UNIVERSITY OF COLORADO BOULDER

BIOSAFETY MANUAL

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OFFICE AND PERSONNEL NOTIFICATION NUMBERS

Office	Personnel		Phone Number
Department	Principal Investigator	Office:	
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		Home:	
Department	Laboratory Manager	Lab/Office:	
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	After hours (they will contact Biosafety Group)		303-492-6666
	Cher Masini Biosafety Officer	Office:	303-492-2817
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Emergency		FIRE	911
		UCB / BOULDER POLICE	911
		AMBULANCE	911
Non-Emergency		UCB POLICE	303-492-6666
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Purpose

This manual provides biosafety guidelines for those working at The University of Colorado Boulder (UCB), including any work that involves the handling of:

1. biohazardous materials
2. recombinant or synthetic nucleic acid molecules (rsNA)
3. human or animal fluids, tissues, or cell lines

This biosafety manual has been developed by the biosafety group in Environmental Health and Safety at CU Boulder. The manual is part of UCB's biosafety program established to accomplish the following goals:

1. protect personnel from exposure to infectious agents
2. prevent environmental contamination
3. provide an environment for high quality research while maintaining a safe workplace
4. comply with applicable federal, state, and local requirements

The biosafety manual provides university-wide safety guidelines, policies, and procedures for the use and manipulation of biohazards. Although the implementation of these procedures is the responsibility of the Principal Investigator (PI), its success depends largely on the combined efforts of the laboratory supervisors and employees. Planning for and implementation of biological safety must be a part of every laboratory activity in which biohazardous materials are used.
In general, the handling and manipulation of biological agents and toxins, as well as recombinant or synthetic nucleic acid molecules, requires the use of various precautionary measures depending on the material(s) involved. This manual will provide assistance in the evaluation, containment and control of biohazards. However, it is imperative that all parties involved or working with these materials seek additional advice and training when necessary.

Instructions

This manual may be maintained as an electronic document or printed off as a hard copy for use in your laboratory. The Biosafety Group in EH&S will be responsible for updating the manual on-line periodically to reflect changes in relevant guidelines, regulations, and policies as they occur. Researchers will be notified when those changes have been made.

Suggestions for researcher generated documents that should be added to this manual to enhance its usefulness are:

1. PDF of current biological registration (IBC application) from BioRAFT

2. Standard Operating Procedures for:
    a. Decontaminating laboratory surfaces
    b. Addressing spills of biological materials
    c. Biosafety cabinet operation
    d. Autoclave operation
    e. Specialized equipment operation and maintenance unique to the research
    f. Post-exposure procedures

Principles of Biosafety/Biosafety Levels

General Elements of Containment

Biosafety in Microbiological and Biomedical Laboratories (BMBL)[1], published by the United States Department of Health and Human Services, is the definitive reference on biosafety and should be read and followed by all CU Boulder personnel working with potentially infectious agents. This publication can be accessed on the Centers for Disease Control and Prevention (CDC) website.

Biosafety in Microbiological and Biomedical Laboratories—6th Edition (cdc.gov)

Central to any discussion involving biosafety is the concept of containment of infectious agents to prevent contamination of the worker, nearby workers, or the environment. Containment is also utilized to prevent contamination of research samples or animals. There are three general elements of containment:

1) Laboratory practices and techniques
2) Safety equipment
3) Facility design

Each of these will be discussed briefly – for more detail, see the section on Principals of Biosafety in the BMBL.

Laboratory Practices and Techniques

Strict adherence to standard microbiological practices and techniques is essential for successful containment. Most exposures and subsequent infections occur while performing routine procedures and techniques.

Every manipulation of a biological sample has the potential for releasing a portion of the sample in microdroplet form to the air and work surfaces. One way to view the potential for release of biological agents from a given sample is to consider the amount of energy that is used to manipulate the sample. High-energy techniques (i.e. homogenization) have the potential to release aerosols of the sample if not properly contained. However, even low energy procedures such as removing screw caps and pouring or stirring of liquid medium can release aerosols of the sample. Other examples of procedures that can generate aerosolized biohazards include:

Washing down animal rooms

Laboratory dishwashing

Transferring tissue culture media

Centrifugation

Separating blood serum

Aerosols have the potential to contaminate work surfaces, exposed skin and garments, and air in the breathing zone. Therefore, aerosols can result in topical, oral, and respiratory exposures for workers.

Personal hygiene practices provide the simplest yet most important means for preventing disease transmission. This is especially true for workers who directly handle animals or animal tissues/body fluids. Practices such as routine hand washing at each available opportunity can be very successful in preventing contamination of more susceptible regions of the body, as well as inanimate surfaces.

Specifics on standard microbiological practices and techniques are discussed in more detail in the "Standard Biosafety Practices" section in the BMBL and in Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards. Development of, and adherence to, standard microbiological practices is fundamental to the practice of biosafety. Safety equipment and laboratory design cannot be counted on to compensate for a lack of these practices.

Safety Equipment

Safety equipment includes safety centrifuge cups, biological safety cabinet (BSC's) and enclosed containers. Safety equipment also includes personal protective equipment (PPE) such as gloves, lab coats or gowns, respirators, safety glasses and goggles. Safety equipment is often referred to as a primary barrier, since it generally represents the initial barrier(s) of protections downstream from the potential hazard.

Combinations of various types of safety equipment can be used to create more than one primary barrier. However, circumstances may make it impractical to use equipment such as BSC's or completely enclosed containers, leaving PPE as the only primary barrier between the worker and a sample containing an infectious agent. This again illustrates the importance of standard microbiological practices because of the potential for PPE or other safety equipment failure. The use of safety equipment is discussed further in the BMBL.

Facility Design

The design of a facility used to conduct research involving specific biological agents is highly dependent on the epidemiology and the risk and route of transmission associated with those agents. Facility design is viewed as a secondary barrier to protect workers, both inside and outside the facility. These secondary barriers may include separation of the laboratory work area from public access, hand washing facilities, specialized ventilation systems to assure directional airflow, air treatment systems to decontaminate or remove agents from exhaust air or controlled / restricted access zones. More information on design criteria for specific agents and biosafety levels is found in the BMBL.

As risk of transmission increases, the number of requirements for facility design also increases. Evaluation of risk associated with a given human pathogen is a highly subjective task. The epidemiology and etiology associated with a specific human pathogen may be a steadily evolving course of events. Thus, facility design should not be viewed as a substitute for standard microbiological practices. To minimize risk of transmission, the first aspect to consider is engineering controls, followed by administrative controls. The last route of protections should be wearing of PPE.

Risk Assessment

Risk assessment is a process used to examine the various factors associated with a procedure involving biological materials in order to identify the hazardous characteristics of the material, the activities that can result in an exposure to an infectious agent, the likelihood that exposure will cause a laboratory acquired infection, and the probable consequences of an infection. The information identified by risk assessment will provide a guide for the selection of biosafety levels, microbiological practices, safety equipment, and facility safeguards that can prevent laboratory acquired infections and reduce the risk of environmental contamination. Factors to consider in a risk assessment include both agent hazards and laboratory procedure factors.

Agent Hazards:

1. Capability to infect and cause disease in a susceptible host
2. Virulence as measured by the severity of disease
3. Availability of preventive measures and effective treatments for the disease
4. Probable routes of transmission of laboratory infection:
    a) mucous membrane exposure
    b) parenteral injection
    c) ingestion
    d) inhalation
    e) dermal
5. Infective dose
6. Stability in the environment
7. Host range
8. Its endemic nature
9. Confirmed reports of laboratory acquired infections
10. Origin of the agent

Hazardous Characteristics of Laboratory Procedures:

1. Procedures and operations that generate aerosols
2. Agent concentration and suspension volume
3. Use of sharps
4. Procedures that involve animals
    a) Bites and scratches
    b) Exposure to zoonotic agents
5. Complexity of a laboratory procedure

Potential Hazards Associated with Work Practices, Safety Equipment and Facility Safeguards:

1. Potential deficiencies in laboratory worker training and proficiency
2. Inadequate training in the selection and use of personal protective equipment
3. Safety equipment that does not work properly
4. Inadequate training on the proper use and operation of safety equipment
5. Loss of directional airflow and integrity of the facility's HVAC system

Biological risk assessment is a subjective process that requires careful consideration of the potential hazards associated with the biological agents, laboratory procedures, and the facility itself. The Centers for Disease Control and Prevention publication Biosafety in Microbiological and Biomedical Laboratories (BMBL) describes a five-step approach to provide structure to the risk assessment process.

1. Identify hazards associated with the agent and perform an initial assessment of risk.
2. Identify laboratory procedure hazards.
3. Make a determination of the appropriate biosafety level and incorporate additional precautions indicated by the risk assessment. (Determination of appropriate biosafety level should be done in consultation with biosafety professional)
4. Evaluate the proficiencies of staff regarding safe practices and the integrity of safety equipment.
5. Review the risk assessment with a biosafety professional, subject matter expert and the Institutional Biosafety Committee (IBC).

Any new knowledge and experience may justify re-examining the risk assessment and the safeguards that were put in place. Risk assessment must be the basis for any recommended change.

The University of Colorado Institutional Biosafety Committee (IBC)

The Institutional Biosafety Committee (IBC) is responsible for reviewing all University research and teaching activities involving the use of biohazards, recombinant or synthetic nucleic acid molecules, select agents, or bloodborne pathogens whether the activities are carried out on campus or off campus (usually under other Institutional Biosafety Committees at other institutions).

Most biological research requires IBC authorization prior to initiation. This authorization must be renewed every 3 years.

The IBC meets regularly and will review and authorize research involving: any biological agents, infected animals or tissues (including fieldwork), recombinant or synthetic nucleic acid molecules, select agents and toxins, and work with human blood, bodily fluids, tissues or cells in culture.

Researchers can complete the biological registration in BioRAFT and submit it to the Assistant Biosafety Officer or the Biosafety Officer for pre-review. If there are corrections to be made or if the application needs to have more information added for clarification, the application will be returned to the researcher for modification. The completed biological registration is then sent to a designated member for review and presentation during the next scheduled IBC meeting. Researchers are notified of the results of the IBC review. Once the biological registration has been approved and personnel listed on the protocol have successfully completed the appropriate training, the letter of approval will be sent to the Principal Investigator.

Every researcher who submits a biological registration must also have a Biosafety Lab Inspection/Audit completed. The Biosafety Lab inspections/audits are coordinated through the Environmental Health and Safety biosafety group. The Biosafety Lab Inspection process addresses several key laboratory safety issues including contamination control, inventory control, biosafety training, engineering controls, administrative controls, containment, and other pertinent elements of laboratory safety. A copy of the Laboratory Biosafety Checklist is available at http://ehs.colorado.edu/resources/biosafety-laboratory-audit-checklist/. Biosafety Lab inspections are conducted on an annual basis.

Recombinant or Synthetic Nucleic Acid Molecule Research

As a condition for funding of recombinant or synthetic nucleic acid molecule research, UCB must ensure that research conducted at or sponsored by UCB, irrespective of the source of funding, complies with the most current National Institutes of Health (NIH) *Guidelines for Research Involving* Recombinan*t or Synthetic Nucleic Acid Molecules* *http://osp.od.nih.gov/office-biotechnology-activities/biosafety/nih-guidelines*. At UCB, the responsibility for ensuring that recombinant or synthetic nucleic acid molecule activities comply with all applicable guidelines rests with the institution and the Institutional Biosafety Committee (IBC) acting on its behalf.

Before experiments involving recombinant or synthetic nucleic acid molecule research can begin at UCB, the Principal Investigator (PI) must submit an IBC Biological Registration in BioRaft: https://colorado.bioraft.com/. A PI Quick Start Guide can be requested from the Biosafety Office (ehsbio@colorado.edu).

All recombinant DNA research proposals require the PI to make an initial determination of the required level of physical and biological containment. For that reason, the NIH has developed six categories (**III-A** to **III-F**) addressing different types of rDNA research.

If the proposed research falls within section **III-A** of the NIH Guidelines, the experiment is considered a "Major Action". This includes experiments involving human gene transfer experiments. As a result, the experiment cannot be initiated without submission of relevant information to the Office of Science Policy (OSP) at the NIH. In addition, the proposal has to be published in the Federal Register for 15 days, it needs to be reviewed by the Recombinant DNA Advisory Committee *(*RAC), and specific approval by the NIH has to be obtained. The containment conditions for such an experiment will be recommended by the RAC and set by the NIH at the time of approval. The proposal requires IBC approval before initiation.

If the proposed research falls within section **III-B**, the research cannot be initiated without submission of relevant information on the proposed experiment to NIH/OSP (For exceptions see the NIH guidelines). Experiments covered in III-B include the cloning of toxic molecules. The containment conditions for such experiments will be determined by NIH/OSP in consultation with *ad hoc* experts. Such experiments require Institutional Biosafety Committee approval before initiation. Please refer to the guidelines for more specifics.

In section **III-C**, experiments with human subjects are covered. These experiments require IBC and IRB (Institutional Review Board) approval and NIH/OSP registration before initiation.

Section **III-D,** the next category, covers whole animal or plant experiments as well as projects involving DNA from Risk Group 2, 3 or 4 agents. Prior to the initiation of an experiment that falls into Section **III-D**, the PI must submit a biological registration to the IBC. The IBC reviews and approves all experiments in this category prior to their initiation.

Section **III-E** experiments require that the filing of a biological registration with the IBC at the time the experiment is initiated. The IBC reviews and approves all such proposals, but IBC review and approval prior to initiation of the experiment is not required.

Section **III-F** experiments are exempt from the NIH Guidelines but a registration with the UCB IBC is still required.

For much more detailed and thorough information on the requirements for conducting research involving recombinant or synthetic nucleic acid molecules please refer to the National Institutes of Health (NIH) *Guidelines for Research Involving* Recombinan*t or Synthetic Nucleic Acid Molecules* *http://osp.od.nih.gov/office-biotechnology-activities/biosafety/nih-guidelines*.

Reporting Requirements for Incidents Involving Recombinant or Synthetic Nucleic Acids, Violations of the NIH Guidelines, or other Significant Research Related Accidents

The NIH *Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules* states that any significant problems, violations of the NIH Guidelines, or any significant research related accidents, exposures and/or illnesses must be reported to the NIH Office of Science Policy (OSP) within **30 days.** Certain types of incidents must be reported sooner. **Spills or accidents in BSL-2 laboratories that result in an overt exposure must be reported to NIH OSP immediately**.

What Types of Incidents Must be Reported to NIH OSP?

Any spill or accident involving recombinant or synthetic nucleic acid molecules that occurs in BSL-2 laboratories or higher, leads to a personal injury or illness, or results in a breach of containment must be reported to NIH OSP. Examples of such incidents are:

1. Skin punctures with needles containing recombinant or synthetic nucleic acid molecules
2. The escape or improper disposition of a transgenic animal
3. Spills of high-risk recombinant or synthetic nucleic acids outside of a biosafety cabinet
4. Failure to adhere to containment requirements and appropriate biosafety practices as outlined in the NIH Guidelines must be reported to NIH OSP.

Minor spills of low-risk agents that do not involve a breach of containment and were properly decontaminated and disposed of normally do no need to be reported.

If there is any doubt about whether an incident should be reported please contact the **Environmental Health and Safety Office Biological Safety Group** at **303-492-6025**. NIH OSP should be consulted if the IBC, investigator, or other institutional staff are uncertain whether an incident should be reported.

Reporting Procedure at the University of Colorado Boulder

1. Incidents that occur at the University of Colorado that involve recombinant or synthetic nucleic acid molecules, incidents that result in an overt exposure to materials containing recombinant or synthetic nucleic acids or any risk group 2 agent in a BSL-2/ABSL-2 laboratory must be reported to the University of Colorado Biosafety group **303-492-6025.**

2. The Biosafety Officer or the Assistant Biosafety Officer will work with the Primary Investigator to gather the details of the incident to decide if the incident does need to be reported to NIH OSP, and if deemed necessary, consult with NIH OSP to determine if the incident warrants a report.

3. If a report is deemed necessary, the Biosafety Officer or Assistant Biosafety Officer will work with the Principal Investigator to complete the report. The report should contain sufficient information to explain the nature and consequences of the incident as well as the cause. The report should also include the measures that were taken to mitigate the problem and to prevent a similar incident from happening again. An incident reporting template and additional information is available from NIH OSP to facilitate the reporting process: https://osp.od.nih.gov/biotechnology/incident-reporting/.

4. The Biosafety Officer or Assistant Biosafety Officer shall inform the IBC and Institutional Official of the incident and provide a copy of the report for review.

5. NIH OSP may require other information be provided such as
    a. A copy of the IBC meeting minutes documenting approval of the relevant protocol for the research laboratory in which the incident occurred.
    b. A copy of the IBC minutes documenting that the incident was reviewed.
    c. Policies that were in place at the time the incident occurred.
    d. Revised policies or procedures that were prepared in response to the incident.
    e. Training records for the personnel who were involved in the incident.

6. The Biosafety Officer or Assistant Biosafety Officer shall submit the written report to NIH OSP.

Bloodborne Pathogens

The University of Colorado has adopted the Occupational Safety and Health Administration (OSHA) 1910.1030 OSHA Bloodborne Pathogen Standard to protect workers who may be exposed to blood from microorganisms that can cause disease in humans. Such pathogens include the hepatitis B virus (HBV), hepatitis C virus and the human immunodeficiency virus (HIV).

Select Agents

Infectious agents and toxins that are considered by the Department of Health and Human Services (DHHS) or the United States Department of Agriculture (USDA) as having the potential to pose substantial harm or a severe threat to human, animal, or plant health or plant products are regulated as “select agents”.

Select agents in any quantity are **not permissible** at CU Boulder. Toxins are permissible when in exempt quantities only. If you would like to work with toxins in exempt quantities, please contact the Biosafety Group at Environmental Health and Safety. Information regarding the Federal Select Agent Program can be found at:

Select Agent Website: http://www.selectagents.gov/

Select Agents and Toxins List: http://www.selectagents.gov/SelectAgentsandToxinsList.html

Permissible Toxin Amounts: http://www.selectagents.gov/PermissibleToxinAmounts.html

Lentiviral Vectors

The use of lentiviral vectors has been increasing because the vector system has attractive features; however, such research also raises biosafety concerns. The NIH Office of Biotechnology Activities (now the Office of Science Policy) received frequent questions regarding the appropriate containment for lentiviral vectors, particularly those derived from HIV-1. Because the NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (NIH Guidelines) do not explicitly address containment for research with lentiviral vectors, the RAC was asked to provide additional guidance for institutional biosafety committees (IBCs) and investigators on how to conduct a risk assessment for lentiviral vector research. These guidelines are provided here: https://osp.od.nih.gov/wp-content/uploads/Lenti_Containment_Guidance.pdf and additional training on lentiviral vectors is available: https://colorado.bioraft.com/rafttraining/course/716 .

POLICIES AND PROCEDURES

The information provided in this document has been taken, in part from the CDC-NIH publication, "Biosafety in Microbiological and Biomedical Laboratories", (BMBL) (6th Edition, June 2020); "NIH Guideline for Research Involving Recombinant or Synthetic Nucleic Acids Molecules" (NIH Guidelines) (April, 2019). Information from the University of Colorado Boulder Environmental Health and Safety Hazardous Waste Generators' Guide, Laboratory Safety Guidelines and other pertinent state, local and federal guidelines and regulations have also been incorporated into this document.

The table below provides a brief summary of the four biosafety levels, relative health risk associated with each level and some examples of microorganisms classified at each level.

BSL	Description	Health Risk	Examples
1	Not known to consistently cause disease in healthy adults	Low individual risk, low community risk	• E. coli K12 • *Bacillus subtilis*
2	Associated with human disease. Treatment and/or vaccine are *often* available	Moderate individual risk, low community risk	• *Salmonella* sp. • MRSA • *E. coli* O157 • Human, non-human primate bodily tissues or fluids, including cell lines
3*	Agents associated with serious or lethal human disease. Preventative or therapeutic interventions may be available	High individual risk, low community risk	• *Yersinia pestis* • *Mycobacterium tuberculosis* • SARS-CoV-2
4*	Agents likely to cause serious or lethal human disease for which preventative or therapeutic interventions are not usually available	High individual risk, high community risk	• Ebola • Marburg Virus

***Agents requiring BSL-3 and BSL-4 facilities and practices are not permitted at CU Boulder**.

Biosafety Level 1 (BSL-1)

Biosafety Level 1 is suitable for work involving well-characterized agents not known to consistently cause disease in immunocompetent adult humans, and present minimal potential hazard to laboratory personnel and the environment. BSL-1 laboratories are not necessarily separated from the general traffic patterns in the building. Work is typically conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is not required but may be used as determined by appropriate risk assessment. Laboratory personnel must have specific training in the procedures conducted in the laboratory and must be supervised by a scientist with training in microbiology or a related science.
The following standard practices, safety equipment, and facility requirements apply to BSL-1.

A. Standard Microbiological Practices

1. The laboratory supervisor must enforce the departmental policies that control access to the laboratory.
2. Persons must wash their hands after working with all potentially hazardous materials including recombinant or synthetic nucleic acids, potentially infectious materials, chemicals etc., before leaving the laboratory.
3. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose. Please refer to the UCB Eating, Drinking, and Related Activities Policy for more information: https://www.colorado.edu/policies/eating-drinking-related-activities-laboratories .
4. Mouth pipetting is prohibited; mechanical pipetting devices must be used.
5. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented. UCB Policies are available here:

   https://www.colorado.edu/ehs/resources/disposal-broken-glass-pipette-tips-plastic-puncture-hazards

   https://www.colorado.edu/ehs/resources/disposal-metal-sharps

   Whenever practical, laboratory supervisors should adopt improved engineering and work practice controls that reduce risk of sharps injuries. Precautions, including those listed below, must always be taken with sharp items. These include:

   a. Careful management of needles and other sharps are of primary importance. Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

   b. Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.

   c. Non disposable sharps must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.

   d. Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.
6. Perform all procedures to minimize the creation of splashes and/or aerosols.
7. Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material or recombinant or synthetic nucleic acids with appropriate disinfectant. Work surfaces are decontaminated at least once a day for all recombinant or synthetic nucleic acids work.

   1) Place a physical barrier between the spill and yourself to contain aerosols. Generally, a paper towel or towels will be sufficient for this purpose.
   2) Pour, or spray an appropriate disinfectant on the paper towel. For guidance: https://www.colorado.edu/ehs/resources/disinfectants-sterilization-methods
   3) Leave for appropriate contact period to inactivate the spilled material.
   4) Dispose of all clean up materials in the biohazardous waste stream.
   5) For biological agent spills inform both the lab director and the Biosafety Officer.

8. Decontaminate all cultures, stocks, recombinant or synthetic nucleic acids and other potentially infectious materials before disposal using an effective method. Depending on where the decontamination will be performed, the following methods should be used prior to transport:

   a. Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.

   b. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state and federal regulations.

9. All spills and accidents involving potentially biohazardous material are reported to the laboratory director and to the Biosafety Officer as soon as possible. This reporting is important to safeguard personnel at CU Boulder who work with potentially biohazardous material and facilitate compliance with application local, state and federal regulations and other legal obligations.

10. Equipment and pertinent lab areas are cleaned and decontaminated before workers, (Facility Maintenance, Vendors, Contractors or other non-lab workers) are asked to move equipment or work in the lab area. Equipment decontamination follows the manufacturer's recommendations and is effective for the potentially biohazardous materials that are in use with the piece of equipment.

11. A sign incorporating the universal biohazard symbol must be posted at the entrance to the laboratory. The sign should include the names of the agent(s) used and the name and phone number of the lab director or other responsible personnel.

12. An effective integrated pest management program is required. https://www.colorado.edu/ehs/resources/pest-control-policy-procedure

13. The laboratory director must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposure, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur. Personal health status may impact an individual's susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of child-bearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions are advised to self-identify to the institution's health provider or their own health care provider for appropriate counseling and guidance.

14. Long hair must be restrained so it cannot contact hands, specimens, containers, or equipment.

15. A safety manual specific to the laboratory is prepared or adopted in consultation with the laboratory director and the Biosafety group. This document with the addition of appropriate agent-specific standard operating procedures and post-exposure plans, can serve as this.

16. Animals and plants not associated with the work being performed are not permitted in the laboratory.

B. Safety Equipment

1. Special containment devices or equipment, such as biosafety cabinets, are not generally required.

2. Protective laboratory coats, gowns or uniforms are recommended to prevent contamination of personal clothing.

3. Wear protective eyewear when conducting procedures that have the potential to create splashes of microorganisms or other hazardous materials. Persons who wear contact lenses in laboratories should also wear eye protection.

4. Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Alternative to latex gloves should be available. Wash hands prior to leaving the laboratory. In addition:

   a. Change gloves when contaminated, integrity has been compromised, or when otherwise necessary.

   b. Remove gloves and wash hands when work with hazardous material has been completed and before leaving the laboratory.

   c. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated laboratory waste (biohazardous waste stream). Hand washing protocols must be rigorously followed.

   d. Gloves are removed before leaving the laboratory and before touching common use items such as telephones, doorknobs, keyboards, drawer handles etc.

C. Laboratory Facilities

1. Laboratories should have doors for access control.

2. Each laboratory must have a sink for hand washing.

3. The laboratory should be designed so that it can be easily cleaned. Carpets and rugs in laboratories are not appropriate.

4. Laboratory furniture must be capable of supporting anticipated loads and uses. Spaces between benches, cabinets, and equipment should be accessible for cleaning.

   a. Bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis and other chemicals.

   b. Chairs used in laboratory work must be covered with a non-porous material that can be easily cleaned and decontaminated with appropriate disinfectant(s).

5. Laboratory windows that open to the exterior should be fitted with screens.

D. Animal Biosafety Level 1 (ABSL-1)

Animal Biosafety Level 1 is suitable for work in animals involving well-characterized agents that are not known to cause disease in immunocompetent adult humans, and present minimal potential hazard to personnel and the environment.

ABSL-1 facilities should be separated from the general traffic patterns of the building and restricted as appropriate. Special containment equipment or facility design may be required as determined by appropriate risk assessment. Personnel must have specific training in animal facility procedures and must be supervised by an individual with adequate knowledge of potential hazards and experimental animal procedures.

The following standard practices, safety equipment, and facility requirements apply to ABSL-1.

1. The animal facility director establishes and enforces policies, procedures, and protocols for institutional policies and emergency situations.

    a) Each institute must assure that worker safety and health concerns are addressed as part of the animal protocol review.
    b) Prior to beginning a study, animal protocols must also be reviewed and approved by the Institutional Animal Care and Use Committee (IACUC) and the Institutional Biosafety Committee.

2. Safety practices specific to the animal facility are adopted in consultation with the animal facility director and appropriate safety professionals.
    a) Safety information must be available and accessible. Personnel are advised of potential hazards and are required to read and follow instructions on practices and procedures.

3. Supervisors must ensure that animal care, laboratory and support personnel receive appropriate training regarding their duties, animal husbandry procedure, potential hazards, manipulations of infectious agents, necessary precautions to prevent hazard or exposures, and hazard/exposure evaluation procedures (physical hazards, splashes, aerosolization, etc.). Personnel must receive annual updates or additional training when procedures or policies change. Records are maintained for all hazard evaluations, employee training sessions and staff attendance.

4. Appropriate medical surveillance program is in place, as determined by risk assessment. All personnel working with live animals are required to be enrolled in CU Boulder's Occupational Health & Safety for Animal Researcher's Program and trained on allergy awareness.
    a) Facility supervisors should ensure that staff is informed of potential occupational hazards within the animal facility, to include those associated with research, animal husbandry duties, animal care and manipulations.
    b) Personal health status may impact an individual's susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution's healthcare provider for appropriate counseling and guidance.
    c) Personnel using respirators must be enrolled in CU Boulder's respiratory protection program.

5. A Biological Hazard sign and SOP incorporating safety information must be posted at the entrance to the areas where infectious material and/or animals are housed or are manipulated. The sign must include the animal biosafety level, general occupational health requirements, personal protective equipment requirements, the supervisor's name (or other responsible personnel), telephone number, and required procedures for entering and exiting the animal areas. Identification of specific infectious agents is recommended when more than one agent is being used within an animal room.
    a) Security-sensitive agent information should be posted in accordance with the institutional policy.
    b) Advance consideration should be given to emergency and disaster recovery plans, as a contingency for man-made or natural disasters.

6. Access to the animal room is limited. Only those persons required for program or support purposes are authorized to enter the facility.
   a) All persons including facility personnel, service workers, vendors and visitors are advised of the potential hazards (natural or research pathogens, allergens, etc.) and are instructed on the appropriate safeguards.

7. Protective laboratory coats, gown, or uniforms are recommended to prevent contamination of personal clothing.
   a) Gloves are worn to prevent skin contact with contaminated, infectious and hazardous materials, and when handling animals.
   b) Gloves and personal protective equipment should be removed in a manner that minimizes transfer of infectious materials outside of the areas where infectious materials and/or animals are housed or are manipulated.
   c) Persons must wash their hands after removing gloves, and before leaving the areas where infectious materials and/or animals are housed or are manipulated.
   d) Eye and face and respiratory protection should be used in rooms containing infected animals, as dictated by the risk assessment.

8. Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human use should only be done in designated areas and are not permitted in animal or procedure rooms.

9. All procedures are carefully performed to minimize the creation of aerosols or splatters of infectious materials and waste.

10. Mouth pipetting is prohibited. Mechanical pipetting devices must be used.

11. Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented.
   a) When applicable, laboratory supervisors should adopt improved engineering and work practice controls that reduce the risk of sharps injuries. Precautions, including those listed below, must always be taken with sharp items. These include:
      (i) Needles and syringes or other sharp instruments are limited to use in the animal facility when there is no alternative for such procedures as parenteral injection, blood collection, or aspiration of fluids from laboratory animals and diaphragm bottles.
      (ii) Disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used disposable needles must be carefully placed in puncture-resistant containers used for sharps disposal. Sharps containers should be located as close to the work site as possible.
      (iii) Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination.
      (iv) Broken glassware must not be handled directly. Instead, it must be removed using a brush and dustpan, tongs, or forceps. Plastic ware should be substituted for glassware whenever possible.
      (v) Equipment containing sharp edges and corners should be avoided.

12. Equipment and work surfaces are routinely decontaminated with an appropriate disinfectant after work with an infectious agent, and after any spills, splashes, or other overt contamination.

13. Animals and plants not associated with the work being performed must not be permitted in the areas where infectious materials and/or animals are housed or are manipulated.

14. An effective integrated pest management program is required. https://www.colorado.edu/ehs/resources/pest-control-policy-procedure

15. All wastes from the animal area (including animal tissues, carcasses, and bedding) are transported from the animal room in leak-proof, covered containers for appropriate disposal in compliance with applicable institutional, local and state requirements.
    a) Decontaminate all potentially infectious materials before disposal using an effective method.

16. A risk assessment should determine the appropriate type of personal protective equipment to be utilized.

17. Special containment devices or equipment may not be required as determined by appropriate risk assessment.
    a) Protective laboratory coats, gowns, or uniforms may be required to prevent contamination of personal clothing.
    b) Protective outer clothing is not worn outside areas where infectious materials and/or animals are housed or manipulated. Gowns and uniforms are not worn outside the facility.

18. Protective eyewear is worn when conducting procedures that have the potential to create splashes of microorganisms or other hazardous material. Persons who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations or airborne particulates.

19. Gloves are worn to protect hands from exposure to hazardous materials.
    a) A risk assessment should be performed to identify the appropriate glove for the task and alternative to latex gloves should be available.
    b) Change gloves when contaminated, integrity has been compromised, or when otherwise necessary.
    c) Gloves must not be worn outside the animal rooms.
    d) Gloves and personal protective equipment should be removed in a manner that prohibits transfer of infectious materials.
    e) Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated waste.
    f) Persons must wash their hands after handling animals and before leaving the areas where infectious materials and/or animals are housed or are manipulated. Hands should be washed after gloves are removed.
    g) The animal facility is separated from areas that are open to unrestricted personnel traffic within the building. External facility doors are self-closing and self-locking.
        (i) Access to the animal facility is restricted.
        (ii) Doors to areas where infectious materials and/or animals are housed, open inward, are self-closing, are kept closed when experimental animals are present, and should never be propped open. Doors to cubicles inside an animal room may open outward or slide horizontally or vertically.
    h) The animal facility must have a sink for hand washing.

(i) Sink traps are filled with water, and/or appropriate liquid to prevent the migration of vermin and gases.

i) The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors and ceilings) are water resistant.
   (i) It is recommended that penetrations in floors, walls and ceiling surfaces are sealed, to include openings around ducts, doors and door frames, to facilitate pest control and proper cleaning.
   (ii) Floor must be slip resistant, impervious to liquids, and resistant to chemicals.

20. Cabinets and bench tops must be impervious to water and resistant to heat, organic solvents, acids, alkalis, and other chemicals. Spaces between benches, cabinets, and equipment should be accessible for cleaning.
   a) Chairs used in animal areas must be covered with a non-porous material that can be easily cleaned and decontaminated. Furniture must be capable of supporting anticipated loads and uses. Sharp edges and corners should be avoided.

21. External windows are not recommended, if present windows must be resistant to breakage. Where possible, windows should be sealed. If the animal facility has windows that open, they are fitted with fly screens. The presence of windows may impact facility security and therefore should be assessed by security personnel.

22. Ventilation should be provided in accordance with the Guide for the Care and Use of Laboratory Animals. No recirculation of exhaust should occur. It is recommended that animal rooms have inward directional airflow.
   a) Ventilation system design should consider the heat and high moisture load produced during the cleaning of animal rooms and the cage wash process.

23. Internal facility appurtenances, such as light fixtures, air ducts, and utility pipes, are arranged to minimize horizontal surfaces areas to facilitate cleaning and minimize the accumulation of debris or fomites.

24. If floor drains are provided, the traps are filled with water, and/or appropriate disinfectant to prevent the migration of vermin and gases.

25. Cages are washed manually or preferably in a mechanical cage washer or disposable.

26. Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

27. Emergency eyewash and shower are readily available; location is determined by risk assessment.

28. Animal carcasses shall be disposed of to avoid their use as food for human beings or animals unless food use is specifically authorized by an appropriate agency.

29. A permanent record shall be maintained of the experimental use and disposal of each animal or group of animals.

30. The containment area shall be locked.

31. The containment area shall be patrolled or monitored at frequent intervals.

32. All genetically engineered neonates shall be permanently marked within 72 hours after birth, if their size permits. If their size does not permit marking, their containers should be marked. In addition, transgenic animals should contain distinct and biochemically assayable DNA sequences that allow identification of transgenic animals from among non-transgenic animals.

33. A double barrier shall be provided to separate male and female animals unless reproductive studies are part of the experiment or other measures are taken to avoid reproductive transmission. Reproductive incapacitation may be used.

34. The containment area shall be in accordance with state and Federal laws and animal care requirements.

35. Animals shall be confined to enclosed structures (animal rooms) to minimize the possibility of theft or unintentional release.

Biosafety Level 2 (BSL-2)

Biosafety level 2 builds upon BSL-1. BSL-2 is suitable for work involving agents that pose moderate hazards to personnel and the environment. It differs from BSL-1 in that 1) Laboratory personnel have specific training in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures; 2) Access to the laboratory is restricted when work is being conducted; and 3) All procedures in which infectious aerosols or splashes may be created are conducted in BSC's or other physical containment equipment.

A. Standard Microbiological Practices (in addition to BSL-1 practices)

1. Access to the laboratory is limited or restricted by the laboratory director when work with infectious agents or recombinant DNA is in progress. Additionally, the PI must enforce institutional policies that control access to the laboratory. The door should be kept closed whenever work is being performed with Risk Group 2 agents in the laboratory.
2. Decontaminate all cultures, stocks, recombinant or synthetic nucleic acid molecules and other potentially infectious materials before disposal using an effective method.
    a. Materials to be decontaminated outside of the immediate laboratory must be placed in a durable, leak proof container and secured for transport.
    b. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state and federal regulations.

B. Special Practices

1. All persons entering the laboratory must be advised of the potential hazards and meet specific entry/exit requirements. In general, persons who are at increased risk of acquiring infection or for whom infection may be unusually hazardous are not allowed in the laboratory. The director has the final responsibility for assessing each circumstance and determining who may enter or work in the laboratory.
    a. Personnel are advised of special hazards and are required to read instructions on practices and procedures, and to follow them.
2. Laboratory personnel must be provided medical surveillance and offered appropriate immunizations for agents handled or potentially present in the laboratory. Contact Occupational Health and Safety for more information (ehsohs@colorado.edu).
    a. When appropriate, considering the agent(s) handled baseline serum samples for laboratory and other at-risk personnel are collected and stored. Additional serum specimens may be collected periodically, depending on the agents handled or the function of the facility
3. The laboratory supervisor must ensure that laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-2 agents.
4. Potentially infectious materials must be placed in a durable, leak proof container during collection, handling, processing, storage, or transport within a facility.
5. Laboratory equipment should be routinely decontaminated, as well as, after spills, splashes, or other potential contamination.
    a. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.

b. Equipment must be decontaminated before repair, maintenance, or removal from the laboratory.

6. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the laboratory biosafety manual. All such incidents must be reported to the laboratory supervisor. Medical evaluation, surveillance, and treatment should be provided, and appropriate records maintained.

a. **All accidents resulting in overt or potential exposure are immediately reported to the Biosafety Officer and the Institutional Biosafety Committee.**

C. Safety Equipment

1. Properly maintained Biosafety Cabinets (BSC's) (preferably Class II), other appropriate personal protective equipment, or other physical containment devices must be used whenever:

a. Procedures with a potential for creating infectious aerosols or splashes are conducted. These may include pipetting, centrifuging, grinding, blending, shaking, mixing, sonicating, opening containers of infectious materials, inoculating animals intranasally, and harvesting infected tissues from animals or eggs.

b. High concentration or large volumes of infectious agents are used. Such materials may be centrifuged in the open laboratory using sealed rotor heads or centrifuge safety cups.

2. Protective laboratory coats, gowns, smocks, or uniforms designated for laboratory use must be worn while working with hazardous materials. Remove protective clothing before leaving for non-laboratory areas (e.g., cafeteria, library, administrative offices). Dispose of protective clothing appropriately, or deposit it for laundering by the institution. It is recommended that laboratory clothing not be taken home.

3. Eye and face protection (goggles, mask, face shield or other splatter guard) is used for anticipated splashes or sprays of infectious or other hazardous materials when the microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. Persons who wear contact lenses in laboratories should also wear eye protection.

4. Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Alternative to latex gloves should be available. Gloves must not be worn outside the laboratory. In addition, BSL-2 laboratory workers should:

a. Change gloves when contaminated, integrity has been compromised, or when otherwise necessary. Wear two pairs of gloves when appropriate.

b. Remove gloves and wash hands when work with hazardous material has been completed and before leaving the laboratory.

c. Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated laboratory waste. Hand washing protocols must be rigorously followed.

5. A written assessment of laboratory risks must be performed to determine the appropriate personal protective equipment (PPE) required for a particular task. The appropriate PPE will be assigned for each potentially hazardous task performed in the lab. Include decontamination and waste disposal processes.

D. Laboratory Facilities

1. BSC's must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSC's should be located away from doors, windows that can be opened, heavily traveled laboratory areas, and other possible airflow disruptions.
2. Vacuum lines should be protected with High Efficiency Particulate Air (HEPA) filters, or their equivalent. Filters must be replaced as needed. Liquid disinfectant traps may be required.
3. An eyewash station must be readily available.
4. There are no specific requirements on ventilation systems. However, planning of new facilities should consider mechanical ventilation systems that provide an inward flow of air without recirculation to spaces outside of the laboratory.
5. HEPA filtered exhaust air from a Class II BSC can be safely re-circulated back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer's recommendations. Provisions to assure proper safety cabinet performance and air system operation must be verified.
6. A method for decontaminating all laboratory wastes should be available in the facility (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method).

Animal Biosafety Level 2 (ABSL-2)

Animal Biosafety Level 2 builds upon the practices, procedures, containment equipment, and facility requirements of ABSL-1. ABSL-2 is suitable for work involving laboratory animals infected with agents associated with human disease and pose moderate hazards to personnel and the environment. It also addresses hazards from ingestion as well as from percutaneous and mucous membrane exposure.
ABSL-2 requires that: 1) access to the animal facility is restricted; 2) personnel must have specific training in animal facility procedures, the handling of infected animals and the manipulation of pathogenic agents; 3) personnel must be supervised by individuals with adequate knowledge of potential hazards, microbiological agents, animal manipulations and husbandry procedures; and 4) BSCs or other physical containment equipment is used when procedures involve the manipulation of infectious materials, or where aerosols or splashes may be created.
Appropriate personal protective equipment must be utilized to reduce exposure to infectious agents, animals, and contaminated equipment. Implementation of employee occupational health programs should be considered.
The following standard and special practices, safety equipment, and facility requirements apply to ABSL-2:

A. Standard Microbiological Practices **(in addition to ABSL-1 practices)**

1. Animal care staff, laboratory and routine support personnel must be provided a medical surveillance program as dictated by the risk assessment and administered appropriate immunizations for agents handled or potentially present, before entry into animal rooms. When appropriate, a base line serum sample should be stored**.**

2. Procedures involving a high potential for generating aerosols should be conducted within a biosafety cabinet or other physical containment device. When a procedure cannot be performed within a biosafety cabinet, a combination of personal protective equipment and other containment devices must be used. Restraint devices and practices that reduce the risk of exposure during animal manipulations (e.g., physical restraint devices, chemical restraint medications) should be used whenever possible.

3. Decontamination by an appropriate method (e.g. autoclave, chemical disinfection, or other approved decontamination methods) is necessary for all potentially infectious materials and animal waste before movement outside the areas where infectious materials and/or animals are housed or are manipulated. This includes potentially infectious animal tissues, carcasses, contaminated bedding, unused feed, sharps, and other refuse. A method for decontaminating routine husbandry equipment, sensitive electronic and medical equipment should be identified and implemented.
   Materials to be decontaminated outside of the immediate areas where infectious materials and/or animals are housed or are manipulated must be placed in a durable, leak proof, covered container and secured for transport. The outer surface of the container is disinfected prior to moving materials. The transport container must have a universal biohazard label. Develop and implement an appropriate waste disposal program in compliance with applicable institutional, local and state requirements. Autoclaving of content prior to incineration is recommended.

4. Equipment, cages, and racks should be handled in a manner that minimizes contamination of other areas. Equipment must be decontaminated before repair, maintenance, or removal from the areas where infectious materials and/or animals are housed or are manipulated.

5. Spills involving infectious materials must be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material.

6. Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the safety manual. All such incidents must be reported to the animal facility supervisor or personnel designated by the institution. Medical evaluation, surveillance, and treatment should be provided as appropriate, and records maintained.

B. Safety Equipment

1. Properly maintained BSCs, personal protective equipment (e.g., gloves, lab coats, face shields, respirators, etc.) and/or other physical containment devices or equipment, are used whenever conducting procedures with a potential for creating aerosols, splashes, or other potential exposures to hazardous materials. These include necropsy of infected animals, harvesting of tissues or fluids from infected animals or eggs, and intranasal inoculation of animals.

2. When indicated by risk assessment, animals are housed in primary biosafety containment equipment appropriate for the animal species, such as solid wall and bottom cages covered with filter bonnets for rodents or other equivalent primary containment systems for larger animal cages.

3. A risk assessment should determine the appropriate type of personal protective equipment to be utilized.

4. Scrub suits and uniforms are removed before leaving the animal facility. Reusable clothing is appropriately contained and decontaminated before being laundered. Laboratory and protective clothing should never be taken home. Gowns, uniforms, laboratory coats and personal protective equipment are worn while in the areas where infectious materials and/or animals are housed or manipulated and removed prior to exiting. Disposable personal protective equipment and other contaminated waste are appropriately contained and decontaminated prior to disposal.

5. Eye and face protection (mask, goggles, face shield or other splatter guard) are used for manipulations or activities that may result in splashes or sprays from infectious or other hazardous materials and when the animal or microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. Persons who wear contact lenses should also wear eye protection when entering areas with potentially high concentrations or airborne particulates. Persons having contact with NHPs should assess risk of mucous membrane exposure and wear protective equipment (e.g., masks, goggles, face shields) appropriate for the task to be performed. Respiratory protection is worn based upon risk assessment.

D. Laboratory Facilities

1. The animal facility is separated from areas that are open to unrestricted personnel traffic within the building. External facility doors are self-closing and self-locking.
   Doors to areas where infectious materials and/or animals are housed, open inward, are self-closing, are kept closed when experimental animals are present, and should never be propped open. Doors to cubicles inside an animal room may open outward or slide horizontally or vertically.

2. A hand-washing sink is located at the exit of the areas where infectious materials and/or animals are housed or are manipulated. Additional sinks for hand washing should be located in other appropriate locations within the facility.
   If the animal facility has segregated areas where infectious materials and/or animals are housed or manipulated, a sink must also be available for hand washing at the exit from each segregated area. Sink traps are filled with water, and/or appropriate disinfectant to prevent the migration of vermin and gases.

3. The animal facility is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors and ceilings) are water resistant. Penetrations in floors, walls and ceiling surfaces are sealed, including openings around ducts, doors and doorframes, to facilitate pest control and proper cleaning. Floors must be slip-resistant, impervious to liquids, and resistant to chemicals.

4. Cages should be autoclaved or otherwise decontaminated prior to washing. The cage wash area should be designed to accommodate the use of high-pressure spray systems, humidity, strong chemical disinfectants and 180°F water temperatures during the cage/equipment cleaning process.

5. If BSCs are present, they must be installed so that fluctuations of the room air supply and exhaust do not interfere with proper operations. BSCs should be located away from doors, heavily traveled laboratory areas, and other possible airflow disruptions.

6. HEPA filtered exhaust air from a Class II BSC can be safely re-circulated back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to manufacturer's recommendations. BSCs can also be connected to the laboratory exhaust system by either a thimble (canopy) connection or directly to the outside through an independent, hard connection. Provisions to assure proper safety cabinet performance and air system operation must be verified. BSCs should be recertified at least once a year to ensure correct performance.

   All BSCs should be used according to manufacturer's specifications to protect the worker and avoid creating a hazardous environment from volatile chemicals and gases.

7. If vacuum service (i.e., central or local) is provided, each service connection should be fitted with liquid disinfectant traps and an in-line HEPA filter placed as near as practicable to each use point or service cock. Filters are installed to permit in-place decontamination and replacement.

8. An autoclave should be present in the animal facility to facilitate decontamination of infectious materials and waste.

9. Emergency eyewash and shower are readily available; location is determined by risk assessment.

For much more detailed and specific information the Office of Animal Resources may be contacted at:

Attending Veterinarian and Director of OAR**:** ucb.veterinarian@colorado.edu

OAR Administrative Office: oaroffice@colorado.edu

Institutional Animal Care and Use Committee: iacucoffice@colorado.edu

Diagnostic Work- What to do if you Culture a BSL-3 Organism

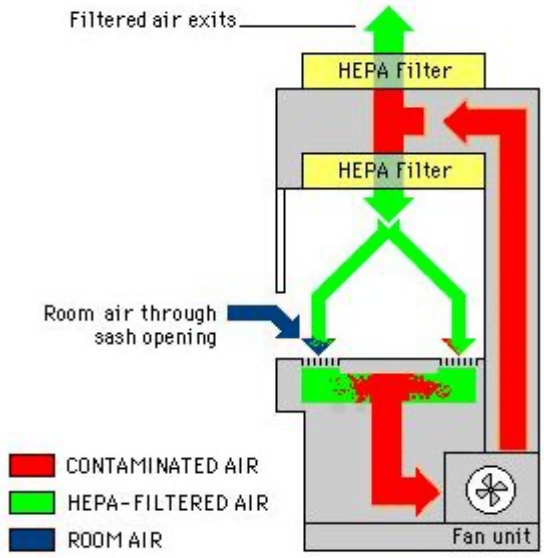
If during the course of conducting diagnostic work in the laboratory a BSL-3 organism or select agent or toxin is identified you must stop work with that material, secure it against theft, loss, or release, and call the Biosafety Group in the Environmental Health and Safety Office immediately so that the appropriate regulatory agencies can be notified. UCB is **not** registered for the possession, use and transfer of select agents and toxins.

Biosafety Cabinets

What is a Biosafety Cabinet?

A biosafety cabinet (BSC) is **not** a chemical fume hood. Chemical fume hoods are designed to protect personnel by removing chemical vapors and aerosols away from the work area. BSCs are designed to protect personnel, the products being handled, and the environment from particulate hazards, such as aerosolized infectious microorganisms. BSCs use uniform vertical laminar airflow to create a barrier to airborne particulates. BSCs utilize High Efficiency Particulate Air (HEPA) filters to clean both the air entering the work area and the air exhausted to the environment.

The HEPA filter removes airborne particles from the air but does not remove chemical fumes. Only biosafety cabinets that are exhausted via duct work are appropriate for use with small amounts of toxic volatile chemicals. Always use a fume hood when working with large amounts of toxic volatile chemicals. Appendix A of the 6th edition of the BMBL titled "Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets" provides more detailed information on the different types of BSCs.



Class II Biological Safety Cabinet

http://www.ars.usda.gov/News/docs.htm?docid=14605&page=3

When Must I Use a BSC?

Biosafety cabinets should be used whenever you are conducting lab procedures with biohazardous materials that may produce aerosols, or anytime you are working with large amounts of infectious materials. BSCs, when properly used, have been shown to be highly effective in reducing laboratory-acquired infections and cross-contamination of cultures due to aerosol exposures. BSCs also protect the environment. BSCs are designed to provide personnel, environmental and product protection when appropriate practices and procedures are followed. Three kinds of biological safety cabinets, designated as Class I, II, and III are available. Biological safety cabinets use high efficiency particulate air (HEPA) filters in their exhaust and/or supply systems. The HEPA filter traps 99.97% of particles of 0.3 μm in diameter and 99.99% of particles of greater or smaller size. Biological safety cabinets must not be confused with other laminar flow devices or "clean benches."

Horizontal flow cabinets direct air towards the operator and should never be used for handling infectious or toxic materials.

Open Flames in a BSC

Open flames, such as Bunsen burners, should never be used in a BSC. Open flames inside of a BSC disrupt the airflow, compromising protection of both the worker and the material being handled. Open flames are extremely dangerous around flammable materials, such as ethanol, which is often found in a BSC. Electric incinerators or sterile disposable instruments are excellent alternatives.

Decontamination and Ultraviolet Lights in a BSC

The BSC work area must always be cleaned and disinfected thoroughly before and after each use, using a chemical disinfectant such as an iodophor. Be sure to allow adequate disinfection time for the disinfectant used. 70% alcohol can evaporate too quickly to be effective, and fumes can build up in the biosafety cabinet, creating a potential explosion hazard. If you use bleach as a disinfectant, be sure to follow by wiping with sterile water, as bleach will corrode the stainless steel of the biosafety cabinet. The use of ultraviolet (UV) lights in a biosafety cabinet is not recommended because of their ineffectiveness and safety risk. UV light has very little power to penetrate, even through a dust particle, so the UV light is not a method that should be used for primary decontamination. Note that UV lights lose effectiveness over time. Warning: Be sure the UV light is turned off before beginning work. Exposure to UV light for a prolonged period will cause skin, corneal and/or retinal burns. Newer BSCs have safeguards to prevent personnel from being exposed to UV light; however, some older models may not have these safeguards. For most consistent contamination control and safe operation, biosafety cabinets should be run 24 hours a day, 7 days a week.

Annual Certification Testing

To ensure that BSCs are providing necessary protection to workers and the environment, a contracted qualified servicing company provides annual certification testing for all BSCs on campus that are used to contain biological hazards. Testing is done according to the internationally accepted standards of National Sanitation Foundation (NSF) International. Each BSC should have a label displaying the date it was last certified.

Moving or Repairs

Filter changes and repairs must be done by the contracted qualified servicing company. This company will also be responsible for filter disposal.

BSCs must be recertified whenever they are moved or have the filters changed. If you planning to move your BSC please contact a qualified servicing company prior to the move. Once the BSC has reached its new location it will have to be re-certified by a qualified servicing company before it is used. For questions related to moving a BSC or for a list of NSF/ANSI 49 certified service providers in the area, please contact Environmental Health and Safety.

Purchasing and Installing a New BSC

If plans exist for the purchase of a new BSC, the Environmental Health and Safety Office must be notified to provide assistance in choosing the appropriate BSC and for ensuring that the BSC is put on the annual certification testing schedule.

Response to Spills and Exposures Involving Biological Materials and Recombinant or Synthetic Nuclei Acid Molecules

In the event of accidental spills or exposures, the priority should be the safety and welfare of facility personnel. The second priority should be containment of the exposure. In all cases, care should be taken to avoid tracking spills through the facility and broadening the exposure.

General: Biohazards include body fluids, blood, infectious waste, or other potentially infectious material. Any body fluid may contain microorganisms capable of causing disease. Therefore, appropriate protective attire must be worn when having direct contact with any body fluid or tissue. Gloves must be changed, and hands washed after handling laboratory specimens containing body fluids and between animal examinations. All procedures involving blood or other potentially infectious materials must be performed in a manner that minimizes splashing, spraying, and aerosolization of these substances.

Personal Readiness Activities

- Provide immediate first aid.
- Eyes or mouth splattered with blood, biological organisms, or body fluid:
    - Flush with water at least 15 minutes.
    - Use the eyewash stations located in any procedure room or just outside of the facility/lab.
- Needle stick
    - Milk wound to induce bleeding.
    - Wash with soap and water for at least 15 minutes.
- All injuries
    - Remove contaminated clothing, wash skin, and replace with clean clothing.
    - Get medical attention/consultation for exposures to biohazardous materials
    - Call 911 for medical emergencies
    - Contact the Biosafety Officer at 303-492-2817 or Alternate Biosafety Officer (303-492-7072) or after hours, UC Boulder Police to contact EHS on-call staff member.
    - Submit an Accident/Illness Report Form online (https://www.cu.edu/content/fileclaim).

Cleanup Actions: Small Spill

- Protect body by putting on protective clothing (gloves, eye protection, and lab coat).
- Provide first aid if needed.
- Cover the spill with paper towels or other absorbent materials. Carefully pour the appropriate disinfectant around the edges of the spill and then work your way into the center. Allow an appropriate contact period. Use paper towels to clean up the spill, working from the edges to the center. For guidance: https://www.colorado.edu/ehs/resources/disinfectants-sterilization-methods
- Clean spill area with fresh towels soaked in disinfectant.
- Remove broken glassware with forceps, tongs or broom and dustpan and dispose in sharps container. Do not pick up any contaminated sharp objects with your hands.
- Wipe down all equipment and surfaces that were potentially contaminated.
- Dispose of contaminated material as biohazardous waste.
- Remove all PPE before leaving area of the spill, put in a biohazard bag, and wash hands.

Cleanup Actions: Large Spill

- Evacuate the immediate area of all personnel and close the door(s). Post a person by the area to prevent re-entry. Wait 30 minutes for aerosols to settle.
- Check for exposure and provide first aid if needed.

- Follow instructions listed above for a small spill.
- Inform all personnel and lab supervisor about the spill and successful cleanup as soon as possible.
- Notify the biosafety group in the event of a spill (303-492-6025) so that all pertinent information is collected. The biosafety group will recommend a course of action based on this information.

Cleanup Actions: Spill Inside of a Biosafety Cabinet

- Wear appropriate protective clothing before proceeding with the clean-up.
- Allow the cabinet to run while addressing the spill
- Cover the spill with paper towels or other absorbent material, then carefully pour the disinfectant on surface of the towel and work your way to the center of the spill. Make sure to saturate the towel and allow to soak for a minimum of 20 minutes contact time directly on the spill.
- Wipe the walls, work surfaces, inside of sash and any potentially contaminated equipment with disinfectant soaked towels before removing it from the BSC.
- Lift exhaust grill and tray and wipe all surfaces.
- Discard contaminated disposable material using appropriate biohazardous waste disposal procedures.
- Wipe down contaminated reusable items with disinfectant then place in autoclave bag or autoclave pans with lids for autoclaving.
- Items that are non-autoclavable should be wiped down with disinfectant and kept wet for a minimum of 20 minutes before removal from BSC.
- Remove protective clothing, when done and place in biohazard bag for disposal or autoclaving for reusable items.
- Run the BSC for at least 15 minutes after clean-up before reusing
- WASH HANDS!

Disposal of Biohazardous Waste

Biohazardous waste is biological, infectious, and some non-infectious waste. Biological waste includes cultures, plates, media, and other materials that contain or come in contact with living cells, body fluids, viruses, clinical materials, and other microorganisms. Infectious waste is biological waste that involves the presence of organisms containing recombinant DNA or other organisms hazardous to human health. Non-infectious waste includes all examples listed under biological waste that do not meet the criteria of infectious or have been rendered non-infectious by chemical disinfection or autoclaving.

Before biohazardous waste can disposed it must be rendered non-infectious by using effective chemical disinfection methods or by autoclaving. **If in doubt, be conservative and autoclave or chemically treat all non-radioactive biological waste. Do NOT use an autoclave if your waste contains radioactive material.** If you have questions, contact the Biosafety Group.

Autoclaves

The Autoclave Operator is responsible for assuring that any infectious waste that has not been rendered non-infectious by chemical treatment, is autoclaved and managed according to the following biowaste autoclave procedures. General autoclave use training is available on BioRaft: https://colorado.bioraft.com/node/1904106
NOTE: *These procedures **do not apply** to non-biowaste autoclave use, such as sterilizing glassware or equipment.*

- Make sure that each autoclave used for biowaste disinfection has been identified with a unique EH&S assigned number, posted on the front of the autoclave. Let EH&S know if you become aware of other autoclaves being used for treating biological waste.

- Make sure that the autoclave machine you are using has a prominently posted standard operating procedure (SOP), including directions for proper loading and adequate cycle time. Please provide EH&S with a copy of the SOP (413 UCB).

- Make sure that infectious waste has been placed into non-leaking, heat resistant autoclave bags with built-in sterilization indicators. Each bag must have a non-biohazardous waste tag attached (initially completed by the generator) with the “autoclave” box marked to show that the bag needs autoclaving.

- Leave the bags loosely tied (do not seal during the autoclave process) so that steam can access all areas of the load and autoclave the load according to the posted SOPs.

- For infectious Sharps, make sure that the puncture-proof sharps container is not completely sealed during autoclaving so that sharps won’t puncture containers due to the heat and pressure. Once the container has been autoclaved, make sure the autoclave indicator changed to show that the sharps have been rendered non-infectious.

- Verify that built-in autoclave bag indicators and/or autoclave tape have changed, showing that the waste has been rendered non-infectious. Containers without visible sterilization indicators will NOT be collected for disposal. Remove the autoclaved bags and sharps containers from the autoclave and seal them.

- For bags, finish completing each non-biohazardous waste tag by printing and signing your name in the blank provided along with the date that the biowaste was autoclaved. Remove the top (white) copy of each tag and put it in the designated pocket posted in the area near the autoclave. Leave the other two copies (yellow and bottom manila card) attached to each bag and deposit the bags into the “Certified Non-biohazardous Materials” receptacle. For sharps containers, attach a completed hazardous material/waste tag and submit the top, white copy to EH&S.

Waste Generator & Autoclave Operator Responsibilities & Actions
Non-biohazardous waste tags, available from EH&S, are to be completed as described below and attached to each autoclave bag. Bags that do not have a completed, signed Non-Biohazardous Waste Certification tag attached will be considered “infectious” and WILL NOT BE PICKED UP FOR DISPOSAL. They will be left in a red “Biohazardous Waste” tub (next to the Certified Non-Biohazardous Materials receptacle) for the generating department to properly autoclave and tag.

NON-BIOHAZARDOUS CERTIFICATION TAG

Environmental Health & Safety, 413 UCB
(303) 492-6025 ehs@colorado.edu http://ehs.colorado.edu

Bag/Container ID # B

REMOVE & PLACE TOP-WHITE COPY IN DESIGNATED POCKET

PRESS HARD USING INK - MULTIPLE COPIES

METAL SHARPS (needles, etc.): DO NOT USE THIS TAG
Properly disinfected sharps must be contained in puncture-proof containers and disposed using Hazardous Waste Tags.

Room # _____ Dept. _____

Principle Investigator _____

Contents _____

Method of Disinfection: (check one)

☐ Autoclave: #_____ (sterilization indicator required)

☐ Chemical Disinfection (specify): _____

-Or-

☐ Non-Biohazardous (no disinfection is required)

I certify that this waste is Non-Biohazardous. If autoclaving was required: proper biowaste management procedures were followed, the autoclave is being properly maintained, and the sterilization indicator was visible on this autoclave bag.

Generator : (SIGNATURE REQUIRED)

x _____

Print Name : _____

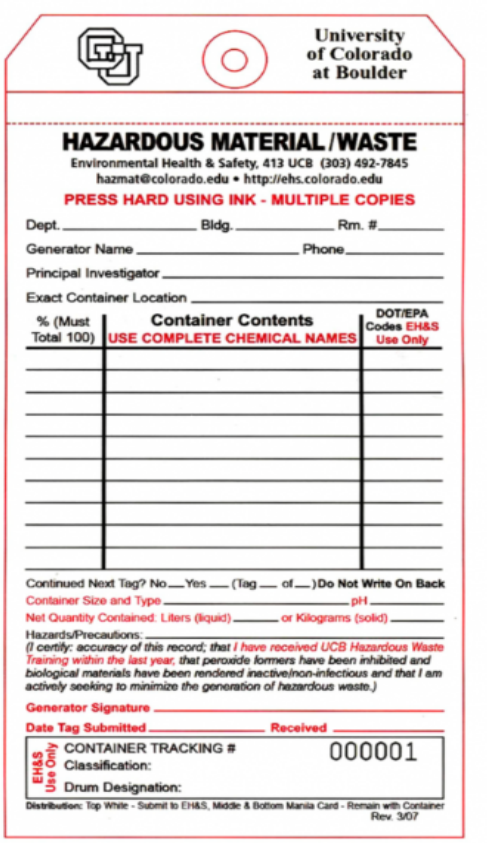
Date : _____ Phone: _____

Distribution: White - Put in Designated Pocket for EH&S. **Canary** - Attach to Bag/Container, **Bottom Manila Card** - Attach to Bag/Container Rev. 3/06

1. Autoclave Number – Write the EH&S autoclave number in the blank provided. This number (black number on a white sticker) has been posted on each autoclave.
2. Department – Indicate the generating laboratory's department.
3. Principal Investigator – Identify the Principal Investigator for the generating lab.
4. Room Number – Indicate the room where the waste originated.
5. Volume – Estimate the waste volume in the bag in cubic feet.
6. Contents – Generically describe contents of the bag.
7. Non-Biohazardous – Check this box if the contained materials are non-infectious biowaste and therefore, do not require disinfection or autoclaving.
8. Method of Disinfection – Check the appropriate boxes, indicating if the infectious waste was rendered non-infectious by chemical treatment or needs autoclaving. If chemical disinfection was used, describe the specific treatment method in the blank provided.
9. Certification – A signature of the person certifying the waste as non-infectious is required. This will either be the generator who chemically disinfected the waste or the operator who autoclaved the waste. The signature also confirms that proper biowaste management procedures were followed and that the autoclave is being properly maintained.
10. Date – Indicate when the waste was certified non-infectious by the waste generator or autoclave operator.

Sharps Disposal

Sharps (needles, syringes, blades, scalpels) CANNOT be disposed of with a Non-Biohazardous Waste Tag; they must be disposed of with a HMW Tag.


University of Colorado at Boulder

HAZARDOUS MATERIAL / WASTE

Environmental Health & Safety, 413 UCB (303) 492-7845
hazmat@colorado.edu • http://ehs.colorado.edu

PRESS HARD USING INK - MULTIPLE COPIES

Dept. _____ Bldg. _____ Rm. # _____

Generator Name _____ Phone _____

Principal Investigator _____

Exact Container Location _____

% (Must Total 100)	Container Contents USE COMPLETE CHEMICAL NAMES	DOT/EPA Codes EH&S Use Only

Continued Next Tag? No ___ Yes ___ (Tag ___ of ___) Do Not Write On Back

Container Size and Type _____ pH _____

Net Quantity Contained: Liters (liquid) _____ or Kilograms (solid) _____

Hazards/Precautions: _____

(I certify: accuracy of this record; that I have received UCB Hazardous Waste Training within the last year, that peroxide formers have been inhibited and biological materials have been rendered inactive/non-infectious and that I am actively seeking to minimize the generation of hazardous waste.)

Generator Signature _____

Date Tag Submitted _____ Received _____

EH&S Use Only
CONTAINER TRACKING # 000001
Classification:
Drum Designation:

Distribution: Top White - Submit to EH&S, Middle & Bottom Manila Card - Remain with Container
Rev. 3/07

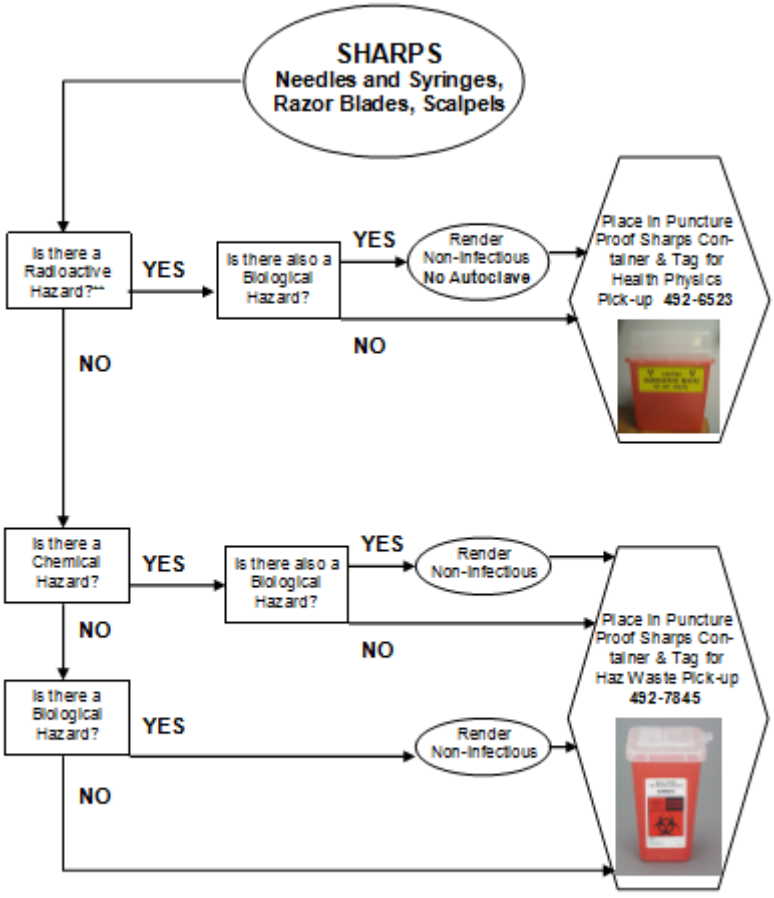
Sharps cannot be trash disposed, even if clean. They must be placed in puncture-proof, sealed containers (no plastic or autoclave bags) and tagged for hazardous material/waste pickup.
Due to their biomedical appearing nature, syringe barrels must also be HMW tagged for EH&S pick-up (although it is not necessary to put these into puncture-proof containers).

Infectious sharps must be autoclaved. Chemical disinfection is not effective for needles and small syringes; these must be autoclaved in a puncture-proof container with a built-in sterilization indicator, or have autoclave tape on the container. **Be sure that the container is not completely sealed during autoclaving so that the sharps won't puncture it due to the heat and pressure**.

Even sharps that have been used to administer chemicals or draw fluids from "clean" animals must be autoclaved. This is for protection of personnel handling the waste.
Write in the word "Autoclaved" under the chemical constituent's section of the HMW Tag if the sharps were autoclaved. Autoclaved sharps containers must also have a sterilization indicator included.

All radioactive sharps must go to Radiation Safety for disposal: radsafety@colorado.edu.

Sharps Segregation Requirements



**Obtain appropriate container and tag from Health Physics—303-492-6523

Transporting Biological Materials on Campus

The following procedure for preparing and transporting biological materials between and within university buildings should be used:

1. Use primary containers that are designed to contain the material to be stored.

2. Place primary sample containers into an appropriate secondary container for transport. If sample material is liquid or may release liquids, use a leakproof secondary container with a secure lid (i.e., cooler with a latch lid). Additionally, place enough absorbent material (i.e., paper towels) in the secondary container to absorb all free liquids if the primary containers rupture or break during transport.

3. Package primary containers in the secondary container in a manner that will reduce shock, rupture, and/or breakage. Bubble wrap or similar shock-absorbing materials may also be used to minimize the potential for primary container rupture.

4. Label all secondary containers with a brief description of the contents and a contact name and phone number.

   Please contact the Biosafety Group regarding the transport biological materials by vehicle between campus buildings.

Shipping of Biological Materials to an Off Campus Destination

Transportation of biological materials is an activity that affects all research and diagnostic service entities. In some instances, these materials may be regulated for transportation and will require specific packaging, labeling and documentation. Additionally, the shipper must have documented training relative to his or her tasks associated with the shipment. This is the case for shipment of diagnostic specimens (from humans or animals), cultures of infectious substances (infectious to humans and/or animals), genetically modified organisms and any biological materials shipped on dry ice. Due to recent current events, there is an increased level of surveillance on the part of federal and international authorities for all hazardous materials/dangerous goods shipments that may include diagnostic specimens and infectious substances.

As a shipper, it is essential to ensure that materials are properly classified and that all applicable regulatory provisions for shipment are met. EHS offers training and consultation for campus personnel who plan to ship biological materials including diagnostic specimens, infectious substances, genetically modified organisms, and biological materials on dry ice.
Impact of non-compliance:

- Increased risk of material release during the shipping process.
- May result in refusal or return of packages during the shipping process. This could be critical if materials are temperature sensitive.
- May result in fines from the Federal Aviation Administration (FAA).

Preparing to Ship Biological Materials:

Before you package and ship materials to an off-campus destination there are several items that should be addressed.

1. You must successfully complete the online training course for Shipping Biological Materials course available on BioRaft: https://colorado.bioraft.com/node/1904112.
The purpose of this training module is to familiarize the Principal Investigator and lab personnel with the regulations, different shipping categories, and proper labeling and packaging of biological materials. This course must be taken every two years or whenever relevant regulations change.

2. The Environmental Health and Safety Office Biosafety Group can provide assistance with the shipping process and may be able to supply the appropriate shipping labels.

3. There are some other important considerations involved in the shipping of biological materials such as:

Material Transfer Agreements

1. Before you send your shipment it is important that you contact Venture Partners at CU Boulder https://www.colorado.edu/venturepartners/ to find out if there are any agreements that need to be completed and processed before you can ship your materials.

Export Controls and Trade Sanctions

1. Export controls and trade sanctions are regulatory areas that may apply to you, depending on your activity. Exports are any items (commodities, software, technology, select biological agents) sent from the United States to a foreign destination. If you will be exporting or transporting materials outside of the United States and/or be working with foreign nationals please contact the UCB Export Controls Office at 303-492-2889 or go to the website https://www.colorado.edu/researchinnovation/export-controls for more information.

Permits

Importation/Exportation of Etiologic Agents

Importation of biohazardous agents, etiologic agents, and vectors that may contain such agents is governed by federal regulation. In general, an importation permit is required for any infectious agent known to cause disease to humans. This includes, but is not limited to, bacteria, viruses, rickettsia, parasites, yeasts, and molds. In some instances, an agent which is suspected of causing human disease also requires a permit.

Importation permits are issued by the U.S. Public Health Service (USPHS) only to the importer, who must be located in the United States. The importation permit, with the proper packaging and labeling, will expedite clearance of the package of infectious materials through the USPHS Division of Quarantine and release by U.S. Customs.

Instead of an importation permit, a Letter of Authorization may be issued by the Centers for Disease Control and Prevention after review of an “Application to Import an Etiological Agent.” The letter is issued for materials that are judged to be noninfectious, but which might be construed to be infectious by U.S. Customs inspection personnel. Letters of Authorization may be issued for items such as formalin-fixed tissues, sterile cell cultures, clinical materials such as human blood, serum, plasma, urine, cerebrospinal fluid, and other tissues or materials of human origin when there is no evidence or indication that such materials contain an infectious

agent. Letters of Authorization are in effect for two years and do not require a shipping label to be issued by CDC.

Importation permits and Letters of Authorization are issued by the Biosafety Branch, Office of Health and Safety, CDC, 1600 Clifton Road, Atlanta, Georgia 30333, after review of a completed application form. Application forms may be obtained by calling CDC at their FAX Information System. Dial 1-888-CDC-FAXX and enter document number 101000. CDC can also be contacted on the Internet at http://www.cdc.gov/cpr/ipp/. Completed forms may be returned to CDC by mail or FAX at 404-639-2294. Application to CDC for the importation permit should be made 15 working days in advance of the shipment date to allow time for processing, issuance, and delivery of the permit and shipping labels to the permittee.

Other Permits
Animal and Plant Health Inspection Service (APHIS) permits are required for importation or domestic shipping of infectious agents of livestock, poultry, and other animal diseases, and any materials that might contain these agents**.** Tissue (cell) culture techniques customarily use bovine material as a stimulant for cell growth. Tissue culture materials, and suspensions of cell culture-grown viruses or other etiologic agents containing growth stimulants of bovine or other livestock origin are, therefore, controlled by the USDA due to the potential risk of introduction of exotic animal disease into the U.S. Applications for USDA/APHIS permits may be obtained by calling the USDA/APHIS at (301) 734-3277 or through the Internet at https://www.aphis.usda.gov/aphis/resources/permits

The importation or domestic transfer of plant pests is also regulated by the USDA. Such a permit is required for plant pests, plant biological agents, or any material that might contain them. Information may be obtained by calling (301) 734-3277 or online at https://www.aphis.usda.gov/aphis/ourfocus/planthealth/import-information/permits.

USDA permits are required for certain live animals and all live bats. Call (800) 358-2104 for further information. Export of infectious materials may require license from the Department of Commerce (DoC). Exporters of a wide variety of etiologic agents of human, plant, and animal diseases, including genetic material and products which might be used for culture of large amounts of agents will require an export license. Information may be obtained by calling the DoC Bureau of Export Administration at 202-482-4811 or online at http://www.bis.doc.gov/.

When in doubt, PLEASE ASK!
For more information on biological materials shipping requirements, please contact the Environmental Health and Safety Office's Biological Safety Group at 303-492-6025 or ehsbio@colorado.edu.

Security

Laboratory security is an important part of an effective safety program. Follow these steps to ensure a secure working environment in your laboratory:

1. Keep laboratory doors closed and locked when unoccupied.
2. Keep stocks of organisms and hazardous chemicals locked when the laboratory is unoccupied.
3. Keep an accurate record of chemicals, stocks, cultures, project materials, growth media, and those items that support project activities.
4. Notify Environmental Health and Safety and UCB police if materials are damaged or missing from laboratories.
5. Inspect all packages arriving into the laboratory.
6. When research is completed for the day, ensure that chemicals and biological materials have been stored properly and securely.
7. Decontaminate materials and work surfaces after completing work and at least daily.
8. Turn off equipment, flames, steam supply, and electrical appliances after completing work.
9. Ask strangers (someone you do not recognize as a co-worker or support staff person) to exit the room if they are not authorized to be there.
10. Discuss other security-specific requirements with your supervisor.

Required Training

When a biological registration is submitted, all aspects of the protocol are reviewed so that the appropriate biosafety training can be assigned to those individuals listed on the registration. Individuals are notified of the training courses that they must successfully complete before final approval is granted. Biosafety training is available in BioRaft: https://colorado.bioraft.com/node/1904107.