1. Purpose

University of Alaska Anchorage (UAA) personnel, student workers, faculty, staff, and outside contractors who work in laboratories handling biohazardous agents face exposure to biological hazards and infections. The hazards associated with biohazardous agents can be substantially reduced with the use of proper knowledge, techniques and equipment for handling these materials. This program for biological safety is intended to ensure personnel are knowledgeable in the hazards when working with biological agents and the steps to be taken to protect themselves and others.

2. Objective

UAA, in its continuing effort to provide personnel with safe, healthful working conditions, and to comply with the Occupational Safety and Health Act is implementing the following program for biological safety to protect

Biohazardous Materials infectious or etiologic (disease causing) agents of humans, animals and plants, toxins of biological origin, human-derived materials, recombinant DNA and any materials potentially containing infectious agents or biohazards that have the capacity to cause harm or damage to humans or animals

Decontamination any process for removing and/or killing microorganisms. The same term is

muffs, hard hats, respirators, or coveralls, vests and full body suits

Prion a

Personnel/Student Workers

Participate in experimental reviews when appropriate

Work in compliance with this program and experimental protocol at all times

Notify Supervisor or PI anytime conditions change, or additional hazards are identified

Identify and communicate safer and more efficient procedures with Supervisor or PI

Outside Contractors

Perform all work in compliance with their compan s biological safety program ~~as~~

Tissues from experimental animals (including animal dander)

[redacted]

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HEPA-filtered exhaust air to the room or exhaust to a facility exhaust system

Class III BSCs, commonly referred to as glove boxes, provide the highest level of personnel, product and environmental protection. These cabinets are specifically designed for work with BSL-4 pathogenic agents, providing maximum protection. The enclosure is gas-tight, and all materials enter and leave through a dunk tank or double-door autoclave. Gloves attached to the front prevent direct contact with hazardous materials.

All personnel must be trained in the proper use of BSCs prior to performing any work in them. Those who work in and around BSCs must be trained in their proper use, including activities that may disrupt inward directional airflow through the work opening and allow the escape of aerosolized particles from within the cabinet.

BSC cabinets must be tested and certified at the time of installation, any time they are moved, following internal repair, and at least annually thereafter. Cabinets must be decontaminated prior to moving and certain repairs/maintenance. Departments with BSCs are responsible for ensuring all maintenance is performed per manufacturers recommendations and schedules. This includes all filter changes.

Laminar Flow H

Laminar flow hoods utilize HEPA-filtered supply air to provide product protection. It is important that users are aware of the differences between clean benches and BSCs. Clean benches do not provide personnel or environmental protection and therefore must never be used with hazardous agents.

personal protective equipment in order to achieve the goals of this program.

Standard Operating Procedure (SOP)

Human blood

Blood components

Blood products

Semen

Vaginal secretions

Cerebrospinal fluid

Synovial fluid

Pleural fluid

Pericardial fluid

Peritoneal fluid

Amniotic fluid

Saliva in dental procedures

Any body fluid that is visibly contaminated with blood

All body fluids where it is difficult or impossible to differentiate between body fluids

Any unfixed tissues or organs (other than intact skin) from a human (living or dead)

HIV- or HBV-containing cell, organ, tissue cultures, culture mediums or other solutions

Blood, organs or other tissue from animals infected with HIV or HBV

It is important to remember personnel working with Other potentially infectious material (OPIM) must receive bloodborne pathogen training and be offered a Hepatitis C vaccination per the UAA BBP Program.

11. Biosafety Level Criteria

A biosafety level is a set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest at level 4 (BSL-4). In the United States, the Centers for Disease Control and Prevention (CDC) have specified requirements for these levels. Table 3 presents a summary of the different biosafety level requirements. A more detailed description can be found in the current edition of the CDC Biosafety in Microbiological and Biomedical Laboratories (BMBL). BSL-3 requirements are included for reference only. BSL-4 requirements are not included because UAA does not have the facilities in place to work with them.

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(volume/volume) in water. They are effective against vegetative bacteria, fungi and lipid-containing viruses but not against spores.

The activity against non-lipid viruses varies. The contact time to achieve effective disinfection is at least 10 seconds on skin and at least 3 minutes on environmental surfaces. An advantage of alcohols is that they do not leave any residue on treated items.

Chlorine Compounds

Chlorine is a broad-spectrum germicide and is the recommended general all-purpose laboratory disinfectant. Chlorine is effective against bacteria, mycobacteria, viruses and fungal spores. However, not all bacterial spores are killed by chlorine and the amount of available chlorine must be considered when preparing the disinfectant. A concentration of 5,000 parts per million (ppm) available chlorine is recommended as an all-purpose disinfectant. A higher concentration, near 10,000 ppm available chlorine, is recommended for biohazardous spills, emergency situations involving viruses and in the presence of large amounts of organic matter (protein, including dirt).

Sodium hypochlorite (NaOCl), as an aqueous solution, is sold as bleach. Household commercial bleach contains 5.25 percent available chlorine; solutions of 10 percent or 20 percent will yield concentrations of 5,000 ppm and 10,000 ppm available chlorine, respectively. The activity of chlorine, especially as bleach, is reduced in the presence of protein. Solutions receiving material containing high levels of organic matter several times a day should be replaced daily, while less frequently used solutions can last for one week. Furthermore, low levels of chlorine gas are naturally released from stored solutions of chlorine and reduce the germicidal activity.

Note: Chlorine gas is highly toxic and therefore bleach should not be mixed with acids which would cause the release of chlorine gas. Additionally, chlorine is highly alkaline and is corrosive to metal. By-products of chlorine can be harmful to humans and the environment, therefore chlorine containing compounds should not be used indiscriminately.

Chloramines release chlorine at slower rates than hypochlorites and therefore higher concentrations are required to achieve equivalent activity to those of hypochlorites. However, chloramine solutions are virtually odor-free and are not inactivated by organic matter to the same extent as hypochlorites. Concentrations of 20,000ppm available chlorine are recommended for

Formaldehyde

Formaldehyde (HCHO) is effective against vegetative bacteria, spores and viruses. Formaldehyde is available in two forms: as a solid polymer, paraformaldehyde, or as a solution of the gas dissolved in water, formalin. Concentrations of 5-8 percent formalin in water are an effective liquid disinfectant. Formaldehyde - Alcohol solutions of 8 percent formaldehyde in 70 percent alcohol are considered very good for disinfection purposes because of the effectiveness against vegetative bacteria, spores and viruses.

Note: Formaldehyde is carcinogenic, and its fumes irritate the eyes and mucous membranes. All storage and use of formaldehyde must be done in a fume hood or well-ventilated area.

Glutaraldehyde

Glutaraldehyde (OHC(CH2)3CHO) is also effective against vegetative bacteria, spores and viruses. It is non-corrosive and faster acting than formaldehyde; however, it takes several hours to kill the bacterial spores. Glutaraldehyde is often purchased as a 2 percent solution and requires before use by adding a bicarbonate compound supplied with the product. A solution of glutaraldehyde which has become turbid should not be used.

Note: Glutaraldehyde is toxic, and its fumes irritate the eyes and mucous membranes. All use must be done in a fume hood or well-ventilated area. Additionally, it is not recommended as a spray or solution to decontaminate environmental surfaces.

Hydrogen Peroxide and Peracids

Hydrogen peroxide (H2O2) and peracids are strong oxidants and are active against vegetative bacteria, spores and viruses. They are safer than chlorine to both humans and the environment. Hydrogen peroxide is available as a 3 percent ready-to-use solution or as a 30 percent aqueous solution that should be diluted 5-10 times with sterilized water before use; however, 3-6 percent solutions are slow acting and limited as germicides. Hydrogen peroxide can be used on work surfaces of laboratory benches and biosafety cabinets; stronger solutions can be used to disinfect heat-sensitive medical/dental devices.

Note: Hydrogen peroxide and peracids are corrosive to metals, including aluminum, copper, brass and zinc, and can decolorize fabrics, hair, skin and mucous membranes. Items treated with them must be thoroughly rinsed before contact with eyes and mucous membranes.

Iodine and Iodophors

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unsuitable for use as a disinfectant. However, iodophors and tinctures of iodine are good antiseptics. Several advantages of iodophors include:

A wide spectrum of anti-microbial and antiviral activity

A built-in indicator (if the solution is brown or yellow, it is still active)

Use as a preoperative skin antiseptic and surgical scrub

Note: Iodine can be toxic, and antiseptics based on iodine are generally unsuitable for use on medical/dental devices. Iodine should not be used on aluminum or copper.

Mercurials

Mercurials are toxic and therefore are not recommended for use.

Phenolic Compounds

Phenolic compounds are active against vegetative bacteria (including mycobacteria), fungi and lipid-containing viruses. They are not active against bacterial spores and show variable use against non-

Infectious materials and contaminated equipment originating from the lab must be sterilized before being washed and stored or discarded. Autoclaving is the preferred method. Each individual working with infectious material is responsible for its sterilization

Biohazardous materials should not be placed in autoclaves overnight in anticipation of autoclaving the next day. To minimize hazard to emergency responders, all biohazardous materials should be placed in an appropriately marked refrigerator or incubator, sterilized or otherwise confined at the close of each work day

Special precautions should be taken to prevent accidental removal of material from an autoclave before it has been sterilized or the simultaneous opening of both doors on a double-ended autoclave

Dry hypochlorites or any other strong oxidizing material must not be autoclaved with organic materials such as paper, cloth, or oil. Oxidizer + organic material + heat = explosion potential

Laboratory rooms containing biohazardous materials should designate, where appropriate, separate areas or containers labeled:

- BIOHAZARDOUS

additional retention times. The importance of properly cleaning items to be sterilized cannot be over emphasized

Place all autoclaved infectious waste into red bags for disposal

Autoclave Bags / Container Guidelines

The proper packaging and containment of infectious materials are crucial to achieve effective sterilization. The most frequent reason for sterilization failure is the lack of contact between the steam and microorganisms

To facilitate steam penetration, bottle caps and stoppers should be loosened after placement into the chamber. If left sealed, they may not be properly sterilized and could burst violently if exposed to extreme heat

Most bags that are marketed as autoclavable are not suitable if closed because the steam will not penetrate them. Steam resistant bags must be left open or have holes punched into the top to allow the steam to penetrate. Do not transfer open bags to the autoclave

Never close autoclave bags that have a printed warning stating they are to remain open during sterilization. If air remains trapped in the bag, the material may not be properly sterilized

Autoclave bags that allow steam penetration tend to melt or crumble during the sterilization process. Autoclavable bags may be placed inside paper bags, or open steam resistant polypropylene bags

Autoclavable bags can leak so they should be placed into a shallow stainless-steel pan. Plastic pans are less effective because they do not transfer heat as fast or efficiently

Sterilization of bulk liquids requires special care to prevent the containers from exploding

Each gallon of infectious liquid must be autoclaved for one hour at 250°F at 15 pounds per square inch. Closures and lids must be loosened prior to sterilizing

Bulk solutions must be sterilized separately from all other items in a load dedicated to liquids only. Solutions are subjected to a cycle designed specifically for

Nonflammable detergent

Biohazard bag

The potential health risk of the spilled agent must be considered. For example, with *Mycobacterium tuberculosis* the risk of exposure from the spill of a small quantity might be many times that of a much larger spill of *E. coli*. A minimally biohazardous material (BSL1 or RG1 agent) spilled without generating significant aerosols may be cleaned up with a paper towel soaked in an effective decontaminating agent. A spill of a large volume with generation of aerosols will require personnel to wear protective clothing and possibly respiratory protection, depending on the biological agent involved. A third-party spill response crew will likely be utilized in the event of a large or highly hazardous spill.

Spills Inside a BSC

Preparation

Cleanup materials should be kept in, or in the immediate area of the cabinet so they are available when a spill occurs

Personnel working in the BSC must be trained in the spill response procedures

of as biohazardous waste

Wash hands and any exposed skin with soap and water

Allow the cabinet to run for at least 15 minutes following cleanup prior to using again

Spills Outside a Biological Safety Cabinet

Incidental Spill

A spill is considered to be incidental if it is easily contained, has not generated infectious aerosols, and is not considered to be a significant threat to the personnel in other areas of the building.

Wear disposable gloves and a lab coat.

Soak paper towels in disinfectant and place over the spill area, allowing sufficient contact time with the disinfectant (20 minutes-

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15. Waste Disposal

Biohazardous waste disposal must be handled in accordance with procedures and practices established in the UAA Waste Management Program. This waste must be segregated from general waste at the point of origin. Potentially infectious material or biohazard waste must be discarded directly into red-bag lined Rubbermaid transport containers or a red-bag lined white biohazard box which is clearly identifiable and distinguishable from general waste. Containers must be marked

21. Training

Departments must provide personnel with information and training in order to ensure that they are apprised of biohazards in their work area. Training may take the form of individual instruction, group seminars, audiovisual presentations, handout material or any combination of the above. Training should include the specific hazards associated with agents in the work area when generic training is insufficient to address specific hazards. Training should be provided at the time of an employee's initial assignment to a work area where biohazardous agents are present and prior to assignment involving new exposure situations. Personnel should receive periodic refresher information and training. All training must be documented.

Information and training provided by departments should include all of the following:

The location and availability of the written Biological Safety Manual

The health hazards, signs and symptoms associated with exposure(s) and infection(s) with the biohazardous agent(s) used in the work area

The measures personnel can take to protect themselves from these hazards, including specific procedures the University or department has implemented such as appropriate work practices, emergency procedures and personal protective equipment

The location and availability of reference material on the hazards, safe handling, storage and disposal of biohazardous agents

Although students are not covered under AKOSH (Alaska Administration), they should be aware of biohazards in teaching situations and be provided information and equipment to protect themselves from those hazards. Departments should provide student training at the beginning of each course in which biohazardous agents are used, with specific safety instructions provided at the beginning of each class period.

Departments are responsible for ensuring that personnel and students receive the proper training.

Shipping Training

Specific training is required to ship hazardous materials. Current regulations for shipping infectious substances/diagnostic specimens can be found through IATA, DOT, USPS (United States Postal Service) EHS/RM should be contacted for shipping training if required.

22. Program Evaluation

The Biological Safety program shall be evaluated on an annual basis utilizing the protocols set forth by Biological Safety Committee. Biological Safety Committee will define the scope of the evaluation. The final report will be developed by the EHS/RM utilizing the information received