

Biosafety at MUSC

■ *Unit 2*

- ◆ Principles of Biosafety as they relate to the safe conduct of science requiring the use of biohazardous materials at MUSC





Definition

■ Biohazard

- ◆ *An agent of biological origin that has the capacity to produce deleterious effects on humans, animals, plants and insects. These include microorganisms, toxins and allergens derived from those organisms; and allergens and toxins derived from insects, animals and plants.*

Biosafety in Microbiological and Biomedical Laboratories

■ Principles of Biosafety

◆ Containment

- ☞ The purpose of containment is to reduce or eliminate exposure of:
 - laboratory workers,
 - other persons
 - the environment
- ☞ Safe methods for managing infectious agents in the laboratory

◆ Environment

- ☞ The location where the agent being handled, maintained or stored.

Infectious Agents and the lab worker

■ Modes of Infection

◆ Infections preceded by overt personal accidents, which include:

☞ Inoculation

- resulting from pricking, jabbing or cutting the skin with contaminated instruments such as:
 - hypodermic needles, scalpels and glassware;
 - from animal bites or scratches

☞ Ingestion

- resulting from mouth-pipetting, eating, drinking and smoking

☞ Splashing into the face and eyes

☞ Spillage and direct contact

Infectious Agents and the lab worker

■ Infections not preceded by personal accidents:

◆ Aerosols, droplets and fomites.

- ☞ These are speculated (from Pike's 1976 data) to be responsible for up to 82% percent of all laboratory-acquired infections.
- ☞ Aerosols are a cloud of very small liquid droplets produced whenever energy is applied to a liquid, and such liquid is allowed to escape into the environment.
 - Centrifugation is a good source (plasmid preps)

Infectious Agents and the lab worker

- **There are many regulations in place to forestall the problem of laboratory-acquired infections.**
 - ◆ **Responsibility for compliance with the regulations**
 - ☞ **Primarily to the Principal Investigator**
 - ☞ **Secondarily, with the laboratory staff.**
 - ◆ **In general a large number of organisms that would ordinarily be innocuous can be infective in immune compromised persons.**
 - ☞ **Therefore, additional and more stringent measures must be established by the PI in an effort to prevent the occurrence of lab-acquired infections in such individuals.**



Introduction

Chain of Infection

Reservoir of pathogen

Portal of escape

Transmission

Route of entry/infectious dose

Susceptible host

Incubation period

**Practices/
Equipment**

PPE

Immunization

Surveillance

Risk Assessment

Biosafety in Microbiological and Biomedical Laboratories

■ Primary containment

- ◆ Protection from exposure to infectious agents, is provided by both good microbiological technique and the use of appropriate safety equipment.

■ Secondary containment

- ◆ Protection of the environment external to the laboratory from exposure to infectious materials
 - ☞ Facility design
 - ☞ Operational practices

Biosafety in Microbiological and Biomedical Laboratories

■ Three elements of containment include:

1. Laboratory practice and technique,
2. Safety equipment
 - ☞ Bunsen burners vs. Bactincinerators
 - ☞ Cages and other barriers
3. Facility design

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

- ## ■ The risk assessment of the work to be done with a specific agent will determine the appropriate combination of these elements.

Biosafety in Microbiological and Biomedical Laboratories

■ **Laboratory practice and technique**

- ◆ **Standard microbiological practices and techniques**
- ◆ **Persons working with infectious agents or potentially infected materials must be aware of potential hazards, and must be trained and proficient in the practices and techniques required for handling such material safely.**

- ◆ **The director or person in charge of the laboratory is responsible for providing or arranging for appropriate training of personnel.**

Biosafety in Microbiological and Biomedical Laboratories

- **A scientist trained and knowledgeable in appropriate laboratory techniques, safety procedures, and hazards associated with handling infectious agents must direct laboratory activities.**
- **Each laboratory should develop or adopt a biosafety or operations manual which identifies the hazards that will or may be encountered, and which specifies practices and procedures designed to minimize or eliminate risks.**
- **All personnel should be advised of special hazards and should be required to read and to follow the required practices and procedures.**
 - ◆ **Each individual in the laboratory should acknowledge that they have been advised and briefed as to the laboratory's plan and to the risks that they will be exposed.**
 - ◆ **There is no such thing as zero risk!**

Biosafety at MUSC

■ *Questions for Unit 2*

- ◆ Principles of Biosafety as they relate to the safe conduct of science requiring the use of biohazardous materials at MUSC

