

Exposure Control Program for Bloodborne Pathogens

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Environmental Health and Safety

UNIVERSITY OF COLORADO

DENVER | ANSCHUTZ MEDICAL CAMPUS

Exposure Control Program for Bloodborne Pathogens

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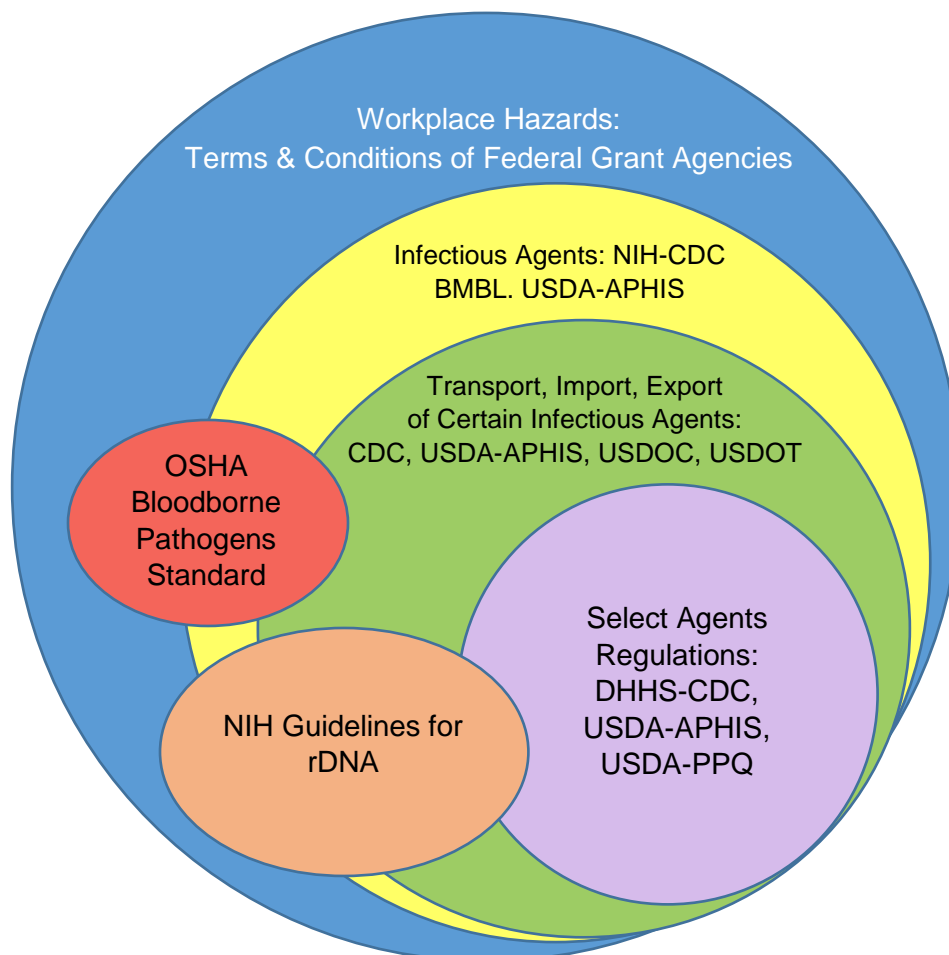
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I. Introduction

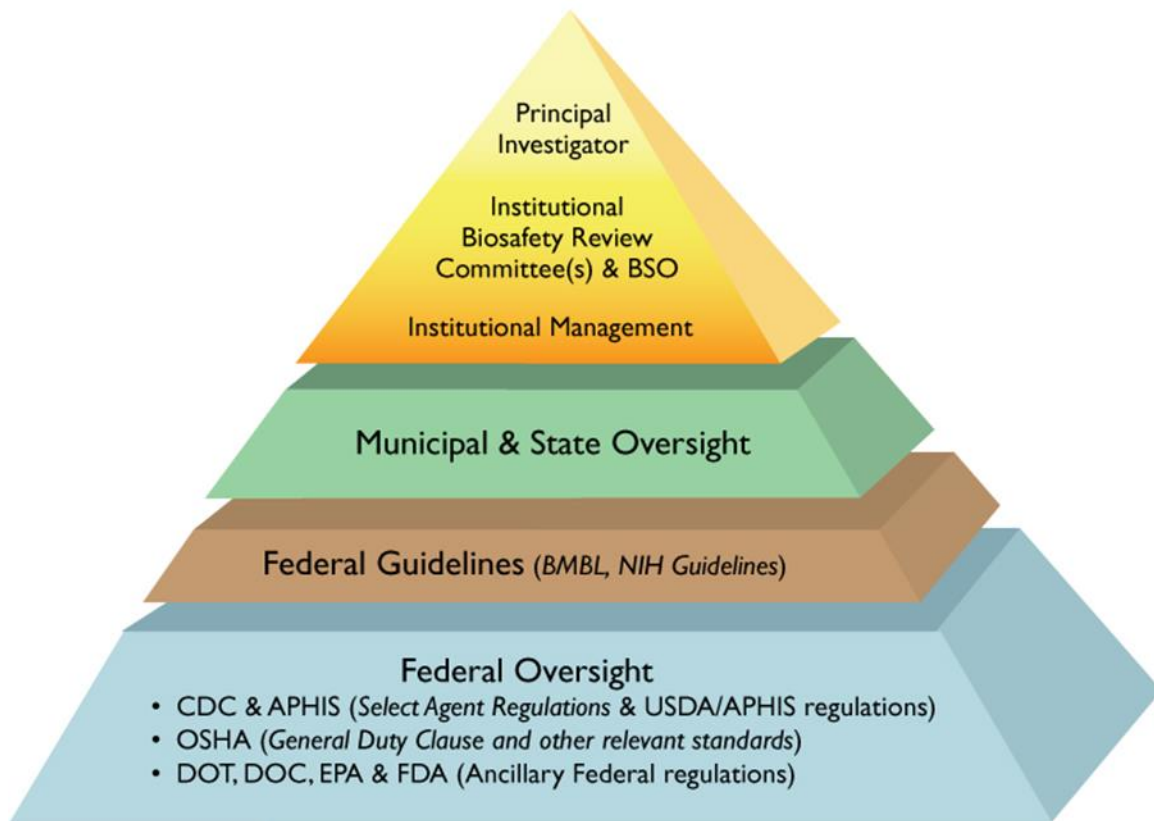
- A. Grantee institutions are responsible for meeting federal, state, and local health and safety standards, and for establishing and implementing necessary measures to minimize employees' risk of injury or illness in activities related to NIH and other federal grants. Federal regulations and guidelines at multiple levels (Figure 1) must be implemented by the university. (Figure 2).
- B. Pertinent federal regulations are found in the [NIH Grants Policy Statement](#), and include the Occupational Safety and Health Administration (OSHA) regulations (*General Duty Clause*, *Personal Protective Equipment Standards*, and *Bloodborne Pathogens Standard*), [Select Agent Regulations](#), USDA-APHIS permitting regulations for animal and agricultural pathogens, and DHHS-CDC permitting regulations for infectious agents known or suspected to cause disease in humans.

Figure 1

Biosafety/Containment Regulations, Standards and Guidelines¹



¹ Report of the Trans-Federal Task Force on Optimizing Biosafety and Biocontainment Oversight, released July 2009, p. 41 <http://www.phe.gov/Preparedness/legal/boards/biosafetytaskforce/Documents/transfedbiocontainmentrpt092009.pdf>

Figure 2²**Biosafety and Biocontainment Oversight**

- C. The **University of Colorado Denver | Anschutz Medical Campus** is committed to providing a safe and healthful work environment for faculty, staff and students and compliance with applicable federal, state and local regulations and applicable university policies. CU Denver | Anschutz ensures compliance with the [NIH Grants Policy Statement](#) with respect to [Health and Safety Regulations and Guidelines](#) (Part 4.1.12) as terms and conditions of the university acceptance of federal funds.

II. References

- A. [NIH Grants Policy Statement, Health and Safety Regulations and Guidelines](#)
- B. [OSHA Bloodborne Pathogens Standard, 29CFR 1910.1030.](#)
- D. [CU Denver | Anschutz BBP and Hepatitis B Vaccination Policy](#)

² Ibid, p. 43. <http://www.phe.gov/Preparedness/legal/boards/biosafetytaskforce/Documents/transfedbiocontainmentrpt092009.pdf>

III. Policy

- A. The purpose of the Exposure Control Program (ECP) is to establish minimum guidelines and procedures at CU Denver | Anschutz for the appropriate training, methods and procedures to eliminate or minimize occupational exposures to bloodborne pathogens (BBP) and other potentially infectious materials (OPIM), in accordance with the OSHA Bloodborne Pathogens Standard, 29 CFR 1930.1030.

NOTE: All full-time, part-time, temporary, contract and per diem employees of the CU Denver | Anschutz are covered by the university policy and this ECP.

IV. Program Administration

A. Scope

1. The ECP:

- a. Establishes the process for identifying individual employees at risk of occupational exposure to human blood, bodily fluids and other potentially infectious materials as identified in the OSHA Bloodborne Pathogens Standard.
 - i. Additionally, other infectious agents, both human and animal pathogens, have been identified by the NIH and CDC and are classified into Risk Groups 1 through 4. Exposure control practices will be implemented for these occupational exposures as well.
- b. Provides communication with and training to employees regarding hazards of occupational exposure to human blood, bodily fluids and OPIM with related initial, annual refresher and on-the-job training (OJT), either instructor-led or in online training modules.
- c. Communicates hazards to employees, and suggests Standard Operating Procedures (SOPs) and implementation of various methods of exposure control for departments, divisions and individuals to reduce the risk of transmission of diseases associated with clinical, research and educational activities at CU Denver | Anschutz, including:
 - i. standard precautions
 - ii. administrative controls
 - iii. engineering and work practice controls
 - iv. personal protective equipment (PPE)
 - v. housekeeping practices
- d. Provides education about and access to an Occupational Health Medical Surveillance Program, to include Hepatitis B vaccinations or other appropriate vaccinations or immunizations for those at risk of occupational exposure to infectious agents in their work.
- e. Provides communication regarding the appropriate steps for reporting occupational exposures, and information on post-exposure evaluation and follow-up.

- f. Provides guidance on procedures for evaluating and mitigating circumstances contributing to occupational exposures.
- g. Provides information on post-exposure evaluation and follow-up, through the [University Risk Management Workers Compensation Program](#) and Designated Medical Providers.
- h. Provides procedures for evaluating circumstances surrounding exposure incidents; and recordkeeping.

NOTE: The ECP cannot cover all potential circumstances of occupational exposure; it is a tool for education and training. Individual departments may need to develop more complete site-specific plans and SOPs.

B. Applicability of the BBP Standard to Cell Cultures

1. It is widely recognized among biosafety professionals that many human subcultures of primary cells are potentially endogenously infected in the donor with silent HTLV viruses, papilloma, JC, BK, CJ, herpes, hepatitis and other viruses, as well as possible intracellular bacterial pathogens, and as such may represent a real and present source for human infection.
2. Human cell lines from the American Type Culture Collection [ATCC] and other sources are labeled to indicate that they may contain BBP. ATCC recommends that these cells be handled at BSL-2, and in compliance with the BBP Standard.
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=21519
3. Most established cell lines have not been fully characterized as to the presence of human pathogens, and therefore they DO fall under the definition of OPIM. Also, human cell lines can become contaminated with human pathogens during the course of many transfers, sub-culturing, etc.
4. **For the purposes of this ECP, all cell lines, tissue cultures, etc. derived from a human source will be considered.**

C. Roles and Responsibilities

1. The Office of the Chancellor has primary responsibility for regulatory compliance and policies for the CU Denver | Anschutz campuses. The day-to-day oversight for regulatory compliance has been delegated to the Assistant Vice Chancellor for Regulatory Compliance.
2. EHS manages those programs for public health and safety and environmental compliance matters, and in this case, specifically for compliance with the Bloodborne Pathogens Standard and the Exposure Control Program.
3. The Biological Safety division of EHS is responsible for compiling and implementing the ECP and all related documents, and making all documents available to employees.

- a. The ECP will be available online at <http://www.ucdenver.edu/research/Research%20Administration%20Documents/UCD%20BBP-Exposure%20Control%20Program-rev%202010.pdf>
 - b. Biological Safety will conduct an annual review and make revisions as necessary to the ECP.
 - c. The Biological Safety and Occupational Health divisions will maintain, review, and update the [University Bloodborne Pathogens/Exposure Control and Hepatitis B Vaccination Policy](#) at least annually, and whenever necessary to include new or modified procedures or regulatory standards.
 - d. Biological Safety, in collaboration with other University resources, will be responsible for the delivery of appropriate training, and documentation of that training, for all employees, faculty and staff covered under the ECP.
 - e. Biological Safety will assist CU Denver | Anschutz work units in developing exposure control policies specific for the work area to comply with the ECP.
 - f. Biological Safety will assist Principal Investigators (PIs) or supervisors in the evaluation of employee exposure potential, and in assigning an exposure category for each employee.
 - g. Employees covered by the Bloodborne Pathogens/Exposure Control Policy will receive an explanation of this ECP during their initial training, and it shall be reviewed in annual refresher training.
 - h. All employees can review this plan at any time during their work shifts by contacting Biological Safety.
 - i. Biological Safety may be reached by phone at 303-724-0345, and by email at biosafety.program@ucdenver.edu.
4. Principal Investigator/Supervisor Responsibilities³
- a. It is the responsibility of the PI, laboratory director or supervisor to make the appropriate risk assessment for the workplace and employees, and to maintain a list of all job classifications within the work unit, detailing those job descriptions for which some or all employees have occupational exposure, to include a list of tasks and procedures, or groups of closely related tasks and procedures, in which occupational exposure may occur for these individuals.
 - b. All job descriptions (PDQs, etc.) will annotate potential occupational exposure to infectious materials, as appropriate. That information should be recorded in the HCM system.

³ The School of Dental Medicine has prepared its own Exposure Control Manual, with appropriate infection control procedures and protocols for faculty and students. For additional information or copies of this document, contact the Office of the Associate Dean of Clinical Affairs, School of Dental Medicine.

- c. It remains the responsibility of the PI, laboratory director or supervisor to offer Hepatitis B vaccination to occupationally exposed employees, per university policy, at no cost to the individual employee.
- d. It remains the responsibility of the PI, laboratory director or supervisor to maintain a copy of the ECP where it can be accessed by all.
- e. PIs, laboratory directors or supervisors shall monitor and ensure compliance with the ECP. Specifically:
 - i. Document individual employee training on potential occupational exposures and exposure controls specific to the work unit, new or modified tasks as they are introduced, when new work procedures are introduced, the arrival when new employees as they are hired, and as regulatory standards and CU Denver | Anschutz policies are changed. This On-the-job training (OJT) should be documented, and evidence of training should be maintained with employee work records.
 - ii. Provide and maintain all necessary personal protective equipment (PPE), engineering controls (e.g., sharps containers), and other supplies as required by the standard.
 - iii. Ensure personnel have access to appropriate and necessary personal protective equipment.
 - iv. Ensure personnel have been assigned a determination of their potential occupational exposure to blood or OPIM.
 - v. Ensure personnel have received the necessary vaccinations prior to beginning work with blood or OPIM. Vaccinations can be coordinated through EHS Occupational Health.

5. Individual Responsibilities

- a. All CU Denver | Anschutz employees and students identified by their department, division, PI, or supervisor, or by Biological Safety, as being at risk of occupational exposure will participate in CU Denver | Anschutz BBP/Exposure Control training and adhere to the requirements as outlined in ECP.
- b. It is the responsibility of the individual to use the appropriate standard precautions and PPE for the work they perform, and to report any occupational exposure or injury as outlined in the [University Workers' Compensation Program](#) and this ECP.
- c. University work units with equivalent BBP/Exposure Control training may consult with Biological Safety for exemption from the university training program when all applicable training, documentation and related requirements can be demonstrated.

6. Employee Training

- a. Biological Safety will provide appropriate Bloodborne Pathogen and Exposure Control training to all identified employees.

- b. Training will be conducted by an individual who is knowledgeable in the subject matter, at no cost to the employee, during regular working hours, and in a manner accessible to the employee. Training information will be available on the EHS website.
- c. Initial Training
 - i. New employees with potential occupational exposures in research, clinical or academic laboratories must be trained in the CU Denver | Anschutz Bloodborne Pathogens and Exposure Control training.
 - ii. This initial training is achieved by enrolling in [the online training sessions](#) available in the training modules in the [UCD Access](#) portal, and completing the training and assessment. Employees will need their university domain login and password to access these features.
 - iii. New employees must complete the training and assessment at the time of their hire and prior to their working with potentially infectious materials. The expectation is that employees will be afforded this training within 10 days of initial assignment and prior to working with potentially infectious materials.
 - iv. This training session will include information on obtaining the Hepatitis B vaccine, and other topics as generally appropriate to a biomedical research institution.
- d. Clinical Staff Training
 - i. Employees of CU Denver | Anschutz involved in direct patient care settings (e.g. ARTS clinics of the Department of Psychiatry) must also participate in a training and education program to meet the intent of the OSHA Bloodborne Pathogens Standard.
 - ii. This training/education will be developed and delivered by Biological Safety based on the specific needs for those direct patient care settings.
 - iii. This training session will include information on the Hepatitis B vaccine, and other topics as generally appropriate to a direct patient care setting.
- e. Support Staff
 - i. University support staff (e.g. Facilities, University Police, housekeeping, etc.) also have potential occupational exposures to human blood, bodily fluids and other potentially infectious materials, based on the nature of the research done at our institution and the locations in which they work.
 - ii. The applicable BBP/Exposure Control training/education will be developed and delivered by Biological Safety based on the specific needs for those support staff in the research and clinical settings. Training will be by arrangement with Biological Safety.

- iii. This training session will include information on the Hepatitis B vaccine, and other topics as generally appropriate to university research, clinical and academic settings.
- f. Additional Initial Training for Employees in HIV and Hepatitis Research Laboratories and Production Facilities
 - i. The supervisor must ensure that employees in these facilities demonstrate proficiency in standard microbiological practices and techniques, and in operations and techniques specific for the facility, before being allowed to work with HIV, HBV, HCV stocks or cultures produced in research or production laboratories.
 - ii. The supervisor must ensure that the employee has sufficient experience in handling human pathogens and cell cultures to be able to work safely with HIV, HBV, HCV stocks or cultures.
 - iii. If an employee is lacking sufficient experience, then the employee must be adequately trained with non-infectious materials to learn correct practices before being allowed to work independently with HIV, HBV, or HCV. The employee should be able to demonstrate proficiency before participating in work activities involving infectious agents.
 - iv. The responsibility for ensuring that employees possess adequate knowledge and skills for such work is the responsibility of the supervisor, PI, and employer.
- g. Annual Refresher Training
 - i. Annual refresher training on the applicable topics is mandatory, and will be available to all employees.
 - ii. The supervisor will ensure the employee's participation in a training session at least annually and within one year (twelve calendar months) of previous training.
- h. Additional Training
 - i. Additional training is required at any time changes in tasks or procedures occur that may affect employee exposure.
 - ii. The supervisor will ensure the employee's participation in any OJT as appropriate.

7. Training Records

- a. EHS will keep the applicable training records, to include the following:
 - i. Name, job title, and department/division of all persons participating in the training
 - ii. Date training and assessment completed
 - iii. Content or summary of the training session (videos used, etc.)

- b. The records shall be kept for 3 years from the date the training occurred.
- c. It is strongly recommended that OJT training records be maintained within an employee file at the work unit.

C. Communication of Hazards to Employees

1. Warning labels and signs of an appropriate size must be displayed at or on:
 - a. Laboratories at BSL2 containment or higher, for work with potentially infectious materials
 - b. Containers of infectious wastes
 - c. Refrigerators and freezers containing blood or OPIM
 - d. Containers used to ship, transport or store blood or other potentially infectious materials
 - e. Equipment contaminated with or likely to become contaminated with infectious materials (e.g. incubators, centrifuges)
2. Warning labels must include the universal biohazard symbol and the word "BIOHAZARD", as shown.
3. It is not necessary to label individual containers that are placed for storage within a larger, labeled container used for storage, transport, shipping, or disposal.



V. Exposure Determination Process

A. Exposure Determination

1. If an employee's duties potentially expose them to human-sourced material which qualifies as a bloodborne pathogen hazard, the employee will be enrolled in the CU Denver | Anschutz Occupational Health Program and offered the Hepatitis B vaccination (HBV), in compliance with the [EHS Bloodborne Pathogens, Exposure Control & Hepatitis B Vaccination Policy](#)
2. The table below is a general guide to probable occupational exposure based on the usual job duties of the positions named. The final determination will be made by the Occupational Health Program staff based on what the person is actually doing, and the potential that poses for exposure to BBP.

Exposure Determination by Job Classification/Activities				
Job classifications	Type of location	Activities	HBV vaccine/titer offered	
CATEGORY 1* <ul style="list-style-type: none"> • Researchers • PIs • Professional Research Assistants • Instructors • Post-doctoral research assistants • Graduate students 	Research laboratories	Handling, culturing, analysis of human tissues, fluids, OPIM (i.e. human cell /tissue cultures) or HBV cultures; handling objects contaminated with human materials or HBV cultures	YES	
	Clinical faculty/staff	Research laboratories; clinical facilities		Handling/processing blood or serum samples; phlebotomy; patient contact.
	Biowaste technicians	Research laboratories; biohazardous waste collection areas		Handling biohazardous waste containers; biohazardous spill response
	Occupational Health professionals	Occupational Health clinic		Handling/processing blood or serum samples; phlebotomy; patient contact.
	Animal care technicians, vivarium staff	Vivarium animal procedure rooms		Handling humanized mice; administering human cells, tumors, tissues to animals
CATEGORY 2**	University police	Entire campus	Contact with accident victims; incidents in research laboratories and biohazardous waste collection areas	Dependent upon activity
	Facilities staff <ul style="list-style-type: none"> 1. General 2. Plumbers 3. Electricians 	1. Research laboratories; clinical areas; biohazardous waste collection areas; restrooms 2. Entire campus 3. Entire campus	1. Cleaning; waste collection 2. Sewer work; HVAC work 3. Work with autoclave	
	Environmental Health & Safety staff	Research laboratories; biohazardous waste collection areas	Incident response; lab audits/consultations; monitoring waste collection areas	
	Spill/incident response team	Research laboratories; biohazardous waste collection areas	Incident response to accidents, spills involving human blood or human-sourced materials	
	Work-study students	Research laboratories	Handling human materials or objects contaminated with human materials	
CATEGORY 3***	Parking attendants	Parking lots, offices	NO	
	Administrative staff	Offices		
	PRAs	Office only		
	Cooks	On-campus kitchens		
	Food service staff	On-campus kitchens and restaurants		

* Category 1: ALL employees have occupational exposure to BBP.

** Category 2: SOME employees may have occupational exposure to BBP.

*** Category 3: Employees are UNLIKELY to have occupational exposure to BBP.

VI. Exposure Control Methods

A. Observation and execution of the control methods outlined in this section are the responsibility of every individual and supervisor determined to be at risk of occupational exposure.

1. Occupational exposure to human blood and OPIM can occur through:

- a. Direct inoculation through the skin by means of cuts, abrasions, punctures, needlesticks, etc.
- b. Contact through direct or diffuse deposition on mucous membranes, i.e. mouth, eyes, nose, etc.
- c. Direct contact with broken skin, e.g. cuts, abrasions and dermatitis
- d. Ingestion of infectious materials, especially those which are infectious by the oral-fecal route (e.g. Salmonella, Hepatitis A, E. coli)
- e. Inhalation of infectious materials, specifically those which are infectious by the respiratory route (e.g. tuberculosis, influenza, adenoviruses)

2. Hepatitis B Vaccination

- a. Among the bloodborne pathogens, Hepatitis B is one of a number of infectious diseases affecting the liver. There are approximately 12,000 new cases among health care workers each year in the U.S. Hepatitis B can be prevented by a very effective and safe vaccine. Workers at risk of exposure to Hepatitis B should seriously consider the benefits of receiving the vaccine.
- b. Employees working with human blood, bodily fluids or tissues, or with bloodborne pathogens in culture or animals, should request and receive the Hepatitis B vaccine immediately, if they have not previously been vaccinated.
- c. It is the responsibility of the employer to provide access to the vaccine for occupationally exposed workers. Employee health services are not covered by Workers' Compensation. These services are paid by the CU Denver | Anschutz department or division employing the worker.
- d. Employees have the right to refuse vaccination, but may request to be vaccinated at a later date. Employees and students who refuse vaccination must sign a declination statement, which should be kept on file in the employing department. A sample declination form is available on the Environmental Health and Safety website.
- e. Initial vaccinations should begin within 10 working days of initial assignment.

B. Standard Precautions

1. The prevalence of HIV, HBV, and HCV infections in the general population increases the risk of infections to individuals who have occupational exposure to human blood, bodily fluids and OPIM.

2. Standard precautions are those practices which have been developed over several years for working with all human blood, bodily fluids and OPIM, whether or not there is a documented infectious agent present.
3. Standard precautions are to be practiced by all CU Denver | Anschutz employees who handle human blood, bodily fluids or other OPIM.
4. Standard precautions are intended to prevent parenteral, mucous membrane and non-intact skin exposures to bloodborne pathogens. In addition, immunization with the HBV vaccine is recommended as an important adjunct to standard precautions for workers who have exposures to these materials.
5. Standard precautions do not specifically apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. The risk of transmission of HIV, HBV and HCV from these fluids and materials is extremely low or nonexistent. However, it is important to remember that these fluids and excretions represent a potential source for nosocomial and community-acquired infections with other pathogens.

C. Fundamentals of Handwashing

1. A sink for handwashing shall be provided readily accessible to the work area. Personnel shall wash hands with soap and water.
2. The physical activity of rubbing hands together under running water is the most effective means of removing infectious agents. The best hand washing relies on the use of friction for a minimum of 15 seconds. Anti-bacterial soaps are not necessary.
3. Hands shall be washed:
 - a. immediately following any contact with blood, body fluids, tissues, or other potentially infectious materials
 - b. after removing gloves or other protective equipment
 - c. after handling potentially infectious materials (even when gloves are worn)
 - d. after completion of work
 - e. before leaving a laboratory
 - f. before and after eating, drinking, smoking, applying cosmetics, and manipulating contact lenses
 - g. after sneezing or coughing into hands
 - h. after using the restroom
 - i. before and after patient contact, even when gloves are used and regardless of whether patient is living or dead
 - j. before and after performing any vascular access procedures
 - k. before and after performing other invasive procedures

4. Hand-wipe towelettes and antiseptic hand cleaners do not provide the necessary dilution and detergent action and are generally not followed by rinsing. Therefore, they are only allowed whenever running water is not available. They are not to be used as a substitute for hand washing.
5. In addition to the indications listed in the ECP, accidental non-gloved contact with blood, body fluids, secretions, excretions and contaminated items warrant complete hand washing.
6. Only water-based hand lotion, which will not degrade gloves, may be used to prevent chapping.

D. Personal Protective Equipment (PPE)

1. CU Denver | Anschutz personnel shall be offered and will use the appropriate PPE for the tasks they perform, to prevent occupational exposure to infectious materials.

2. Gloves

NOTE: Glove allergies and sensitivities

Individuals with suspected or known allergies to the standard gloves provided in the work unit must report to the CU Denver | Anschutz authorized and designated Workers' Compensation Clinic for confirmation and documentation of diagnosis. If allergy is confirmed by the CU Denver | Anschutz authorized and designated Workers' Compensation provider, the work unit shall attempt to make reasonable accommodations, which may include the provision of special hypoallergenic gloves to these personnel.

- a. Gloves must be worn when working with blood, body fluids, secretions, excretions, and contaminated items.
- b. Gloves must be removed promptly after use, before touching uncontaminated items and environmental surfaces, and before leaving the work area.
- c. Hands must be washed immediately after removing gloves to avoid transfer of microorganisms.
- d. Gloves with visible defects must be discarded.
- e. Disposable gloves should **never** be washed and reused.
- f. Gloves contaminated with potentially infectious waste should be discarded into red biohazard bags.
- g. Double gloving is recommended in situations when gross contamination of gloves with blood/body substances is likely, and during exposure-prone procedures or invasive procedures where there is simultaneous presence of the workers' fingers/hands and needles or other sharp objects in a poorly visualized or highly confined anatomical site. Examples include autopsies and fine needle aspirates.

- h. Cut-resistant gloves should be used in situations that pose high risk for percutaneous injury (e.g., washing potentially contaminated sharp instruments and glassware, when using sharp knives for anatomical or surgical dissections, etc.).
- i. Petroleum-based hand lotions rapidly deteriorate latex. Therefore, only water-based hand lotions should be used. Organic solvents rapidly deteriorate latex.
- j. General-purpose rubber utility gloves should be used for cleaning the environment, equipment, and instruments. Intact rubber gloves may be decontaminated and reused, but must be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration.

3. Gowns, Lab Coats, Sleeves and Protective Clothing

- a. A clean gown or lab coat to must be worn to protect skin and prevent soiling of clothing during procedures and activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions,
- b. Remove soiled protective items as promptly as possible and launder.
- c. Laundering instructions
 - i. Uniforms and non-impervious laboratory coats used and purchased by personnel should not be taken home to be laundered.
 - ii. Central laundry services are not available for the University.
 - iii. These items should be cleaned and laundered on a routine or as-needed basis.
 - iv. Disposable gowns are recommended

4. Facial/Mucous Membrane Protection

- a. All personnel are to wear the appropriate facial protection for all procedures that have the potential for generating facial splashes, spray, or spatter.
- b. Appropriate facial protection barriers include:
 - i. Goggles or glasses with sidebars or molded sidepieces that cover both front and sides of the eyes.
 - ii. Face shields that fully cover the face above the eyes and below the chin (fastened securely to the head).

5. Puncture and Needlestick Precautions

- a. All employees must take precautions to prevent injuries when using needles, scalpels, and other sharp instruments or devices during procedures, when cleaning used instruments, during disposal of used needles and sharps, and when handling sharp instruments after procedures.
- b. Needles must NOT be recapped, purposely bent or broken, removed from disposable syringes, or otherwise manipulated by hand.

- c. Broken, contaminated glassware must not be handled directly with hands, but must be cleaned up by mechanical devices such as brush and dustpan or forceps.
- d. After use, disposable syringes and needles, scalpel blades, and other sharp items must be placed in puncture-resistant containers for disposal. The puncture-resistant containers must be located as close as practical to areas where disposable needles or sharps are used. The needle disposal containers are to be replaced before they become full (2/3 full or to the designated line on the container is considered time to replace).
- e. Leak-proof, puncture-resistant containers must be used to transport any reusable sharps to the reprocessing area.

6. Other Work Practice Controls

- a. The standard reference for biosafety in laboratories is the [CDC Biosafety in Microbiological and Biomedical Laboratories \(5th edition, December 2009\)](#). Copies are generally available through Biological Safety for a nominal fee. It may also be downloaded in its entirety from the CDC website.
- b. Workers are required to understand their assigned tasks, per their job description, as they involve the use of infectious or potentially infectious materials.
- c. Workers are required to know the exposure category assigned to the task.
- d. Workers must know the routes of exposure of any infectious or OPIM being used.
- e. Workers must know the procedure for requesting and receiving appropriate vaccinations or occupational health screening.
- f. Workers must know the location of, fitting of and proper use of PPE within the laboratory prior to starting work with BBP and/or OPIM.
- g. If working with human blood, bodily fluids or tissues, or with bloodborne pathogens in culture or animals, workers must request and receive the Hepatitis B vaccine immediately, if they have not previously been vaccinated. It is the responsibility of the employer to provide access to the vaccine for occupationally exposed workers. Employee health services are not covered by Workers' Compensation. These services are paid by the CU Denver | Anschutz department or division employing the worker.
- h. Workers must protect their face, eyes, mucous membranes and any broken, irritated or abraded skin from BBP and/or OPIM, infectious agents or rDNA.
- i. All accidental exposures must be reported to the area supervisor (in writing). The exposed area should be washed, and the appropriate first aid administered immediately.
- j. If there is a possibility of human blood or bodily fluid exposure or an infectious agent exposure, a medical evaluation should be obtained at the UCHHealth

Infectious Disease/Travel (TEAM) Clinic on the 7th floor of the Anschutz Outpatient Pavilion, between the hours of 8:00am and 4:30pm Monday through Friday.

- k. If the exposure occurs after business hours or during the weekend, UCHHealth Emergency Care is available for immediate evaluation and prophylaxis (if necessary), and follow up with the Infectious Disease/Travel (TEAM) Clinic should be continued the next available business day.
- l. Information on infectious agents should be given to the healthcare provider in the event of an exposure.
- m. See [University Risk Management website](#) for the form for reporting exposures. Contact the Biological Safety Officer (303-724-0235) for exposures to rDNA-containing materials so that the appropriate reports can be filed.
- n. Contact the Biological Safety Officer (303-724-0235) for exposures to rDNA containing materials so that the appropriate reports can be filed.

7. Standard Microbiological Practices

- a. Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure to potentially infectious material.
- b. Food and drink are not to be kept in refrigerators, freezers, shelves, and cabinets or in the laboratory.
- c. All procedures involving blood or other potentially infectious materials are to be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.
- d. Exposure to aerosols should be avoided, and aerosol-generating procedures should be conducted in a biosafety cabinet (BSC).
- e. Mechanical devices should be used for manipulating liquids in the laboratory. Mouth pipetting/suctioning of blood or other potentially infectious materials is prohibited. Appropriate experimental techniques, waste containment and appropriate cleaning techniques should be used.
- f. Laboratory work surfaces should be disinfected/decontaminated with an appropriate cleaner after work is completed or if a spill occurs.
- g. Workers must know the correct segregation of and disposal of infectious materials in the laboratory. This includes but is not limited to disposable tissue culture lab ware, pipettes and tips, etc.

E. Engineering Controls

1. Biological Safety Cabinets (BSC)

- a. BSC (also referred to as laminar flow hoods, or tissue culture hoods) will be used to handle potentially infectious materials that pose a threat of exposure via the generation of aerosols.

- b. Examples of these potential aerosol-generating activities include: sonification, homogenizing, vigorous mixing, blending, opening of centrifuged tubes, culture work, mixing, plate streaking, harvesting infected tissues from animals and embryonated eggs, etc.
- c. Removing rubber stoppers from specimen tubes frequently causes minor splattering of blood or serum. This can be minimized by covering the tube with a gauze pad soaked in alcohol.
- d. BSC must be certified annually by a competent certifying company, per CDC and NIH guidance, in accordance with National Sanitation Foundation (NSF) standards.
- e. Biological Safety may be consulted for additional information regarding the proper use and maintenance of BSC.

2. Vacuum Systems

- a. Vacuum systems will be fitted with filters to keep potentially infectious material out of the system (Appendix F).
- b. Vacuum lines shall be protected with liquid disinfectant traps and HEPA filters, which must be routinely maintained and replaced.
- c. Sufficient disinfectant shall be placed in the disinfectant trap, so that the disinfectant does not become less dilute than manufacturer recommendations.

NOTE: Potentially Contaminated Equipment

Equipment that has been contaminated with blood or other body fluids or OPIM must be cleaned and disinfected or decontaminated upon discovery of a spill or loss of containment. In general such spills are handled by laboratory personnel and should be reported to Biological Safety. Some incidents may be reportable to the Institutional Biosafety Committee.

Equipment that has been contaminated with blood or other body fluids or OPIM must be cleaned and disinfected or decontaminated before being repaired in the laboratory or transported for repair; before being transferred to another laboratory or campus; and before being discarded into the trash for disposal. This process is referred to on our campus as "green-tagging" Contact Biological Safety for additional information.

VII. Additional Requirements for HIV, HBV and HCV Research Laboratories and Production Facilities Propagating or Concentrating HIV, HBV and HCV

- A. This section applies to CU Denver | Anschutz HIV, HBV and HCV research laboratories and production facilities that culture, produce, concentrate, manipulate, or otherwise experiment with HIV, HBV and/or HCV viruses in the laboratory.
- B. Design of HIV, HBV and HCV Production Facilities

HIV, HBV and HCV production facilities shall meet the requirements as described in the most current edition of the CDC BMBL, the CU Denver | Anschutz Exposure Control Program and as recommended by current NIH and other appropriate design guidelines.

C. These requirements are in addition to other requirements listed in this Exposure Control Program.

1. HIV and HBV research labs shall meet the following additional criteria:
 - a. Exposure to these infectious materials shall be minimized or eliminated by implementing appropriate engineering controls, work practices and/or use of personal protective equipment.
 - b. A handwashing sink with elbow, automatic or foot pedal controls and eyewash facility must be present near the entrance of the laboratory. All personnel must thoroughly wash their hands upon leaving the laboratory.
 - c. An autoclave must be available in the facility where HIV, HBV or HCV are propagated or concentrated in large volume.
2. Special Practices
 - a. Standard microbiological practices will be used.
 - b. A biosafety manual must be prepared and present in the lab, reviewed annually, and used to train all employees working in these laboratories in all operational procedures. Each worker must be advised of potential biohazards.
 - c. The proficiency of each worker to safely perform basic duties in handling human biohazards must be ensured by the lab supervisor, lab PI, or director.
 - d. Laboratory doors will be kept closed while work is in progress.
 - e. Established written procedures regarding access to the laboratory must be followed. Access shall be restricted to authorized personnel who comply with these requirements.
 - f. The laboratory must have a biohazard warning sign with emblem at the entrance. The sign must designate the hazard, and state the biosafety level measures to be practiced, the name of the supervisor and the emergency contact information.
 - g. All work with infectious materials will be conducted in a certified BSC or controlled by other means.
 - h. Protective lab coats or gowns shall be worn at all times in the containment laboratory. Single use wear, i.e., gowns, booties, masks, must be discarded in infectious waste red bags. Provisions will be made for the decontamination, cleaning, laundering or disposal of and the repair or replacement of reusable lab wear.
 - i. Skin exposure to potentially infectious materials must be prevented by the use of gloves. Gloves should be replaced frequently in situations where they may be punctured in work activities.

- j. House vacuum lines should not normally be used in these labs. If used, they must be protected by proper traps containing fresh disinfectant and appropriate HEPA filters hydrophobic properties. These systems must be checked by the lab director or his/her designee to prevent vacuum line and pump contamination.
- k. Needle and syringe use should strictly be limited to parenteral injections, removal of materials from diaphragm bottles, and very few other applications. Needles must be of the locking type or fused to the syringe, should be disposed of, without recapping, in a proper sharps container, and never otherwise processed.
- l. Before disposal, all waste from work areas and from any animal rooms shall be decontaminated by a method, such as autoclaving, known to effectively destroy bloodborne pathogens. For appropriate disposal Standard Operating Procedures, contact Biological Safety.
- m. Contaminated materials and wastes that are to be decontaminated away from the immediate area must be transported in closed, color-coded, leak-proof, labeled containers following CU Denver | Anschutz policy and procedures for disposing of infectious wastes, as specified in the CU Denver | Anschutz Biosafety Manual.
- n. All spills of human blood or OPIM must be cleaned-up immediately by trained personnel using appropriate disinfectants and equipment maintained at the site. If the hazard is unknown or personnel do not have appropriate training or equipment, contact Biological Safety for assistance.
- o. Spills or accidents causing personnel exposures must be reported to the supervisor and the authorized and designated Workers' Compensation Clinic, which will provide proper follow-up.
- p. All spills of human blood, and OPIM, or other accidents that result in personnel exposures must be reported to Biological Safety, and may require reporting to the Institutional Biosafety Committee.

3. Containment Equipment

- a. Certified BSCs and/or appropriate PPE must be used in all handling of human blood, OPIM, and other biohazardous materials where possible.
- b. Aerosol-generating activities must use available biosafety containment technology to prevent exposures (e.g., safety cups for centrifuges, sealed rotors, containment animal caging, etc.). Appropriate steps must be taken to prevent skin exposure in situations where splashes are likely (e.g., use of protective screens, barriers, HEPA masks, etc.).
- c. Certification must be performed on each BSC when it is installed or moved, and at least annually. The cabinet must be decontaminated prior to filter removal, and before modifications affecting contaminated cabinet spaces are executed.

VIII. General Disinfection and Decontamination

A. Whether preparing infectious materials for disposal, or cleaning up a spill, there are three recognized levels of cleaning: disinfection, decontamination and sterilization.

1. Sterilization: the complete elimination or destruction of all forms of microbial life, including high numbers of bacterial spores. It is accomplished by either physical or chemical processes. Steam sterilization (autoclaving), dry heat, ethylene oxide gas (gas sterilization), and liquid chemicals are common methods.
2. Disinfection: the elimination of most or all pathogenic microorganisms on inanimate objects (with the exception of bacterial spores). A disinfectant generally destroys a specific target organism. This is usually accomplished by use of liquid chemicals or wet pasteurization.
3. Decontamination: the destruction of microorganisms to some lesser quantity, but not necessarily to zero.
4. Disinfection is appropriate for daily cleaning of work areas and work surfaces. The type of work, instruments, and potentially infectious materials in use best determines the proper level of cleaning.

B. Chemical Disinfectants

1. The proper selection and use of disinfectants is essential for safety and quality control. Disinfectants have various characteristics that must be considered before one is selected for a particular use. The disinfectant formulations registered by the EPA can be used for environmental surface cleaning, but the actual physical removal of microorganisms by scrubbing is probably as important, if not more so, than any antimicrobial effect of the cleaning agent used. Therefore, cost, safety, and acceptability with respect to laboratory procedures can be the main criteria for selecting any such registered agent.
2. Chemical disinfection is accomplished by dosing an infectious material with an appropriate amount of disinfectant. An appropriate disinfectant is one that will kill or reduce the numbers of the targeted agent to an acceptable level.
3. Materials termed “-cidal” kills or inactivates an agent (i.e. bacteri-, viru-, fungi-, tuberculo-, microbi-, spori-, or germi-). Many disinfectants will list their “-cidal” activity. To determine whether a specific agent will be killed, the label must be read thoroughly. Usually a manufacturer will include a listing of agents for which industry standard testing has been conducted.
4. The common classes of chemical disinfectants are alcohols, chlorine compounds, phenolic compounds, quaternary ammonium compounds, and iodophors.
5. Manufacturers of the types of disinfectants combine detergents with these materials to improve cleaning capabilities of their products. The manufacturer's comments must always be read carefully to assure appropriateness for a particular agent or agents.
6. The disinfectant table in Appendix E lists the disinfectants most commonly used in laboratories, some commercially available products, general use parameters, important

characteristics, potential applications, and general types of organisms they are effective against. This list should be used as a general guide for selection in meeting your particular requirements. Additional references should be obtained and, if necessary, actual testing should be done to determine the most effective disinfectant and use parameters.

NOTE: The EPA has defined disinfectants (antimicrobials) as pesticides. All EPA-registered antimicrobials must be used according to manufacturers' instructions.

7. Particular care should be observed when handling concentrated stock solutions of disinfectants. A majority of disinfectants are toxic to the human body by skin contact or inhalation. Personnel assigned the task of creating concentrations from stock solutions must be properly informed as to the potential hazards and trained in the safe procedures to follow.
8. Concentrated quaternary and phenolic disinfectants are particularly harmful to the eyes. Even a small droplet splashed into the eyes may cause blindness. Eye protection, long sleeved garments and chemically resistant gloves, aprons, and/or boots should be worn to protect you from the corrosive and toxic effects of the disinfectant.
9. Special Considerations
 - a. The effectiveness of a disinfectant to kill or deactivate infectious agents will depend upon many factors. The following factors must be considered before assuming a disinfectant will be suitable for the particular application:
 - i. Type of Microorganism. Chemicals are not equally effective against the different types of microorganisms.
 - ii. Degree of Contamination. The degree of contamination affects the time required for disinfection, the amount of chemical required, and other variables. For example, the greater the degree of contamination, the longer the contact time needed for effective treatment.
 - iii. Protein Content or Organic Load. Protein containing material (blood, plasma, tissue, etc.) absorbs and inactivates some chemical disinfectants. Halogens, i.e., chlorine, combine readily with proteins. Therefore, when protein-containing materials are present in the waste, sufficient quantities of chlorine bleach must be added to provide the excess needed to react with the microorganism.
 - iv. Type of Chemical. Different chemicals have different modes of action and levels of activity. It is important to understand the mode of action in order to select the appropriate chemical. For example, household bleach is ineffective as a disinfectant in either acidic or basic conditions because the hypochlorous acid is no longer available to penetrate the cell wall.

- v. Chemical Concentration/Quantity. Most chemicals have a range of concentrations that are suitable for use for disinfection. In the development of standard operating procedures, it is important to choose the proper concentration and quantity of chemical that are best used for the disinfection of each type of waste.
 - vi. Contact Time. It is essential that contact time be sufficient to allow for action of the chemicals on the microorganisms. The amount of contact time required for disinfection is proportional to the degree of contamination. Contact time with certain surfaces can cause damage to the surface (e.g. pitting of work surfaces in BSCs).
- b. Other Considerations. Other factors that should be considered in establishing standard operating procedures for chemical disinfection include temperature, pH, mixing requirements, and aggregations of microorganisms.

C. Standard Disinfectants

1. Standard disinfectants for cleaning work area(s) are listed here.
 - a. Household bleach used in a stock dilution of 1:10 (1 part bleach to 10 parts water). This solution should be made daily. However, it must be noted that a bleach solution is corrosive and will corrode stainless steel surfaces if not thoroughly rinsed with water.
 - b. 70% ethanol has commonly been used in the laboratory for disinfecting surfaces. Although it is somewhat effective as a general disinfectant if instruments are soaked in it, it is extremely flammable and has been responsible for lab fires which traveled along the path of the disinfectant vapor trail. Biological Safety does not recommend its use.
 - c. An iodophor disinfectant is a good general-purpose laboratory disinfectant, particularly in rDNA work areas. It is neither flammable nor significantly corrosive. It does however, discolor materials containing starch.
 - d. An alternate disinfectant is a phenolic containing solution, (e.g. EXPOSE). It can be used effectively for disinfecting many infectious agents. However, it is quite toxic in concentrated form. Caution must be used when handling it.
2. All disinfectants must be made per the manufacturer specifications.

D. Steam Sterilization

1. Steam sterilization is recommended for various types of infectious materials. Some examples are cultures and stocks of potentially infectious agents, fermentation wastes, and other infectious liquids not associated with radioactive or chemical materials.
2. Before steam sterilization is used routinely, the effectiveness of the method should be demonstrated for standard loads.

3. Steam sterilization is effective because the moisture available in the load sterilizes the material. The sterilization process - heating under pressure - causes the liquid materials to bubble or boil and may cause bottles to break or explode if overfilled or improperly contained. This is sometimes referred to as a "hot-bottle explosion". For this reason, only vented closures should be used when autoclaving liquids; do not tightly seal bottles. Glass bottles intended for autoclaving, such as Type I borosilicate glass should be used. **Ordinary glass bottles are not designed for sterilization.**
4. NEVER AUTOCLAVE FLAMMABLE OR OTHER HAZARDOUS CHEMICALS , such as corrosives (i.e. bleach, sodium hydroxide, acids, etc.).
5. Always carefully remove hot bottles from the autoclave and do not allow the bottles to be jolted. Do not move bottles if boiling or bubbling is present. The bottles should be allowed to cool to the touch before attempting to move them from the sterilizer shelf or tray(s). For more detailed information on proper autoclaving techniques and procedures refer to the manufacturer's operations manual.
6. Solid Infectious Materials
Materials categorized as infectious solids include pathological wastes, needles and sharps, tissue and culture plates, flasks, tubes, containers, etc.
7. All infectious wastes from this institution are disposed of through a third party vendor. With some exceptions, there is rarely a requirement for pre-treatment or disinfection of such materials prior to disposal in the designated biomedical waste streams.
8. In the case where a laboratory wants to autoclave biohazardous materials it is important to note:
 - a. The laboratory must be enrolled with EHS in the autoclave program
 - b. The autoclave to be used must be validated and tested with a biological indicator on a monthly basis
 - c. The laboratory must be in a building where arrangements have been made for autoclaved materials to be put into the regular trash
 - d. Otherwise such materials **CANNOT** be disposed of as regular trash. The autoclaved bags must be disposed of as infectious waste.

IX. Regulated Medical Waste Disposal

A. Classification of Regulated Medical Waste

1. Regulated Medical Waste (RMW) is a special (solid) waste in Colorado that requires special handling prior to disposal (6 CCR 1007-2 Section 1.2). RMW shall not be deemed hazardous waste solely because it is characterized as infectious waste.
2. The DOT defines RMW, which includes clinical waste, as a waste or reusable material derived from the medical treatment of an animal or human, which includes diagnosis and immunization, or from biomedical research, which includes the production and testing of biological products.

3. The safe handling and preparation of sharps for shipping is also regulated by the DOT. The DOT defines sharps as any object contaminated with a pathogen, or that may become contaminated with a pathogen through handling or during transportation, and is also capable of cutting or penetrating skin or a packaging material.
4. For the purpose of infectious waste disposal for this campus, the following categories of waste are designated as infectious:
 - a. Microorganisms (Cultures and Stocks)

Cultures and stocks of infectious agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, incubate and mix cultures.
 - b. Human Blood and Blood Products and Human Bodily Fluids

Waste human blood: products of blood: items saturated and/or dripping with human blood, or items that were saturated and/or dripping with human blood that are now caked with dried human blood; including serum, plasma, and other blood components; and their container, which is used in either patient care, testing and laboratory analysis or the development of pharmaceuticals; and specimens of bodily fluids and their containers.
 - c. Pathological Wastes

Human pathological waste, including tissues, organs, and body parts that are removed during surgery or autopsy, or other medical procedures, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, vaginal secretions, semen, pericardial fluid, and amniotic fluid from humans are all classified as infectious.
 - d. Contaminated Animal Carcasses and Bedding

Contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research (including research in veterinary hospitals), production of biologicals, or testing of pharmaceuticals.
 - e. Recombinant DNA and Modified Genetic Materials

Under certain circumstances, viable organisms containing altered genetic material may present a potential for causing diseases or toxic effects. All rDNA materials from this institution will be treated as infectious waste.

B. Segregation of Regulated Medical Waste

1. All waste products which meet the definition of an infectious waste must be collected in red bags and placed in an infectious waste container. Standing liquids are **NOT** permitted.
2. Currently most of the institution's laboratories are provided with rigid, color-coded tubs with lids and liners for transport containers. Containers should not weigh more than 50

pounds when they are closed for disposal. This is to prevent injury to those who must lift and move the containers.

3. Do **not** place non-infectious wastes (empty chemical reagent containers, pop cans, newspapers, pizza boxes, etc.) into red bags or autoclave bags. This unnecessarily increases disposal costs for the university.
4. Once properly packaged and labeled, infectious waste is picked up EHS personnel for transport to a central holding facility until picked up by the waste disposal vendor.
5. It is imperative that generators of infectious waste properly package the waste so that exposures and spill incidents do not occur. If there is a spill due to improper preparation of the infectious wastes, the laboratory will be contacted to remedy the situation.

C. Infectious Liquids

1. Infectious liquids have historically been chemically disinfected or steam sterilized. When there is a significant change in protocol or use of a different pathogen is involved, the method should be discussed with Biological Safety prior to implementing experiments.
2. Any disinfected liquid wastes can be safely disposed into the sanitary sewer if the proper steps are followed. Infectious wastes must always be properly treated prior to sewer disposal since there is no further pretreatment prior to entering the city sewer.
3. Infectious Liquids (bulk quantity, 25 ml or greater)
 - a. Infectious liquids cannot be poured or discarded directly into red bags due to the risk of leaking. Infectious bulk liquids can be properly disinfected or autoclaved prior to sink disposal. Most mixed wastes (chemical and radioactive wastes with infectious wastes) are unsuitable for disposal into the sanitary sewer.
 - b. Liquid infectious wastes must be chemically treated (with a liquid disinfectant in sufficient concentration) or autoclaved prior to disposal into any drain. Not all materials are suitable for treatment with bleach or autoclaving, particularly when volatile chemicals and/or radioactive materials may have been part of an analytical process generating wastes.
 - c. Concentrated infectious agents from large fermenters must be disinfected prior to sewer disposal.
 - d. Infectious liquids (e.g. whole blood) which cannot be easily disinfected for sink disposal, will be solidified, put in an appropriate container, and placed into the infectious waste stream. Contact Biological Safety to purchase a commercial product to solidify such liquids.
4. Large volumes of human blood, plasma or serum (greater than 100 ml) should be treated by solidification and proper disposal. Biological Safety maintains a supply for purchase by labs of material suitable for solidifying aqueous infectious wastes.

5. Sewer disposal of properly treated infectious liquids

- a. Disposable gloves, eye protection, and a laboratory coat or gown must be worn.
- b. Liquid waste may not be poured into sinks where people wash their hands.
- c. Liquid should be poured close to the surface of the water to prevent the generation of droplets and aerosols.
- d. Rinse waste down the drain with plenty of running water.
- e. Disinfect the container if it is to be reused. Discard non-reusable containers into the infectious waste container.

6. Other wet waste materials

Wet waste materials or wastes susceptible to leakage will be packaged with sufficient absorbent material to contain residual liquid and to minimize leakage. Animal bedding (wood chips), sawdust, newspaper, or paper towels are acceptable absorbent materials.

D. Sharps

1. The following items are defined as "sharps" for all applications at CU Denver | Anschutz campuses: needles, syringes, scalpel blades, razor blades, Pasteur pipettes, contaminated broken glass, slides of infectious materials.
2. All of the above products must be discarded into rigid plastic sharps containers which have secure lids, whether they are known to be infectious or not.
3. It is strictly prohibited to dispose of loose needles or syringes directly into red bags or household trash.
4. Do not attempt to place sharps items into needle buckets that are too small or too full.
5. Full sharps containers shall be placed in the red bags inside the infectious waste box after the lid and closure are secured tightly.
6. Syringe cartridges and empty IV bags will also be collected for disposal regardless of infectious potential.
7. The following items should be evaluated for potential infectious characteristics: plastic pipettes, large glass pipettes, any other glass containers, including broken glass, and appropriate disposal steps must be taken.
8. The following wastes, when contaminated with infectious materials, are considered to be sharps and must be placed inside rigid plastic buckets which have secure lids before being placed in the red bag-lined infectious waste box: test tubes, culture tubes, centrifuge tubes
9. Tubes Containing Liquids:
Test tubes, culture tubes, and centrifuge tubes containing very minimal amounts of blood or other infectious liquids must be placed inside leak resistant plastic containers prior to disposal in infectious waste tubs.

E. Tissue Samples, Organs, Anatomical Waste

1. Tissue samples and other body parts will be disposed of in the following manner:
 - a. Formalin containing tissue must be carefully decanted into a chemical waste container inside a working fume hood. Toxic formaldehyde vapors must not be inhaled. Waste formalin must be disposed of via EHS Hazardous Materials.
 - b. All tissue, organs, or anatomical waste must be placed into a leakproof container. If there is any chance for leakage, sufficient absorbent material must be placed in the leakproof container with the waste. The container can then be placed into a red bag-lined yellow infectious waste tub for disposal by incineration.
2. The materials above must be refrigerated if they are not disposed of immediately.

F. Animal Carcasses and Bedding

1. All reusable animal cages and any bedding must be returned to the vivarium for appropriate cleaning and disposal.
2. Animals and bedding which may be contaminated with infectious materials, toxic chemicals, carcinogens, or antineoplastic drugs, or radioactive materials must be collected for proper disposal through EHS. OLAR-CCM has set up specific procedures for segregation of contaminated materials.
3. Animal carcasses and bedding which is generated by animals affected with a potential zoonotic disease must be handled as infectious pathological waste.
4. Animal carcasses and bedding which contain potentially infectious materials will be placed into carcass bags and labeled appropriately. Animal carcasses must be refrigerated or frozen if not disposed of immediately.

G. Mixed Wastes

1. Mixed wastes are those which contain infectious materials, and/or hazardous chemicals, and/or radioactive waste, in any combination. Mixed wastes may not be disposed of in infectious waste boxes.
2. A waste that contains radioactive and infectious materials must be disinfected by an appropriate chemical disinfectant or autoclaving, if appropriate, per the RAM authorizations. Autoclaving is not an acceptable method for disinfecting a radiolabeled infectious material in every instance, as there is a potential for emissions of radiolabeled vapors or aerosols. Contact Radiation Safety to verify the appropriate process.
3. If the mixture is an aqueous based solution, a disinfectant solution must be used. (Do not mix bleach with an acidic solution, as this may evolve hydrogen chloride gas.)
4. If the mixed waste is organic based, a phenolic disinfectant such as Lysol (hospital grade), Expose, or Beaucoup must be used. When the mixture has been appropriately disinfected, contact Radiation Safety for pick-up.

5. A mixed waste stream involving infectious materials and hazardous chemical wastes must be evaluated for appropriate disposal. The hazardous waste stream does not allow the disposal of infectious materials. *De minimus* or trace amounts of certain chemical and cytotoxic wastes are often difficult to dispose of appropriately. Contact Hazardous Waste and/or Biological Safety for additional assistance.
6. If a waste stream does not meet these criteria, contact Biological Safety for assistance.

X. Exposure Incidents & Reporting

NOTE: In the case of a life-threatening emergency,

CU Anschutz

Dial 911 from a campus phone

303-724-4444 from a cell phone

CU Denver

Dial 911 from a campus phone

303-556-5000 from a cell phone

- A. In the case of a potential exposure incident, specific steps must be followed to report the incident and receive a medical evaluation and follow up.
 1. Employees who have been exposed to human blood and other potentially infectious materials (e.g., cut, needle stick, inhalation of aerosols, spills, infected animal bites, other accidents involving human blood and other potentially infectious materials, etc.) must report immediately to the authorized and designated Workers' Compensation Clinic for a confidential medical evaluation.
 2. Anyone experiencing an acute sharps injury (e.g. needlestick), eye or mucous membrane exposure, may also report to the UCHHealth Infectious Disease/Travel (TEAM) Clinic on the 7th floor of the Anschutz Outpatient Pavilion for a confidential medical evaluation. The clinic is open Monday through Friday, 8 am to 4:30 pm.
 3. All other hours, report to UCHHealth Emergency Care for a confidential medical evaluation.
- B. The affected individual must report the exposure/injury in writing to the supervisor within four business days of the incident.
- C. The appropriate [Workers' Compensation claim form](#) should also be completed within four business days. It can serve as the written notice to the supervisor as well.
- D. All incidents involving any potential exposure to recombinant DNA must also be reported to Biological Safety and is reportable to the Institutional Biosafety Committee.

XI. Spill Management

A. General Instructions

1. For spills of what appears to be human or animal blood or bodily fluid **located outside a laboratory environment** (e.g. hallways, stairwells, sidewalks, etc.), contact Facilities Operations (303-724-1777) for cleanup.

B. Laboratory Spills

1. Most laboratory spills of infectious materials can be safely cleaned up by the laboratory personnel who work with and are familiar with the hazards of the particular infectious agent involved. Most hazards are associated with bloodborne pathogens, however, for some laboratories, there is a risk of exposure to ingested or inhaled agents.
2. Spills of infectious materials that exceed the ability of laboratory personnel to manage should be reported to EHS and assistance will be provided. Where it is possible an agent has become aerosolized or airborne, EHS should be immediately contacted for assistance.
3. PPE to be worn during a spill cleanup
 - a. A laboratory coat or disposable gown.
 - b. Gloves: Always wear two pairs of gloves. An inner set of disposable nitrile or latex gloves is recommended. An outer impermeable glove is recommended if there is broken glassware or other sharps in the spill area. Immediately replace the gloves if they are torn or become grossly contaminated. If spilled material comes into contact with skin, immediately remove the gloves and wash hands or other exposed skin with soap and water.
 - c. Eye protection consisting of goggles or face shield.
 - d. A N95 respirator is required for potential airborne agents. Most laboratorians are not routinely fitted for these respirators. Where it is possible an agent has become aerosolized or airborne, EHS should be immediately contacted for assistance.
4. Forceps, tongs, or needle-nose pliers should be used to pick up any broken glass and then place it into a rigid sharps container. Use a dustpan and broom to clean up small shards of glass.
5. Decontaminate all equipment used in cleaning the spill before placing it back into service. Wash hands thoroughly with soap and water after the clean-up is completed.
6. Small spills less than 100 ml
 - a. Surround and cover the spill with absorbent materials (i.e. paper towels, disposable absorbent pads, etc.), working from the outside toward the center. Absorb as much of the material as possible.
 - b. Prepare a fresh solution disinfectant following the manufacturer's directions.

- c. Carefully pour disinfectant over the spill area covered with absorbent materials, until soaking wet. Allow at least 20 minutes of contact time before attempting further clean up.
 - d. Wipe up as much as possible, then repeat the procedure. Place all waste in a red biohazard bag .
 - e. Wipe any cleaning aids (tongs, etc.) with the disinfectant solution or dispose of them in a rigid container.
7. Large spills more than 100 ml
- a. An appropriate absorbent (Isosorb) may be used to pick-up much of the spill if it is aqueous. Diatomaceous earth (Ultrasorb 248), paper towels or absorbent pads may be used. Carefully apply the absorbent at the outside edges of the spill working towards the center.
 - b. After 20 minutes of contact time, scrape up the absorbent material and place into a red biohazard waste bag. Repeat as necessary.
 - c. Place the waste into a red biohazard waste tub. Be sure that the initial cleanup is thorough (no visible contaminant), so that complete disinfection can occur.
 - d. Carefully spray the spill area with disinfectant, until soaking wet. Allow at least 20 minutes of contact time before attempting further clean up.
 - e. Wipe up as much as possible, then repeat the procedure. Place all waste in a red biohazard tub.
 - f. Wipe any cleaning aids (tongs, etc.) with the disinfectant solution or dispose of them in a rigid container.
8. In cases involving large spills, infectious agent which may be airborne, or where lab personnel do not possess the skills and/or equipment to perform cleanup, call EHS for immediate assistance, 303-724-0345.
9. For spills involving a BSL3 containment facility, contact the appropriate campus police department.
- a. If circumstances warrant and the laboratory staff cannot clean the spill on their own, the immediate area should be evacuated, the door to the biosafety cabinet and/or room door should be closed, and others should be prevented from entering the affected area. The person contacting the police should remain available to assist in the spill response.

Resources

Biological Safety in Biomedical and Microbiological Laboratories (BMBL)

https://www.cdc.gov/labs/BMBL.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fbiosafety%2Fpublications%2Fbmb15%2Findex.htm

Biological Spill Clean Up Procedures

<http://www.ucdenver.edu/research/EHS/Pages/informationaldocuments.aspx>

Biological Agent Risk Groups

<https://my.absa.org/Riskgroups>

Bloodborne Pathogens Exposure Control and Hepatitis B Vaccination Policy

<http://www.ucdenver.edu/research/EHS/OH/Pages/InformationalDocuments.aspx>

EPA APPROVED DISINFECTANTS

<https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants>

Laboratory Safety: Principles and Practices, p.188 [83]. Found in: *Biosafety on the Laboratory*. National Research Council (1989). National Academy Press. Washington, D.C.

On-the-Job Training Form

<http://www.ucdenver.edu/research/Research%20Administration%20Documents/On-the-Job%20General%20Safety%20Training.pdf>

Occupational Safety and Health Administration (OSHA)

- **BBP Standards/Regulations:**

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10051&p_table=STANDARDS

- **Worker Protections:** https://www.osha.gov/SLTC/bloodbornepathogens/worker_protections.html

Vacuum Filtration Protection (see page 322)

https://www.cdc.gov/labs/BMBL.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fbiosafety%2Fpublications%2Fbmb15%2Findex.htm

APPENDIX A

Definitions

All employees should be familiar with the following terms, used throughout the ECP.

Blood – Human blood, human blood components, and products made from human blood.

Bloodborne Pathogens (BBP) – Pathogenic microorganisms present in human blood which can cause disease in humans. These pathogens include but are not limited to HBV and HIV.

Engineering Controls – Controls (e.g., sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace.

Exposure Incident – A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Occupational Exposure – Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Other Potentially Infectious Materials (OPIM) – All human body fluids; any unfixed tissue or organ (other than intact skin) from a human; HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral – Mucous membrane exposures or piercing the skin barrier through such events as needlesticks, human bites, cuts, and abrasions.

Personal Protective Equipment – Specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Standard Precautions – Those practices and precautions conducted so that all potentially infectious materials are treated as if known to be infectious

Work Practice Controls – Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).