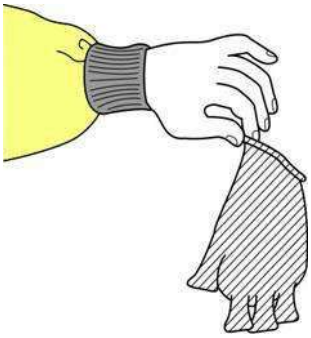
Appendix 6: Proper Glove Removal



- Grasp outside edge near wrist
- Peel away from hand, turning glove inside-out
- Hold in opposite gloved hand



- Slide ungloved finger under the wrist of the remaining glove
- Peel off from inside, creating a bag for both gloves
- Discard



Appendix 7: Leave Your Work in the Lab