Decontamination of Laboratory Equipment from a Containment Level 2 Laboratory
Document No. BIO-008-03

1. INTENT

This Standard Operating Procedure (SOP) applies to all faculty, staff and students at Wilfrid Laurier University handling or storing infectious materials or biological toxins in laboratories. The SOP was developed by Safety, Health, Environment & Risk Management (SHERM) to ensure that work with biohazardous materials is conducted in a safe manner reflecting best practices and adhering to the Canadian Biosafety Standard and Canadian Biosafety Handbook published by the Public Health Agency of Canada. The information in this document serves as an extension to the information in the Biosafety Manual published by SHERM. Any questions regarding this SOP can be directed towards the Biosafety Officer.

2. DEFINITIONS

Decontamination

Decontamination includes both sterilization and disinfection. It is used to make an object (or area) safe for unprotected personnel by removing, neutralizing, or destroying any harmful and/or infectious substance. Items should be cleaned thoroughly before effective decontamination can take place.

Disinfection

Disinfection is the inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores. Disinfectants are used on inanimate objects in contrast to antiseptics, which are used on living tissue. Disinfection usually involves chemicals, heat or ultraviolet light. The nature of chemical disinfection varies with the type of product used.

Sterilization

Sterilization is the destruction of all forms of microbial life including bacteria, viruses, spores and fungi.

3. ROLES AND RESPONSIBILITIES

Supervisors/Principal Investigators

Supervisors and Principal Investigators (PIs) are responsible for ensuring that:

- Employees have been given adequate supervision and instruction on the hazards associated with working with biological agents
- Providing employees with adequate materials for decontamination
- Providing employees with proper PPE required for decontamination
- Full compliance with the SOP exists at all times
- Everyone working in the lab under the authority of the PI follows the procedures outlined within this SOP

Staff/Students Working In Labs

Staff and students working in labs are responsible for ensuring that they:

- Carrying out proper decontamination procedures as outlined in this SOP and reviewed by their supervisor
- Don proper PPE for the process of decontaminating
- Are familiar with the hazards and this SOP as it relates to working with biohazardous agents
- Promptly report any known accidents or unsafe conditions to their supervisor

4. GENERAL GUIDELINES

4.1 Decontamination of Laboratory Equipment

As per the SOP BIO-001; "Work Practices in Containment Level 2 Laboratories", all equipment must be decontaminated prior to removal from the Level 2 laboratory, whether being moved to a different laboratory in the university or removed from the university for the purposes of servicing or disposal. Items that do not come into direct contact with biohazardous materials, or aerosols containing biohazardous materials, such as boxes of pipette tips and carts, are not included in the scope of this procedure.

Chemical disinfection is used for the decontamination of equipment that cannot be autoclaved. The initial choice of a chemical disinfection depends upon the resistance of the microorganisms of concern. The most susceptible are vegetative bacteria, fungi and enveloped viruses, and bacterial spores are among the most chemically resistant.

Commonly used laboratory disinfectants at Wilfrid Laurier University include: alcohols, chlorinated compounds, and iodophors. Significant characteristics of these 3 classes of disinfectants can be seen in Table 1. Table 2 outlines the target microorganisms susceptible to these disinfectants. Always read the SDS and the directions printed on the label of the disinfectant before use.

4.2 Alcohols (Ethanol, 2-Propanol)

Ethanol or 2-propanol in concentrations of 70% - 85% are good general-use disinfectants. They are most effective against lipophilic viruses, less effective against non-lipid viruses, and ineffective against bacterial spores. The -cidal activity of alcohols drops sharply when diluted below 50% concentration. The antimicrobial activity of alcohols can be attributed to their ability to denature proteins. Higher concentrations are also less effective as the action of denaturing proteins is inhibited without the presence of water.

Alcohols are commonly used topical antiseptics. They are also used to disinfect the surface of medical equipment. Alcohols require time to work and they may not penetrate organic material. The shortcomings of alcohols are that they may damage the shellac mountings of lensed instruments, they tend to cause rubber and certain plastic tubing to swell and harden after prolonged and repeated use, and discolour rubber and plastic tiles. Alcohols are flammable and consequently must be stored in a cool, well-ventilated area. They also evaporate rapidly which makes extended exposure time difficult to achieve unless items are immersed.

4.3 Chlorine Compounds (household bleach – 5.25% sodium hypochlorite)

Chlorine-containing solutions have universal disinfectant activity. With proper concentration and sufficient contact times, hypochlorite solutions can be considered chemical sterilants since they will inactivate bacterial spores. The downside is that chlorine compounds are quickly inactivated by excess organic materials and are corrosive to metals and tissues. Consequently their use in labs has some limitations.

In solutions of 500 ppm available chlorine, they are effective against vegetative bacteria and most viruses. Bacterial spores require concentrations of 2500 ppm with extended exposure time. Household bleach (5.25% sodium hypochlorite) diluted 1:100 with water yields a disinfectant solution containing to 525 ppm available chlorine; a 1:10 dilution yields 5000 ppm available chlorine.

Disadvantages of chlorinated compounds include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discolouring or “bleaching” of fabrics, and release of toxic chlorine gas when mixed with ammonia or acid. Additionally, since free chlorine is inactivated by light and air, disinfectant chlorine solutions are best made fresh before use.

4.4 Iodophor Disinfectants

Iodophors are well established chemical disinfectants. These compounds are bactericidal, sporicidal, virucidal and fungicidal. The disinfecting ability of iodine, like chlorine, is neutralized in the presence of organic material and hence frequent

applications are needed for thorough disinfection. Iodine can be very irritating to tissues, can stain fabric and may be corrosive. Besides their use as an antiseptic, iodophors have been used for the disinfection of blood culture bottles and medical equipment such as hydrotherapy tanks, thermometers, and endoscopes.

A concentration of 75 ppm titratable iodine is suitable for use as an antiseptic. However, a concentration of 150 ppm titratable iodine is required for its use as a hard-surface disinfectants.

Table 1. Significant characteristics of three common classes of liquid disinfectants. Adapted from University of Memphis, OEHS, 2006.

Disinfectant	Characteristics							
	Effective Shelf Life[1] >1 week	Corrosive	Flammable	Residue	Skin Irritant	Eye Irritant	Respiratory Irritant	Toxic[2]
Alcohol	Y		Y			Y		Y
Chlorinated compounds		Y		Y	Y	Y	Y	Y
Iodophore	Y	Y		Y	Y	Y	Y	Y

[1] Protected from air and light.
[2] By skin or mouth, or both. See manufacturer's Material Safety Data Sheet.

Table 2. Microorganisms targeted for inactivation by various classes of disinfectants. Adapted from University of Memphis, OEHS, 2006.

Disinfectant		Inactivates				
	Dilution Use	Vegetative Bacteria	Lipoviruses	Nonlipid Viruses	Mycobacteria	Bacterial Spores
Alcohol	70 – 85%	Y	Y	[1]		
Chlorinated compounds	500 ppm	Y	Y	Y	Y	Y[2]
Iodophore	150 ppm	Y	Y	Y		

[1] Dependant upon virus.
[2] Bacterial spores require 5000 ppm available chlorine (1:10 household bleach).

5. PROCEDURES

5.1 Hygiene

- Hand washing must occur after handling materials, after removing gloves and before leaving the laboratory.
- Long hair must be tied back or restrained so that it cannot come into contact with equipment.

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

5.2 Personal Protective Equipment (PPE)

- Appropriate personal protective equipment (PPE) must be worn by all whenever equipment is being decontaminated.
- Minimal PPE consists of a dedicated lab coat, long pants, footware that cover the entire foot, proper gloves and eye protection.
- Other PPE may be required depending on the work being performed, i.e. if hazardous chemicals are involved, safety glasses or goggles should be used. Consult with the Principal Investigator and the Safety Data Sheet (SDS) for any materials being used before starting work to determine if additional PPE is required.
- PPE must never be worn outside of the laboratory because of the risk of contamination with residue on gloves, laboratory coats etc.
- Contaminated clothing, including labcoats, must be decontaminated before laundering.

5.3 Decontamination of Equipment

- Obtain form BIO-009; “Laboratory Equipment Decontamination Certificate.”
- Unplug any electrical equipment prior to decontamination.
- Spray equipment with an appropriate working solution of disinfectant and allow it to remain on equipment for an appropriate contact time.
    - Be aware that chlorinated compounds can be corrosive to metals.
    - Alcohol sprays may need to be periodically reapplied as it evaporates.
- Wipe down equipment with paper-towels and dispose of them properly.
- Complete form BIO-009.
- Provide a copy of completed form BIO-009 to the Laboratory Supervisor of the laboratory from which the equipment is being removed.
- Detach and affix the bottom half of the completed form to the decontaminated equipment.
    - If equipment is being shipped for servicing, attach whole form to item.
- Remove the equipment from the laboratory as soon as possible so as to minimize further contamination.
- Prior to returning the equipment to original laboratory, ensure that it has once again been decontaminated.

5.4 Accidents and Injuries

- After receiving treatment, all accidents/injuries must be reported to the Lab Supervisor and the Biosafety Officer.
- An Accident/Incident Report Form must be completed and sent to SHERM within 24 hours.

6. APPENDIX

Relevant Standards/Legislation/Policies

Biosafety Manual, Safety, Health, Environment & Risk Management, Wilfrid Laurier University.

Canadian Biosafety Handbook, Public Health Agency of Canada.

Canadian Biosafety Standards, Public Health Agency of Canada.
Laboratory Health and Safety Manual, Safety, Health, Environment & Risk Management, Wilfrid Laurier University.

7. REVISION HISTORY

Revision	*Date*	*Comments*	*Initials*
00	July 14/08	SOP comes into effect	SJL
01	June 2014	Editorial updates	SJL
02	June 2017	SOP is updated	SJL
03	July 2018	SOP updated	VB