

REMEMBER!

Call Security at extension 6562 (673-2661 after hours) for assistance, or Health Services at extension 1067 if medical aid is required.

Report all incidents to your supervisor and to Human Resources (Occupational Health and Safety) as quickly as possible.

IMPORTANT TELEPHONE NUMBERS:

**Human Resources (Occupational Health and Safety)
extension 3016**

for information or assistance on matters relating to employee safety and safety in the workplace, to report an accidental injury or industrial disease, and to complete a Workplace Safety and Insurance Board accident claim form.

**Department of Security and Parking
extension 6562**

for information on fire safety and fire regulations and regular campus-security items.

**Health Services
extension 1067**

for medical assistance, services or information and doctor and nurses on duty during normal working hours.

**Department of Physical Plant and Planning
extension 1500**

to report maintenance items, electrical, mechanical, heating or ventilation problems.

**Dr. F. Caron, Radiation Safety Officer, Department of Chemistry and Biochemistry,
extension 2400**

**Dr. D. Hallman, Associate Radiation Safety Officer, Department of Physics and
Astronomy, extension 2202**

G. Cowper-Benoît, Department of Chemistry and Biochemistry, extension 2109

Central Analytical Facility, extension 2283

Remember to first dial "9" for an outside line, then 911 for police, fire, and ambulance emergencies.

Laboratory

Safety Handbook

**EVERY PERSON WORKING OR INTENDING TO WORK IN A
LABORATORY MUST READ THIS DOCUMENT.**

August 2004

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Environmental/Health and Safety Policy

Laurentian University recognizes the value of every member of the campus community, and it is, therefore, vitally interested in the health and safety of all persons working, studying, residing, or visiting on, or within, its premises, wherever situated.

It is the policy of Laurentian University to provide and maintain a safe and healthy work environment for all employees, students and visitors, to protect them from injury or occupational disease through the enforcement of legislative requirements as contained in the Ontario Occupational Health and Safety Act, Environmental Protection Act, their Regulations, and other statutes, plus all policies, rules, or instructions as may be issued by the University.

Both the employer and all employees are responsible, jointly, for compliance and enforcement of the rules and regulations, and to take appropriate steps to prevent accidents, occupational illnesses, injuries, or adverse effects upon the natural environment.

Laurentian University, as the employer, is ultimately responsible, through its Board of Governors, for the provision of a safe-working environment, as well as for the health and safety of its employees, and is committed to the resources as may be necessary to carry out these responsibilities.

Deans, chairs, research supervisors, non-academic managers, and supervisors are responsible for the safety of employees, students, and visitors who work and study within their areas of jurisdiction, and for compliance with statutory and University requirements. Supervisors will be held accountable for the health and safety of workers under their supervision.

Employees have a duty to protect their own health and safety by working in compliance with the law, as well as with safe-work practices and procedures established by the University, and to report hazards and violations to supervisory staff for correction.

It is the responsibility of all external contractors, sub-contractors, and their workers to meet or exceed the legislative and the University's health and safety and environmental requirements.

The health and safety of each individual on University premises is the joint responsibility of all members of the University community, and includes the Board of Governors, management, faculty and staff, as well as students, visitors, contractors, and their subcontractors. Disciplinary or other action may be necessary in instances where work practices or other activities are in contravention of, or not in accordance with, the Environmental/Health and Safety Policy of Laurentian University, the Occupational Health and Safety Act, the Environmental Protection Act and their Regulations, or other relevant legislation.

1. GOAL

Our goal is a safe environment for everyone. This handbook is provided to assist you in maintaining high standards of safety practices and programs in adherence to the obligations of the Ontario Occupational Health and Safety Act by:

- providing information and standards in the form of established Safety Guidelines in laboratories;
- explaining basic emergency procedures;
- outlining specific policies where applicable.

The manual may be supplemented as new information becomes available or as new legal standards are developed.

2. INTRODCUTION

Safety standards are designed to reduce the inherent risks in the handling of dangerous materials and potentially dangerous procedures or practices. All laboratories can be inherently dangerous places and the attitudes and actions of those who work in the laboratory determine their own safety and that of their colleagues and, ultimately, that of the community. Different standards are set for different levels of risk. High levels of risk require more stringent standards than lower levels of risks. Compromises are, therefore, made in setting safety standards so as not to impede much needed research while keeping risks of those involved to a minimum. Laboratory equipment and design have become more sophisticated and safer, but safe operation still depends on properly trained and genuinely concerned personnel, who are **safety conscious at all times**.

Throughout this manual, proper training and knowledge of equipment and materials are stressed. With the WHIMS legislation, suppliers are required to provide Material Safety Data Sheets, and these should always be consulted prior to working with a new material. Always ensure that a **knowledgeable and safety-conscious person** trains you in the safe use of specific equipment. Document the training whenever possible.

If you have any questions about how to undertake a task or project safely, contact your supervisor. Your Joint Health and Safety Committee members serve as an additional resource.

We trust that this handbook will help you to work safely and to develop effective safety programs. We welcome any suggestions you have to improve both the handbook and Laurentian University's safety programs.

3 DISCLAIMER

The manual is intended to provide basic rules for safe-work practices in a laboratory. The procedures may be supplemented with safer work practices, where applicable.

The manual is, by no means, all encompassing, and any omission is not an excuse for unsafe practices.

In all cases, the individual supervisor is ultimately responsible for teaching safe-work practices and must insist upon the use of such proper procedures to eliminate unnecessary hazards.

The individual supervisors must identify and supplement this manual with safety procedures and training specific to the needs of their laboratory safety programs, if the subject is not adequately covered in this manual.

4 RESPONSIBILITES AND LIABILITES

Everyone actively engaged in laboratory work is legally responsible for safety performance. All laboratory personnel must meet the legal requirements of various environmental and health-and-safety statutes. It is expected that adherence to this manual is a good starting point for establishing an acceptable laboratory safety program. Everyone is encouraged to develop and use practices which exceed the basic information in this manual.

More detailed and specific safety procedures and practices may be necessary. Any deviation from this manual must be to establish safer practices. Everyone should be able to justify that reasonable care and deliberation have been exercised before the implementation of any changes.

By not using recommended practices in this manual or safer alternatives, individual liability may increase.

It is everyone's responsibility to know all emergency procedures, location, and use of safety equipment and exit routes in case of an emergency.

4.1 Responsibilities and Rights

Under the terms of the Occupational Health and Safety Act (OSHA), employees have a responsibility to report to their supervisors the existence of hazardous conditions which are contrary to good health and safety practices, or which contravene any requirements of the Act. It is the **supervisor's responsibility** to ensure that corrective action is taken at once.

It is the unconditional right of all members of the University community to bring, **without prejudice**, health-and-safety concerns to their supervisors, or to Human Resources (Occupational Health and Safety), or to the Joint Health and Safety Committee. The supervisor, in every case, must be informed of a concern before a complaint is taken elsewhere.

4.2 Summary of Duties

The following is a summary of responsibilities according to the OHSA. (Please refer to the OHSA for specific wording.)

The employer must:

- ensure that the equipment, materials, and protective devices provided by the employer are in good condition;
- provide information, instruction, and supervision to a worker to protect the health or safety of the worker;
- appoint a competent supervisor;
- acquaint a worker or a person in authority over a worker, with any hazard in the work;
- take every reasonable precaution to protect the worker;
- prepare and review a written health-and-safety policy at least annually and post this in the workplace.

The supervisor must:

- ensure a worker works in a manner required by the Act and with the proper protective devices;
- ensure a worker uses or wears the equipment, protective devices, or clothing required;
- advise the worker of any potential or actual danger to the health and safety of the worker;
- provide the worker with written instructions about measure and procedures for protection;
- take every reasonable precaution to protect the worker.

The worker must:

- work in compliance of the Act;
- wear any equipment, protective devices, or clothing that the employer requires;
- report any defect in protective gear that may endanger himself/herself or someone else;
- report any contravention of this Act or any hazards;
- not remove or alter any protective device;
- operate or use any equipment in such a manner as to endanger himself/herself or someone else.

4.3 Right to Refuse Work

Under the provisions of the OHS Act, workers have the right to refuse to perform work which they believe may endanger the health or safety of themselves or another worker. There are strict guidelines to be followed in this instance by both the worker, the supervisor, and other interested parties. For further information, employees are referred to Section 43 of the Act.

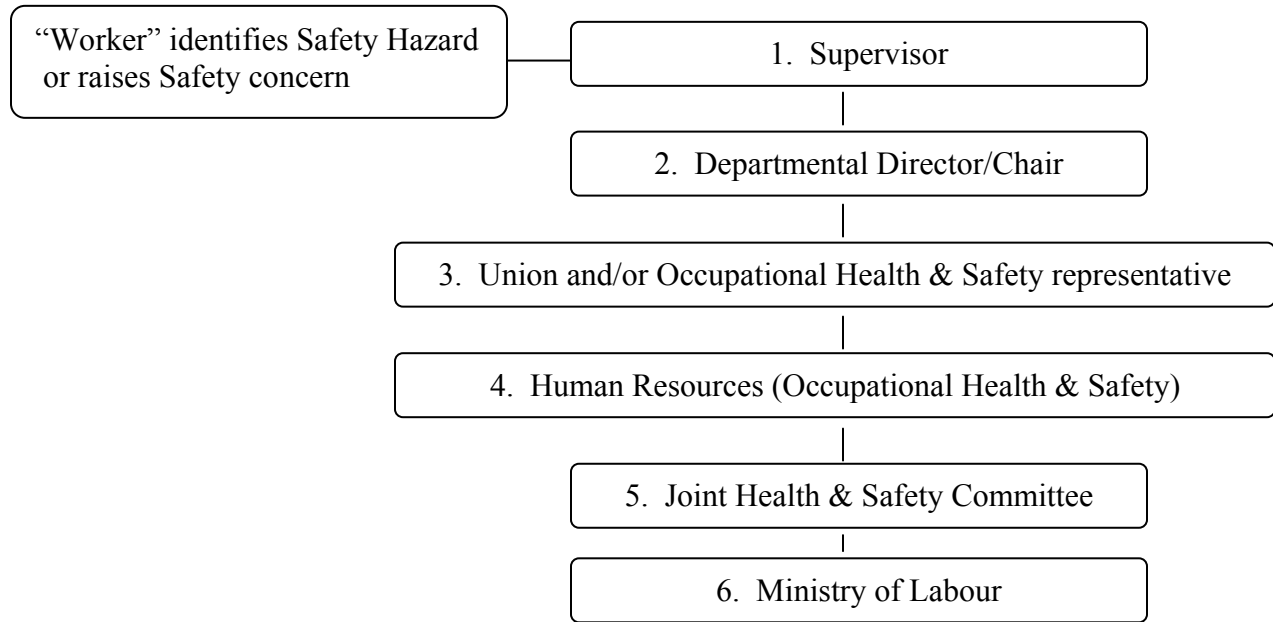
4.4 Reporting Accidents or Injuries

Every accident, whether or not it results in injury or is a "near miss" occurrence, should be reported to your supervisor or department director/chair **within 24 hours**. The supervisor or department director/chair must then immediately advise Human Resources (Occupational Health and Safety) of the accident, to provide, when applicable, details for completion of a Form 7 to the Workplace Safety and Insurance Board. In those circumstances where the employee has no immediate supervisor, or the supervisor is absent, then the employee must initiate this contact with Human Resources (Occupational Health and Safety).

5. RESOLUTION OF A HEALTH AND SAFETY CONCERN

In order for the "internal responsibility system" to function properly, normal lines of communication should be maintained as much as possible.

5.1 Steps in the Resolution of a Health and Safety Concern



first response: inform the supervisor as quickly as possible.

second response: advise the departmental director/chair.

third response: the concern may be brought to the attention of the union representative and/or the Occupational Health and Safety representative.

fourth response: if no satisfactory resolution is reached Human Resources (Occupational Health and Safety) must be consulted.

fifth response: the Joint Health and Safety Committee will be consulted if no resolution is reached once the first four steps have been done.

sixth response: the underlying principle of the Occupational Health and Safety Act of Ontario is that of an **internal responsibility** system; the Ministry of Labour should only be consulted if all other attempts have failed to bring satisfactory resolution to a health- and-safety problem

Note: The worker, the supervisor, or the departmental director/chair may contact Human Resources (Occupational Health and Safety) at any time for consultation.

6. JOINT HEALTH AND SAFETY COMMITTEE

Section 9 of the Occupational Health and Safety Act requires the employer to establish a Joint Health and Safety Committee in the workplace. Such a committee is in place on campus, and is made up of the following members:

- Representative, United Steelworkers of America (local 2020)
- Representative, Laurentian University Faculty Association
- Representative, Laurentian University Staff Union
- Representative, Laurentian University Staff Union
- Representative, Science and Engineering Safety Committee
- Representative, Health Services
- Representative, Administrative and Professional Staff Association
- Director, Human Resources
- Manager, Occupational Health and Safety

The Joint Health and Safety Committee is very active on campus, and meets on a regular basis. Minutes of every meeting are circulated to all members of the Committee, the presidents of all unions and associations represented, the Executive Committee of the Board of Governors, to senior administration. Check with your association, union or Human Resources (Occupational Health & Safety) to find out more about the duties and responsibilities of Committee members, the name of your member, and how to reach them.

6.1 Other Safety Committees on Campus

Several smaller safety committees are in place throughout the University. At present, these include:

- Chemistry and Biochemistry Safety Committee
- MIRARCo Health and Safety Committee
- MIRARCo Environmental Committee

Minutes from these committees, along with any comments or recommendations, are tabled at regular meetings of the Joint Health and Safety Committee.

6.2 Workplace Inspections

Regular inspections of the workplace help to identify hazards and prevent accidents. It is the Departmental Safety Committee's responsibility to schedule and conduct regular inspections. Workers and the employer must give the safety representative information and assistance to carry out these inspections.

7. SPECIFIC EMERGENCY PROCEDURES

Call Security at extension 6562 (673-2661 after hours) for assistance, or Health Services at extension 1067 if medical aid is required.

Report all incidents to your supervisor and to Human Resources (Occupational Health and Safety) as quickly as possible.

7.1 Medical Emergency

For critical injury, dial "9" for an outside line, then **911** to request ambulance assistance. In the interim, Health Services (extension 1067) may be able to offer help or advice.

For non-critical injuries, report to Health Services located on Student Street in the Single Student Residence.

7.2 In Case of a Fire

In case of a fire alarm: immediately vacate the building via the nearest exit route. **DO NOT USE THE ELEVATORS!**

Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.

The safety of all people in the vicinity of a fire is of foremost importance. **However, do not endanger yourself.**

If you should be the first person to notice a fire, DO NOT attempt to extinguish it unless you are confident it can be done in a prompt and safe manner, utilizing a hand-held fire extinguisher. First thing to do is to proceed to the nearest fire-pull station and pull the alarm. Then, if it can be done safely, telephone the local Fire Department by dialing 911. Remember, first dial "9" for an outside line.

If possible, close all windows leave fume hoods on, make sure the room is evacuated, close the door, and briskly exit the building, following instructions of the Fire Warden(s).

Assure that the fire extinguisher is appropriate for the specific type of fire. In selecting the appropriate extinguishers for the laboratory, the type of combustible material must be considered.

All laboratories are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely-divided metals which are oxidizable.

Clothing on Fire:

Douse with water from safety shower immediately **OR**

roll on the floor and scream for help **OR**

wrap with fire blanket to smother flame (a coat or other non-flammable fibre may be used if blanket is unavailable).

Do not wrap a standing person, because of a chimney effect; and lay the victim down to extinguish the fire. The blanket should be removed once the fire is out in order to disperse the heat and thus minimize tissue damage. These blankets may also be used to keep injured persons warm.

N.B. Do not use fire extinguishers on people.

7.3 Chemical Spill

on body:

Remove contaminated clothing (avoid modesty). Wash thoroughly with water, or use emergency shower immediately for 15 minutes. Prevent further contamination of other body parts, especially the face and eyes.

in eye:

Contact lenses must be removed immediately, if possible. Immediately flush eyes with water for at least 20 minutes. Hold the eye open during flushing; ask for assistance.

indoors:

Decide if you can **safely** handle the spill. If unsure, call for assistance.

If safe to do so:

1. eliminate all ignition sources if flammable material is involved;
2. dike, block, or contain size or spread of spill by using appropriate absorbing material (sand, vermiculite, commercial absorbent, spill pillows, etc.);
3. carefully remove other materials, containers, equipment from path of liquid/solid spills;
4. turn on fume hoods to capture or direct flow of gases/vapours.

STOP, THINK! CAREFULLY PLAN CLEANUP STEPS; GET ASSISTANCE TO CHECK YOUR PLAN.

Dispose of cleanup material as hazardous waste.

If unsafe or unable to clean up spill:

1. call Security (extension 6562) for assistance; fire alarm should only be pulled if situation is out of control;
2. evacuate to safe location and prevent others from entering by posting warning signs available from your department;
3. follow instructions of security officers until security defers the matter to University officials.

Mercury spill:

Mercury vapours are highly toxic. Clean up immediately.

Small amounts may be picked up with an aspirator bulb, a medicine dropper, or a mercury sponge. Place in a container, cover with water, and seal it.

Mercury Spill Kits may be used where available.

Once larger droplets are removed, wash the surface with mercury-neutralizing solution, such as 20 percent (%) calcium sulphide or saturated sodium thiosulphate.

If mercury has broken up into many globules, sprinkle the sulphur powder or commercial product over the area, and leave for several hours before clean-up.

Waste must be properly sealed and labeled with hazardous-waste label.

If a larger spill of mercury (i.e. a broken manometer) occurs, the area must be evacuated, closed off, and warning signs posted. Inform Security at extension 6562 immediately.

Note: the Threshold Limit Value (T.L.V.) for mercury is 0.05mg/m³.

outdoors:

Contain spill rapidly by diking with suitable material (spill stockings, sand, vermiculite, etc.). Prevent the chemical from contaminating ground water and sewer system. Call for assistance.

Ensure that the spill site is not left unattended

7.4 Bio-hazardous Spill

Alert all other present, and isolate the area.

Wear a lab coat and disposable gloves.

Apply a paper towel over the spill being careful to avoid splashing.

Soak the towel with disinfectant, starting at the periphery and working inwards, without splashing. Appropriate disinfectants are 10 percent (%) household bleach, 70 percent (%) alcohol, or 5 percent (%) Lysol.

Leave for a contact time of at least 10 minutes.

Scoop the material into a container for autoclaving before disposal in the regular garbage.

Do not dispose of broken glass in the regular garbage. Autoclave broken glass before disposal in the special glass-garbage container.

Remove contaminated clothing, and wash all exposed skin with antiseptic.

Autoclave clothing.

Inform supervisor and follow her/his instructions.

7.5 Spills Involving Radioactive Material

Although this is covered in details in the Radiation Safety Protocols of the University, a summary of the procedure is as follows:

- I. Close off the area and post a “**NO ENTRY**” sign.
- II. Inform personnel in the area that a spill has occurred, and keep them away from the spill.
- III. Cover the spill with absorbent material to avoid the spread of contamination.
- IV. Inform the laboratory supervisor that a spill has occurred. If the spill is minor (100 Equivalent Quantities - EQ - or less), the Radiation Safety Officer (RSO) does not need to be informed, but a record of the quantity spilled and sent to radioactive wastes must be written in the Laboratory Log Book. After clean-up, contamination checks must be done.
- V. If the spill is more important (>100 EQ), follow the same procedure as above, and contact the laboratory supervisor. He or she is required to contact the RSO after the situation is under control.

A pamphlet about spill procedures is available from the Radiation Safety Officer (RSO), Dr. François Caron, at extension 2400. A copy should be available in each laboratory licensed for radioactive work.

7.6 Bomb Threats

No bomb threats should be ignored. Immediately call Security at extension 6562 or 673-2661 after hours.

8. RECOMMENDED GUIDELINES FOR WORKING IN LABORATORIES

Always be prepared and informed. Know the safety rules and procedures.

Before starting an experiment using chemicals, make sure you know all the properties and compatibilities by checking the Material Safety Data Sheets, other appropriate resources, and by checking with your supervisor.

Smoking is prohibited within all University buildings and vehicles, except the private apartments of Married Student Residence. Smoking is also prohibited within 9 metres (30 feet) of any entrance at all University buildings. Contact Human Resources for your copy of the Non-Smoking Policy. The Non-Smoking Policy is also available on the Human Resources/Occupational Health and Safety Web site.

Know the location of emergency equipment in your area.

Always report unsafe conditions and accidents promptly to your supervisor.

Eating and drinking is only allowed in designated clean areas away from hazardous materials and radioactive sources.

Food and drinks are not to be stored in laboratory refrigerators.

Laboratory glassware and utensils that have been used for laboratory operations should never be used to consume food or drink.

Working alone, especially during off hours, is discouraged. Always check with your supervisor if certain procedures require a buddy system. Check the policies in your department regarding "**working alone**" during off hours, and stick to these policies.

Experiments should only be left unattended when it is safe to do so.

Post suitable warning signs if a hazardous situation is present. Include your name and extension where you can be reached.

Wear clothing appropriate for the level of hazard. High heeled or open-toed shoes are

discouraged. Long hair, loose clothing, and dangling jewellery should be constrained. Store flammables in approved flammable safety cabinets.

Reagents and samples must be labeled as required by WHIMS legislation.

Work involving hazardous materials should be done in fume hood or other containment facilities.

There is to be no mouth pipetting.

Keep an updated inventory of all material.

Practice good housekeeping - promptly clean up glassware and dismantle equipment when no longer needed.

Clean up spills immediately.

All lab benches should be kept clear of clutter.

No rough-housing or pranks in laboratories. In-line-skating is prohibited in all laboratories.

Do not use extension cords in laboratories on a permanent basis.

Never block emergency exits, emergency equipment, or electrical panels.

According to the Ontario Fire Code, all laboratory doors are fire doors, and must be kept closed at all times.

8.1 Universal Precautions for Bio-hazards

Applies to all blood, body fluids, body tissues, or extracts.

Gloves should be worn when coming in contact with blood or body fluids.

Wash hands when contaminated, or immediately after gloves are removed.

Take precautions to prevent injuries by sharp instruments.

DO NOT RECAP NEEDLES.

Use only mechanical-pipetting devices.

Use biological safety cabinet or fume hood whenever procedures such as blending, sonicating, or vigorous mixing may generate aerosols.

Decontaminate work surfaces daily or after a spill. Use 1 in 10 dilution of household bleach, 70 percent (%) ethanol, 5 percent (%) Lysol solution or alternative germicide. Dispose of pathogenic waste in the proper containment.

Remove all lab coats and other protective clothing before leaving the lab.

Decontaminate all equipment prior to repair or relocation.

The Hepatitis B vaccine or other relevant vaccinations are recommended.

8.2 Guidelines for Working with Radioactive Substances

All personnel working with radioactive substances must have prior training from an RSO, plus from the laboratory supervisor. Training must be consistent with guide C-200 of the Canadian Nuclear safety Commission (CNSC).

General guidelines are in the appendix of the Radiation Safety Protocol of Laurentian University available in all laboratories licensed for radioactive work.

9 LABORATORY SAFETY EQUIPMENT

9.1 Fume Hoods

Properly functioning fume hoods are an important safety device in a laboratory. In emergency situations such as fires, gaseous emissions, or spills in a fume hood always pull the sash down completely and assure hood fans are turned on.

In case of a malfunction, call Physical Plant at extension 1500. If after hours, call Security at 673-2661.

9.2 Fume Hood Operation Guidelines

All work involving hazardous or malodorous materials should be done in operating fume hoods.

Any hazardous material used outside of the fume hoods must be used safely!

Keep all chemicals and equipment six (6) inches behind the sash during experiments.

If possible, set up equipment a couple of inches above the working surface of the hood to maintain efficient air flow. Ensure that equipment is stable.

Close the sash completely whenever the hood is on and unattended.

Keep the sash completely lowered any time no "hands-on" part of an experiment is in progress.

All electrical devices should be connected outside of the hood to avoid sparks which may ignite a flammable or explosive chemical.

Do not use the hood if the exhaust system is not in operation. A tissue taped to the sash or inside the hood provides a good indicator of air flow.

Do not put your head inside the hood, at any time.

The hood is **not a substitute** for personal protective equipment. Wear gloves, aprons, safety glasses, as appropriate.

Keep the sash clean and clear.

Clean all chemical residues from the hood chamber after each use.

Visually inspect the baffles before using the hood to be sure the slots are open and unobstructed.

Minimize storage of hazardous waste in hoods, and dispose of collected waste promptly.

Use flammable safety cabinet for storage of flammable waste.

9.3 Showers and Eye Wash Stations

Know where the showers and eye-wash stations are located before commencing your work.

Laboratories should conduct periodic checks to ensure that showers work properly. To prevent possible amoeba infections, each eye-wash station should be tested weekly by letting the water run for several minutes. Water in the eye-wash bottle should be replaced frequently.

10. PERSONAL PROTECTIVE EQUIPMENT

Wear clothing appropriate for the level of hazard in the laboratory.

10.1 Eye Protection

In most laboratories eye protection is a requirement.

Remember contact lenses **MUST NOT** be worn while working in a laboratory with chemicals.

Depending on the protection required during a specific procedure, regular safety glasses, chemical safety goggles, or a full-face shield may be necessary.

10.2 Protective Clothing

Gloves can protect your hands from many hazards.

There are many different types of protective gloves available, and they should be chosen carefully to offer the best protection for specific procedures and chemicals. Be aware that different glove materials have different chemical permeabilities, and this should be checked with the manufacturer before choosing a specific glove type.

Lab coats provide additional protection, and it is recommended that they be worn at all times in a lab, especially when working with chemicals.

10.3 Hearing Protection

Hearing protection is not required if average noise levels do not exceed 90 db (A) over an eight-(8) - hour period. It is permissible to be at noise levels greater than 90 db (A), but not exceeding 115 db (A) for short periods of time without hearing protection. Contact Human Resources (Occupational Health and Safety) for more information, or refer to the regulations for industrial establishments.

11 PROCEDURES

11.1 Hazardous Waste

It is Laurentian University's policy to comply with all legislation to protect the environment. Hazardous waste disposal is managed by Human Resources (Occupational Health and Safety), extension 3016.

Some implications of these laws are:

1. no hazardous materials are to be disposed of down the drain;
2. all hazardous materials must be properly identified, safely contained, and disposed of through the established waste-disposal procedures for pathological waste and hazardous chemical waste;
3. every person that may use, handle, or dispose of wastes must be informed of the proper methods of disposal;
4. it is everyone's responsibility to adhere to established procedures and to comply with the law.

11.1.1 Pathological Waste

PATHOLOGICAL WASTES are infectious or suspect-infectious materials, other biological or biologically contaminated materials, which require special disposal procedures.

Non-Anatomical:

Segregate and label pathological waste and put in a proper container. General waste is to be disposed of in autoclave bags; glass and sharps in plastic containers. **Autoclave before disposal.**

Preserved Animal Anatomical Parts:

Segregate anatomical parts waste and put in double garbage bags.

Label bags "Garbage - Animal Waste" and store bags in a freezer.

Call Physical Plant at extension 1500 to complete disposal procedures.

11.1.2 Hazardous Waste Chemicals

Hazardous Waste Chemicals are materials which are of no further research, academic, or commercial use, and cannot be recycled, reclaimed, or rendered nonhazardous.

Choose proper containment to match volume and type of waste. (Tighten lids where applicable.) Do not completely fill bottles.

Do not mix incompatible waste chemicals. Check the Guide to Storage of Chemicals available from your department.

Keep a record of waste in containers.

Every container must be clearly labelled.

Waste will be accepted by Gail Cowper-Benoît, Department of Chemistry and Biochemistry, extension 2109, every Tuesday from 9:30 a.m. to 11:30 a.m.

NOTE: Unlabelled wastes will not be accepted! Ownership and liability for wastes remains the responsibility of the generator until acceptance by the final contracted external receiver.

Chemical waste disposal is costly! ...

- be environmentally conscious;
- minimize generation of wastes whenever possible;
- replace highly-toxic chemicals with less-toxic materials;
- buy only quantities needed;
- plan ahead - use "cradle-to-grave" approach;

donate chemicals to fellow researchers;
return unopened chemicals to supplier if possible;
render end product non-toxic, if possible;
use only vendors who accept the return of empty cylinders at no cost.

11.1.3 Disposal of Empty Glass Containers or Cans that Contained Chemicals.

1. Rinse empty bottles with water if content was water soluble.
2. Deface label, label as empty and for disposal, and place in hallway for custodial pick-up.
3. If the chemical is toxic, collect initial concentrate rinse and discard via the Hazardous Chemical Waste stream.
4. Leave empty solvent bottles in fume hood with lid removed until liquid residue has evaporated. Follow Step 2.

11.1.4 Radioactive Materials

Disposal of radioactive materials must be done under strict CNSC rules. The University Radiation Safety Protocol outlines the approaches for waste management. All employees working with radiation (who must have had prior training) must adhere to these protocols, and any quantity sent for disposal must be recorded in the Laboratory Log Book. Trained laboratory personnel must take care of radioactive waste disposal, as janitorial staff will not take it, as they do not have the training.

It should be noted that radioactive wastes must be labelled as such, and they must be kept separate from regular garbage. Radioactive wastes must also be separate from bio-hazardous materials and hazardous materials, such that there are no mixed wastes.

It is permissible, and it is a good practice, to let radioactive material decay away (e.g., for 32P). IN GENERAL, AFTER ~10 half-lives, A RADIOISOTOPE WILL DECAY TO LOW LEVELS and the material becomes regular garbage. ONLY TRAINED LABORATORY PERSONNEL CAN EVALUATE AND APPROVE THIS PROCEDURE. CONSULT THE POLICIES OR THE RSO TO ENSURE THAT LEVELS ARE SAFE. See the guidelines for radioisotope handling or contact Dr. François Caron, Radiation safety Officer, at extension 2400.

11.1.5 Equipment

Hazardous chemicals must be removed from equipment before the disposal of the equipment. Some examples of hazardous materials within equipment are heavy metal particulates, polychlorinated biphenyls (PCB's), mercury, oils, chlorofluorocarbons, compressed gas(es), or pressurized containers.

Equipment cavities, sufficiently large to entrap children, must be left open by complete removal of hinged, or fastened doors or coverings.

11.2 Radiation Safety

Radiation safety must be obeyed at all times. All personnel working with radiation must be trained according to the Canadian Nuclear Safety Commission guidelines (guide C-200). At Laurentian University, this training consists of a general part, given by the RSO or designate, and a specific part for each laboratory, given by the (trained) laboratory supervisor.

Support staff must attend a short, non-technical information session, also based on the CNSC guide C-200. This training covers the procedures in case of emergencies, and what signs to look for. It is intended for personnel, including, but not limited to, security staff, janitorial staff, labourers, etc., who would have to enter premises for regular maintenance or otherwise.

For training, contact the Radiation Safety Officer, Dr. François Caron, at extension 2400. The Associate RSOs are Dr. D. Hallman, extension 2202 (Laurentian University), and Dr. Z Z. Wang, (705) 461-8550 (Elliot Lake Research Field Station).

11.2.1 X-Rays Generators

Contact the Central Analytical Facility, extension 2283.

11.2.2 Laser Safety

Study and follow all safety precautions specified by the supplier of the instrument before using it.

If possible, keep laser beams at, or below, waist level.

Always wear eye protection that is specified for the particular wave length and power level used.

Never look directly at the beam of pump source.

Use the image converter to look at the beam pattern directly.

Assure that there are no unwanted reflective objects in, or along, the beam (even buttons

or screw heads could be dangerous).

Keep the general illumination level high to avoid pupil dilation.

Post warning signs in laser areas and on doors leading to those areas.

Homemade lasers must conform to all safety rules applied to similar commercial lasers.

11.2.3 UV Radiation

Ensure that all safety precautions recommended by the manufacturer of the instrument are adhered to.

If UV lamps are used, protective safety glasses with UV-filtering lenses must be worn.

Protect all skin from UV radiation.

Do not touch mercury lamp with oily fingers - this may cause spot heating and cracking.

UV sources should be operated within an enclosure and adequately cooled to prevent the mercury lamp from exploding and leaking mercury vapour.

11.2.4 Microwaves

Do not attempt to operate microwave ovens with the door open.

Do not tamper with, or defeat, safety interlocks.

Assure that seals around the door are clean and undamaged.

Loosen lids on containers to relieve pressure buildup during heating process.

Do not use metal containers in microwaves.

Stand clear during use.

11.3 Electrical Safety

All electrical equipment, 50 volts or greater capacity, must be approved by an agency acceptable within Ontario. Therefore, CSA, OH, ULC, approval must be sought from the electrical authorities.

All electrical apparatus must be properly grounded.

Any two-pin device must be CSA approved.

Never remove the ground pin of a three-(3)-pronged plug.

Minimize the use of extension cords on a permanent basis. Ask Physical Plant to install more outlets.

Only qualified and trained people should repair or modify electrical or electronic equipment.

Electrical equipment must have spark protection in areas where there is a danger of fire or explosion.

Do not use portable space heaters in proximity of combustible and flammable material.

Circuit breaker panels must be easily accessible and clearly marked. Familiarize yourself with their location.

Frayed wires or cords must not be used.

Do not use electric wires as supports, and never pull on live wires.

Ensure that all wires are dry before plugging into circuits.

All electrically energized equipment when immersed in liquids must have ground-fault interrupters.

11.3.1 Static Electricity and Sparks

Static electricity and sparks may cause a fire under the right circumstances. Always be conscious of the potential for generating sparks.

Some protection from static electricity and sparks is obtained by proper grounding and bonding of containers and equipment.

A dry atmosphere promotes the formation of electrical charges.

Common sources of sparks and static electricity are:

- decanting of organic liquids from one metal container to another;
- plastic aprons;
- metal clamps, nipples, or wires used with non-conducting hoses;
- gases released quickly from cylinders under high pressure;
- switches and thermostats;
- electrical contacts (light switches and thermocouples, refrigerators).

11.4 Compressed Gases

"Compressed Gases" is a generic term and includes compressed gases, liquified compressed gases, and cryogenic liquified gases. Different hazards are associated with compressed gases, depending on their physical and toxicological properties. Always read the labels carefully, and check the Material Safety Data Sheet for a particular type of gas.

11.4.1 General Precautions

The following general precautions must be followed when dealing with compressed gases.

Cylinders of compressed gases must be properly secured at all times.

The valve protection cap must always be on when the cylinder is not connected to a regulator.

Do not store full and empty cylinders together. Serious suck-back can occur when an empty cylinder is attached to a pressurized system.

Move cylinders only with a suitable cart.

Never tamper with safety devices in valves or cylinders - do not use Teflon tape on regulators.

Never attempt to lift or move a cylinder by holding onto the collar at the top of the cylinder. The collar is not welded onto the cylinder and may dislodge.

Compressed gas cylinders are potential rockets! Never drop a cylinder, and prevent any violent collision with another object.

The cylinder-delivery pressure shall be set to zero before the main cylinder valve is closed.

When returning empty cylinders, close the valve before shipment - leave some positive pressure in the cylinder.

Replace any valve outlet and protective caps originally shipped with the cylinder. Mark "empty" or "M/T" with chalk, and store in a designated area for return.

Return cylinders, which are of no further use, promptly to the supplier, even if only partially used.

Never use a flame or subject any part of a compressed-gas cylinder to high temperatures.

Bond and ground all cylinders, lines, and equipment used with flammable compressed

gases.

Use only in well-ventilated areas - do not vent through window!

Toxic, flammable, and corrosive gases must be handled in a properly-functioning hood.

Purchase the smallest quantity necessary in reusable cylinders.

When discharging gas into a liquid, a trap or suitable check valve must be used to prevent liquid from reentering the cylinder or regulator.

Never interchange regulators intended to be used for different gases!

Do not lubricate the high pressure side of an oxygen cylinder, or a cylinder containing other oxidizing agent.

11.5 Cryogenics

The following hazards are associated with Cryogenics:

- asphyxiation due to displacement of oxygen (does not apply to liquid air and oxygen);
- cracking of material from cold;
- frost bite;
- an explosion due to pressure build-up (i.e. in a cold tap);
- condensation of oxygen and fuel (e.g. hydrocarbons) resulting in explosive mixtures.

Precautions for handling cryogenics:

- always wear a full face shield, impervious gloves, and proper protective clothing;
- use cryogenics only in approved containers that are capable of withstanding the extreme cold without becoming brittle;
- use and store in well-ventilated areas;
- properly label cryogenic material;
- keep reactive cryogenics away from sparks and flames.

12. LEGISLATIONS

12.1 WHIMS

WHIMS stands for Workplace Hazardous Materials Information System.

This is a Canada-wide legislation, and all workers who work with, or are in the proximity of, hazardous materials must have WHIMS training. WHIMS is also known as the

"right-to-know" legislation. Workers are entitled to know the dangers of the materials they use on the job, and how to protect themselves from these dangers by reading the labels and the MSDS (Material Safety Data Sheet).

MSDS are available for every substance controlled under WHIMS.

Within WHIMS, chemicals are put into six (6) different classes to identify their hazards. Within these classes, there are symbols identified with each class. Within class D, there are three (3) hazard symbols. See Appendix A.

Example of Label:

METHANOL
DANGER
POISON
FLAMMABLE
VAPOUR HARMFUL
MAY CAUSE BLINDNESS IF SWALLOWED

Keep away from heat, sparks and flame. No smoking. Container must be grounded when being emptied. Vapour may travel long distance. Avoid contact with eyes and skin. Do not inhale vapours or mist. Do not take internally. Harmful if absorbed through the skin.

FIRST AID: In case of contact, immediately flush eyes and skin with plenty of water for at least 15 minutes.

If swallowed, induce vomiting by sticking finger down throat, or by giving soapy water to drink. Repeat until vomit is clear.

If affected by vapour, move to fresh air.

If breathing has stopped, apply artificial respiration.

GET MEDICAL ATTENTION IMMEDIATELY.

PRECAUTIONS: Wear chemical goggles and resistant gloves. Wash thoroughly after handling. Use with enough ventilation to keep below TLV. Keep container closed. Never use pressure to empty container.

MÉTHANOL
DANGER
POISON
INFLAMMABLE
VAPEURS NOCIVES
PEUT PROVOQUER LA CÉCITÉ, SI AVALÉ

Garder loin de la chaleur, des étincelles et de la flamme. Ne pas fumer. Brancher le contenant à une prise de terre avant de le vider de son contenu. Les vapeurs peuvent s'étendre sur de longues distances. Éviter tout contact avec les yeux et la peau. Ne pas respirer les vapeurs. Ne pas absorber. Nocif, si absorbe par la peau.

PREMIERS SOINS: En cas de contact avec les yeux ou la peau, laver à grande eau pendant au moins 15 minutes. Si avalé, provoquer le vomissement en introduisant un doigt dans la gorge ou en faisant absorber de l'eau savonneuse à la victime. Répéter jusqu'à cessation du vomissement. Sortir au grand air, si indisposé par les vapeurs.

Si la respiration est interrompue, recourir à la respiration artificielle.

OBTENIR DES SOINS MÉDICAUX IMMÉDIATS.

PRÉCAUTIONS: Porter des lunettes protectrices (pour produits chimiques) et des gants résistants. Se laver minutieusement après usage. Utiliser dans un endroit bien aéré, afin de maintenir le niveau de vapeurs tolérable. Garder le contenant fermé. Ne jamais user de pression en vidant le récipient.

**SEE MATERIAL SAFETY DATA SHEET FOR PRODUCT/
VOIR FICHE SIGNALÉTIQUE**

ABC Company
Anytown, Ontario Telephone 123-4567

12.2 Designated Substances

The following substances, if present in any amount in your laboratory, require a legally-written assessment to determine the risk of exposure and health effects. A draft of the assessment should be discussed by the Joint Health and Safety Committee. The use, handling, storage, and exposure to these chemicals are strictly regulated by the Ontario Ministry of Labour (see Designated Substances Regulations). Prior to working with any of these substances, the appropriate regulation must be consulted.

ACRYLONITRILE
ARSENIC
ASBESTOS
BENZENE
COKE OVEN EMISSIONS
ETHYLENE OXIDE
ISOCYANATE
LEAD
MERCURY
SILICA
VINYL CHLORIDE

Call Human Resources (Occupational Health and Safety), at extension 3016 for more information.




13 RESOURCES

- 1. Material Safety Data Sheets**
Before working with any hazardous material, read the MSDS carefully. Paper copies are located in individual departments and in Human Resources (Occupational Health and Safety). MSDS are also available on the Human Resources/Occupational Health and Safety Web site.
- 2. Guide to Storage of Chemicals**
Available from individual departments.
- 3. Lab Safety CSLT Guideline**
Available from individual departments.
- 4. Health and Safety Policies and Procedures**
Available from Human Resources (Occupational Health and Safety).
- 5. Designated Substances in the Workplace: A General Guide to the Regulations**
Available from Human Resources (Occupational Health and Safety).

Other resource materials such as videos and CD ROMS may be obtained from Human Resources

(Occupational Health and Safety), from individual departments, from the Library, or from the Internet.

APPENDIX "A"

CLASS AND SYMBOL	CHARACTERISTICS	PRECAUTIONS
<p>Class A Compressed Gas</p> 	<ul style="list-style-type: none"> • Gas inside cylinder is under pressure • The cylinder may explode if heated or damaged • Sudden release of high pressure gas streams may puncture skin and cause fatal embolism 	<ul style="list-style-type: none"> • Transport and handle with care • Make sure cylinder is properly secured • Store away from sources of heat or fire • Use proper regulator
<p>Class B Flammable and Combustible Material</p> 	<ul style="list-style-type: none"> • May burn or explode when exposed to heat, sparks or flames • Flammable: burns readily at room temperature • Combustible: burns when heated 	<ul style="list-style-type: none"> • Do not store near Class C (oxidizing) materials • Store away from sources of heat, sparks and flame • Do not smoke near these materials
<p>Class C Oxidizing Material</p> 	<ul style="list-style-type: none"> • Can cause other materials to burn or explode by providing oxygen • May burn skin and eyes on contact 	<ul style="list-style-type: none"> • Do not store near Class B (flammable and combustible) materials • Store away from sources of heat and ignition • Wear the recommended protective equipment and clothing
<p>Class D Poisonous and Infectious Material</p> <p>Division 1: Materials Causing Immediate and Serious Toxic Effects</p> 	<ul style="list-style-type: none"> • May cause immediate death or serious injury if inhaled, swallowed, or absorbed through the skin 	<ul style="list-style-type: none"> • Avoid inhaling gas or vapours • Avoid skin and eye contact • Wear the recommended protective equipment and clothing • Do not eat, drink or smoke near these materials • Wash hands after handling
<p>Class D Poisonous and Infectious Material</p> <p>Division 2: Materials Causing Other Toxic Effects</p> 	<ul style="list-style-type: none"> • May cause death or permanent injury following repeated or long-term exposure • May irritate eyes, skin and breathing passages: may lead to chronic lung problems and skin sensitivity • May cause liver or kidney damage, cancer, birth defects or sterility 	<ul style="list-style-type: none"> • Avoid inhaling gas or vapours • Avoid skin and eye contact • Wear the recommended protective equipment and clothing • Do not eat, drink or smoke near these materials • Wash hands after handling
<p>Class D Poisonous and Infectious Material</p> <p>Division 3: Biohazardous Infectious Materials</p> 	<ul style="list-style-type: none"> • Contact with microbiological agents (e.g., bacteria, viruses, fungi and their toxins) may cause illness or death 	<ul style="list-style-type: none"> • Wear the recommended protective equipment and clothing • Work with these materials in designated areas • Disinfect area after handling • Wash hands after handling
<p>Class E Corrosive Material</p> 	<ul style="list-style-type: none"> • Will burn eyes and skin on contact • Will burn tissues of respiratory tract if inhaled 	<ul style="list-style-type: none"> • Store acids and bases in separate areas • Avoid inhaling these materials • Avoid contact with skin and eyes • Wear the recommended protective equipment and clothing
<p>Class F Dangerously Reactive Material</p> 	<ul style="list-style-type: none"> • May be unstable, reacting dangerously to jarring, compression, heat or exposure to light • May burn, explode or produce dangerous gases when mixed with incompatible materials 	<ul style="list-style-type: none"> • Store away from heat • Avoid shock and friction • Wear the recommended protective equipment and clothing