**Biosafety for Education, Research, and Community Health Program**

**Section 2 – Animal Activities**

**Health, Safety, and Wellness**

**Human Resources Department**

**Biosafety for Education, Research and Community Health**

This University of Regina Biosafety for Education, Research, and Community Health Program (2nd Edition) has been created in accordance with the Public Health Agency of Canada’s *Canadian Biosafety Standards*, 2015, *Human Pathogen and Toxin Act* and *Regulations*, the Canadian Food Inspection Agency’s *Health of Animals Act* and *Regulations,* the *Plant Protection Act* and *Regulations,* the Saskatchewan Government Ministry of Labour Relations and Workplace Safety *Occupational Health & Safety Act* and *Regulations*, Canadian Council on Animal Care’s numerous guidelines, and World Health Organization’s *Laboratory Biosafety Manual*, 2004.

In addition, the University of Regina would like to thank the University of Saskatchewan, University of Manitoba, University of British Columbia, the University of Winnipeg, the University of Rochester, Massachusetts Institute of Technology, Stanford University, and Laurier University for the use of their biosafety resources.

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# Biosafety for Education, Research, and Community Health

## Introduction

The University of Regina is committed to providing a safe and healthy work, learning, and living environment for all members of the University community. To meet this commitment the **Biosafety for Education, Research, and Community Health Program** (Program)administrated by Health, Safety & Environment, Human Resources, provides resources and guidance for the safe and responsible use and management of biological materials on campus. The University of Regina *Health and Safety Policy* (GOV-100-005) provides the guidance and authority to this Program and forms part of the Health and Safety Management System.

This Program manual consists of three sections. The first two sections *Biosafety for Education and Research Activities* and *Biosafety for Animal Activities* is intended for use and reference by Academic Staff Members, Staff, Students, and others with responsibility for biosafety related to research and teaching activities. The third section *Community Health* is intended for use and reference for those conducting or advising activities related to community health on campus.

There are various Federal, Provincial, and Municipal regulations for controlling the acquisition, use, storage, transfer, decontamination and disposal of biological materials. The University is responsible to ensure that these regulations are being enforced to protect the safety of staff, students and the public, while at the same time, the use of the biological material for the benefit of the public and the furtherance of the aims of the University is encouraged.

## Definitions, Acronyms, and Abbreviations

**Academic Staff Members** are Faculty, Librarians, Laboratory Instructors, Instructors, and Sessionals at the University of Regina.

**Administrator** means senior administration of the university, including the Vice-President (Administration), Deans, Directors, or designates.

**Animals** are defined as non-human, living vertebrates, and any living invertebrates of the class of cephalopoda, including free-living and reproducing larval forms, used for research, education, or breeding purposes.

**Aerosol** is a suspension of fine solid particles or liquid droplets in a gaseous medium (e.g., air) that can be created by any activity that imparts energy into a liquid/ semi-liquid material.

**Bacteria** (singular: bacterium) are a large group of unicellular microorganisms.

**Biohazard** is an organism or material derived from an organism that poses a threat to human health.

**Biological material** is pathogenic and non-pathogenic microorganisms, proteins, and nucleic acids, as well as any biological matter that may contain microorganisms, proteins, nucleic acids, or part thereof. Examples include, but are not limited to, bacteria, viruses, fungi, prions, toxins, GMOs, RNA, DNA, tissues samples, diagnostic specimens, and live vaccines.

**Biological Safety Cabinet** is a primary containment device that provides protection for personnel, the environment, and the product (depending on BSC class), when working with biological material.

**Biosafety** are the containment principles, technologies, and practices that are implemented to prevent unintentional exposure to infectious material and toxins, or their accidental release.

**Biosafety Advisory Committee (BSAC)** is responsible for the oversight and administration of the University’s Biosafety Program, which is designed to ensure the safe management of biological materials in education, research, and community health at the University.

**Biosafety Committee (BSC)** implements and leads University of Regina day-to-day procedures governing the safe management of biological materials, in education, research, and community health, in accordance with the University’s Health and Safety Policy

**Biosafety Officer (BSO)** is the individual designated by the Vice-President (Administration) to oversee the University biosafety and biosecurity practices.

**Biosecurity** are the security measures designed and implemented to prevent the loss, theft, misuse, or intentional release of infectious materials or toxins.

**Canadian Council on Animal Care (CCAC)** is the national peer-review organization responsible for setting, maintaining, and overseeing the implementation of high standards for animal ethics and care in science throughout Canada.

**Canadian Food Inspection Agency (CFIA)** that through collaboration and partnership with industry, consumers, and federal, provincial and municipal organizations, continues to work towards protecting Canadians from preventable health risks related to food and zoonotic diseases.

**Community Health** refers to health, safety, and wellness initiatives directed towards all University Students, Faculty, Staff, and Community (Public) Members regardless of relationship with the University. This definition includes activities related to living, working, and learning on campus.

**Containment** is the combination of physical design parameters and operational practices that protect personnel, the immediate work environment, and the community from exposure to biological material.

**Containment** **Level (CL)** is the minimum physical containment and operational practice requirements for handling infectious material or toxins safely in laboratory and animal work environments. There are four containment levels ranging from a basic laboratory (CL1) to the highest level of containment.

**Containment** **Zone** is a physical area that meets the requirements for a specified containment level.

**Contamination** is the presence of infectious material or toxins on a surface (e.g. bench top, hands, gloves) or within other materials (e.g. laboratory samples, cell culture).

**Decontamination** is the process removing and/or inactivating infectious materials or toxins; this may be accomplished through disinfection or sterilization.

**Disinfection** is a process that eliminates most forms of living microorganisms; disinfection is much less lethal to infectious material than sterilization.

**Disinfectant** is any chemical agent used dominantly on inanimate objects to destroy or inhibit the growth of living micoorganisms.

**DNA** (deoxyribonucleic acid) is an organic molecule that contains the genetic instructions used in the development and functioning of all known living organisms.

**Exporting** is the activity of transferring or transporting regulated items from Canada to another country.

**Exposure** is the contact of close proximity to infectious material or toxins that may result in infection or intoxification, respectively. Routes of exposure include inhalation, ingestion, inoculation, and absorption.

**Fungi** (singular: fungus) is a member of a large group of eukaryotic organisms that include microorganisms such as single-celled yeasts and multi-cellular molds.

**Good Microbiological Laboratory Practice** is the basic code of practice applicable to all types of laboratory work with biological material. These practices serve to protect and prevent contamination of lab workers, the lab environment, and the samples in use.

**Genetic Engineering** is a term that applies to the direct manipulation of an organism’s genes using techniques of molecular cloning and transformation.

**Genetically Modified Organisms (GMOs)** are microorganisms whose genetic materials have been altered using genetic engineering techniques such as recombinant DNA.

**Hazard** is any activity, situation, or substance that can cause or has the potential to cause illness or injury.

**Health, Safety & Environment** is the unit within Human Resources, that is available to assist faculty, staff, students, and visitors in making the University a safe place to live, work, and learn.

**Human Pathogen and Toxin Act (HPTA)** and **Human Pathogen Toxin Regulations (HPTR)** are legal documents that establish a safety and security regime to protect the health and safety of the public against the risks posed by human pathogens and toxins in Canada.

**Human/Primary/Diagnostic/Clinical Specimen** is defined as any bodily substance taken from a person for the purpose of analysis, such as blood, urine, stool, tissue, and fluid.

**Importing** is the activity of transferring or transporting regulated items into Canada from another country.

**Incident** is an event or occurrence involving infectious material, infected animals, or toxins, including a spill, exposure, release of infectious material or toxins, animal escape, personnel injury or illness, missing infectious material or toxins, unauthorized entry into the containment zone, power failure, fire, explosion, flood, or other crisis situations (e.g., earthquake, hurricane). Incidents include laboratory- acquired infections.

**Infectious Agent/Material/Organism** is biological material that is pathogenic in nature (i.e. contains human and/or animal pathogens) and poses a risk to human and/or animal health.

**Infectious Dose** is the amount of pathogen required to cause an infection in the host, measured in number of organisms.

***In vitro*** is the Latin word for “within the living,” *in vitro* refers to experimentation involving components of a living organism within an artificial environment (e.g., manipulation of cells in a petri dish).

***In vivo*** is the Latin word for “within glass,” *in vivo* refers to experimentation conducted within the whole living organism (e.g., studying the effect of antibiotic treatment in animal models).

**Laboratory (Lab)** is an area within a facility or the facility itself where biological material is handled and/or stored for *in vitro* and/or *in vivo* work.

**Laboratory (Lab)** **Work Area** is an area within a containment zone designed and equipped for research, diagnostics, and teaching.

**Laboratory (Lab) Manager** is the person most responsible for the activities being conducted and/ or most responsible for the personnel conducting activities in the lab work area.

**Large scale** is activities generally involving volumes of toxins or the *in vitro* culture of infectious material on a scale of 10 litres or greater. This could be a single vessel within a volume of 10 litres or greater, or based on the processes and pathogens used, could be multiple vessel with a total volume of 10 litres or greater. Determination of cut-off values for lab and large scale volumes can be made in consultation with the PHAC and/ or CFIA.

**Local Risk Assessment (LRA)** is the site-specific risk assessment used to identify hazards based on the infectious material or toxins in use and the activities being performed. This analysis provides risk mitigation and risk management strategies to be incorporated into the physical containment design and operational practices of the facility**.**

**Local Safety Committee (LSC)** is a committee in the Faculties and/or Departments that have been identified as a higher-risk to establish a process where health and safety concerns can be addressed at a local level.

**Limited Access** is the access to a containment zone that is limited to authorized personnel and is achieved through a controlled access system or operational procedures (i.e., CL2 lab work areas).

**Medical Surveillance Program** is the program designed to prevent and detect personnel illness related to exposure to infectious material or toxins. The focus of the program is primarily preventative, but provides a response mechanism through which a potential infectious can be identified and treated before serious injury and disease occurs.

**Member of the Community** is all persons associated with the University of Regina, including, but not limited to, the Board of Governors, President, VP’s, AVP’s, Deans, Directors, employees, students, contractors, visitors, and volunteers.

**Microorganism** is broadly defined as a microscopic entity, cellular or non-cellular, capable of replication or transferring genetic material. These include bacteria, viruses, fungi, and may be pathogenic or non-pathogenic in nature.

**Non-Indigenous Animal Pathogen** is a pathogen that causes an animal diseased listed in the World Organization for Animal Health’s “OIE-Listed Diseases, Infectious and Infestation” (as amended from time to time) and that is not indigenous (i.e., is exotic) to Canada. These pathogens may require additional containment requirements. For ease of reference, example lists of non-indigenous animal pathogens and emerging disease pathogens, sorted by risk group, are available though the Canadian Food Inspection Agency Automated Import Reference System, which can be accessed here: <http://www.inspection.gc.ca/plants/imports/airs/eng/1300127512994/1300127627409>

**Opportunistic Pathogen** is a pathogen that does not usually cause disease in a healthy host but can cause disease when the host’s resistance is low (e.g., compromised immune system).

**Over-Arching Risk Assessment (ORA)** is abroad risk assessment that supports the biosafety program as a whole and may encompass multiple containment zones within an institution or organization. Mitigation and management strategies reflect the type of biosafety program needed to ensure the safety of personnel.

**Pathogen** is a microorganism, nucleic acid, or protein capable of causing disease in humans and/or animals. Examples are listed in Schedule 2-4 or Part 2 of Schedule 5 of the HPTA but these are not exhaustive lists. Examples of animal pathogens can be found by visiting the CFIA website.

**Pathogen Safety Data Sheets (PSDS)** are technical documents describing the hazardous properties of pathogens and recommendations for the safe handling of them. A PSDS may include information such as pathogenicity, drug susceptibility, first aid treatment, PPE, and risk group classification.

**Pathogenicity** is the ability of a pathogen to cause disease in a human and/or animal host.

**Personal Protective Equipment (PPE)** is equipment and/or clothing worn by personnel to provide a barrier from infectious material or toxins, thereby minimizing the risk of exposure. PPE may include, but is not limited to, lab coats, gowns, full-body suits, gloves, protective footwear, safety glasses, safety goggles, masks, and respirators.

**Phlebotomy** is the practice of drawing or collecting blood from a venous (venipucture) or capillary blood source**.**

**President’s Committee on Animal Care (PCAC)** is responsible for overseeing all animal care and use undertaken by members of the University of Regina, and ensuring compliance with institutional and Canadian Council on Animal Care standards.

**Principal Investigator (PI)** is the holder of an independent grant administered by a university and the lead researcher for the grant project, usually in the sciences, such as a laboratory study or a clinical trial. The phrase is also often used as a synonym for head of the laboratory or research group leader.

**Primary Containment** ensures the protection of personnel and laboratory work areas from exposure to infectious material and toxins. This is accomplished by the provision of a physical barrier between the individual and/or the work environment and the infectious material or toxins. Examples include biosafety cabinets, glove boxes, PPE, etc.

**Primary Containment Device** is a device and/or equipment that is designed to prevent the release of infectious materials or toxins (i.e., provide a physical barrier between the individual and/or the work environment and the biological material). The most common primary containment device is a biological safety cabinet.

**Prion** is a small proteinaceous infectious particles generally accepted to be responsible for causing TSE disease in human and animals.

**Public Health Agency of Canada** promotes and protects the health of Canadians through leadership, partnership, innovation and action in public health.

**Recombinant DNA (rDNA**) is a form of DNA that is created by combining DNA sequences that would not normally occur together using genetic engineering techniques.

**Restricted access** is access to a containment zone that is restricted to authorized personnel using a controlled access system (e.g., electronic access card, access code).

**Responsible Official (RO)** is responsible for the development, training, and implementation of safety, security, and emergency response plans. This person assists with maintaining detailed records of information necessary to give a complete account of all activities related to pathogens.

**Risk** is the probability of an undesirable event occurring and the consequences of that event.

**Risk Assessment** is a thorough review of all the risks based on the probability, severity, and frequency with which we are exposed to the hazard/ event.

**Risk Group (RG)** is the classification of biological material based on its inherent characteristics, including pathogenicity, risk of spread, and availability of effective prophylactic and/or therapeutic treatments.

**Security Sensitive Biological Agents (SSBAs)** are human pathogens and toxins that have been determined to pose an increased biosecurity risk due to their inherent dual-use potential for bioterrorism. Also known as “prescribed human pathogens and toxins.” For ease of reference, the PHAC maintains an exhaustive list of all SSBAs, including trigger quantities, which can be accessed here: <http://phac-aspc.gc.ca/lab-bio/regul/ssba-abcse-eng.php>.

**Standard Operating Procedures (SOPs)** are specific safe operating procedures developed by the Principle Investigator, Laboratory Instructor, or individual responsible for the purchase, use, collection, storage, maintenance, and disposal of a biological substance.

**Sterilization** is the process that completely eliminates all living microorganisms, including bacterial spores.

**Supervisor** means a person who is authorized by the University to oversee or direct the work of employees or students, including, but not limited to, Deans, Directors, Department and Unit Heads, Academic Staff Members, and Managers.

**(Biological) Toxin** is a poisonous substance that is produced or derived from a microorganism and can led to adverse health effects in humans and/or animals. Human toxins are listed in Schedule 1 or Part 1 of Schedule 5 in the HPTA.

**Terrestrial Animal Pathogen** is pathogen that causes diseased in terrestrial animals, including avian and amphibian animals, but excluding aquatic animals and invertebrates.

**Transportation** is the action of transporting biological material to a building or another location, within Canada or abroad.

**University Community Member** is all persons associated with the University of Regina, including, but not limited to, the Board of Governors, President, VP’s, AVP’s, Deans, Directors, employees, students, contractors, visitors and volunteers.

**Validation** is the act of confirming that a method has achieved its objective by observing that specific parameters have been met (e.g., validating the temperature and pressure of an autoclave to confirm prion inactivation). Validation infers that a method is suitable for its intended purpose.

**Verification** is the process of comparing the accuracy of a piece of equipment to an applicable standard or SOP (e.g., testing of a Class I BSC in accordance with the manufacturer’s specifications).

**Virulence** is the degree/ severity of a disease caused by a pathogen.

**Virus** is a small infectious agent that can replicate only inside the cells of other organisms.

**Waste** is any solid of liquid material generated by a facility for disposal.

**Zoonotic Pathogens** are pathogens that can be transmitted from animals to humans and vice versa.

**Zoonoses** are diseases that are transmissible between living animals and humans. Zoonoses include anthropozoonoses (i.e. disease transmitted from animals to humans) and zooanthropoposes, also known as reverse zoonoses (i.e., diseases transmitted from humans to animals).

## Roles and Responsibilities

The roles and responsibilities outlined under the *Health and Safety Policy* *(GOV-100-005)* apply to this Program and include the following additions over and above the policy:

### Biosafety Advisory Committee

#### Terms of Reference

The Biosafety Advisory Committee (BSAC) is responsible for the oversight and administration of the University’s Biosafety Program, which is designed to ensure the safe management of biological materials in education, research, and community health at the University of Regina. The BSAC advises the Vice-President (Administration) on all matters related to biosafety and community health.

The BSAC is comprised of faculty and staff members who are familiar and agree with the importance of safely managing biological materials. Committee members may represent various areas of expertise but will be concerned with regulations concerning all types of biological substances.

#### Constitution of BSAC

The BSAC consists of the following members:

1. Vice-President (Administration)
2. Academic Staff Members and Staff Members chosen for their expertise in the safe use of biological materials or organisms
3. Two members from the following: Student, Post-Doctorate, Research Associate, and/or Research Assistant
4. Representatives from Administration
5. The Biosafety Officer (BSO)
6. The Director, Health, Safety & Wellness, Human Resources (Standing member as required)
7. Facilities Management (Standing member as required)

#### Duties of BSAC

BSAC is authorized and responsible for:

1. Establishing a Biosafety Committee (BSC) to implement and lead University of Regina day-to-day procedures governing the safe management of biological materials in accordance with the University’s *Health and Safety Policy*;
2. Formulating, developing, and advising on all matters related to biosafety in education, research, and community health;
3. Ensuring the Public Health Agency of Canada *Human Pathogen and Toxin Act* and *Regulations* License Application and Plan are sufficient, updated, and leading-practice;
4. Ensuring the University of Regina Biosecurity Plan is sufficient for the dynamic research and teaching activities;
5. Ensuring the University Community Health/ Exposure Control Plan is up-to-date and appropriate for University activities;
6. Monitoring, reviewing and if necessary amending or rescinding the procedures and decisions made by the BSC and BSO; and
7. Reviewing incident and accident trends on a regular basis to make University recommendations.

#### Frequency of Meetings

BSAC meets at least twice per year.

#### Chair of BSAC

The Chair and Vice-Chair (Chair select) of the Committee are selected from Academic Staff Members on the Committee. The Chair serves a two year term and is responsible for calling meetings, for correspondence with the committee members, and sitting on the Committee. In the absence of the Chair, the Vice-Chair assumes the duties of the Chair.

### Biosafety Committee

#### Terms of Reference

The BSC implements and leads University of Regina day-to-day procedures governing the safe management of biological materials, in education, research, and community health, in accordance with the University’s Health and Safety Policy. Procedures and decisions made by the BSC or the BSO are subject to review and amendment by BSAC.

#### Constitution of the Biosafety Committee

The Committee consists of the following members:

1. The Chair of the Biosafety Advisory Committee (BSAC)
2. The Biosafety Officer (BSO)

#### Duties of the Biosafety Committee

The Committee:

1. Under BSAC direction, implements and leads University of Regina day-to-day procedures governing the use and management of biological materials in accordance with the University’s Health and Safety Policy;
2. Reports its activities to BSAC at such times and to such extent as BSAC directs;
3. Annually assesses/ inspects Biosafety Permit activities and facilities;
4. Reviews requests for and authorizes the commissioning of new Containment Level 2 laboratories in consultation with Facilities Management; and
5. Responds to biological substance safety situations which require immediate action.

### Biosafety Officer

The Biosafety Officer (BSO), reporting to the Director, Health, Safety & Wellness(HSW), is appointed by the Vice-President (Administration) to give professional advice and coordinate all matters related to biological materials in education, research, and community health on campus. As according to the Public Health Agency of Canada *Human Pathogen and Toxin Regulations BSO Minimum Qualifications* the BSO must have knowledge of microbiology appropriate to the risks associated with the controlled activities authorized under the license, attained through a combination of education, training, and experience. The BSO is responsible for keeping procedures and practices for the use of biological materials up to date, for identifying improvements and opportunities to keep biologically hazardous exposures minimal, and in assisting Academic Staff Members to meet regulatory compliance and University Policies.

#### The duties of the BSO include:

1. Verifying the accuracy and completeness of license applications;
2. Maintaining communication as necessary with the Public Health Agency of Canada (PHAC), Canadian Food Inspection Agency (CFIA), and the Occupational Health and Safety Division of the Government of Saskatchewan Ministry of Labour Relations and Workplace Safety (LRWS) including preparation of annual reports and maintenance of required records;
3. Promoting and monitoring compliance with the provisions of the HPTA and HPTR;
4. Providing on-going advice and technical assistance to persons managing biological materials;
5. Reviewing biosafety aspects of plans, protocols, and operating procedures for research and teaching activities involving biologically hazardous substances prior to the implementation of these activities in consultation with the Biosafety Advisory Committee (BSAC);
6. Serving as the Responsible Official for the University;
7. Leading investigations and supervising after accidents or incidents involving biologically hazardous substances;
8. Coordinating with medical persons regarding possible laboratory-acquired infections;
9. Ensuring proper waste management;
10. Performing periodic internal biosafety audits on technical methods, procedures and protocols, biological agents, materials, and equipment;
11. Discussing violations of biosafety protocols and procedures with the appropriate persons;
12. Providing biosafety training for staff and students who wish to use biological materials or organisms, including animals;
13. Providing a continuing education in biosafety;
14. Assisting with the import/export of biologically hazardous materials or organisms to/from the laboratory, according to regulations;
15. Assisting with coordination of the receipt, shipment, and transport of biologically hazardous materials or organisms according to WHMIS and Transportation of Dangerous Goods Regulations; and
16. Liaising with Academic Staff Members.

# Section 2 – Animal Activities

## President’s Committee on Animal Care

### Animals

At the University of Regina (U of R), all animal use and care in research and teaching fall under the purview of the President’s Committee on Animal Care (PCAC). Health & Safety acts in an advisory role to the PCAC, providing recommendations and assessments of the proposed research and teaching projects. It is the responsibility of the PCAC for ensuring that the Principle Investigators (PIs) implement and apply all recommended hazard identification and mitigation measures that have been identified.

All animal care and use must be reviewed and approved by the PCAC prior to commencement. Contact Research Services or refer to the Animal Care website at <https://www.uregina.ca/research/for-faculty-staff/ethics-compliance/animal/index.html> for more information.

### Human and Animal Pathogens

If animal research and teaching activities involve Public Health of Canada or Canadian Food Inspection Agency regulated biological materials, the Biological Safety Officer takes lead and these activities fall under the purview of the Biosafety Advisory Committee. Please contact the BSO (health.safety@uregina.ca) for more information.

## Animal Education & Research Risk Assessment

“Risk” is the probability of an undesirable event occurring and the consequences of the event (CSG, 2015). To ensure the safety of the community without making “blanket University statements or policies,” biological and animal risk (in additional to all other types of risk (e.g. chemicals, mechanical, ergonomic, etc.)) must be assessed and mitigated through various mechanisms.

Prior to starting a new project, activity, or experiment, you should take a step back and identify the hazards present. To assist you in this process, see **Appendix 1** for a generic **Hazard Identification Guide**. Once the hazards are identified, you use a risk assessment process to determine which risks are higher and require the greatest mitigation effort.

The Biosafety Officer (BSO) welcomes the opportunity to conduct this assessment process with you, please contact health.safety@uregina.ca for assistance and guidance.

## Animal Education & Research Risk Management

Once you have identified hazards and determined the level of risk, the accepted mechanisms to control a hazard are:

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**Elimination (Substitution):** Is there an animal or process that poses less of a risk that the one selected that will provide the same result?

**Engineering Controls:** This includes the selection and use of primary containment devices (e.g. primary containment caging, biological safety equipment, closed vessel, HVAC systems, etc.) Another example includes handling materials in specialized Containment Level Labs that have increased physical infrastructure safety requirements.

**Administrative Controls:** These are the controls that can alter the way in which the tasks are done and can include procedures and practices. For example, detailed procedures and training regarding how animals are transported to and from the various rooms in the laboratory.

**PPE:** The PPE selected and worn by individuals can reduce or minimize the potential exposure to animals or zoonoses. This is the last and least reliable line of defense.

These strategies should be developed, implemented, and regularly reviewed and updated. The following pages will identify mitigation controls for some of the Canadian Council on Animal Care (CCAC) noted hazards. Please contact the BSO (health.safety@uregina.ca) for assistance and guidance.

## Animal Education & Research Training

### Animal Care Training Program

All personnel involved with the use of animals in research and education must be adequately trained in the principles of laboratory animal science and the ethical issues involved in animal use. Personnel includes principal investigators, researchers, students, technicians, etc.

In order for an Animal Use Protocol (AUP) to be approved, the Animal Care Training Program must be completed by all individuals listed on the AUP, as required by the CCAC.

This is a UR Courses program created by the Canadian Council on Animal Care (CCAC). The Animal Care Training program is twelve web-based modules covering the general core topics for all animal users and specific core topics for the Laboratory Animal/Teaching Stream of the **Canadian Council on Animal Care** Recommended Syllabus.

Contact Research Services or refer to the PCAC website at <https://www.uregina.ca/research/for-faculty-staff/ethics-compliance/animal/index.html> for more information.

### Evidence of Practical Training

Each individual listed on the Animal Use Protocol must complete the **Evidence of Practical Training Form** and submit it to the Research Office. This form should also indicate any previous training and related practical skills by the animal user. Contact Research Services or refer to the PCAC website at <https://www.uregina.ca/research/for-faculty-staff/ethics-compliance/animal/index.html> for more information.

### Animal & Zoonotic Disease Awareness

This is a UR Courses program created by UofR Health & Safety to introduce you to human safety requirements that are identified in the Canadian Council on Animal Care *Guidelines*. Contact health.safety@uregina.ca to be enrolled for training.

## Health and Medical Surveillance Program Procedures

The purpose of a health and medical surveillance program is to help prevent and detect illness related to the exposure of personnel to infectious materials or toxins.

Personnel working with animals may encounter a variety of unique biological hazards, including allergies, asthma, skin irritations, and zoonoses. The Canadian Council on Animal Care’s (CCAC) **Guide to the Care and Use of Experimental Animals** (accessed here: <http://www.ccac.ca/Documents/Standards/Guidelines/Experimental_Animals_Vol1.pdf>) indicates that zoonotic hazards may sporadically affect susceptible persons or animals.

Persons potentially at higher risk are those who suffer from defective immune systems and those who are under severe stress or who have non-overt clinical disease. Caution should be exercised in assigning women of childbearing status to animal care duties that mightexpose them to potential or known teratogens.

It is also suggested that work involving exposure to hazardous microorganisms may require prior immunization of the staff, if a vaccine is available. It is recommended, for example, that all personnel handling random-source dogs and cats, including dealers and handlers, should receive routine rabies vaccination. In addition, procedures for monitoring exposure, health-monitoring of staff at risk, and for dealing with staff who become allergic to laboratory or fieldwork animals should also be considered.

At the U of R, health and medical surveillance programs are determined on a project-by-project basis under the discretion of the PI/ LI/ Lab Manager in consultation with the BSO. Based on each individual project risk assessment, risk mitigation controls such as exposure control plans, immunizations, waivers, medical pre-screening, and SOP development may be required.

In general, all personnel must understand the hazards and risks of their specific work projects and immuno-compromised and pregnant women must have the option of taking extra care and/or not working with certain biologically hazardous materials or organisms. Contact the BSO (health.safety@uregina.ca) for details on how to determine if your activities require a robust health and medical surveillance program.

### Pregnant Worker Notification

Students and workers who are pregnant should take steps to reduce their exposure to harmful biological substances by notifying their Supervisor immediately. PIs, LIs, and Lab Managers who have been notified that a lab user is pregnant must take steps to minimize the student/worker’s exposure or assign the student/worker to less hazardous work if available. Contact BSO (health.safety@uregina.ca) for assistance.

###

### Allergies and Asthma

Personnel working with animals may encounter the development of allergies, sensitivities, asthma, and/or skin irritations. Allergies to laboratory and fieldwork animals are a significant occupational health concern which may require affected workers to change jobs or careers.

Animal-related asthma and allergies are exaggerated reactions of the body’s immune system to animal proteins. Source of allergens include animal fur, dander, urine, saliva, serum or other body tissues.

Typical symptoms range from:

* mild (e.g. upper respiratory signs such as sneezing, itchy and/or runny nose and eyes, and skin reactions such as red, raised and itchy welts after contact with animals, their tissues or their excreta); to
* severe (e.g. wheezing, shortness of breath and a feeling of chest tightness (asthma).

Persons experiencing such symptoms should be advised to contact their physician for diagnosis and treatment.

Common sources of exposure, as reported by the National Institute of Occupational Health and Safety, are:

* urine of rats
* saliva and pelts of guinea pigs
* rabbit pelts
* cat saliva and dander
* dog dander
* horse serum and dander

Exposure to rats, mice, and rabbits have frequently been associated with the development of occupational asthma. Species of other mammals have also been reported to cause respiratory symptoms. Exposures to birds have been associated with other respiratory diseases, including hypersensitivity pneumonitis.

Methods to reduce the degree of exposure to laboratory and fieldwork animal allergens include:

* use of protective gear such as gloves, face masks, gowns, shoe covers, etc. worn only in animal rooms;
* regular hand-washing, and showering after work;
* use of improved filtration in animal room ventilation systems, and the use of special filtered caging systems;
* perform animal manipulations within ventilated hoods and biological safety cabinets; when possible, use an animal species or sex that is known to be less allergenic than others; and
* educational programs for employees identifying high risk (e.g. high allergen load) areas and tasks, and strict use of preventive measures, as set out by task-specific SOPs.

### Zoonoses

A zoonosis is an animal disease or infection that can be transmitted to humans. Specific animal parasites, bacteria, fungi, viruses, and pria have been found to cause zoonoses (see **Appendix 2 -** **Zoonoses Awareness Guide**) and animal users and handlers must be made aware of the hazards and risks of working with animals before research or teaching begins. Furthermore, not only can personnel acquire infections or diseases directly from animals, but they can also be exposed to infectious agents from other contaminated personnel and equipment.

Transmission of infections from animals to humans can generally be avoided through proper veterinary care and adherence to standard operating procedures (SOPs) for control of transmission. Special attention is required anytime animals capable of carrying zoonoses are handled.

## Biological Exposure, Suspected Exposure, and Post-Exposure Response Procedures

### Medical Emergency

1. Phone 911 – Direct them to the scene of the occurrence.
2. Call Campus Security: 585-4999
3. Give First Aid, if you are qualified to do so, or get help from Campus Security.
4. Stay with victim.

### Needle Stick Poke, Puncture Wound, or Percutaneous Injury

1. Remove gloves and allow the wound to bleed.
2. Immediately wash the affected area for 15 minutes with soap and warm water.
3. Notify Supervisor (if available) to obtain assistance.
4. Seek **medical assistance immediately** (within **1-2 hours**) from a health care professional. The cause of the wound and organisms involved should be reported.
5. Details of the incident must be documented using the **Incident Report Form** and forwarded to Health, Safety & Environment within 24 hours. Forms can be found online at[www.uregina.ca/hr/hse](http://www.uregina.ca/hr/hse) or by contacting health.safety@uregina.ca or 306-585-4776. Please include the following details:
6. What was the method of contact (e.g. needle stick, splash)?
7. How did the exposure occur?
8. What known biological agents or body fluids were you in contact with?
9. What action was taken in response to the exposure to remove the contamination (e.g. hand washing)?
10. What personal protective equipment was being used at the time of exposure?
11. What is your immune status (e.g. Tetanus, Hepatitis A or B Virus)?

### Eyes or Mucous Membrane Exposure (e.g. Splash)

1. Immediately flush the affected area for 15 minutes using an eyewash or shower.
2. Notify Supervisor (if available) to obtain assistance.
3. Seek **medical assistance immediately** (within **1-2 hours**) from a health care professional. The organisms involved should be reported.
4. Details of the incident must be documented using the **Incident Report Form** and forwarded to Health, Safety & Environment within 24 hours. Forms can be found online [www.uregina.ca/hr/hse](http://www.uregina.ca/hr/hse) or by contacting health.safety@uregina.ca or 306-585-4776. Please include details as listed above.

### Ingestion

1. Protective clothing should be removed.
2. Notify Supervisor (if available) to obtain assistance.
3. Seek **medical assistance immediately** (within **1-2** **hours**) from a health care professional.
4. Identification of the material ingested and circumstances of the incident should be reported.
5. Details of the incident must be documented using the **Incident Report Form** and forwarded to Health, Safety & Environment within 24 hours. Forms can be found online [www.uregina.ca/hr/hse](http://www.uregina.ca/hr/hse) or by contacting health.safety@uregina.ca or 306-585-4776. Please include details as listed above.

### Post-Exposure Procedures

If a student or employee has been exposed to biologically hazardous substances at the U of R, the University will, with the consent of the student/employee, during the student/employee’s normal working hours, arrange for immediate medical evaluation, medical intervention, and confidential post-exposure counselling.

If a student/employee cannot receive medical evaluation, medical intervention, or post-exposure counselling during the student/employee’s normal working hours, the U of R will credit the student/employee’s attendance for evaluation, intervention, or counselling as time at work and shall ensure that the student/employee does not lose any pay or other benefits.

The U of R HSW Unit investigates and documents any occurrence of an occupationally transmitted infection and any occupational exposures to an infectious agent to identify the route of exposure and implement measures to prevent infection. All investigations and documentation concerning personal information of any work-related exposure incident, including the route of exposure and the circumstances in which the exposure occurred, are held in complete confidentiality.

## Biological Material Decontamination Procedures

### General

Decontamination includes both the complete destruction of all microorganisms and any bacterial spores by **sterilization** and the chemical destruction and removal of specific types of microorganisms by chemical **disinfection**.

All contaminated materials including, but not limited to, laboratory cultures, stocks, animal tissues, laboratory equipment, tools, sharps, and personal and protective clothing that has been in contact with biologically hazardous substances must be decontaminated before disposal or reuse. A basic knowledge of how to properly decontaminate using chemical disinfectant and sterilization methods is important for biosafety in the laboratory.

Lab bench tops, biological safety cabinets, tools, and surfaces are to be decontaminated after all spills of biologically hazardous substances *and* at the end of the working day. Lab working rooms and large pieces of equipment may also require decontamination prior to servicing, maintenance, transfer and reassignment.

### Sterilization

Dry heat sterilization is a non-corrosive process used to sterilize lab glassware, lab waste, some plastics, metals, tools, etc. which can withstand temperatures of 160°C (320°F) or higher for 2-4 hours.

Moist heat sterilization is a process used to sterilize laboratory wares and wastes, and is most effective when used in the form of autoclaving. For more details, please see the online [**U of R Autoclave Program**](https://www.uregina.ca/hr/hsw/laboratory-safety/biosafety/Research%20and%20Teaching1/autoclave.html)**.** The process of boiling does not necessarily kill all biologically hazardous materials or organisms but it may be used as the minimum processing for decontamination where other methods such as chemical disinfection and autoclaving are not feasible.

### Disinfection

Dirt, soil, and organic material can shield microorganisms and interfere with the killing action of disinfectants; thus, pre-cleaning is required before properly decontaminating heavily soiled items with disinfectants. Cleaning is the removal of dirt, organic matter, and stains by brushing, vacuuming, dry dusting, washing, or damp mopping with water containing a soap or detergent.

Many types of chemicals can be used as disinfectants; therefore, the proper type of disinfectant must be carefully selected for each laboratory’s specific needs. Refer to **Appendix 3 -** **Disinfectants** for a comprehensive list of disinfectant types and against which biological agents the disinfectant is effective.

### Protective and Personal Clothing Decontamination

All contaminated personal clothing items and non-disposable gowns, coveralls, and coats should be properly decontaminated to reduce risk of transmission and exposure. The risk of disease transmission from soiled linen is low, but soiled linens may carry organisms that may contaminate the air and immediate environment. See **Appendix 4 – Personal Protective Equipment** for step-by-step details.

## Biological Material Laboratory Equipment Procedures

### Personal Protective Equipment

Personal protective equipment (PPE) also known as barrier equipment is used to prevent biologically hazardous substances from making direct contact with an individual. In accordance with Universal Precautions, blood, body fluids, and tissues of all persons are considered potentially infectious.

The type and amount of PPE depends upon the task or activity performed. Remember PPE is the least effective type of hazard control and the last resource on which to rely. Administrative and engineering controls are the most effective means of hazard control.

See **Appendix 4 -** **Personal Protective Equipment** for more information regarding types of PPE available for use with biological materials.

### Biological Safety Cabinets

Biological safety cabinets are specialized, vented cabinets, which use a variety of combinations of high efficiency particulate air (HEPA) filtration, laminar airflow, and containment to provide protection to personnel, laboratory materials, or the environment. *Biological safety cabinets are not chemical fume hoods and must not**be used as such.*

A variety of types of cabinets exist, and the cabinet chosen must be suited to the work proposed:

* **Clean Air Bench** **(Laminar Flow Hood)** – These benches are used for product protection only, and do not protect the worker from aerosols or particulates from the work. HEPA-filtered air flows towards the worker. *This is not a biological safety cabinet and should not be used as such.*
* **Class I** – Laminar air flow is directed away from the user and through a HEPA filter. These cabinets provide partial protection to the user and protection of the environment, but do not protect the product. Class I cabinets are suitable for some work procedures at Containment Level 1 and 2.
* **Class II** – These cabinets provide protection to the worker, the work, and the environment.
* **Class III** – These cabinets are typically used in containment Level 4 facilities.

Please contact the BSO (health.safety@uregina.ca) for more information, including procedures, training, and certification requirements.

## Biological Waste Disposal Procedures

All human, animal, and microorganism material that has been produced, used, or handled at the University must be disposed of properly. Biological material must never be poured down the drain or put into the regular garbage before inactivation and/or decontamination; this excludes whole water, soil, and plant samples that have not been manipulated.

See the online [**Biological Waste Disposal**](https://www.uregina.ca/hr/hsw/laboratory-safety/biosafety/Research%20and%20Teaching1/autoclave.html) for more details.

### Autoclaves

An autoclave is a specialized piece of equipment designed to deliver heat under pressure to a chamber, with the goal of decontaminating or sterilizing the contents of the chamber. Packaging materials to be autoclaved and using autoclave equipment properly ensures the integrity of research and teaching activities. Please see the online [**U of R Autoclave Program**](https://www.uregina.ca/hr/hsw/laboratory-safety/biosafety/Research%20and%20Teaching1/autoclave.html)for a comprehensive manual detailing how to achieve these objectives.

### Incineration

Incineration is a useful method for disposing of laboratory waste, animal carcasses and tissues, and anatomical biomedical waste. Effective incineration depends on proper equipment design; modern incinerators have two chambers with an ideal temperature in the primary chamber of at least 800°C and in the secondary chamber a temperature of at least 1,000°C.

The University has a contract with a waste disposal company to transport and incinerate all human, animal, and chemically-contaminated microbiological waste produced on and off campus. As most wastes need to be stored in fridges and freezers, a waste disposal pick-up is only scheduled as required. Contact health.safety@uregina.ca to schedule a waste disposal pick-up.

## Laboratory and Wild Animals

### General

When research and teaching activities involve animals, these activities must comply with the policies and procedures of the PCAC, as mentioned in the above section. All animal work, including field studies done by research personnel of the U of R, must be in compliance with the national guidelines for animal care and use as established by the CCAC.

The CCAC has a series of online guides to assist implementation of animal use and care best practices. See: [www.ccac.ca/en/CCAC\_Programs/Guidelines\_Policies/GDLINES/Guidelis.htm](http://www.ccac.ca/en/CCAC_Programs/Guidelines_Policies/GDLINES/Guidelis.htm).

* Personal cleanliness is an important barrier to infection, and washing of hands after handling any animal will reduce the risk of disease spread and self-infection. All employees working with animals, as well as visitors to the facility, must wear appropriate protective clothing.

* Physical injuries related to the handling of animals may be kept to a minimum by ensuring that:
	+ All staff are trained and experienced in handling the species with which they work, and that they know the particular hazards associated with each species;
	+ all staff are familiar with the hazards of the experiment, and are provided with (and use) a proper working area, protective clothing and equipment; and
	+ a mechanism is in place in every unit to deal with animal-inflicted injury, and for referral for any further medical treatment if this is required.
* All personnel using and caring for animals must complete the required training courses in addition to duty/project specific training provided by their Supervisors, which is documented by the Office of Research, Innovation & Partnership.

### Wild Animals (Fieldwork)

The approved CCAC guidelines on the care and use of wildlife provide detailed information for all personnel working with wildlife in the field. Please see the CCAC website and become familiar with the entire document prior to initiation of activities: [www.ccac.ca/en\_/standards/guidelines](http://www.ccac.ca/en_/standards/guidelines).

Personnel working in the field may encounter a variety of unique hazards and risks, which have been identified in the CCAC guidelines on the care and use of wildlife. Please see**Appendix 5 -****Human Safety Considerations for Wildlife** **Use** for the list of concerns that CCAC has identified.

In addition, the U of R **Travel and Fieldwork Safety Procedures** pertain to all work activities carried out for the purpose of research, study, or teaching undertaken by employees or students of the University at a locality beyond the geographic boundary of University property (accessed here:<https://www.uregina.ca/hr/hsw/travel-fieldwork.html> or contact health.safety@uregina.ca for more information).

### Laboratory Animal Work

Animal Facilities

Once approval has been received from PCAC, the PI must design the animal housing facility appropriately. The Public Health Agency of Canada’s (PHAC) *Canadian Biosafety Standards,* Canadian Food Inspection Agency’s (CFIA) C*ontainment Standards for Veterinary Facilities,* and the CCAC’s *Guide to the Care and Use of Experimental* *Animals* resources should be followed when designing and operating animal facilities for work with animals.

At the U of R, animal facilities will be designated Containment Level 1 or 2 according to a risk assessment done by the PI in consultation with the BSO (health.safety@uregina.ca).

For facilities that use animals in the animal laboratory, things to be considered are:

* The nature of the animals (i.e. their aggressiveness and tendency to bite and scratch).
* Their natural ecto- and endoparasites.
* The zoonotic disease to which they are susceptible.
* The possible dissemination of allergens.

Pathogen and toxin work performed *in vivo* involves living animals and is carried out in an animal containment zone. Contact the BSO (health.safety@uregina.ca) for more information.

## Appendices

## Appendix 1 – General Hazard Identification

##

This form is designed to assist faculty, staff, and students in identifying potential hazards associated with research activities. If you require assistance in assessing the safety hazards and risks associated with your activities, please contact health.safety@uregina.ca.

|  |  |
| --- | --- |
| [ ]  | Will faculty, staff, or students be training or directing the work of other staff and students?  |
| [ ]  | Will the research activities require that faculty, staff, or students leave the City of Regina for travel and/or fieldwork? |
| [ ]  | Will faculty, staff, or students be working alone during evenings and weekends? |
| [ ]  | Will faculty, staff, or students spend significant periods of time working at a desk or standing? |
| [ ]  | Will faculty, staff, or students be lifting or transferring heavy loads? |
| [ ]  | Will faculty, staff, or students be handling, storing, or working near WHMIS controlled chemicals? |
| [ ]  | Will faculty, staff, or students work unsupervised with chemicals and equipment (e.g. gas cylinders) in a wet laboratory? |
| [ ]  | Will faculty, staff, or students be receiving, shipping, and/or transporting chemicals and/or other dangerous goods? |
| [ ]  | If research activities present a risk of fire, will faculty, staff, or students benefit from knowing how to use a fire extinguisher in an emergency situation? |
| [ ]  | Will faculty, staff, or students be handling, storing, or culturing biological materials (e.g. bacteria, viruses, fungi, prions, etc.)? |
| [ ]  | Will faculty, staff, or students be handling or using human, tissues, organs, and/or cell lines (e.g. heart tissue, HEK cell line, etc.)? |
| [ ]  | Will faculty, staff, or students be injecting or extracting live human blood or body fluids by methods such as intravenous cannulation, intramuscular or subcutaneous injection, capillary sampling using a lancet, sputum sampling, etc? |
| [ ]  | Is there a potential for faculty, staff, or students to be exposed to human and/or animal blood and body fluids? |
| [ ]  | Will faculty, staff, and students be handling, using, or caring for live animals? |
| [ ]  | Will faculty, staff, or students use an autoclave? |
| [ ]  | Will faculty, staff, or students use biological safety cabinets when performing research activities? |
| [ ]  | Will faculty, staff, or students use centrifuges or other rotating equipment? Will power tools or pressurized equipment (i.e. gas cylinder, hydraulic press, table saw, drill press, hydrostatic (pump) be used? Will equipment with stored energy (i.e. compressed springs, suspended loads) be used? Will robotics be used? |
| [ ]  | Will faculty, staff, or students handle or use radioisotopes, lasers, or x-ray equipment? |
| [ ]  | Will faculty, staff, or students require the use of respiratory protection (i.e. dust mask, air purifying respirator, supplied air respirator)? |
| [ ]  | Will faculty, staff, or students be required to enter or work in confined spaces? A confined space is defined as any space not normally intended for human occupancy.  |
| [ ]  | Will faculty, staff, or students be working at heights greater than 3 meters, or using ladders? |
| [ ]  | Will faculty, staff, or students be exposed to extreme temperatures, noise, or vibration? |

## Appendix 2 – Zoonoses Awareness Guide

##

The spread of zoonoses requires a source of an infectious agent (from an animal), a susceptible host (human), and a means of transmission. Zoonoses can be transmitted by various routes; thus, the University of Regina’s *Biosafety Program* and duty/procedure specific safe operating procedures (SOPs) must be followed to reduce the risk of exposure and illness.

There are a number of ways in which biologically hazardous substances can enter the body and cause infection and disease, including ingestion, inhalation, injection or absorption. The types of events that can lead to an infection or disease include, but are not limited to, exposure to infectious aerosols, spills and splashes, accidental needle stick injuries, cuts from sharps, bites and scratches from animals, oral pipetting, equipment accidents and secondary spread of biologically hazardous substances to non-laboratory areas.

The Canadian Council on Animal Care’s (CCAC) *Guide to the Care and Use of Experimental Animals*, 1993, indicates that zoonotic hazards may sporadically affect susceptible persons or animals. Persons potentially at higher risk are those who suffer from defective immune systems and those who are under severe stress or who have non-overt clinical disease. Caution should be exercised in assigning women of childbearing status to animal care duties that mightexpose them to potential or known teratogens.

**Zoonoses**

The following information has been adapted from the CCAC’s *Guide to Care and Use of Experimental Animals,* 1993, Appendix VII, *Zoonoses - Experimental Animals to Man* and supplemented using the Public Health Agency of Canada’s online Pathogen Safety Data Sheets.

1. **Bacterial Diseases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Anthrax**(Woolsorter’s disease) | *Bacillus anthracis* | Wild and zoo animals (cattle, sheep, goats, horses, pigs). Vultures have been reported to spread the organism from one area to another. **Vectors:** Biting flies which had fed on infected animals. | Contact with infected animal tissues, contaminated hair, wool, hides or products made from them. By biting flies feeding on such animals. Inhalation of spores in contaminated soil areas, dried or processed skins, and hides of infected animals. Spores are resistant and remain viable for years in soil, dried or processed hides. Ingestion of contaminated undercooked meat.  | Skin lesions becoming papular, then vesiculated and developing into a depressed eschar; respiratory distress, fever and shock with death shortly thereafter; abdominal distress followed by fever, septicemia. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Brucellosis**(Undulant fever, Malta fever, Bang’s disease) | *Brucellosis suis,* *B. abortus,* *B. melitensis,* *B. ovis, B. canis* | Cattle, swine, goats, sheep, deer, caribou, elk, dogs and coyotes | Ingestion of raw milk or cheese from infected animals. Direct contact via skin abrasions and mucous membranes and in abattoirs. Inhalation. Risk factors: contact with infected animal tissues, blood, urine, vaginal discharge, aborted fetuses. | Systemic bacterial disease with acute or insidious onset. Intermittent fever, headache, weakness, sweating, chills, arthralgia; localized suppurative infections. |
| **Campylobacteriosis** | Campylobacter fetus | Cattle | Ingestion of organisms in food. Contact with infected animals. | Systemic infection in immunocompromised hosts; bacteremic illness, high fever; endocarditis, pericarditis, thrombophlebitis, meningoencephalitis. |
| **Campylobacteriosis**(Campylobacter enteritis, Vibrionic enteritis, Traveler’s diarrhea) | Campylobacter jejuni | Swine, cattle, sheep, cats, dogs, other pets, rodents and birds, including poultry | Ingestion of organisms in undercooked food or in unpasteurized milk or water. Contact with infected pets (puppies and kittens), farm animals or infected infants. Cross-contamination from these sources to foods eaten uncooked or poorly refrigerated. | Acute enteric disease; diarrhea, abdominal pain, malaise, fever, nausea and vomiting; blood in association with mucus and WCBs present in liquid of foul-smelling stools; typhoidal-like syndrome, reactive arthritis; rare cases of febrile convulsions, Guillain-Barré syndrome and meningitis. |
| **Chlamydiosis**(Psittacosis, Parrot’s Fever) | *Chlamydia psittaci* | Cattle, swine, parakeets, parrots, pigeons, turkeys, ducks, other birds and other misc. animals. Infections have occurred through contact with infected domestic mammals, but this is relatively uncommon. | Inhalation of the agent from desiccated droppings and secretions of infected birds. Direct contact with infected birds; relatively uncommon infections have occurred through contact with infected domestic mammals. Bite from an infected bird. | Fever, headache, myalgia, chills, upper or lower respiratory tract disease, pneumonia, lethargy, anorexia, encephalitis. |
| **Colibacillosis** | *Escherichia coli* | Cattle, swine, poultry and other misc. animals | Ingestion | Systemic infections; bacteremia progresses to septicemia and death, or the infection extends to serosal surfaces, pericardium, joints and other organs. |

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| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Leptospirosis**(Weil’s disease) | *Leptospira* spp. | Farm and pet animals, including cattle, dogs, horses, swine, rats and other rodents. Wild animals, including deer, squirrels, foxes, skunks, reptiles and amphibians. In Europe: field mice, voles, shrews and hedgehogs. | Indirect contact of the skin or mucous membranes with contaminated water, soil, or vegetation. Direct contact with urine or tissues of infected animals. Ingestion of contaminated food. Inhalation of droplet aerosols of contaminated fluids. | Fever, headache, chills, severe malaise, vomiting, myalgia and conjunctival suffusion; meningitis, rash and uveitis; jaundice, renal insufficiency, anemia and hemorrhage of the skin. |
| **Pasturellosis**(Shipping fever) | *Pasteurella multocida*, *P. hemolytica* and *P. pneumotropica* | Cats, dogs, rabbits, misc. mammals, and birds**Vectors:** Fleas, flies, cockroaches, mosquitoes | Animal bite or scratch (especially from cats and dogs). Inhalation of aerosols. Indirect wound contamination from infected tissues. Vector transmission by fleas, flies and cockroaches. | Localized infection such as cellulitis and abscess, osteomyelitis, arthritis, chronic pulmonary infections, bacteremia, meningitis, septicemia, otitis media, hepatic cirrhosis and peritonitis. |
| **Plague** | *Yersinia pestis* | > 200 mammalian species including: wild rodents (rats), lagomorphs (rabbits, hares) and carnivores**Vectors:** Wild rodent fleas, especially the oriental rat flea (Xenopsylla cheopis), and occasionally by human fleas (Pulex irritans) | Contact of rats, flea bites and domestic pets can carry plague-infected fleas. Handling of infected tissues. Airborne droplets from humans or pets. Careless manipulation of laboratory cultures. Person-to-person transmission by human fleas. | Bubonic plague with lymphadenitis occurring in lymph nodes and inguinal areas, fever, may progress to septicemic plague with dissemination by blood to meninges. Secondary pneumonic plague with pneumonia, mediastinitis, and pleural effusion. |
| **Pseudotuberculosis** | *Yersinia pseudotuberculosis* | Rodents, lagomorphs (rabbits and hares), pigeons, turkeys, canaries and other wild and domesticated birds and mammals (puppies, kittens, pigs) | Fecal-oral transmission by contact with infected persons or animals. Ingestion of food or drink fecally contaminated. Transmission by infected blood products has been reported. | Acute watery diarrhea, enterocolitis, acute mesenteric lymphadenitis mimicking appendicitis, fever, headache, pharyngitis, anorexia, vomiting, erythema nodosum, arthritis, iritis, cutaneous ulceration, hepatosplenic abscesses, osteomyelitis and septicemia. |
| **Rat Bite Fever** | *Spirillum moniliformis* and *Spirillum minus* | Rodents | Rodent bites and ingestion | Fever, headaches |
| **Salmonellosis** | *Salmonella* spp. | Farm animals, rodents, reptiles, amphibians, and other zoo and wild animals | Ingestion of food contaminated directly from infected animals or indirectly by infected animal or person. Contact by animal feeds and fertilizers prepared from contaminated meat scraps. Fecal-oral transmission from person to person. Inhalation. | Acute gastroenteritis with sudden onset of headache, abdominal pain, diarrhea, nausea and sometimes vomiting and septicemia, intravascular lesions, osteomyelitis, and meningitis |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Shigellosis**(Bacillary dysentery) | *Shigella* spp. | Non-human primates | Direct or indirect fecal-oral transmission: poor hygiene practices spread infection to others by direct physical contact or indirectly by contaminating food and water, milk, cockroach, and fly-borne transmission may occur as the result of direct fecal contamination. | Acute disease of large and small intestine; diarrhea, fever, nausea, and sometimes toxemia, vomiting, cramps and tenesmus, stools contain blood, mucus and pus, alterations in consciousness, and mild and asymptomatic infections. |
| **Tetanus** | Clostridium tetani | Dogs, cats, and equine species | Tetanus spores introduced into the body through a wound, laceration or burn contaminated with soil, street dust or feces, or injected street drugs. | An acute disease induced by a neurotoxin: painful muscular contractions, primarily of neck muscles, secondarily of trunk muscles, abdominal rigidity, and generalized spasms. |
| **Tuberculosis** | *M. tuberculosis* *M. bovis*, and*M. avium* | Non-human primates, cattle, dogs, poultry, swine, and sheep | Inhalation. Direct exposure to airborne bacilli from sputum of infected persons. Direct invasion of mucous membranes or breaks in skin. Bovine tuberculosis from exposure to infected cattle (airborne, ingestion of raw milk or dairy products). | Tuberculin sensitivity appears in a few weeks and lesions commonly heal. May progress to pulmonary tuberculosis (fatigue, fever, cough, chest pain, hemoptysis fibrosis, cavitation) or extrapulmonary involvement (miliary, meningeal) by lymphohematogenous dissemination. |
| **Tularemia**(Rabbit Fever) | *Francisella tularensis* | Lagomorphs (rabbits and hares), wild rodents, birds, and dogs.**Vectors**: Ticks, deerflies, fleas, and mosquitoes | Inoculation of skin, conjunctival sac or oropharyngeal mucosa with blood or tissue while handling infected animals, or by fluids from infected flies, ticks or other animals; able to pass through unbroken skin. Bite of arthropods and ticks. Ingestion of contaminated food and drinking water. Inhalation of contaminated dust. Rarely through bites of animals. | Indolent ulcer at site of infection, swelling of the regional lymph nodes (ulceroglandular); sudden onset of pain and fever. |

1. **Rickettsial Diseases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Q fever, Query fever, Rickettsia** | *Coxiella burnetii* | Cattle, sheep, and goats. **Vectors**: Ticks - several species (transmit C. burnetii to domestic animals but not to humans) | Airborne dissemination of rickettsiae in dust from contaminated premises. Direct contact with infected animals and their birth products (especially sheep), wool from sheep, straw, fertilizer and laundry of exposed persons. Ingestion of raw milk from infected cows has been responsible in some cases. | Acute febrile disease: sudden onset, chills, headache, weakness, malaise, severe sweats; pneumonitis, pericarditis, hepatitis, generalized infections. |
| **Rickettsial pox** | *Rickettsia akari* | Wild mice, rats, and voles. **Vectors**: Mites- Leponyssoides sanguineus | Mite bites | Skin lesion at the site of a mite bite associated with lymphadenopathy. Fever, sweats, headache, disseminated vesicular rash, may be confused with chickenpox. |
| **Rocky Mountain Spotted Fever (RMSF), New World spotted fever, Tick-borne typhus fever, Sao Paulo fever** | *Riskettsia rickettsia* | Wild rodents, rabbits, and dogs. **Vectors**: Ticks East and South USA - dog tick, Dermancentor variabilis; Northwest USA - wood tick, D.andersoni;Southwest USA - Lone Star tick, Amyblyomma americanum; Latin America - A. cajennense | Bite of an infected tick: several hours of attachment are required before the rickettsiae become reactivated to infect humans. Direct contamination of skin with crushed tissues or feces of tick. | Sudden onset with moderate to high fever, malaise, deep muscle pain, severe headache, chills, conjunctival injection, maculopapular rash appears on extremities 3rd day and spreads rapidly, and hemorrhages are common. |
| **Asian tick fever** | *Riskettsia siberica* | Wild mice and rats**Vectors**: Rat fleas | Flea bites from rat fleas, rat to rat spread by lice, and ingestion of contaminated food. |  |

1. **Viral Diseases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Marburg Disease, Ebola Hemorrhagic Fever** | Filovirus | African green monkey (Macaca sp.) | Direct contact with monkey tissues |  |
| **South American and Korean Hemorrhagic fever** | Hemorrhagic fever virus | Wild rodents (Mastomys ratalensis) | Direct contact with rodents and contact and contamination of food, etc. with rodent excreta |  |
| **Hepatitis A** | Hepatitis A Virus | Marmosets (experimentally infected), chimpanzees, macaque monkeys, and owl monkeys | Person-to-person by faecal-oral route. Ingestion of contaminated food (i.e. shell fish) and water. Hands may play an important role in the direct as well as the indirect spread of HAV. | Many infections are asymptomatic, abrupt onset with fever, malaise, anorexia, nausea and abdominal discomfort, followed within a few days by jaundice. |
| **Herpes B Encephalitis, Herpes simiae, B virus** | *Cercopithecine Herpes Virus 1* | Rhesus and other Macaca sp., Old World monkeys, rabbits, guinea pigs and mice | Monkey bite or by direct or indirect contact with/exposure to naked skin (broken or mucous membranes) to infected saliva, tissues, tissue fluid or monkey cell cultures. Splashes or droplets of infected fluids to eye. Aerosols exposure of CHV-1 is likely to be minimal. Human-to-human transmission has been documented in one case. | Acute, usually fatal, ascending encephalomyelitis, febrile onset with headache, vesicular skin lesions at site of exposure and variable neurological patterns. |
| **Lymphocytic meningitis** | *Lymphocytic choriomeningitis virus* | Rodents and numerous other mammals (monkeys) | Inhalation of infectious aerosolized particles of rodent urine, feces or saliva. Ingestion of food contaminated with virus, contamination of mucus membranes, skin lesions or cuts with infected body fluids. Congenital transmission. Tissue culture transmission | Biphasic febrile illness: mild influenza-like illness or occasionally, meningeal or meningoencephalomyeli-tic symptoms, transverse myelitis, a Guillain-Barre-type syndrome; orchitis or parotitis; infection asymptomatic in one third of individuals; temporary or permanent neurological damage is possible; pregnancy-related infection has been associated with abortion, congenital hydrocephalus, chorioretinitis and mental retardation. |
| **Rabies** | *Rabies virus* | All mammals with varying susceptibility. Urban rabies - dogs and cats. Sylvatic or rural rabies - wild carnivores and bats, with sporadic disease among dogs, cats and livestock. In USA and Canada - primarily foxes and raccoons and in Europe - foxes. | Virus-laden saliva of a rabid animal is introduced by a bite or rarely by a scratch (rarely into a fresh break in skin or through intact mucous membranes). Airborne spread demonstrated in caves and in laboratory setting. | Acute viral encephalomyelitis, invariably fatal after the onset of symptoms; onset with apprehension, behavioral changes, headache, fever, malaise and sensory changes referred to site of preceding animal bite wound; progresses to paresis or paralysis; spasm of muscles on attempts to swallow may lead to fear of water; delirium and convulsions; duration of 2 to 6 days. |

1. **Viral Diseases Spread by Arthropods (Arthropod-Borne Viruses)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Tick-borne Hemorrhagic Fevers (various)** | Asian arboviruses | Wild rodents, hares, wild-caught monkeys | Tick bites | Subtropical climate conditions favour cycle. |
| **California Encephalitis** | California serogroup | Wild rabbits and rodents. **Vectors:** Woodland mosquitoes - Aedes triseriatus (LaCrosse), Spring Aedes (Snowshoe hare) California serogroup | Bite of infective mosquitoes; viruses are transmitted between woodland mosquitoes and small animals - human infection is tangential. | Onset is abrupt, typically with a severe bifrontal headache, fever, vomiting, lethargy and convulsions; less frequently, there is only aseptic meningitis; fatalities and neurologic sequelae are rare. |
| **Colorado Tick Fever** | Colorado tick fever virus | Small mammals, ground squirrels, and *Deromyscus* spp. **Vectors:** Tick - Dermacentor andersoni | By bite of an infective tick; immature ticks acquire infection by feeding on infected viremic animals; ticks remain infected through the various moults and transmit virus to humans by feeding as adult ticks. | Acute febrile, often diphasic, dengue-like disease with infrequent rash; headache, chills, muscle pain, photophobia; brief remission followed by second bout of fever lasting 2-3 days; neutropenia, thrombocytopenia; occasional encephalitis, myocarditis, or hemorrhagic symptoms (especially in children); deaths are rare. |
| **Eastern/Western Equine Encephalitis** | Eastern equine encephalitis virusWestern equine encephalitis virus | Horses, other animals, and birds. **Vectors:** EEE - *Culiseta melanura* (USA and Canada) (bird to bird)- *Aedes, Coquillettidia spp.* (bird or animal to humans). WEE - *Culex tarsalis* (Western USA and Canada) (major epidemic vector) | By the bite of infective mosquitoes | Acute inflammatory disease of short duration involving brain, spinal cord, and meninges; EEE mild cases often occur as febrile headache or aseptic meningitis; severe infections are marked by acute onset, headache, high fever, meningeal signs, stupor, disorientation, coma, tremors, occasional spastic convulsions and paralysis; up to 60% case fatality rate; WEE infections are asymptomatic or present as mild, nonspecific illness, mortality rate is about 3%. |
| **Powassan Encephalitis, Arbovirus** | Powassan encephalitis virus | Woodchuck, snowshoe hare, coyotes, foxes, raccoons, skunks, and domesticated cats and dogs. **Vectors:** Tick - Ixodes cookei, Ixodes marxi, Ixodes spinipalpus | By the bite of infective ticks. Consumption of raw milk from certain infected animals.Larval ticks ingest virus by feeding on rodents, sometimes other mammals and birds. | Resembles mosquito-borne encephalitis clinically; acute inflammatory disease of short duration involving parts of brain, spinal cord and meninges; asymptomatic and mild cases with febrile head ache or aseptic meningitis; severe infections with stupor, disorientation, coma, tremors, convulsions and spastic paralysis; high incidence of neurologic sequelae; 0.3 - 60% case fatality rate (highest case fatality rate among Arboviruses). |
| **St. Louis Encephalitis, SEV, SELV, Mosquito-borne encephalitis, arbovirus, viral encephalitis** | *St. Louis encephalitis* | Wild birds, other mammals. **Vectors:** Mosquitoes - Culex spp.- C. pipiens, C. tarsalis, C, quinquefasciatus, and C. nigripalpus | By bite of infective mosquitoes | Acute inflammatory disease of short duration involving brain, spinal cord and meninges; most infections are asymptomatic; severe infections marked by acute onset, headache, high fever, nausea, myalgia, and malaise, followed by meningeal signs, stupor, coma, convulsions and paralysis; children may develop urinary tract symptoms; severity increases with age, over 60 has the highest rate of acute encephalitis; fatality rate of 2-22%. |
| **Venezuelan Equine Encephalitis, Venezuelan equine encephalomyelitis, VEE, Venezuelan equine fever, arbovirus** | Venezuelan equine encephalitis virus | Horses. **Vectors:** Mosquitoes - Culex (Melanoconion), Aedes, Mansonia, Psorphora, Haemogogus, Deinocerites, Sabethes, Anopheles | Bite of infected mosquito. Laboratory infections by aerosols. No evidence of transmission from horses to humans. | Influenza-like manifestations; abrupt onset of severe headache, chills, fever, myalgia, retro-orbital pain, nausea and vomiting; conjunctival and pharyngeal injection; most infections mild with symptoms 3-5 days; some cases have diphasic fever, CNS involvement, encephalitis with disorientation, convulsions, paralysis, coma and death. |

1. **Fungal and Protozoa Diseases**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **Balantidiasis, Balantidiosis, Balantidial dysentery** | *Balantidium coli* | Nonhuman primates and pigs | Fecal-oral route. Ingestion of fecally-contaminated water. | Infection of colon characterized by diarrhea or dysentery; accompanied by abdominal colic, tenesmus, nausea, and vomiting with bloody and mucoid stools. |
| **Coccidioidomycosis, Valley fever, Desert fever** | *Coccidioides immitis* | Domestic animals, cattle. horses, sheep, swine, wild desert rodents and other animals | Inhalation of air-borne spores and fungus present in desert soil. Laboratory accidents involving cultures. | Systemic mycosis beginning as a respiratory infection; primary infection asymptomatic or influenza-like; 1/5 clinical cases develop erythema nodosum; rare progression to disseminated disease; progressive, frequently fatal granulomatous disease with lung lesions and abscesses throughout body. Meningitis common, 90% fatal if not treated. |
| **Amebiasis, Amebic dysentery, Ameboma** | *Entamoeba histolytica* | Non-human primates and dogs | Ingestion of fecally-contaminated water and food (raw vegetables) by fecally contaminated hands of food handlers. | Approximately 90% of most infections are asymptomatic, only evidence may be seroconversion; debilitated, pregnant or immunocompromised individuals may develop an abrupt onset of fever, severe abdominal cramps, profuse bloody diarrhea and tenesmus; complications include massive hemorrhage, peritonitis, amebomas and liver abscesses. |
| **Giardiasis, G. intestinalis, G. duodenalis, giardia enteritis, Lambliasis, lamblia intestinalis, "beaver fever"** | *Giardia intestinalis* | Non-human primates, dogs, beavers and other wild and domestic animals. | Person-to-person, faecal-oral route is most important. Infected food handlers. Ingestion of fecally-contaminated water and food found in soil and on surfaces. | Varies from asymptomatic in most individuals to a sudden onset of diarrhea with foul-smelling, greasy-looking stool that lacks mucous and blood; associated with abdominal cramps, bloating, fatigue and weight loss; restricted to upper small intestine with no invasion; normally illness lasts 1 - 2 weeks; chronic infections can last months to years. |
| **Histoplamosis, Ajecllomyces capsulatus** | *Histoplasma capsulatum* | Dogs, cats, cattle, horses, rats, skunks, opossums, foxes and other animals | Inhalation of fungi and may also grow in soil. | Systemic mycosis of varying severity with primary lesion in lungs; disease appears as a mild, flu-like respiratory illness with symptoms including malaise, fever, chest pain, dry or non-productive cough, headache, loss of appetite, shortness of breath, joint and muscle pain, chills; five clinical forms - asymptomatic, acute benign respiratory, acute disseminated, chronic disseminated, chronic pulmonary. |
| **Toxoplasmosis, congenital toxoplasmosis, Toxoplasma infection** | *Toxoplasma gondii* | Cats and other felines, most warm blooded animals and birds | Consuming undercooked infected meats (pork, mutton, and beef). Ingestion of infective oocysts in milk, food or water. Inhalation of oocysts. Transplacental. Contact with soil containing infected cat feces. Blood transfusions or organ transplantations. Transmitted to food by flies or cockroaches. | Most infections are asymptomatic; mild cases with a localized lymphadenopathy accompanied with fever, sore throat, rash, mimicking infectious mononucleosis in some individuals; immunocompromised host suffers from widespread dessimination of the infection with pneumonitis, myocarditis, and encephalitis; some immunocompetent individuals develop **severe symptoms; congenital cases can result in** abortion and stillbirth, live births may result in severe central nervous system involvement along with chorioretinitis; transplacental infection is least likely during 1st trimester. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Disease/Infection****in Human** | **Infectious****Agent** | **Animal Hosts (Common)****& Vectors** | **Mode of****Transmission** | **Early Signs****and Symptoms** |
| **African Trypanosomiasis, African Sleeping Sickness**  | Trypanosoma brucei and other Tyrpanasoma spp. | Wild and domestic animals. **Vectors:** Glossina palpalis, G. tachinoides, G. morsitans, G. pallidipes, G. swynnertoni, G. fuscipes | By bite of infective tsetse fly of the genus *Glossina*: fly is infected by ingesting blood that carries trypanosomes, parasites multiply in fly for 12-30 days until infective form develops in salivary glands. Congenital transmission. | Systemic protozoal disease; infection occurs in three stages - chancre at primary tsetse fly bite site, hemolymphatic stage with fever, lymphadenopathy and pruritis, meningoencephalitic stage with invasion of the CNS causing intense headaches, somnolence, abnormal behaviour, loss of consciousness and coma; death may follow within a few months or several years; frequently fatal if untreated. |
| **Family Trypanosomatidae, Leishmaniasis, Kala-azar** | Leishmania **spp.:** L. donovani, L. tropica, L. braziliensis, L. mexicana, L. Chagasi, | Wild rodents, Canidae including domestic dogs. **Vectors:** Phlebotomine (sandflies) | By bite of infective female sandflies: sandfly is infected by ingesting protozoan from zoonotic reservoir. Congenital transmission from mother to child. Transmission from person to person. Blood transfusion.  | L. donovani - chronic systemic disease characterized by fever (irregular with 2 daily peaks), hepatosplenomegaly; lymphadenopathy, anemia with leukopenia, and progressive emaciation and weakness; fatal if untreated; leishmanoid dermal lesions; cutaneous leishmaniasis. Leishmania spp. - local skin lesions, ulceration; self-limiting or progressive; mucocutaneous lesions in nasopharyngeal tissues can be fatal. |

**Prevention**

**Engineering Controls and Safer Work Practices**

The most common hazards associated with laboratory and fieldwork animals are bites, transmission of disease and development of allergic reactions. Healthy animals may be infected with organisms which are pathogenic to humans. We are usually aware of hazards from animal bites and scratches, but harmful contact may also result from splashes of their body fluids onto our mucous membranes or into non-intact skin. The following measures must be used to reduce the risks from working with laboratory animals:

* Use appropriate equipment and techniques for handling or restraining animals.
* Use work procedures and handling methods designed to control the spread of aerosols. For example, perform animal manipulations within ventilated hoods when possible.
* Keep animal quarters and handling areas clean and hygienic.
* Use gloves, lab coats and other protective clothing and equipment to minimize contact with animal products such as hair, fur, dander, saliva and urine. Do not wear street clothes when working with animals.
* When possible, use an animal species or sex that is known to be less allergenic than others.
* Animal health must be monitored by qualified personnel, and sick or infected animals must be quarantined as required.
* Workers should be educated about animal-related allergies and ways of avoiding them. Those who have become sensitized to animals or develop allergic reactions should seek medical attention and counseling and must follow the requirements for reporting incidents.

**Personal Protective Equipment**

Personal protective equipment (PPE) - also known as barrier equipment - is used to prevent blood, body fluids, and other potentially infectious agents from making direct contact with an individual. The type and amount of PPE depends upon the task or activity performed. Remember: PPE is the least effective type of hazard control and the last resource to rely on**.**

## Appendix 3 – Disinfectants

##

Many disinfectants can be harmful to humans or the environment; therefore, they should be selected, stored, handled, used and disposed of with care, following manufacturers’ instructions. For personal safety, appropriate personal protective equipment (gloves, laboratory coats, closed-foot shoes, and eye protection) is recommended when preparing dilutions of the disinfectant.

**Most Resistance**

Prions

Bacterial spores

Coccidia (cryptosporidium)

Mycobacterium

Non-lipid viruses (Hepatitis A, Polio)

Fungi

Rickettsiae, Chlamydia

Vegetative bacteria

Lipid-containing viruses (HIV, Influenza)

**Least Resistance**

\* Figure modified from University of Saskatchewan’s Biosafety Manual, 2006

**Comparison of Common Chemical Disinfectants**

**Legend:** **🗸**  Effective 🞇 Variable X Not Effective

**Chlorine** (sodium hypochlorite; household bleach)

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Usually sold as household bleach (*e.g.* Chlorox)
* Fast-acting oxidant
* General all-purpose disinfectant: 1 g/l available chlorine concentration (WHO, 2004)
* Cleaning biohazardous spills and in the presence of large amounts of organic matter: 5 g/l available chlorine concentration
* Highly alkaline and can be corrosive to metal
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses **🗸**Mycobacteria **🗸**Fungi **🗸**Bacterial Spores 🞇 | * Chlorine gas is toxic, so bleach must be stored and used in well-ventilated areas
* Bleach must not be mixed with acids or other chemicals to prevent the release of harmful chlorine by-products
* Activity is reduced by organic matter and a freshly (daily-weekly) made dilution is required
* Household bleach contains approximately 50 g/l available chlorine so should be diluted 1:50 or 1:10 (to obtain a working concentration of 1 g/l and 5 g/l, respectively)
 |

**Alcohol** (ethanol, isopropanol)

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Does not leave residue on items
* 70 % (v/v) of ethanol can be used on skin, lab work surfaces, and to soak small pieces of surgical instruments
* Alcohol-based hand rubs can be used for the decontamination of lightly soiled hands where hand washing is not possible or inconvenient
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses 🞇Mycobacteria **🗸**Fungi **🗸**Bacterial Spores X | * Highest effectiveness is used at ~70% (v/v) in water
* Alcohols are volatile and flammable and must not be used near open flames
* Alcohol will evaporate so alcohols need to be properly stored
* Alcohol may harden rubber and some glue types
* Mixtures with other agents (formaldehyde (100 g/l), chlorine (2 g/l)) are more effective than alcohol alone
 |

**Phenolic compounds** (Triclosan and chloroxylenol)

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Safe for skin and mucous membranes
* Safety concerns: In lab studies, bacteria show resistance to certain types of antibiotics
* Used for the decontamination of environmental surfaces and some are among the more commonly used antiseptics (e.g. triclosan and chloroxylenol)
* Triclosan is common in hand-washing products
* Not recommended for use of food contact surfaces and in areas with young children
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses 🞇Mycobacteria 🞇Fungi 🞇Bacterial Spores X | * Some phenolic compounds could be inactivated by water hardness and therefore must be diluted with distilled or deionized water
* May be absorbed by rubber
 |

**Quaternary ammonium compounds** (benzalkonium chloride; Lysol)

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Often used as mixtures in combination with other germicides, such as alcohols
* Low biodegradability- may accumulate in the environment
* Benzalkonium chloride is used as an antiseptic
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses 🞇Mycobacteria XFungi 🞇Bacterial Spores X | * Germicidal activity reduced by organic matter, water hardness, and anionic detergents (soaps)
* Potentially harmful bacteria can grow in quaternary ammonium compound solutions
 |

**Hydrogen peroxide and peracids**

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Like chlorine, hydrogen peroxide and peracids are strong oxidants
* Safer to humans and the environment
* Hydrogen peroxide can be corrosive to metals such as aluminum, copper, brass and zinc
* Can decolourize fabrics, hair, skin, and mucous membranes
* Potent broad-spectrum germicide
* Hydrogen peroxide can be used for the decontamination of work surfaces
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses **🗸**Mycobacteria **🗸**Fungi **🗸**Bacterial Spores **🗸** | * Hydrogen peroxide is supplied as a ready-to-use 3% or as an aqueous 30% solution that needs to be diluted 5-10 times its volume with sterilized water
* Articles treated must be thoroughly rinsed
* Should be stored away from heat and protected from light
* 3-6% solutions are relatively slow and limited
* Stronger concentrations may be suitable for disinfecting heat-sensitive devices
 |

**Formaldehyde**

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * A gas which is slow-acting and needs a humidity level of ~70%
* A suspected carcinogen and is a dangerous, irritating gas with a strong smell
* Decontamination & disinfection
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses **🗸**Mycobacteria **🗸**Fungi **🗸**Bacterial Spores **🗸** | * Supplied as paraformaldehyde or formalin which is heated to liberate the gas
* Must be stored and used in a fume-hood or well-ventilated area
* Chemical safety regulations must be followed
* May be used as a liquid disinfectant
 |

**Glutaraldehyde**

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Non-corrosive
* Fast-acting but takes several hours to kill bacterial spores
* Supplied as a solution with a concentration of 20 g/l (2%)
* Toxic and an irritant so contact must be avoided
* Not recommended as a spray or solution for the decontamination of environmental surfaces
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses **🗸**Mycobacteria **🗸**Fungi **🗸**Bacterial Spores **🗸** | * Activated solution (by addition of a bicarbonate compound supplied with the product) can be reused for 1-4 weeks depending on the type and frequency of use
* Should be discarded if it becomes turbid
* Must be used in a fume-hood or well-ventilated area
* Chemical safety regulations must be followed
* Some products may need to be activated before use
 |

**Iodine and Iodophors**

|  |  |  |
| --- | --- | --- |
| General Info/ Used For | Effective Against | Directions for Use |
| * Iodine can stain fabrics and environmental surfaces
* Iodine can be toxic
* Iodine is generally unsuitable for use for lab disinfectant
* Iodophors are good antiseptics
* Action similar to chlorine, but slightly less inhibited by organic matter
 | Vegetative Bacteria **🗸**Lipid Viruses **🗸**Nonlipid Viruses **🗸**Mycobacteria ○Fungi ○Bacterial Spores ○ | * Action similar to chlorine, but slightly less inhibited by organic matter
* Iodine should not be used on aluminum or copper
* Organic iodine-based products must be stored at 4-10C to avoid the growth of potentially harmful bacteria
* Polyvidone-iodine is a reliable and safe surgical scrub and preoperative skin antiseptic
 |

\* Data compiled from numerous sources including the World Health Organization’s *Laboratory biosafety guidelines,* 2004, University of Saskatchewan’s *Biosafety Manual*, 2006, and Arizona State’s *Biosafety Manual*, 2010.

## Appendix 4 – Personal Protective Equipment

##

### Gloves

* Gloves reduce the possibility that personnel will become exposed to infectious substances and contract infectious diseases.
* Gloves should always be worn when touching blood, body fluids, fecal matter, saliva, contaminated objects, pathogens, toxins, microorganisms, animal droppings, and wild animals. When in doubt, wear a pair of gloves.
* When gloves are required, disposable single-use gloves should be worn.
* No glove can provide protection against all hazards, so the gloves selected must be appropriate for the duty/activity they are used for. Gloves available for protection against biologically hazardous materials or organisms are latex, nitrile, vinyl, or rubber.

Along with the increasing usage of latex gloves, there have been increasing reports of irritations or allergic reactions to latex, including some severe, immediate reactions. If you detect a reaction to latex, notify your Supervisor immediately.

**Steps for Putting on Gloves**

1. Place hand through opening of first glove and pull the glove up to the wrist.
2. Repeat with second glove.
3. Adjust gloves to cover wrists or cuffs of gown. Caution: Do not touch any part of your body with gloved hands.
4. Complete duty.

**Steps for Removing Gloves**

1. Grasp one glove on the inside of wrist at ½ inch below band of dirty side of glove without touching the skin.
2. Pull down glove, turning it inside out, and pull hand out. Hold the glove with the still-gloved hand.
3. Insert fingers of ungloved hand under the cuff of the glove on the other hand (on inside of cuff).
4. Pull down glove until it is inside out, drawing it over the first glove.
5. Discard both gloves by dropping them in appropriate trash container.
6. Wash hands well.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 20140820_133338 | 20140820_133345 | 20140820_133357 | 20140820_133401 | 20140820_133409 |

###

### Laboratory Coats, Gowns, Coveralls, and Aprons

* U of R employee uniforms/clothing are not considered appropriate PPE.
* Lab coats, gowns, coveralls, and aprons are used to prevent skin and clothing from being splashed or soiled with biologically hazardous substances.
* If the protective clothing is disposable, these must be properly disposed of in a plastic-lined garbage receptacle after use and before leaving area of use. If the protective clothing is non-disposable and soiled, the coat must be laundered.

**Steps for Removing Laboratory Coat:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 20140820_133057 | 20140820_133138 | 20140820_133148 | 20140820_133158 | 20140820_133220 |
| 1. With gloves still on, unbutton coat.
 | 1. Pull off one arm, keep coat away from body.
 | 1. Pull off second arm, keeping coat away from body.
 | 1. Once coat is off, hold away from body and slowly roll coat.
 | 1. Dispose of coat in garbage receptacle.
 |

### Protective and Personal Clothing Decontamination

All contaminated personal clothing items and non-disposable gowns, coveralls, and coats should be properly decontaminated to reduce risk of transmission and exposure. The risk of disease transmission from soiled linen is low, but soiled linens may carry organisms that may contaminate the air and immediate environment. It is recommended that decontamination via the University Laundry Service (Science Stores) be performed every 6 months, but this will vary with the type and intensity of research activity.

1. Do not walk into public areas with contaminated clothing.
2. Promptly don the appropriate PPE for removing contaminated clothing (i.e. gloves).
3. If soiled clothing cleaning and disinfecting procedures cannot be completed in the room that the clothing was soiled, the items must be removed and transported in strong biohazard/plastic bags.
4. Soiled clothing should be handled as little as possible and with minimum agitation.
5. Hold the soiled clothing away from your unsoiled clothing.
6. Bring the soiled clothing sealed in strong biohazard/plastic bag down to Science Stores for Laundry Servicing.

### Face and Eye Protection

* Face and eye protection must be worn whenever there is potential for the generation of splashes, spray, splatter, or droplets of biologically hazardous substances in the face, especially eyes, nose and mouth.
* Eye protection may be provided by safety glasses, goggles, or chin length face shields. Nose and mouth protection may be provided by surgical masks and face shields. Some face shields may provide protection against impact injuries.
* Surgical masks may protect the mucous membranes of the mouth and nose against sprays, splashes and droplets, but do not offer protection from infectious aerosols.

**Steps for Removing Goggles:**

|  |  |  |
| --- | --- | --- |
| 20140820_133250 | 20140820_133258 | 20140820_133315 |
| 1. Without touching face, grasp goggle with one gloved-hand.
 | 1. Pull goggle upward away and off of head.
 | 1. Dispose of goggle in the garbage receptacle.
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**Steps for Removing Mask:**

|  |  |  |  |
| --- | --- | --- | --- |
| 20140820_133855 | 20140820_133904 | 20140820_133914 | 20140820_133938 |
| 1. Without touching face, grasp mask strap behind one ear with a clean hand.
 | 1. Pull mask to the front and away from the face, taking care not to touch the outer surface of the mask.
 | 1. Keep pulling mask around to the other side of face until the last ear strap comes away from head.
 | 1. Dispose of mask in the garbage receptacle.
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### Respiratory Protection

* Respirators offer levels of protection against different contaminants by varying their aerosol filter or cartridge efficiency (95, 99, & 99.7%).
* National Institute of Safety and Health (NIOSH)-approved masks and respirators for airborne protection against infectious aerosols are the N95, N99 or N100 rated respirators.
* All respirator wearers must be properly Fit Tested before they can use a respirator! If the respirator does not fit properly on the user’s face, it will not offer any protection against infectious aerosols.

Please contact health.safety@uregina.ca for more information.

## Appendix 5 – Human Safety Considerations for Wildlife Use

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The following section has been taken from the Canadian Council of Animal Care’s *Guidelines on the Care and Use of Wildlife*, 2003. Please see the complete document for more information: [www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf](http://www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf)

**J. HUMAN SAFETY CONSIDERATIONS**

**Guideline 45:**

**Many species of wildlife are capable of inflicting serious injury or transmitting disease to persons handling them. Appropriate handling and restraint techniques should be used, and training in how to apply them should be provided to avoid injury to both animals and humans.**

Investigators are responsible under occupational health and safety legislation for their own health and safety as well as that of their coworkers in the field. Investigators must ensure that the hazards to human health and safety when working with wild animals are clearly identified and communicated to the project personnel, and that training, written procedures and any necessary protective clothing and equipment are provided to ensure that personnel are protected against possible injury or exposure to potentially dangerous wild animals or their fluids and waste. Personnel should work in teams of at least two people in the field, especially when involved in physical or chemical restraint and handling of animals or other high risk situations. Appropriate physical and/or chemical restraint may be necessary to prevent injury to an animal and/or personnel. Investigators should maintain a record of any injuries incurred while handling wildlife in the field or in a holding facility. Applicable local regulations regarding the documentation and reporting of workplace injuries should be consulted. A record must be kept of all training given to staff with the date of the training and signature of the staff member.

1. **Drug Hazards**

**Guideline 46:**

**The risks involved in using drugs for the capture and immobilization of wildlife must be identified and communicated to all personnel involved in the project. At least two people on the team should be trained in first aid and CPR (cardiopulmonary resuscitation), local medical authorities should be informed of the potential hazards, and an evacuation plan to medical facilities should be discussed prior to fieldwork.**

**Guideline 47:**

**Personnel using drugs for wildlife should have current training and inform other members of the team of the risks of human exposure. There should be adequate quantities of applicable reversal drugs on hand in the field if these exist.**

Anesthesia of free ranging wildlife may place personnel at risk of injury. Injury can occur from animal attacks, capture equipment, or exposure to potent drugs. Every possible effort must be made to minimize the probability of human injury when undertaking chemical restraint and anesthesia of wildlife. It is the responsibility of the investigator to ensure that personnel have knowledge of current procedures with the subject species and thorough knowledge of the emergency care of personnel exposed to the pharmaceuticals involved. Training for those authorized to use immobilization drugs must include first aid and emergency procedures relevant to the region. Members of the field team must be familiar with and competent in such first aid procedures as may be required in an accidental exposure emergency. Because smaller volumes of drugs are more easily delivered via remote drug delivery systems, most drugs used for wildlife anesthesia are extremely potent and pose significant hazards to the people using them. This is especially true for the potent opioid drugs such as carfentanil, A3080, etorphine, and the potent alpha-2 agonist, medetomidine (Sawyer & Hoogstraten, 1980; Petrini & Keyler, 1993).

**Guideline 48:**

**Every reasonable attempt should be made to recover any darts that miss the target animal and contain chemicals which could pose a public health risk.**

**2. Hazardous Physical or Environmental Situations**

**Guideline 49:**

**It is the responsibility of the investigator to ensure that hazardous conditions involved in field work are identified to the personnel involved. Some situations require particular experience and/or training, such as working around aircraft, diving, climbing, working at high altitude or in extreme temperature conditions, and working on ice.**

When working in such locations, the investigator must ensure that the hazards involved are clearly described to field staff and that appropriate training and protective equipment and clothing are provided. The investigator is responsible for ensuring that field staff are competent to work under difficult conditions.

**3. Equipment Hazards**

**Guideline 50:**

**Personnel involved in wildlife restraint should have current training in the use of pertinent equipment (e.g. ATVs [all terrain vehicles], boats, firearms, drugs, dart rifles, pistols, and jab sticks).**

**4. Emergency Preparedness**

**Guideline 51:**

**The investigator is responsible for ensuring that an emergency plan is in place.**

An emergency plan appropriate for the intended study must be developed involving collaboration with local emergency personnel where necessary. This may include: making plans for evacuation; informing local medical authorities of the project and possible safety issues; and putting a checkup and/or response system in place. A procedure for accessing emergency medical services must be developed. Materials and equipment, such as helmets, face masks/protectors, gloves, firearms, or respirators, should be supplied to facilitate the safe conduct of projects. Field personnel should also be provided with appropriate and effective means of communication with each other and with emergency personnel.

**5. Biohazards**

**Guideline 52:**

**The investigator must ensure that all potentially hazardous biological or zoonotic agents which may be encountered in the field situation or that are particular to the species under study are identified for field staff before field work is started, and that the necessary training and preventive medical care is obtained.**

The investigator is responsible for identification of any specific biohazards or zoonotic agents which may reasonably be expected to be encountered in the field. Field staff must be informed about the possible routes of disease transmission and exposure, and trained in the use of protective equipment, medical interventions and safety procedures which are to be used to manage the hazard. In the interest of human health and safety, it is important that all wildlife that die from unknown causes in the field or in holding facilities undergo a thorough postmortem to determine the cause of death. Depending on the postmortem results, it may be necessary to obtain medical assistance to protect personnel from diseases and parasites.

Investigators should familiarize themselves with the known biohazards specific to the species under study. All individuals involved in wildlife projects should have medical checkups and be given access to any recommended vaccinations. Where exposure to infectious agents can reasonably be expected (e.g. field work with bats), all field staff must be provided with immunization or prophylactic drugs, if available and appropriate.

Investigators who become ill should seek immediate medical assistance and advise their physician of their possible exposure to potentially hazardous animals, diseases and environmental conditions. The investigator must ensure that safety procedures are established for the conduct of postmortems in the field and that appropriate protective equipment (e.g. gloves, aprons, eye protection and respiratory protection) is provided. The investigator is responsible for ensuring that all personnel are trained in the postmortem techniques appropriate for the species. Where an animal that can reasonably be expected to be infectious is to be trapped or handled, the investigator must provide hazard information, safety equipment, and training to minimize the potential of transmission of the infectious agent. If wild animals potentially infected with an infectious agent or identified as potentially carrying a zoonotic agent are to be brought back to the laboratory or confined in proximity to personnel, the investigator must ensure that the animals are housed according to the requirements of the *Containment Standards* *for Veterinary Facilities* (CFIA, 1996) and the *Guide* *to the Care and Use of Experimental Animals*, vol. 1, 2nd ed. (CCAC, 1993).

All potential accidents or exposures, or suspected exposures, to infectious biological agents must be reported immediately to the nearest medical authorities as described in the emergency plan. The investigator must be notified and a record of the accident or injury kept. Any unexpected illness must also be reported immediately in a similar manner.