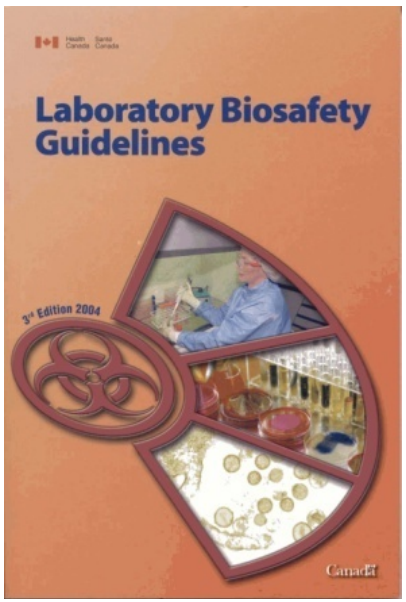
Laboratory Research Conduct & Safety: Biohazards and Biosafety

McGill
Environmental Health & Safety

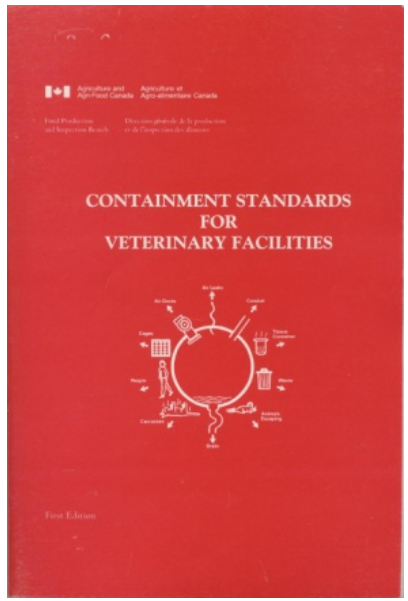
Guidelines & Standards



Human Pathogens

Public Health Agency of Canada

Canadian Food Inspection Agency



Animal Pathogens

Biosafety Manual

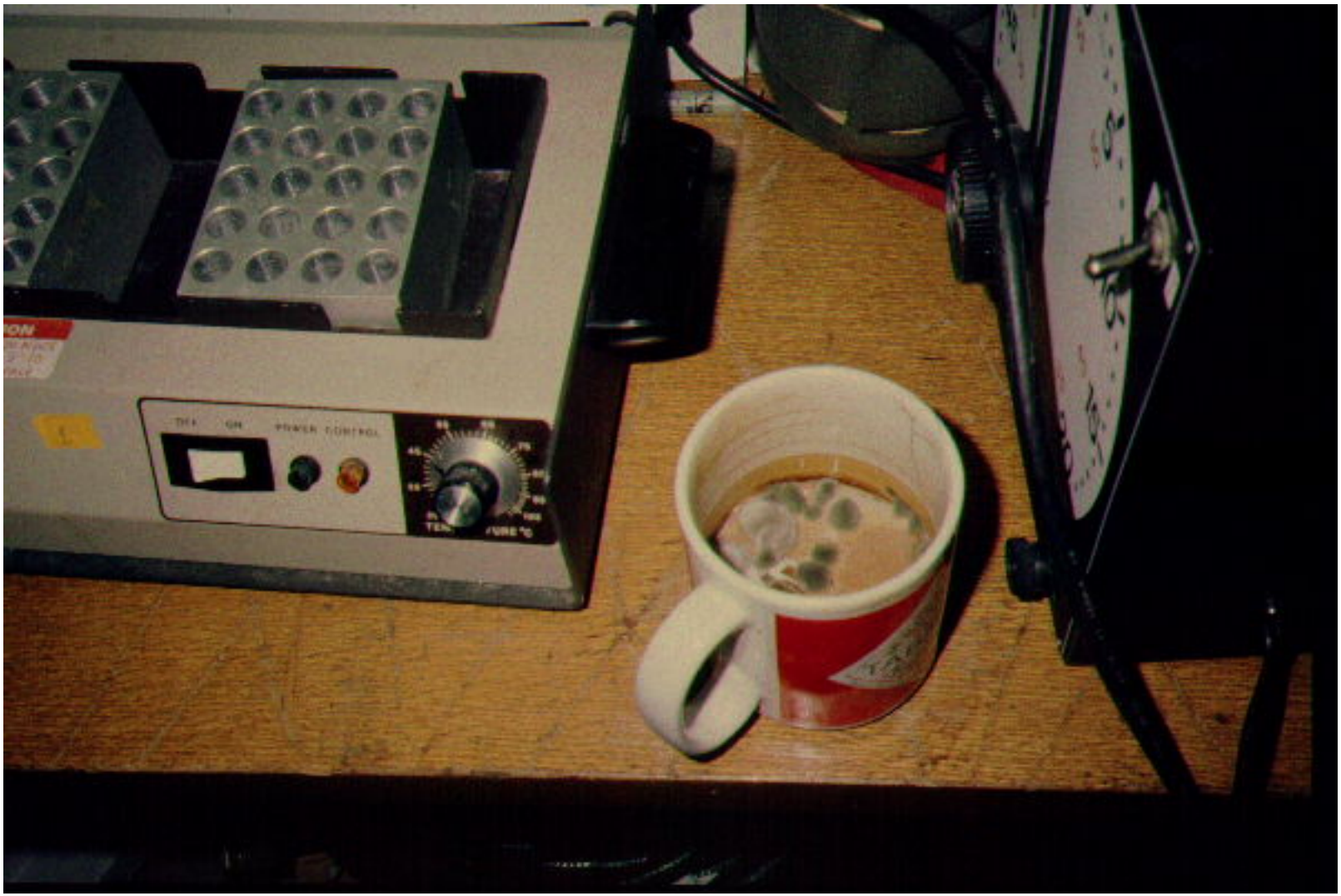
CONTENTS

Maps and directories
Downtown campus
Macdonald campus

Staff directory
Student directory
Unit directory

Community calendar
See all McGill events

Definition: Biohazards



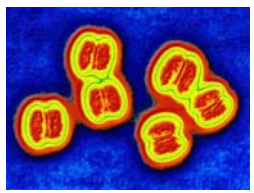
Definition: WHMIS*

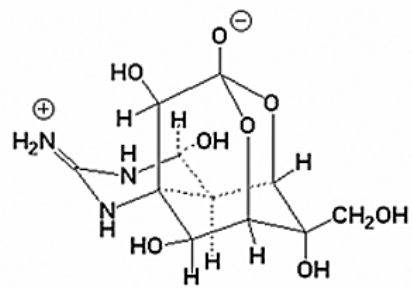
CLASS AND SYMBOL	CHARACTERISTICS	PRECAUTIONS
Class D Poisonous and Infectious Material  Division 3: Biohazardous Infectious Materials	Microbiological agents (e.g., bacteria, viruses, fungi and their toxins) that may cause illness or death	▪ Wear the recommended protective equipment and clothing ▪ Work with these materials in designated areas ▪ Disinfect area after handling ▪ Wash hands after handling

*Workplace Hazardous Materials Information System

Definition: Biohazards

- Parasites
- Fungi
- Viruses
- Bacteria
- Rickettsiae
- Microbial toxins
  - e.g., Anthrax edema factor, Botulinum toxin, Pertussis toxin





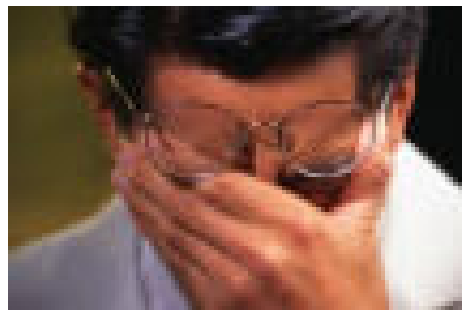
Tetrotodotoxin

Definition: Biohazards

- Any material that could contain biohazardous material, for example:
  - Human tissues, blood, body fluids
  - Animal tissues, carcasses
  - Cell lines
  - Cultures from soil samples
  - Waste water

Routes of Disease Transmission

- Direct contact (splash)
- Inoculation
- Ingestion
- Indirect contact
- Inhalation



Safe Work Practices

- Understand hazards
- Restrict lab access
- Avoid clutter
- Use personal protective equipment
  - Lab coat
  - Gloves
  - Eye protection

McGill PPE Policy

EYE AND FACE PROTECTION:

All students, staff, faculty and visitors must wear appropriate eye and/or facial protection in the following:

- All areas where hazardous materials, or substances of an unknown area, are stored, used or handled
- All areas where the possibility of splash, flying objects, moving particles and/or rupture exist
- All areas where there are other eye hazards, e.g. UV or laser light

LAB COATS:

Appropriate protective clothing (e.g., lab coats, aprons, coveralls) is required in all experimental areas where hazardous materials are handled.

NB. Hazardous materials are defined as:
controlled products, as defined by WHMIS legislation and;
open radioactive sources, as defined by the Canadian Nuclear Safety and Control act.

Safe Work Practices (cont'd)

- No shorts, sandals, etc.
- Observe "Universal Precautions"
- No food, drinks, etc.

Safe Work Practices (cont'd)

- Work carefully, deliberately
- No mouth pipetting
- Use needles, syringes only if necessary
- Decontaminate work surfaces, hands
- Report accidents
  - Cuts, needlesticks, scrapes
  - Contamination of broken skin
  - Splash of infectious material
  - Incidents and near accidents

Definition: Risk Group

- Categorization of relative hazards of infective organisms (4 levels)
- Risk classification:
  - Pathogenicity
  - Infectious dose
  - Mode of transmission
  - Host range
  - Effective prevention (e.g vaccine)
  - Effective treatment (e.g., antibiotic, antiviral PEP)

Definition: Containment Level

- Minimum requirements for safe handling (4 levels)
  - Operational practices
  - Engineering, technical, physical:
    - Location & access
    - Surface finishes & casework
    - HVAC
    - Containment perimeter (windows, autoclave location, etc.)
    - Services (water, drains, gas, electricity, equipment)

Risk Group 1

- Low individual & community risk
- Unlikely to infect healthy humans/animals
- Containment Level 1 minimum

Standard molecular biology organisms, e.g. *E. coli* K12, *Lactobacillus* spp., *Bacillus subtilis*, *Micrococcus* spp., *Aerococcus* spp.

Containment Level 1

- No special design features
- BSC not required, may be used for sterility
- Work may be done on open benchtop
- Good microbiological technique

Risk Group 2

- Moderate individual, low community risk
- Prevention or treatment available
- Spread unlikely
- Containment Level 2 minimum

Salmonella typhimurium, Creutzfeldt-Jacob agent, *Leishmania* spp., *Toxoplasma* spp., *Ascaris* spp., human blood, eukaryotic cell cultures, enteropathogenic *E. coli*

Containment Level 2

- Additional physical requirements, e.g.
  - Limited access, signage, lockable doors
  - Resistant, non-absorptive surfaces (for disinfection)
- Containment of aerosols:
  - BSC
  - Centrifuges with sealed rotors or safety cups
- Minimize environmental contamination:
  - Handwashing sinks
  - Decontamination facilities (autoclaves)

Risk Group 3

- High individual, low community risk
- May cause serious disease
- Prevention and/or treatment available
- Unlikely to spread by casual contact
- Containment Level 3 minimum

Lassa fever virus, hantavirus, *Bacillus anthracis, Yersinia pestis, Histoplasma capsulatum, SARS, cultures of Hepatitis B or HIV*

Risk Group 4

- High individual, high community risk
- Readily transmitted (aerosol)
- Low infectious dose
- Very serious disease
- No treatment or preventive vaccine
- Containment Level 4

Marburg virus, Ebola virus, *Herpesvirus simiae*, Crimean-Congo hemorrhagic fever

Containment Levels 3 and 4

- Level 3
  - Respiratory protection
  - HEPA filtration of lab exhaust
  - Strictly controlled access
- Level 4
  - Isolated facility with sealed perimeter
  - Positive pressure suits or Class 3 BSC
  - Effluent sterilization system

Health Canada Santé Canada

Canada

Population and Public Health Branch (PPHB)

Office of Laboratory Security

MSDS

Material Safety Data Sheets (MSDS), regulated under Workplace Hazardous Materials Information System (WHMIS) legislation, for chemical products have been available to workers for many years. However because many laboratory workers, whether in research, public health, teaching, etc., are exposed to not only chemicals but infectious substances as well, there was a large gap in the readily available safety literature for employees. These MSDS are produced for personnel working in the life sciences as quick safety reference material relating to infectious micro-organisms.

The MSDS are organized to contain health hazard information such as infectious dose, viability (including decontamination), medical information, laboratory hazard, recommended precautions, handling information and spill procedures. The intent of these documents is to provide a safety resource for laboratory personnel working with these infectious substances. Because these workers are usually working in a scientific setting and are potentially exposed to much higher concentrations of these human pathogens than the general public, the terminology in these MSDS is technical and detailed, containing information that is relevant specifically to the laboratory setting. It is hoped along with good laboratory practises, these MSDS will help provide a safer, healthier environment for everyone working with infectious substances.

Please note that although the information, opinions and recommendations contained in these Material Safety Data Sheets are compiled from sources believed to be reliable, we accept no responsibility for the accuracy, sufficiency, or reliability or for any loss or injury resulting from the use of the information. Newly discovered hazards are frequent and this information may not be completely up to date.

MENU

A | B | C | D | E | F | G | H | I | J | K | L | M
N | O | P | Q | R | S | T | U | V | W | X | Y | Z

Disease Agent Information

Pathogen Safety Data Sheet (PSDS)

The Pathogen Safety Data Sheets (PSDS) were prepared by the Biohazard Containment and Safety Unit as a quick reference to provide information intended to promote the safe use and containment of animal pathogens in importing laboratories and animal facilities. They are similar to the Material Safety Data Sheets for human pathogens prepared by the Public Health Agency.

Reportable Diseases:

- African Horse Sickness
- African Swine Fever
- Anaplasmosis
- Anthrax
- Bluetongue
- Bovine Spongiform Encephalopathy
- Bovine Tuberculosis
- Brucellosis
- Equine Infectious Anemia
- Foot and Mouth Disease
- Highly Pathogenic Avian Influenza (HPAI)
- Hog Cholera
- Lumpy Skin Disease
- Peste des petits ruminants
- Pseudorabies
- Pullorum Disease
- Rabies
- Rift Valley Fever
- Rinderpest
- Sheep and Goat Pox
- Venezuelan Equine Encephalomyelitis
- Vesicular Stomatitis

Immediately Notifiable Diseases:

Biohazards Policy*

- "Prior to beginning work with biohazardous material, responsible users must complete and submit an *Application to Use Biohazardous Materials* to Environmental Health & Safety for review and approval"

**University Laboratory Safety Committee September 24, 2007*

Biohazards Applications

- Completed by PI/lab supervisor prior to starting project
- Required for research, testing, diagnostic activities using biohazards
- Required for all activities, including Level 1
- Submit to EHS for approval (~1 week)

Thesis Preparation & Submission Guidelines*

"*If the research for the thesis involved ..... microorganisms, living cells, other biohazards ..... the appropriate compliance certificates must be included as an appendix to the thesis*"

*Graduate and Postdoctoral Studies:
www.mcgill.ca/gps/current/programs/thesis/guidelines/submission

Lab Safety Training Courses

- *WHMIS Training for Lab Personnel*
- *Principles of Laboratory Radiation Safety*
- *Introduction to Biosafety*
- *Safe Use of Biological Safety Cabinets*
- *Hazardous Waste Management & Disposal Training for Lab Personnel*

Environmental Health & Safety

- Contact information:
  - Telephone: 514-398-4563
  - Fax: 514-398-8047
  - E-mail: ehs@mcgill.ca
  - Website: www.mcgill.ca/ehs
  - Address: 3610 McTavish, 4th floor