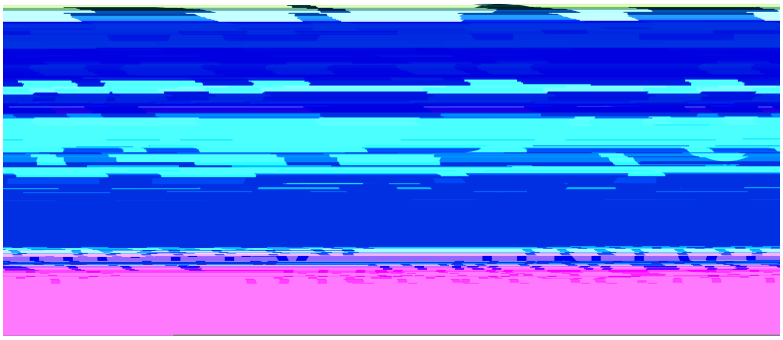

Biological Safety Manual

The Biological Safety Manual is Reviewed and Updated Annually

By Environmental Health & Safety
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Overview

Pace University's Approach to Biosafety

School of Law-White Plains: Preston Hall Lobby	(914) 422 - 4300
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CHAPTER 1.0 INTRODUCTION

- Ensure laboratory personnel develop and adhere to proper health and safety protocols.

- Provide direction to supervised individuals regarding required safety training necessary prior to work involving biological hazards.
- Provide appropriate training resources.
- Develop practices and procedures that serve to protect employees and students.
- Maintain workplaces and equipment under your direction in a safe, well maintained manner.
- Identify and meet the safety needs for personnel they relate to appropriate engineering controls, training, personal protective equipment and corrective measures for non-compliant issues.
- Conduct periodic self-audits to identify operational gaps in work practices and or facilities.

1.3.3 Employees and Students

- Comply with policies and procedures outlined in this manual and all other university health and safety practices and programs.
- Attend all required health and safety training.
- Conduct activities involving the use of biological materials in a safe manner using information received through safety education or training, properly functioning safety equipment or devices, all recommended personal protective equipment and specific standard operating procedures as necessary for the work being done particularly those involving the use of carcinogenic or radioactive materials, select agents or recombinant DNA.
- Inform supervisor or instructor of any safety hazards in the workplace.
- Report accidents, laboratory acquired illnesses, material losses and work site injuries to supervisor or instructor.

1.3.4 Department of Environmental Health

1.3.9 Institutional Review Board for Human Participants (IRB)

- Protect the rights and welfare of individuals who volunteer to participate in the research mission of the University.

1.3.10 Safety & Security

- Ensure that the university has an integrated approach to Safety, Health, and Risk Management across the campus.

Chapter 2.0 RISK ASSESSMENT and MANAGEMENT

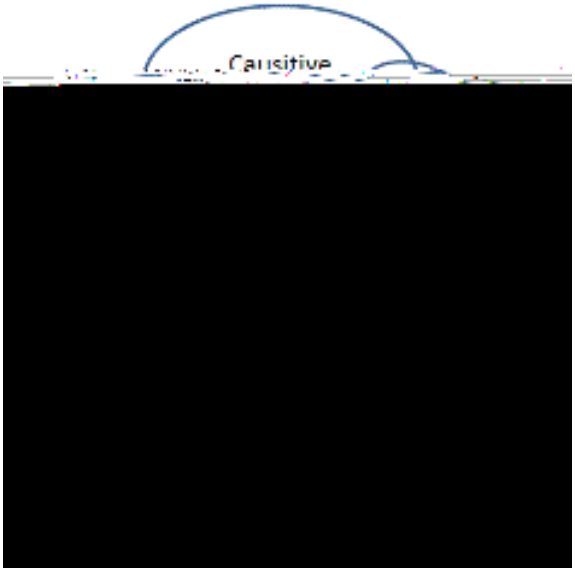
The essential steps in the risk analysis and management process are outlined below:

2.1 Assessment

Risk assessment serves as the basis for developing and implementing safeguards to protect the health and safety of laboratory workers and the public from risks associated with working with hazardous materials. The term risk implies that there is a probability that injury or disease will occur. This probability increases with the number of hazardous activities or the number of related variables. Working with biological material may be hazardous given the specific material or agent. However, since research involving biological materials often involves the use of radiological and/ or chemical materials, it is imperative that the risk assessment strategy assume a holistic approach, one that accounts for contributing hazards from sources other than the biological that may further complicate the task of managing risks within the laboratory. The risk assessment process is designed to assist personnel in the proper selection of appropriate biosafety levels, training, procedural protocols, microbiological practices, safety equipment, and facilities to prevent occupationally acquired infections. It is essential that the risk assessment be performed ’”‹‘” –‘ –Š‡ •–ƒ”–‘ˆ ò”‹•›ó ƒ…–‹˜‹–‹‡• determination of the Ž ƒ••‡•‡• acceptability of risks are necessary activities when judging the safe handling of potentially infectious organisms. An agent or procedure is considered safe when the risks associated with it are well managed. The risk assessment process must be mutable and must change as agent use, practices, employees or facilities change.

2.3 Resources

The Material Safety Data Sheets for Infectious Substances developed by the Public Health Agency of Canada contains health hazard information such as infectious dose, viability (including decontamination), medical information, laboratory hazard, recommended precautions, handling information and spill procedures. The Control of Communicable Diseases Manual is an important reference for information on communicable diseases and provides detailed agent



2.4.2 Understanding the Infectious Disease Process

The infectious disease process is defined as the interaction between the pathogenic microorganism, the environment, and the host. The process may be thought of as a circular chain with six links.

For an infectious disease to occur, each link in the chain must be connected. Missing links and/ or breaks in the chain interrupt the infectious disease process.

2.4.3 Factors to Consider When Evaluating Risk Posed by a Biological Agent

- Pathogenicity - the ability of an agent to cause disease.
- Virulence - severity or degree of pathogenicity
- Route of transmission - Historically, agents that can be transmitted via the aerosol route have caused the most laboratory acquired infections. Agents that exhibit greater aerosol potential, pose a higher risk of infection to personnel.
- Agent stability - An increased ability of the agent to survive in the environment, results in a higher probability of transmission. Consider whether factors such as desiccation, exposure to sunlight/ ultraviolet light or chemical disinfectants influence agent stability.
- Infectious dose - the infectious dose varies from organism to organism and can range from one to hundreds to millions of organisms or infectious units. The investigator must be conscious of the amount of agent needed to cause illness in a healthy individual. However, the investigator must also bear in mind that individuals with compromised immune systems demonstrate an increased susceptibility to infection at much lower doses.
- Concentration - Given that the risk of infection generally increases as the agent concentration increases, the investigator must consider if procedures such as amplification, sonication or centrifugation may affect the amount of agent or its transmissibility. Additionally, investigators must take into account the presentation of the material whether solid tissue or media, viscous blood or fluid.
- Origin - This may refer to a geographic location (foreign or domestic), host (human, plant, animal, zoonotic) or nature of the source (disease outbreak, clinical diagnostic specimen).
- Availability of data from animal studies - while data from animal models does not always correlate directly to agent action in human models, this information is quite valuable in the absence of human data.
- Availability of effective prophylaxis or therapeutic intervention - effective vaccines, if available, should be offered to laboratory personnel in advance of their handling infectious material. However, immunization must not substitute for engineering controls,

protective equipment (PPE). The availability of post-exposure prophylaxis should also be considered and discussed with personnel.

- Medical surveillance - medical surveillance is an important component of occupational medical support services and serves as a form of secondary protection. Effective surveillance programs help to identify exposures early, preventing further injury and expedite treatment.
- Experience and skill level of at - risk personnel - in this environment, it is essential that laboratory workers demonstrate proficiency in specific tasks prior to working with microorganisms. The investigator must develop tools which accurately assess employee aptitude and document that staff has demonstrated the skills necessary to work with biological materials.

2.4.4 Risk Group Classification of Infectious Agents

Several systems exist for the classification of human and animal infectious agents (e.g., NIH Guidelines, WHO, Canadian Biosafety) based on the relative hazards these agents may pose to healthy, immuno-competent individuals in the laboratory.

Classification of Infectious Microorganisms by Risk Group

Risk Group Classification	NIH Guidelines for Research involving Recombinant DNA Molecules 2002 [2]	World Health Organization Laboratory Biosafety Manual 3rd Edition 2004[1]
Risk Group 1	Agents not associated with disease in healthy adult humans.	(No or low individual and community risk) A microorganism unlikely to cause human or animal disease.
Risk Group 2	Agents associated with human disease that is rarely serious and for which preventive or therapeutic interventions are often	

Restricted animal pathogens defined as animal pathogens that are excluded from the United States by law or whose entry is restricted by United States Department of Agriculture administrative policy are also prohibited.

The NIH Guidelines contain a comprehensive list of risk group 2-4 agents. However, those agents not listed in Risk Groups 2, 3, and 4 are not automatically or implicitly classified in Risk Group 1; you must conduct a risk assessment on the known and potential properties of the agent, and consider the relationship to agents on the list. The risk group classification and the types of laboratory activities being conducted are used as a starting point to estimate the appropriate containment for working with a biohazardous agent and assignment to one of four biosafety levels (BSL1-4). The assigned biosafety level takes into consideration characteristics of the agent such as its infectivity, severity of any associated disease, transmissibility and the nature of the work being conducted. Generally, organisms of a particular risk group are handled at the corresponding biosafety level (e.g., RG2 at BSL2). The fundamental principle of biological safety is containment. A thorough understanding of containment includes knowledge of acceptable practices and techniques, components of primary barriers, protective clothing, mechanical devices, and secondary facility design. Each of these components contributes to decreased personal exposures, and laboratory and environmental contamination.

Bloodborne Pathogens and Standard/ Universal Precautions
Universal precautions require that all blood and body fluids be handled as if contaminated with HIV, HBV or other bloodborne pathogens. In the laboratory, this translates to the consistent use of standard microbiological practices, BSL2 facilities and BSL2 specific practices in addition to additional precautions identified by the risk assessment.

2.4.5 Recombinant DNA (rDNA)

Recombinant DNA organisms are typically constructed by introducing a small segment of ˆ”‘• ƒ ò†‘•‘”ó ‘”‰ƒ•‹•• ‹•–‘ƒ ò”‡…‹’‹•–ó ‘”‰ƒ•••ä Š‡ ‰‡•‘ ‘”‰ƒ•• †‡”‹˜‡† „› ƒ ”–‡…Š•‹“—‡ ˆ”‘• –Š‡•‡ –™‘ that ƒ”‡•–• ‹ of the recipient organism. Since all but a small fraction of the genetic information in the modified organism is that of the recipient organism. The risk assessment of the new organism would rely heavily on the knowledge of its parental organism, as well as on an analysis of how the new organism appears to differ from the parent. Contact EH&S prior to beginning any rDNA work.

Properties of donor and recipient organisms
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The relevant properties of the recipient organism and the donor DNA provide information on the properties specific to the modified organism. Description of the rDNA techniques for deriving the organism provides important information on its anticipated properties. Component parts, for example, would include the donor nucleic acids, control elements, linking sequences, antibiotic resistance genes, flanking regions etc.

Properties of the organism derived by rDNA techniques

humans, the greater the risk of its use. The following chart summarizes the risk assigned to intrinsic properties of cell cultures.

Intrinsic Properties of Cell Cultures and Associated Risk Level

Often, cells are deliberately infected with pathogens as part of the study design. The risk assessment must include the Risk Group categorization of the agent and the associated risk factors. Additionally, one must consider the presence of uncharacterized, adventitious contaminating biological agents within the cell line. These agents may include bacteria, fungi, viruses, prions, mycoplasma or parasites. The user should be aware that cell lines are generally not screened to rule out the presence of adventitious biological agents. Finally, due to the nature of many cell lines, tumorigenic potential must also be considered in the risk assessment. Under certain circumstances, a cell line may be considered free of contaminating agents. These conditions are outlined below.

Conditions to be fulfilled in order to consider cells free of adventitious contaminating pathogens:

- Use of well-characterized cell lines or controlled cell sources for primary cells such as specified-pathogen-free (SPF) animals.
- In the absence of well-characterized cell lines or SPF, tests for detection of likely contaminating agents should be negative;
- The use of media sources free from contamination;
- The use of appropriate containment measures to reduce contaminations during sampling or subsequent manipulation of cells (re-feeding, washing steps).

The following flowchart summarizes key steps in the risk assessment of a cell line.

A culture collection, such as ATCC will generally recommend a minimum the containment level required for a given cell line based upon its risk assessment. For most cell lines the appropriate level of containment is Category 2. However, this may need to be increased to Category 3 depending upon the type of manipulations to be carried out and whether large culture volumes are envisaged. In order to receive Risk group 2 level materials

Occupational Inhalation Exposure may occur through the following practices:

- Using aerosol-generating procedures such as vortexing, blending, sonicating, etc.
- Changing contaminated bedding from infected animals
- Blowing out pipettes

Parenteral Inoculation may result in the piercing of skin or mucous membranes by:

- Accidental inoculation with needles, sharp instruments, broken glass, etc.
- Cuts, scratches
- Animal bites

2.6 Recognizing Task/ Equipment Specific Hazards

The equipment discussed below are known to produce aerosols in the laboratory under normal operating conditions however, it is the responsibility of the Principal Investigator to identify any and all aerosol generating sources of equipment and encourage the use of techniques that minimize the release of aerosols and subsequent exposures to laboratory staff.

Equipment

Centrifuge

Centrifuges are commonly found in microbiological laboratories. They provide a physical barrier between the worker and the bio-hazardous material being centrifuged.

Centrifuges are also a source of exposures to infectious aerosols and have been associated with hundreds of laboratory-acquired infections. Practices such as filling tubes, removing caps after centrifugation, removing supernatants, and resuspending pellets can create aerosols. The most significant hazard, however, is created when a tube containing infectious material breaks during centrifugation. To minimize the risk of creating hazardous aerosols, equipment should be properly maintained and personnel trained on operating procedures. All centrifugation of biohazardous materials must use safety buckets or sealed centrifuge tubes in sealed rotors. If centrifuging infectious materials, the rotors should be opened in the BSC. Small centrifuges that are not equipped with safety cups may be operated in the Biological Safety cabinet. A log book should be maintained detailing operation records for centrifuges and rotors. Observe the following procedures when infectious and biohazardous materials are centrifuged:

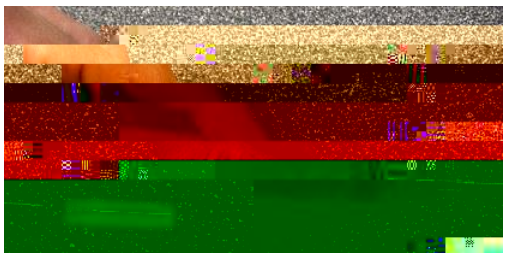
- Always retrieve samples, change blades, dislodge blocks, or clean equipment with appropriate engineering controls (i.e. forceps, tweezers, dissecting probes, and small brushes
- Always keep hands away from blades.
- Use extreme caution when aligning blocks, the block may be close to the blades. If available, make sure block holder is in locked position when loading/aligning blocks.
- Use protectors/guards for knife-edges that may extend beyond microtome knife holder.
- Keep blocks wet when in the microtome to minimize airborne shavings during slicing.
- Wear appropriate PPE such as gloves, lab coat/gown, mask, safety glasses or goggles. Consider the use of surgical grade Kevlar gloves to provide additional protection from cuts and scrapes.
- Avoid freezing propellants that are under pressure as they may cause splattering or droplets of infectious materials.
- Decontaminate equipment on a regular schedule using an appropriate disinfectant.
- Considertrimmings and sections of tissue as contaminated and discard in the appropriate waste stream.
- Do not move or transport microtome with knife in position.
- Secure knives in containers when not in use.
- Do not leave motorized microtomes running unattended.

Miscellaneous Equipment

Ultra low freezers, liquid nitrogen, and dry ice chests as well as refrigerators should be periodically checked and cleaned out to remove any broken ampoules, tubes, plates, etc. that contain infectious or biohazardous materials, and subsequently decontaminated. Use rubber gloves and respiratory protection during this cleaning. All infectious or toxic material stored in refrigerators or deep freezers should be properly labeled. Security measures should be commensurate with the hazards. The degree of hazard represented by contaminated liquid nitrogen reservoirs will be largely dependent upon the infectious potential of the stored microorganisms, their stability in liquid nitrogen, and their ability to survive in the airborne state. Investigations suggest that storing tissue culture cell Lines in con

Cryogenic Liquids

When working with cryogenic materials such as liquid nitrogen, you must wear appropriate PPE including face shields, splash goggles and heavy leather or other insulating protective gloves. These items must be worn during the transfer and normal handling of cryogenic fluids. Additionally, shirt sleeves should be rolled down and buttoned over glove cuffs, or a lab coat, should be worn in order to protect against liquid spraying or spilling inside the gloves. Trousers without cuffs should be worn. Avoid storing cryogenics in cold rooms, environmental chambers, and other areas with poor



Pipettes

- Use pipetting aids when pipetting infectious materials. Even with pipetting aids, pipettes should always be plugged with cotton. When possible, perform pipetting activities in a biosafety cabinet.

Note: Never suction or pipette by mouth.

- Pipette toxic chemicals in a chemical fume hood.
- Do not forcefully expel infectious or toxic materials from a pipette. Discharge as close as possible to the fluid or agar level. To expel the last drop of liquid, touch the pipette end to the side of the container to break the surface tension.
- Avoid mixing infectious or toxic fluids by alternate suction and expulsion through a pipette, or by bubbling air from a pipette through the fluid.
- Place a disinfectant dampened towel or other absorbent material (e.g., plastic backed bench paper) on the work surface to catch stray droplets of infectious or toxic materials.
- Contaminated pipettes should be placed horizontally into a pan or tray containing enough suitable disinfectant (e.g., 1:10 dilution of household bleach) to completely immerse the pipette. These disinfectant trays should

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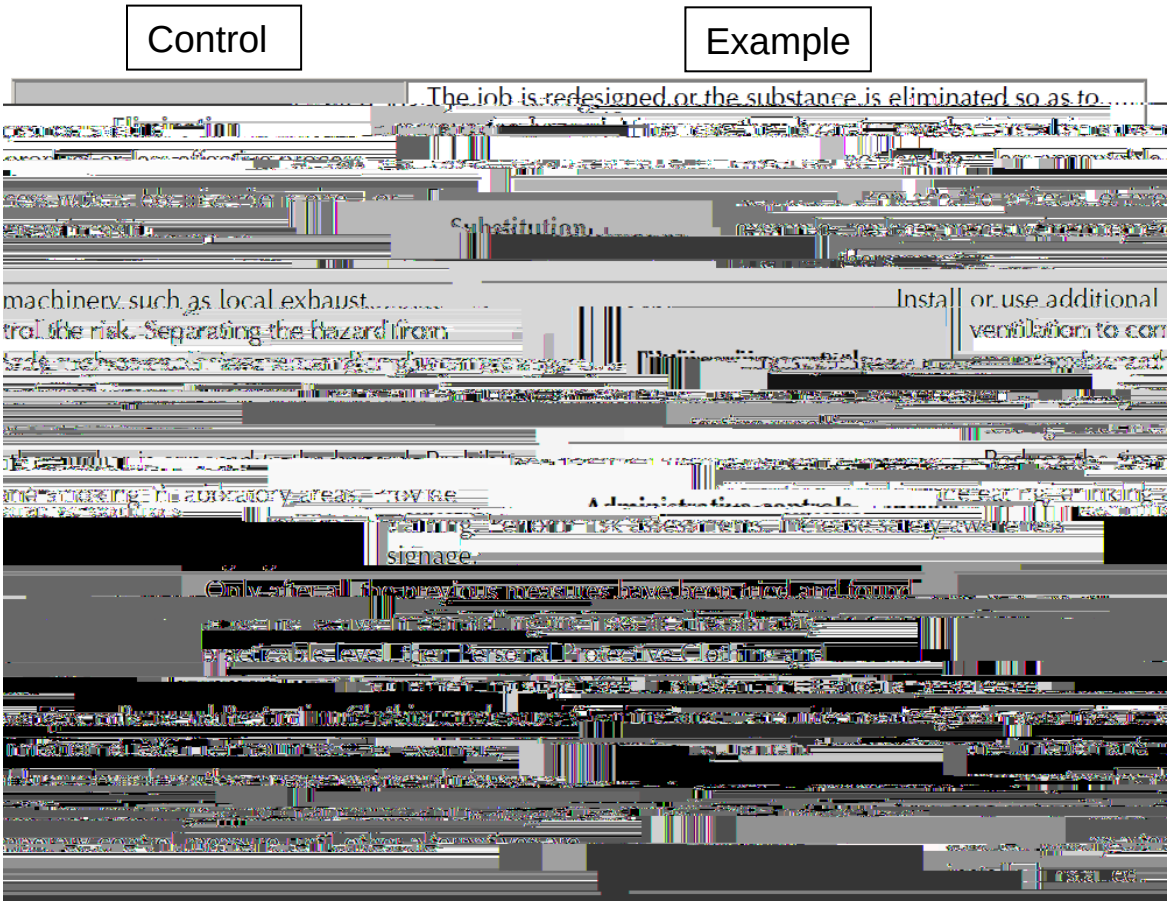


3.1 Administrative Controls

Training

Adequate training is essential to establishing and maintaining a safety culture in the laboratory. It is the responsibility of the Principal Investigator to define training objectives for laboratory staff and specify the skill set needed to meet the desired level of proficiency. Initial training must be based on a need assessment which defines tasks and details the steps needed to accomplish them. It must include problem solving and stress corrective and preventative actions which rely on thinking and reasoning approaches as opposed to sheer memorization. Training must be followed by documented evaluation and revised or repeated as needs change. Finally, the overall effectiveness of training is dependent on management buy-in and good communication. At minimum, laboratory staff must receive training in:

- The appropriate selection and use of personal protective equipment
- The appropriate use of laboratory equipment and instrumentation
- Hazard recognition in the laboratory (chemical, biological, radiological, electrical)
- Good microbiological technique
- Appropriate decontamination and disinfection procedures
- Proper handling of waste streams
- Accident/ exposure reporting
- Notification and emergency procedures

- Laboratory specific protocols and procedures
- Additional required training may include:
- Bloodborne Pathogen training
- Biosafety Level 2
- Shipping and Transport of Infectious Materials

Outside Vendor Training Programs

Principal Investigators and laboratory supervisors can provide training programs to their employees through con-tracts with outside training companies or product vendors. A number of vendors are willing to provide free training programs upon request. If using an outside company or vendor, be sure to ask for documentation including training content, date of training, copies of handouts, and the sign-in sheet. All of this documentation must be kept on file.

In-House Training Programs

In-house training can include department provided training, and training by Principal Investigators and laboratory supervisors. Training sessions can be stand-alone classes, on-the-job training, or short (15 minute) training

- Spill response measures
- Decontamination procedures
- Description of how to perform the experiment or operation
- Standard Operating Procedures

It is the responsibility of Principal Investigators and laboratory supervisors to ensure that

safer, alternative procedures or non-infectious or less infectious organisms that could be substituted, and yet provide the desired outcome. While there is a wealth of acceptable procedures that have been performed in the laboratory for many years, the inherent safety of an activity is not always implied from its long-term usage. Consider the example of mouth pipetting, commonly used for many years, which is now considered a high-risk practice.

General Good Laboratory Practices

- Outer street clothing (coats, hats, etc.) should be kept in an area where accidental contamination with infectious or other hazardous materials is unlikely to occur.
- Long hair, beards, and loose

Chromic acid should not be used due to its toxicity and disposal concerns. One product that may be substituted for Chromic acid ‹ • ò ‘ … Š ” ‘ • ‹ š ‡ ƒ ‰ ‡ • – ó ä log Š ‡ ‹ • Š ‡ ” … describes this material as: ò ‘ … Š ” ‘ • ‹ š ‡ ƒ ‰ ‡ • – ä • ‘ ” ‰ chemically clean ce glassware, contains no metal ion, rinses freely leaving no metal residue, making this product valuable for trace analysis, enzymology, and tissue culture work. It is mixed with sulfuric acid.

Standard Microbiological Work Practices

- The overall use of standard microbiological practices can minimize and even prevent exposure to biohazardous materials. Standard practices are based on the primary need to protect the worker, coworkers, community and environment while assuring product integrity.
- The principal investigator or laboratory director should limit or restrict access to the laboratory when experiments that involve infectious agents or biohazardous materials are conducted. Additionally, the principal investigator can impose special entry requirements, such as personal protective equipment or immunizations.
- Wash hands with soap and water after exposure to potentially infectious materials, after removing gloves and other personal protective equipment, after completion of any procedure in which biohazardous material is used, and before you leave the laboratory. If a sink with water and soap is not available or accessible, alcohol based hand sanitizers (e.g., gels or foams) can be substituted.
- Storage of food in refrigerators or freezers used for infectious materials, radioactive materials, or chemical carcinogens is strictly forbidden. Store and consume food outside the laboratory or work place.
- Use mechanical devices when pipetting. Mouth pipetting is expressly forbidden.
- Institute policies for the safe handling of sharps such as:
    - Securing unused hypodermic syringes and needles, and log their distribution
    - Utilizing one sharps item at a time. Don not leave sharps unattended
    - Having readily accessible sharps disposal containers close to work area
    - Incorporating engineered sharps injury protection systems (e.g., safer needles) when practical
    - Substituting plastic-ware for glass items whenever possible.
    - Use sharps only when no other alternatives are available
- Conduct procedures or activities that impart a significant amount of energy to material within a certified biological safety cabinet or other type of approved secondary containment. These activities are likely to produce aerosols, splashing, or splattering of infectious or biohazardous materials, and include procedures such as vortexing, grinding, blending, sonicating, centrifuging, and cutting or slicing of infectious or biohazardous materials.
- Decontaminate work surfaces at least once a day and after any spill of infectious or biohazardous materials. With a disinfectant that has been proven to be effective against the agent/ material used.
- Segregate biohazardous waste in red biohazard bags or sharp disposal containers, and dispose as regulated medical waste (see section on waste disposal for more

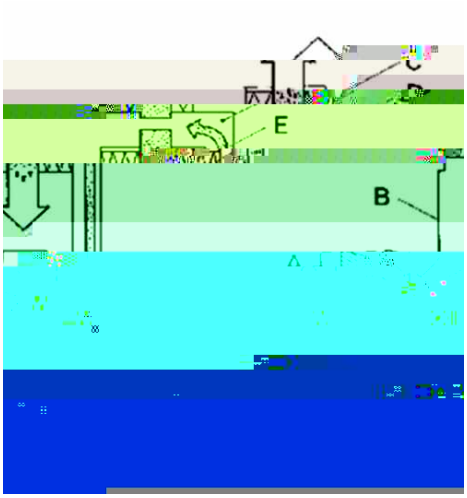
specific information). It is recommended that regulated medical waste be autoclaved to reduce the hazard of handling the waste.

- Use the universal biohazard warning symbol to indicate areas and equipment where infectious agents and biohazardous materials are handled and stored.
- Incorporate an insect and rodent control program to reduce any mechanical transmission of disease agents. Report any insect or rodent intrusion to facility manager.
- Persons working with infectious material should avoid touching the face, eyes or nose with gloved or unwashed hands.
- The use of Kleenex rather than cloth handkerchiefs is recommended for personal hygiene in laboratories handling infectious materials.
- Gloves must be worn when working with an infectious agent. Gloves must also be worn when one anticipates hand contact with blood, potentially infectious materials, mucous membranes, or non-intact skin. Vinyl, latex, and nitrile single-use, disposable gloves should be replaced as soon as possible if contaminated, torn, punctured or damaged in any way. Never wash or decontaminate gloves for reuse.
- PIs should be aware of the possibility that employees may have allergies to latex which can be life-threatening to some individuals. When chemical hazards are also present more extensive consideration of the many available types of glove materials is necessary. Contact EHS if assistance is needed.
- Laboratory clothing should be routinely laundered at work. When clothing is overtly contaminated with infectious materials decontaminate by steam sterilization (autoclaving) or other proven effective means (e.g., soak in bleach solution) before laundering. Avoid laundering at home unless the clothing can first be decontaminated. Disposable clothing (coats, gowns, etc.) must be decontaminated by steam sterilization before discarding.

3.2 Engineering Controls

The release of infectious aerosol particles has been determined to be the leading cause of laboratory acquired infections. Many standard laboratory procedures impart enough energy to microbial suspensions to generate respirable aerosols (1- s r J • ä ‘ f these particles are capable of remaining airborne for protracted periods and when inhaled can be retained deep within the lung. Larger droplets may settle out onto skin or mucous membranes of the upper respiratory tract as well as present a contamination hazard to surrounding surfaces, which serve as reservoirs for cross contamination. The assessment of the risks associated with aerosol generating equipment and the implementation of practices and procedures designed to mitigate these risks are essential to safe operation of the laboratory.

Class II cabinets are most commonly used on campus and can be used to manipulate low to moderate risk agents. Unlike class I cabinets, class II cabinets afford protection for the operator AND the work performed. The capacity to protect materials within the cabinet is provided by the flow of HEPA-filtered air over the work surface. There are four subtypes of Class II cabinets based on the construction, inflow air velocities, and the exhaust systems.

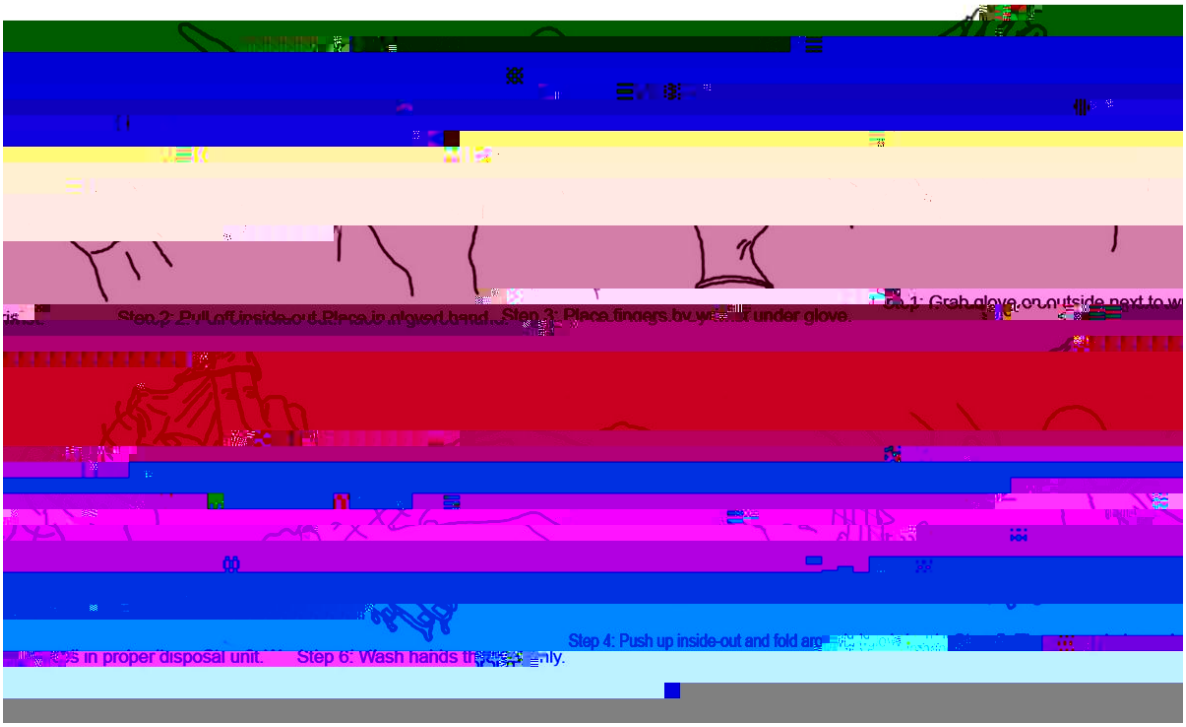


circumstances where voluntary usage of respiratory protection is acceptable. However, please consult with EH&S before use.

Gloves

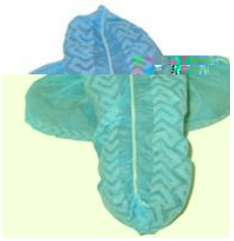
Gloves protect the user from a variety of hazards including contact with infectious agents, contaminated surfaces or equipment, and animals. Employees must select a glove based on the particular tasks, as no one type of glove can adequately protect against every kind of hazard. Additionally, you should consider an alternative glove material (e.g., nitrile, vinyl) if you are sensitive to latex.

Disposable gloves (e.g., latex, nitrile, vinyl) offer little protection against needle sticks or animal bites, and so it is important to follow good microbiological practices and procedures to maintain an envelope of protection. Specialty gloves such as Kevlar or stainless steel mesh gloves can be worn during necropsy or surgery of infected animals to prevent accidental cuts from scalpels. Gloves should be long enough to cover the cuff or lower sleeve of laboratory clothing and protect e



Shoe Coverings

Open toed shoes and sandals are prohibited in the laboratory as these do not provide the appropriate level of protection against hazardous materials. In some instances, shoe covers are recommended to prevent the spread of contamination from one area to another. Additionally, shoe covers are a recommended PPE component when cleaning up large spills.



3.4 Decontamination

The decontamination process is required on a routine basis to protect laboratory workers and the general community from the inadvertent release of infectious agents and subsequent disease. Additionally, the integrity of microbiological experiments relies on the sterility of media and decontamination of equipment as standard operating practice. Decontamination encompasses treatments that reduce the number of microorganisms on contaminated items to an amount below which microbes can cause disease or contamination. It renders the material, whether an instrument, surface, or waste, safe for further handling. Decontamination includes disinfection, antisepsis, and sterilization.

- Disinfection utilizes antimicrobial materials to eliminate nearly all non-spore forming organisms on fomites or inanimate objects (e.g., equipment, work surfaces).
- Antisepsis is the application of an antimicrobial compound to the surfaces of living human or animal tissue.
- Sterilization destroys all microbial life, including spores, generally with steam or gas.

Chemical surface disinfection is the method used in the laboratory to inactivate and/or destroy microbes on surfaces. Many different chemical disinfectants are available. The most effective are, in many circumstances, the most toxic and corrosive as well.

Note: No one liquid disinfectant is equally effective against all organisms and under all physical and environmental conditions.

The effectiveness of a disinfectant to kill or deactivate infectious agents will depend upon many factors, including:

- Type of Agent/Microorganism- Proteinaceous material, viruses, bacteria and fungi all display varying susceptibility to chemical agents. Spore-forming b3.43 341.33 Tm [(isi)-3(nnc(

- **Protein /Organic Content**- Protein containing material (blood, plasma, feces, 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, it may be more effective to absorb the waste and – Š ‡ • † ‹ • ‹ • ˆ ‡ … – – Š ‡ ò … Ž ‡ ƒ • ‡ † ó • — ” ˆ ƒ … ‡ ä
- **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.
- **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 standard waste load.
- **Other Considerations**- Other factors that should be considered in establishing standard operating procedures for chemical disinfection are the type of surface to be disinfected, and the presence of organic matter. The presence of organic matter (e.g., blood, animal feces) or hard water may reduce the effectiveness of many disinfectants like bleach, phenolics, or quaternary ammonium compounds. Finally, some disinfectants, such as bleach, may corrode metal surfaces.

Disinfectants

Alcohol- Ethyl and isopropyl alcohols, in concentrations of about 60% to 95%, are the most common alcohol disinfectants. They are effective against vegetative forms of bacteria, fungi, and lipid-containing viruses. Alcohols are relatively inexpensive, have low toxicity, and do not cause corrosion of surfaces. However, alcohols evaporate quickly and must be continually applied to achieve adequate disinfection, and are highly flammable. Alcohols are less effective against non-lipid viruses, and completely ineffective against bacterial spores and Mycobacterium tuberculosis (TB).

Chlorine Compounds- Chlorine-containing compounds are probably the most commonly used laboratory disinfectants for, bench tops, and floors, and spill cleanups as they are strong oxidizers and are highly corrosive. The most prevalent form, sodium hypochlorite (the form found

Sterilants

Heat- Sterilization by heat can be wet or dry. Moist heat, in the form of saturated steam, is inexpensive and results in effective and rapid heat transfer to a variety of materials. Steam sterilization, or autoclaving, uses steam in an insulated pressure chamber to achieve elevated pressures of at least 15 psi and temperatures of 121-132C for a prescribed time (see figure). There are two types of autoclaves; gravity displacement and pre-vacuum.

In the gravity displacement autoclave, steam enters the chamber and displaces the heavier air downward and out of the autoclave. The autoclave must be carefully loaded to eliminate air pockets or cold spots, which have a lower temperature than steam (containers in these air pockets will take longer to achieve adequate temperature). The pre-vacuum autoclave, as its name applies, uses a vacuum to remove heavier air from the chamber, and replaces it with lighter, saturated steam. However, this vacuum mode cannot be used with liquids. Heating under pressure, causes liquid materials to bubble or boil and may cause the bottles to break or explode if overfilled or improperly contained. This is sometimes referred to as a "hot-bottle explosion".

When autoclaving liquids:

- Use only vented closures do not tightly seal bottles.
- Use glass bottles intended for autoclaving such as Type I borosilicate glass. Ordinary glassbottles are not designed for sterilization.
- Carefully remove hot bottles from the autoclave and do not allow the bottles to be jolted. Do not move bottles if boiling or bubbling are present. The bottles should be

Note: Never autoclave flammable or other hazardous chemicals.

Chemical, physical or biological indicators can be used to ensure that the correct temperature has been achieved and maintained for the specified amount of time needed to ensure sterilization. Chemical indicators, such as those used in autoclave tape, use a color change to indicate that the appropriate temperature and pressure have been reached. Biological indicators contain spores of the thermally resistant bacterium Geobacillus stearothermophillus. These spore strips are placed in a load, and are incubated after the autoclave cycle is completed. Growth of the spores and ensuing metabolism will cause a change in the color of a pH-sensitive chemical located in each strip, indicating that sterilization conditions were not achieved. Physical indicators often consist of an alloy designed to melt only after being subjected to 121°C or 249°F for 15 minutes. The change to the melted alloy is visible.

Dry Heat is used to treat materials that are impermeable to steam or could sustain damage from moisture. Dry heat sterilization, usually performed in a hot-air oven, is less efficient and requires higher temperatures and longer exposure times. To effectively kill all types of microbial cells, the temperature of dry heat in an oven needs to be 160-180°C (320-356°F) for two to four hours.

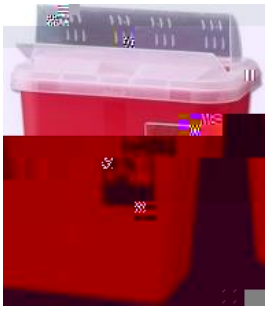
GAS

Paraformaldehyde/Formaldehyde- Paraformaldehyde/formaldehyde will inactivate vegetative bacteria, fungi, lipid and non-lipid viruses and bacterial spores when vaporized by heat, and is commonly used to decontaminate large containment equipment such as biological safety cabinets as well as entire laboratories. These substances are highly irritating, toxic, and suspected carcinogens. Extreme care must be taken when handling and using these substances. They should not be used in the laboratory on the open bench to decontaminate any equipment.

Vaporized Hydrogen Peroxide- Vaporized Hydrogen Peroxide will inactivate vegetative bacteria, fungi, lipid and non-lipid viruses and bacterial spores when vaporized by heat, and is commonly used to decontaminate large containment equipment such as biological safety cabinets as well as entire laboratories. The procedure commonly uses an aqueous solution of 30% hydrogen

is also affected by the accumulation of dust on the UV lamp, and the growth stage of the organism (dividing organisms are more susceptible than those in a dormant state). The effective life spans of the lamps are relatively short and expensive to replace. The UV light should be periodically checked with a flux meter to ensure that the energy output (40 uW/cm^2) is adequate to kill micro-organisms. It is important to remember that the use and misuse of UV lamps are an occupational hazard that carries risks for eye and skin injury, even after the radiation output has dropped below biocidal levels.

Note: You must wear the appropriate PPE and fol Ž ‘ ™ • ƒ • — ˆ ƒ … – — ” ‡ ” ï • ‹ • • – ” — … – ‹ ‘



CHAPTER 4.0 DETERMINING THE APPROPRIATE BIOSAFETY LEVEL

Biosafety Levels

There are four biosafety levels for activities involving microorganisms. The levels are designated in ascending order, by degree of protection provided to personnel, environment and surrounding community. Each biosafety level incorporates a set of standard microbiological practices and special practices aimed at addressing agent risks, enhancing worker safety and environmental protection. A thorough understanding of the agent, laboratory procedures and safety equipment, and associated hazards will assist you in selecting the appropriate biosafety level and precautions. However, certain circumstances such as changes in the health status or condition of an employee, pre-existing diseases, immune deficiency, increased age, medications, or pregnancy can increase the risks of an

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- The use of protective laboratory coats, gowns or uniforms are recommended to prevent contamination of personal clothing.
- Protective eyewear such as chemical splash goggles, safety glasses or a face shield should be worn when conducting procedures that may create splashes.
- Gloves must be worn when working with hazardous materials. Glove selection should be based on an appropriate risk assessment.
- Gloves should be changed when contaminated, if glove integrity has been compromised or when otherwise necessary.
- Plastic-ware must be substituted for glassware whenever practicable.
- Sharps such as needles and scalpels must be placed in a sharps container or other suitable hard walled for disposal.
- Procedures should be performed in a manner that minimizes the production of aerosols.
- Decontaminate surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.
- Decontaminate all cultures, stocks and other potentially infectious materials using an effective method prior to disposal.

4.2 Biosafety Level 2

Biosafety Level 2 (BSL2) practices incorporate practices of Biosafety Level 1. Biosafety Level 2 work generally involves agents that pose a moderate hazard to individuals or the environment. Procedures that may create infectious aerosols or splashes are conducted in a Biological Safety cabinet (BSC) or other containment device. Personnel working in a BSL2 laboratory also have specific traini

- Spills involving infectious materials must be contained, decontaminated, and cleanedup by staff properly trained and equipped to work with infectious material.
- Incidents that may result in exposure to infectious materials must be immediately ‡ ˜ ƒ Ž — ƒ – ‡ † ƒ • † – ” ‡ ƒ – ‡ † ƒ … … ‘ ” † ‹ • ‰ – ‘ ’ ” ‘ … ‡ † — ” ‡ • ‘ — – Ž ‹ • ‡ biological safety manual. These incidents must also be reported to the laboratory supervisor.
- Medical evaluation, surveillance, and treatment should be provided and appropriate records maintained.
- Animals and plants not directly associated with the work being performed are not permitted in the laboratory.
- All procedures involving the manipulation of infectious materials that may generate an aerosol should be conducted within a BSC or other physical containment devices.
- Protective laboratory coats, gowns, smocks, or uniforms designated for laboratory use must be worm while working with hazardous materials.
- Personal protective clothing must be removed before leaving the laboratory for non-laboratory areas such as cafeterias, libraries, and administrative offices.
- Eye and face protection must be when conducting procedures that pose a risk of splashes or sprays of infectious or otherwise hazardous material.
- Gloves must be worn to protect hands from contamination or exposure to hazardousmaterials. Gloves must not be worn outside the laboratory. Eye, face and respiratory protection should be used in rooms containing infected animals as determined by therisk assessment.
- An eyewash station must be readily available.
- A validated method for decontaminating all laboratory wastes should be available in the facility.

4.3 Biosafety Level 3

Biosafety Level 3 (BSL3) incorporates both BSL1 and BSL2 precautions. Work at BSL3 generally involves agents that may cause serious or potentially lethal disease via the inhalation route of exposure. Personnel working in the BSL-3 laboratory will receive training specific to the handling of pathogenic and potentially lethal agents and must be supervised by scientists that demonstrate competency in handling infectious agents and associated procedures. Procedures involving the manipulation of infectious materials must be conducted within certified BSCs, other approved containment devices or by personnel wearing the appropriate personal protective equipment. Biosecurity is a major concern for the BSL3 laboratory due to the nature of the agents in use. Access to the laboratory is restricted to approved individuals. Additionally, BSL3 work must receive EH&S pre approval and is predicated upon a thorough risk assessment and contingent of proper engineering controls in the space. Each BSL3 laboratory must develop and maintain a Biosafety Level 3 manual that is specific to the laboratory. Laboratory specific procedures and practices will be developed in order to appropriately manage the hazards of working at Biosafety Level 3. Currently no BSL3 work is conducted at the University.

4.4 Animal Biosafety Levels

Laboratories engaged in animal research involving infected animals or non-infected animals that may serve as host species to zoonotic agents, present special challenges for risk assessment and management. Generally, the selected biosafety level with complementary practices and procedures should reflect established practices for working with infectious agents in vivo and in vitro.

Animal Biosafety Levels

Animal facilities must be physically separated from other activities including animal production and quarantine and clinical laboratories in order to minimize the risk of cross contamination. Animals not directly involved in animal research should not be brought into the laboratory. Control of arthropod vectors is of particular concern in animal facilities. If exposure to arthropods is a requirement of the study being conducted or if the agent under study can be transmitted via an arthropod vector, interior work areas must be mesh screened. Perimeter joints and openings must be sealed and additional control measures must be implemented to prevent arthropod entry and propagation.

As with other biosafety levels, access to the animal facility must be restricted. Personnel must have general safety training as well as specific training in animal facility procedures and the appropriate engineering controls, such as Class II BSC, must be present to manage aerosols and splashes.

4.5 Clinical / Diagnostic Laboratories

Clinical laboratories generally receive requests for analysis of a variety samples types with equally ambiguous histories. Typically, the infectious nature of the sample is unknown and specimens are often submitted with a broad request for microbiological examination for multiple agents.

It is the responsibility of the Laboratory Director or PI to establish written standard procedures in the laboratory that specifically address the issue of the infective hazard posed by clinical/diagnostic specimen and control access to clinical/diagnostic areas of the laboratory.

Generally, the initial processing of clinical/ diagnostic specimen and serological isolates can be done at biological safety level 2 and requires the use of standard precautions unless there is information which suggests the presence of an agent which may be transmissible via an aerosol route. Procedures that may cause spraying, splashing, splattering of droplets or the generation of aerosols must be performed in a BSC. Recommendations of practices specific to clinical laboratories can be obtained from the Clinical Laboratory Standards Institute.

4.6 Biosecurity

Recent federal regulations mandate increased security measures in order to protect biological pathogens and toxins from theft, loss or misuse. These legislations require institutions engaged in microbiological research or teaching to notify the U.S. Department of Health and Human Services (DHHS) or the Department of Agriculture (USDA) of the possession of select agents. The regulations also allow for increased supervision of material and include a mechanism for restricting access to these materials to legitimized uses.

At the operational level, appropriate security measures must be implemented in order to protect public health from potential misuse of biological research materials as agents of terrorism. Facility, institutional security plans and emergency response procedures must be developed and standardized and must include notification of coordinating or appropriate agencies such as law enforcement, CDC, NIH, DHHS and Department of Homeland Security. Additionally, preventing access to laboratory or clinical areas by unauthorized individuals, maintaining records and inventories of agents of interest, development of procedures that prevent the removal of microbiological materials from laboratories and clinical settings and guarding access to electronic data are necessary for an effective biosecurity plan.

Chapter 5.0 - Selecting Additional Precautions

5.1 Eyewashes and Safety Showers

Plumbed emergency eyewashes should be activated weekly to verify proper operation by laboratory personnel and showers inspected and tested annually by Buildings & Grounds. Regular activation (weekly flushing) ensures the units are operating properly, helps to keep the units free of clutter, and helps prevent the growth of bacteria within the plumbing lines, which can cause eye infections. It is the responsibility of laboratory personnel to activate (flush) units on a regular basis. It is recommended to allow the water to run for at least 3 minutes. EH&S strongly encourages laboratories to post an Eyewash Testing LOG/ sign near the eyewash to keep track and document that weekly activation is occurring.

Due to the flow requirements outlined in the ANSI standard, hand held bottles do not qualify as approved eyewashes. Hand held eyewash bottles are acceptable to use in conjunction with an emergency eyewash, such as sink mounted or portable units.

Laboratories are responsible for ensuring that access to eyewashes and emergency showers are kept free of clutter and ensuring the eyewash nozzle dust covers are kept in place. If nozzle dust covers are not kept on the eye-wash nozzles, dust or other particles can clog the nozzles and result in poor or no water flow. This can also result in dust or other particles being forced into the eyes when the eyewash is used.

If you discover your emergency shower or eyewash is not functioning properly, then contact your Building Coordinator to request a ticket to have the unit repaired.

5.2 Occupational Assessments

The Department of Environmental Health and the University Health Care Unit are committed to providing consultative services to assist Pace University in fostering a safe and healthy campus environment. EH&S responds to requests for assessment of potential safety hazards, possible instances of exposure, and suitability of protective equipment. The following is a list of programs:

Exposure Assessments

- Personal Protective Equipment – Environmental Health and Safety has developed a PPE training program and provides consultative services to departments in order to meet the employee protection needs and OSHA requirements. The EH&S program provides employees with the appropriate protective equipment and training that meets the OSHA PPE standard.
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BSM APPENDICES

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Appendix A - Risk Group 2 (RG2) - Bacterial Agents Including Chlamydia

- Acinetobacter baumannii (formerly Acinetobacter calcoaceticus)
- Actinobacillus
- Actinomyces pyogenes (formerly Corynebacterium pyogenes)
- Aeromonas hydrophila
- Amycolata autotrophica
- Archanobacterium haemolyticum (formerly Corynebacterium haemolyticum)
- Arizona hinshawii - all serotypes
- Bacillus anthracis
- Bartonella henselae, B. quintana, B. vinsonii
- Bordetella including B. pertussis
- Borrelia recurrentis, B. burgdorferi
- Burkholderia (formerly Pseudomonas species) except those listed in Appendix B-III-A (RG3))
- Campylobacter coli, C. fetus, C. jejuni
- Chlamydia psittaci, C. trachomatis, C. pneumoniae
- Clostridium botulinum, Cl. chauvoei, Cl. haemolyticum, Cl. histolyticum, Cl. novyi, Cl. septicum, Cl. tetani
- Corynebacterium diphtheriae, C. pseudotuberculosis, C. renale
- Dermatophilus congolensis
- Edwardsiellatarda
- Erysipelothrix rhusiopathiae
- Escherichia coli - all enteropathogenic, enterotoxigenic, enteroinvasive and strains bearing K1 antigen, including E. coli O157:H7
- Haemophilus ducreyi, H. influenzae
- Helicobacter pylori
- Klebsiella - all species except K. oxytoca (RG1)
- Legionella including L. pneumophila
- Leptospira interrogans - all serotypes
- Listeria
- Moraxella
- Mycobacterium (except those listed in Appendix B-III-A (RG3)) including M. avium complex, M. asiaticum, M. bovis BCG vaccine strain, M. chelonei, M. fortuitum, M. kansasii, M. leprae, M. malmoense, M. marinum, M. paratuberculosis, M. scrofulaceum, M. simiae, M. szulgai, M. ulcerans, M. xenopi
- Mycoplasma, except M. mycoides and M. agalactiae which are restricted animal pathogens
- Neisseria gonorrhoeae, N. meningitidis
- Nocardia asteroides, N. brasiliensis, N. otitidiscaviarum, N. transvalensis

- Sphaerophorus necrophorus
- Staphylococcus a4(s2nr)7(op)-5(h)] TJ ET EyV

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Appendix B - Risk Group 2 (RG2) - Fungal Agents

- Blastomyces dermatitidis
- Cladosporium bantianum, CXylohypha) trichoides
- Cryptococcus neoformans
- Dactylaria galopava (Ochroconis gallopavum)
- Epidermophyton
- Exophiala (Wangiella) dermatitidis
- Fonsecaea pedrosoi
- Microsporum
- Paracoccidioides braziliensis
- Penicillium marneffei
- Sporothrix schenckii
- Trichophyton

Appendix C - Risk Group 2 (RG2) - Parasitic Agents

- Ancylostoma human hookworms including A. duodenale, A. ceylanicum
- Ascaris including Ascaris lumbricoides suum
- Babesia including B. divergens, B. microti
- Brugia filaria worms including B. malayi, B. timori
- Coccidia
- Cryptosporidium including C. parvum
- Cysticercus cellulosae (hydatid cyst, larva of T. solium)
- Echinococcus including E. granulosis, E. multilocularis, E. vogeli
- Entamoeba histolytica
- Enterobius
- Fasciola including F. gigantica, F. hepatica
- Giardia including G. lamblia
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Appendix D - Risk Group 2 (RG2) Viruses

- Adenoviruses, human - all types
- Alphaviruses (Togaviruses) - Group A Arboviruses
  - Eastern equine encephalomyelitis virus
  - Venezuelan equine encephalomyelitis vaccine strain TC-83
  - Western equine encephalomyelitis virus
- Arenaviruses
  - Lymphocytic choriomeningitis virus (non-neurotropic strains)
  - Tacaribe virus complex
  - Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
- Bunyaviruses
  - Bunyamwera virus
  - Rift Valley fever virus vaccine strain MP-12
  - Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
- Caliciviruses

Appendix E - What to Do in the Event of an Exposure

An exposure is defined as specific contact (eye, mouth, other mucous membrane, non

Appendix G - What to do in the Event of a Biohazardous Material Spill

At Biosafety Level 2 (BSL2)

1. Avoid inhaling possibly airborne material, while quicklyleaving the room. Notify others to leave. Close the door, and post with a warning sign.
2. Remove contaminated clothing, turning exposed areas inward, and place in a

Appendix H - Spill of a Biohazardous Radioactive Material

A biohazard spill involving radioactive material requires response procedures that combine the techniques used when addressing these hazards separately. Use procedures that protect you from the radiological hazard while you disinfect the biological material. Before any clean up, consider the type of radionuclide, characteristics of the microorganism, and the volume of the spill. Contact EH&S (923-2818) and Security (777) for assistance with clean-up procedures.

General Guidelines for Personal Contamination

- Avoid inhaling airborne material. Quickly leave the area or room and notify others to leave. Close the door and post a DO NOT ENTER - warning sign.
- Remove contaminated clothing, turning exposed areas inward, and place in a biohazard bag or radioactive waste container labeled with both radioactive materials AND biohazard labels.
- Monitor exposed personnel for radioactive contamination with a survey meter and note locations where contamination has been found.
- Gently wash all exposed skin with soap and water, following it with a three-minute water rinse. Do not use bushes or abrade the skin as this will allow entry of radioactive and/or bio materials into the body. Continue to monitor radioactive contamination levels and stop washing when levels do not continue to decrease or when all of the contamination is removed.
- Immediately inform your supervisor and Security/ Environmental Health & Safety by calling 777 (or 914-923-2818) to report the event.

General Guidelines for Cleanup

1. Allow aerosols to disperse for at least 30 minutes before reentering the laboratory.
2. Assemble cleanup materials (disinfectant, autoclavable bags/containers, forceps, towel, sponges, and radiation survey meter). Label autoclavable waste bags and containers with radioactive and biohazard labels.
3. Put on protective clothing (gown, surgical mask/ N95, gloves, and shoe covers).
4. Cover the area with disinfectant-soaked towels and carefully pour disinfectant around the spill. Use more concentrated disinfectant since it will be diluted by the spill. Allow at least 15-20 minutes contact time.
5. Avoid enlarging the contaminated area if possible. Monitor radioactive contamination levels as cleanup progresses. Place all contaminated items in an autoclave bag/container.
6. DO NOT use bleach solutions on iodinated materials as radioactive iodine gas may be released. Instead, use an alternative disinfectant such as an iodophor or phenolic (consult appendix on disinfectants).
7. Handle any sharp objects with forceps. Wipe surrounding areas where the spill may have splashed with disinfectant.

8. Soak up the disinfectant with towels and place in the autoclave bags/containers, along with all contaminated protective clothing and other contaminated cleanup items.
9. Protective clothing must also be biologically decontaminated prior to disposal as radioactive waste.
10. Continue cleanup and monitoring of radioactive contamination until levels stop decreasing or when all of the contamination is removed.

Post Spill Cleanup Procedure

1. Wash hands and exposed skin areas with soap and water. Monitor personnel and spill area for residual radioactive contamination.
2. If skin contamination is found, repeat decontamination procedures under the direction of EH&S Medical assistance from The UHCU Health Center may be required.
3. The Radiation Safety Officer will provide direction if the spill area has residual fixed contamination.
4. DO NOT autoclave the waste bags/containers until approval is received from EH&S.
5. If waste cannot be autoclaved, add additional disinfectant to ensure complete biological decontamination of all the materials.

Appendix I - Hepatitis B Vaccine Declination Form

(Completion of this form is mandatoryfor employees that are not receiving the hepatitis b vaccine)

Appendix J - Sharps Injury Log Form

Please complete a log for each employee exposure incident involving a sharp and return to EH&S

Institution : _____ Department

Appendix K - ADDITIONAL BIOLOGICAL SAFETY RESOURCES

- NIH Guidelines for Research Involving Recombinant DNA (rDNA) work - http://oba.od.nih.gov/oba/rac/Guidelines/APPENDIX_B.htm#_Toc7238341
- CDC Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition - http://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf
- American Biological Association Risk Group Classification of Agents http://www.absa.org/resriskgroup.html
- Health Canada Biosafety MSDS http://www.phac-aspc.gc.ca/msds-ftss/index-eng.php
- Center for Disease Control & Prevention (CDC) http://www.cdc.gov/
- CDC's Biosafety Links http://www.cdc.gov/od/ohs/biosfty/biosfty.htm
- NIH (National Institutes of Health) Office of Biotechnology Activities (NIH OBA) http://www4.od.nih.gov/oba/
- NIH National Advisory Board for Biosecurity (Dual Use Research) http://www.biosecurityboard.gov/Framework%20for%20transmittal%200807_Sept07.pdf
- US Army Research Institute of Infectious Disease (USAMRIID) http://www.usamriid.army.mil/
- NIH / CDC Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets http://www.cdc.gov/od/ohs/biosfty/bsc/bsc.htm
- Dept. of Transportation's Shipping Infectious Substances http://hazmat.dot.gov/training/Transporting_Infectious_Substances_Safely.pdf

Appendix L - Biosafety Level 2 Checklist

Biosafety Level 2 Checklist (BSL2)

Reference: CDC BMBL/5th Edition, NIH Guidelines, Sep 09

Building & Room:	**Inspector:**
P.I.:	**Inspection Date:**
Laboratory Contact:	Phone Extension:
PI Signature:	Inspector Signature:

Biosafety Level 2	**Yes**	**No**	**N/A**	**Comments (additional space on p.2)**
A. Standard/Special Microbiological Practices				
1. Does the Principal Investigator (PI) establish and enforce policies that control acce the lab?	☐	☐	☐	
a. Are lab doors self-closing and have locks in accordance with university policies?	☐	☐	☐	
b. Are all people entering the lab advised of the hazards and meet specific entry/exit requirements?	☐	☐	☐	
2. Do personnel wash hands after working with potentially hazardous materials and **before leaving** the lab?	☐	☐	☐	
a. Does the lab have a hand washing sink? It should be located near the exit	☐	☐	☐	
3. Is eating, drinking, storing food, applying cosmetics, etc., permitted in the lab?	☐	☐	☐	**Food must be stored outside the lab area**
4. Is mouth pipetting prohibited? Are mechanical pipetting devices used instead?	☐	☐	☐	

5. Are policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware developed and implemented?

a. Are needles bent, sheared, broken, recapped, removed from disposable syringes or otor ot 7(i)-3(p)3vs

Biosafety Level 2	Yes	No	N/A

Biosafety Level 2	Yes	No	N/A	Comments (additional space on p.2)
4. Are gloves worn to protect hands from exposure to agents? Glove selection shoul based on risk assessmen Disposable gloves must not be washed or reused. Gloves m removed and disposed as biohazardous waste prior to leaving lab. Alternatives to lat should be available.	☐	☐	☐	
5. Are eye, face, and respiratory protection used in rooms containing infected animal determined by risk assessment?	☐	☐	☐	

Record of Changes