SAND2012-6695P

Hazard & Risk Communication in the Laboratory

Instructor Guide

Sandia National Laboratories
International
BIOLOGICAL THREAT REDUCTION

BEP

CBEP
Cooperative Biological Engagement Program

Welcome & Introductions

Slide 1

Introduce Instructor(s):

[Introduce others associated with the training, as appropriate]

Name

Affiliation

Representation (I'm here on behalf of. . .)

Quick Experience Glimpse

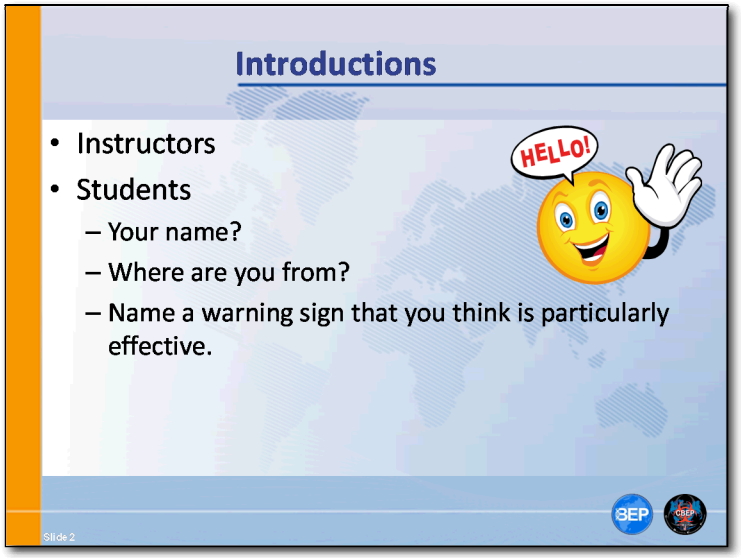
Relevancy of the Course to your experience

Welcome & Introductions

Before you introduce yourselves, I'd like to provide some reminders about this facility and the training:

1. Restrooms are . . .
2. Exits are . . .
3. Evacuation procedures are . . .
4. [any escort or restricted access procedures]
5. We will have intermittent breaks during the course, but please feel free (or not) to take a quick break if you need to at other times during the course
6. Beverages and snacks will be available at (time) and at (location). You may/may not eat and drink in this room
7. Please silence any cell phones or other noise-making devices.
8. Others . . .

Slide 2



Welcome & Introductions

Let's go around the room and let each of you introduce yourself. Please tell us your name, where you work (organization and/or title, as appropriate), and what you hope to gain from the course.

Background Information for Instructor

Examples are stop signs (and most road signs), poison symbols on chemicals, electrical hazard signs, prohibition symbol (no smoking – picture of a cigarette crossed out), etc. The goal of this question is to get the students in the mode of thinking about hazard communication in their everyday lives.

Ground rules

This will be a very interactive session and you will learn the most if you participate fully. We will not intentionally force any one to speak or to do an activity that embarrasses them – if you are uncomfortable, please speak to one of the leaders. For those of you who like to talk, please share your expertise but be aware of those around you who may be quieter and give them time to share their opinion as well. We ask that everyone respect the break times and report back promptly when asked to do so. But most of all, we want to make this a fun time to learn, so remember to smile and enjoy yourself!

Transition to Objectives

Goal

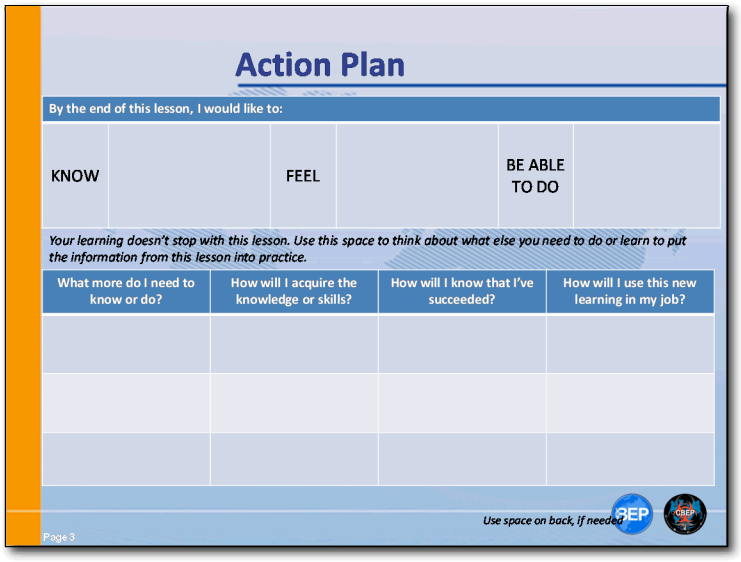
To review the Action Plan and Learning Objectives for the course and to solicit any additional learning goals from the participants.

Time

20 minutes

Welcome & Introductions

Slide 3

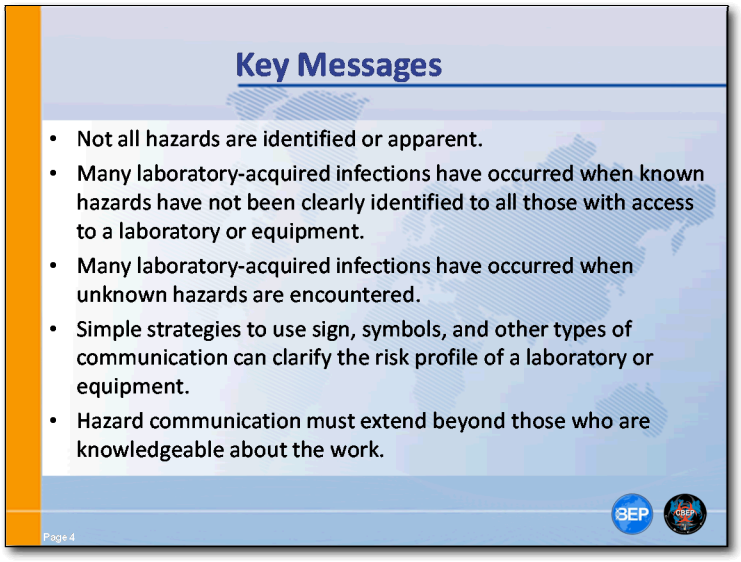


Instructions for the Action Plan handout:

- The Action Plan handout is on page __ of the student guide.
- It is designed to help you assess your learning of the material as we go through the course. It is also referred to as a learning contract.
- Go over each section of the Action Plan. . .
- The sections KNOW, FEEL and DO are designed to help outline personal learning objectives for this course.
- Ask each participant to think about what they would like to be able to KNOW, FEEL, and DO once this course is completed
- Tell the students that this is their own Action Plan. It does not need to be shared with anyone. It can be used during the course and after the course to help continually reach learning goals.
- Allow 5 minutes

Welcome & Introductions

Slide 4



Key Messages for Instructor

1. Not all hazards are identified or apparent.

2. Many laboratory-acquired infections have occurred when known hazards have not been clearly identified to all those with access to a laboratory or equipment.

3. Many laboratory-acquired infections have occurred when unknown hazards are encountered.

4. Simple strategies to use sign, symbols, and other types of communication can clarify the risk profile of a laboratory or equipment.

5. Hazard communication must extend beyond those who are knowledgeable about the work.

Welcome & Introductions

Background Information for Instructor

The key messages are to make students aware that hazard communication is a key and critical practice for biorisk management. The focus will be primarily on the safety aspects of biorisk management. Towards the end of the course, we'll discuss if hazard communication helps or hurts biosecurity.

Consider how to effectively communicate biohazard and biorisk information to people in a laboratory environment. Specifically we want to consider:

- Who needs to be informed of hazards? When and how should this information be communicated? How should this communication differ for people with different roles/responsibilities in the laboratory?
- How can communication about biohazards be used to protect against unanticipated threats?
- Who is responsible for communicating biohazard information?

Background Information for Instructor

Review the key messages, these can be read from the slide. Check for understanding and verify that these objectives are consistent with student expectations.

Capture any additional KNOW, FEEL, or DO or other learning goals

Capture any learning goals that will supplement course objectives and address any that are outside the scope of the course.

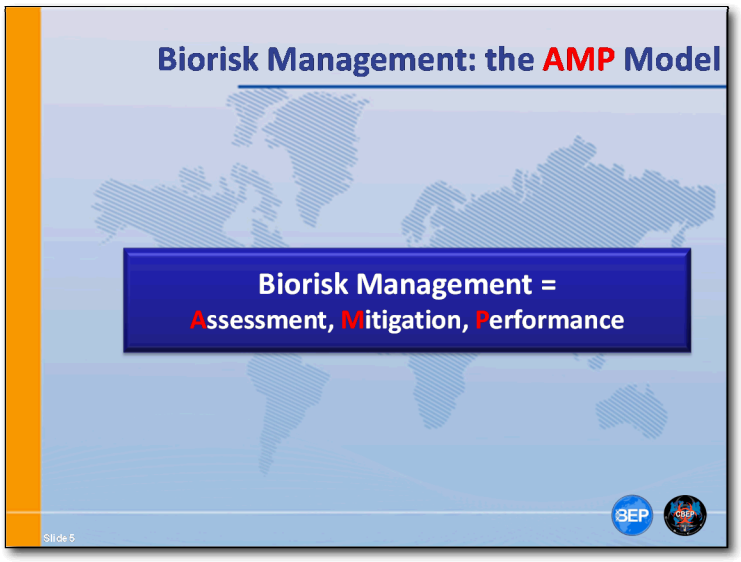
This course is flexible in nature. If there is a learning goal that is easily incorporated into the course, feel free to add it. Please note successful additions and consistently requested learning goals in the evaluation portion of this course and/or to GBRMC administrators.

Welcome & Introductions

Transition to Biorisk Management Touchstone

Biorisk Management

Slide 5

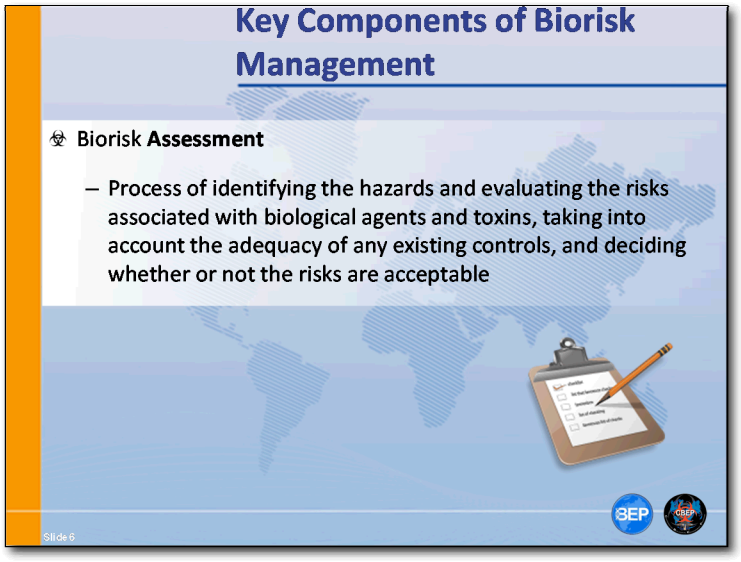


Background Information for Instructor

- Review the AMP model of Biorisk Management with the participants.
- The following three slides provide specific definitions for A, M, and P.
- Integration of laboratory biosafety (protect people from pathogens) and laboratory biosecurity (protect pathogens from people)

Biorisk Management

Slide 6



Background Information for Instructor

The instructor uses the following three slides: Biorisk Assessment; Biorisk Mitigation; and Performance to define key components of biorisk management

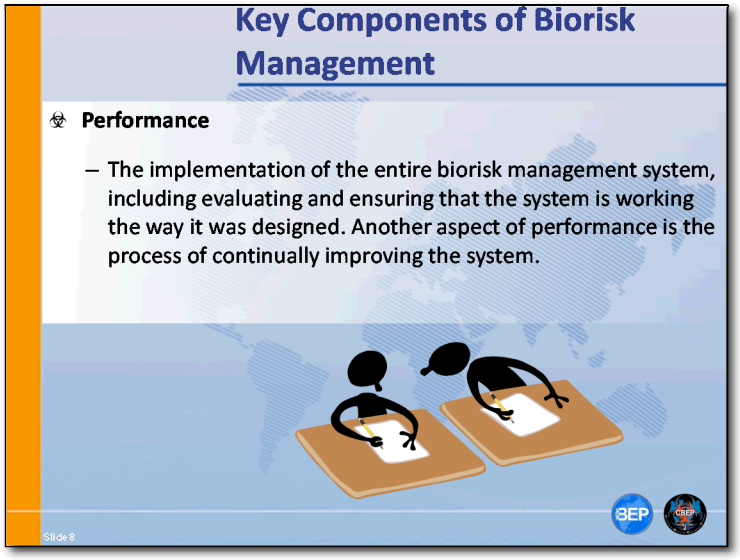
Slide 7

Biorisk Management

Background Information for Instructor

The instructor uses this slide and following slide (Performance) to define key components of biorisk management

Slide 8



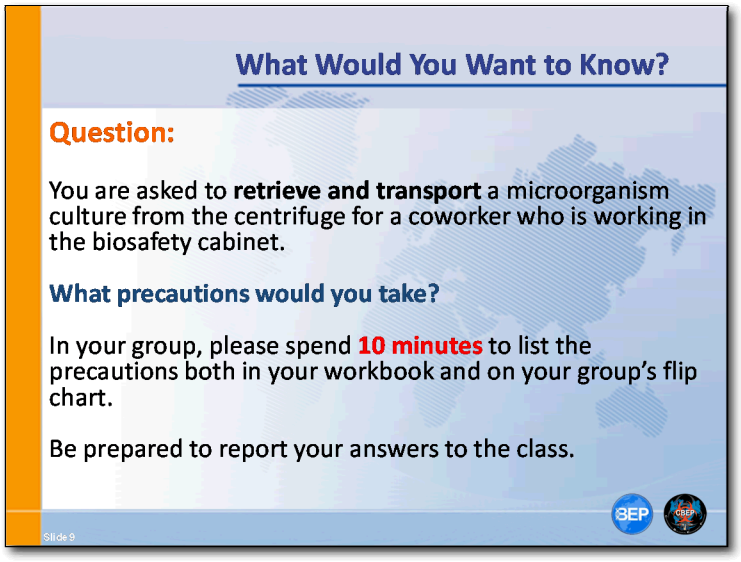
Lecture

Taken together, the three elements of AMP constitute a complete biorisk management system. The elements of the AMP model also underpin CWA 15793:2011 – Laboratory Biorisk Management Standard

Transition to Introduction to Why is Hazard Communication Important?

Why is Hazard Communication Important?

Slide 9



Why is Hazard Communication Important?

Small group activity (15 minutes).

Activity Instructions (to students)

- You are asked to retrieve and transport a microorganism culture from the centrifuge for a coworker who is working in the biosafety cabinet. What precautions would you take?
- In your groups, please spend 10 minutes to list the precautions you would take in your workbook and also on your group's flipchart.
- Be prepared to report your answers to the class?

You have 15 minutes to complete this activity

Directions for Instructor:

- Allow students 10 minutes to come up with answers to the question:
- Spokesperson from each group report in plenary. Ask each group to report one precaution at a time. Ask each reporter why he or she chose that precaution.

Possible follow-up questions/comments:

- The precautions you would choose to take in this situation will depend on the hazard or risk involved in transporting the culture for your coworker. What possible consequences are there for the individual, research groups, and institutions if biohazards are not effectively communicated?
- Whose responsibility is it to communicate information about biohazards?
- As we examine cases of failed biohazard communication, start thinking about how hazards can be communicated and who needs to be informed about these hazards.

Why is Hazard Communication Important?

Expected Responses

- Find out what the organism is and the possible route of exposure from the co-worker
- Wear appropriate PPE
- Transport the culture in secondary containment

New Responses from Students:

Slide 10

Why is Hazard Communication Important?

Background Information for Instructor

In the following examples a scientist became ill with a laboratory acquired infection (LAI), or could have been exposed to a pathogen. In each case the pathogen in question was not expected or known to be present in the laboratory. Emphasize the point that unknown pathogens exist in laboratories and have caused laboratory acquired infections (LAIs). Ask the students, “how can a BRM and specifically communication about biohazards be used to protect personnel from unknown laboratory biohazards?”

Why is Hazard Communication Important?

Background Information for Instructor

SARS, Singapore, 2003

A university graduate student worked on attenuated strains of West Nile virus and obtained a virulent strain of the virus from a recent infection in New York. To work on the virus, he was sent to an institute in Singapore that had BSL-3 laboratories. After minimal training, and with help of an institute technician, several passages of the new virus were made in Vero E6 cells. The line also was used by the institute to grow the SARS (severe acute respiratory syndrome) coronavirus (CoV). The student sickened with fever and myalgia on Aug 26. On September 3, he was admitted to hospital with a dry cough and signs of pulmonary inflammation. He was transferred to an isolation hospital, and had a moderately severe evolution of the disease. Supplemental oxygen was not required. Surveillance, even quarantine, was maintained on several dozen contacts, but no secondary infections occurred.

It was discovered that the supernatant fluids of the virulent West Nile Virus was significantly contaminated with the SARS strain of coronavirus under investigation by the institute laboratory. The student and the technician prepared storage vials of the West Nile Virus harvested on August 26 and this work is thought to have been the point of exposure, albeit the technician did not become infected with the corona virus, and had no antibodies to signify past infection.

have assumed that laboratory supplies were contaminated by SARS until proven otherwise and labeled as if they contained SARS CoV.

Hazard Communication improvements: The BSL3 lab worked with SARS only in a surge capacity (helping to handle the large numbers of samples). A possible outcome would be to have assumed that laboratory supplies were contaminated by SARS until proven otherwise and labeled as if they contained SARS CoV.

Why is Hazard Communication Important?

Background Information for Instructor

Vaccinia, Virginia, USA, 2008

Twenty year old laboratory worker reported to local health clinic with swollen lymph nodes in his neck and pain, swelling, and discharge from his earlobe. His left eye was also swollen and feverish. After three days of investigation, health officials determined that the man was infected with an unattenuated strain of vaccinia virus. The strain of infection did NOT correspond to vaccinia strains used in the laboratory. However, further research revealed that the infecting strain had contaminated the attenuated research strains. (The worker was treated and made a full recovery).

Hazard Communication improvements: Somewhere in the past, the vaccinia cultivated in this lab was contaminated by another strain. It's possible, although not proven, that improper or non-existent labeling of strains might have resulted in cross-contamination. Also, the worker was not educated in the symptoms of vaccinia infection which delayed his treatment.*Cowpox, Illinois, USA, 2010*

A laboratory worker developed a painful lesion on her finger but recalled no injury or needlestick. She was determined to be infected by a genetically-modified cowpox virus strain. The laboratory had not worked with cowpox virus for 5 years previous to the incident but DNA (not live virus) was found in many locations around the lab. Investigation has supposed that the infection came from handling samples in the lab that were unknowingly contaminated with the cowpox virus.

Hazard communication improvements: Pox viruses are notoriously viable. The lab's previous work with cowpox and the possible contamination of media or other samples might have been prevented by presuming that all existing samples and stocks of media, etc., were contaminated unless proved otherwise.

Why is Hazard Communication Important?

Background Information for Instructor

Anthrax, California, USA, 2004

From the Washington Post article: “Federal authorities said they are investigating an apparent laboratory foul-up in which live anthrax bacteria were shipped from Maryland to California by Federal Express because scientists involved in the transfer thought the bacteria were dead.

The potentially lethal germs were sent by Southern Research Institute, of Frederick County, MD, to a private lab in Oakland, CAabout three months ago, officials said. The mistake came to light recently when dozens of laboratory mice died after vaccine researchers in Oakland injected them with anthrax bacteria that supposedly had been chemically deactivated.

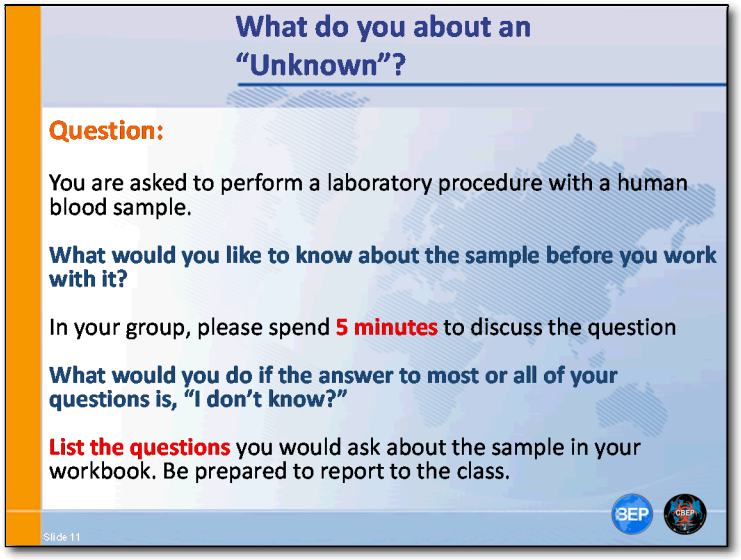
Tests by the California Department of Health Services confirmed Wednesday that the germs were alive.

Federal medical officials are now examining what went wrong when the Southern Research Institute shipped 22 cubic centimeters -- or about four teaspoons -- of anthrax bacteria to the Children's Hospital Oakland Research Institute.”

Hazard communication improvements: This may be a result of a simple mix-up in samples either from a mislabeled sample or a worker somewhere in the chain of custody failing to read the label. Also, the receiving lab was not fully informed of what an infection of viable anthrax looked like in mice – it took them two rounds of experiments to determine that there was something “wrong” with the sample they received.

Hooray for Oakland researchers not getting anthrax. You could highlight this point as a successful hazard communication. The laboratory personnel took appropriate precautions even though the anthrax bacteria were alive.

Slide 11



Small group activity (10 minutes).

Activity Instructions (to students)

- You are asked to perform a laboratory procedure with a human blood sample. What would you like to know about the sample before you work with it?
- In your groups, please spend 5 minutes to discuss the question
- What would you do if the answer to most of your questions is, "I don't know?"
- List the questions you would ask about the sample in your workbook. Be prepared to report to the class.

You have 10 minutes to complete this activity

Directions for Instructor:

- Allow students 5 minutes to discuss their answers to the questions.
- Lead a plenary discussion about the answers to the questions. Be sure to capture any unique answers.

Expected Responses

- Where did the sample come from?
- Does the person have any known infections?
- What were the symptoms or suspected infections?
- What is the route of exposure?
- What PPE is appropriate?
- What disinfectant is appropriate?

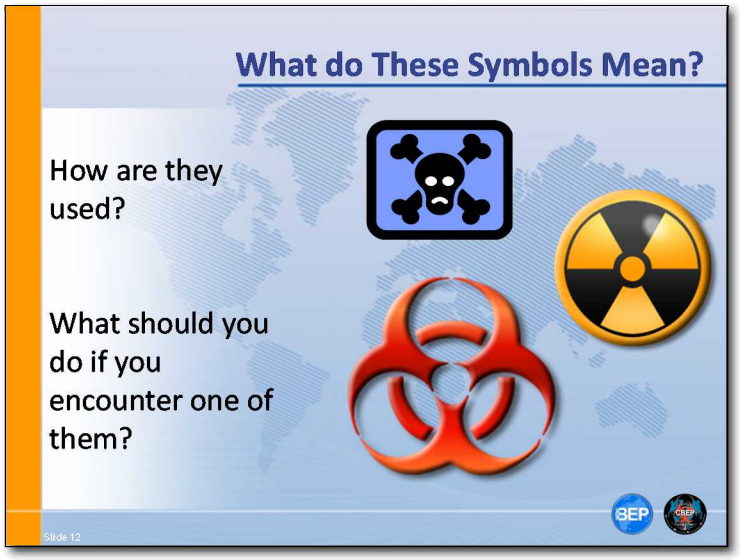
Lead a plenary session on what the questions are and if there is a safe solution to not knowing what materials might contain.

- If there are unknowns about the you could treat it as if it were very hazardous, and, if possible, try to find out some of the missing information before working with the sample.
- The concept of "Universal Precautions"(instructor should note that following "universal precautions" could have prevented the infections above [and highlight Oakland success in preventing possibly deadly infections]) is generally applied to human samples because of the possibility of blood borne pathogens such as hepatitis B and C viruses (HBV and HCV) and human immunodeficiency virus (HIV). Universal Precautions means assuming that blood contains these pathogens and practicing appropriate precautions for prevention of exposure and infection.
- More details in US OSHA regulations 32CFR1910.1030 (URL included in the references section)

New Responses from Students:

International Warning Symbols

Slide 12



Background Information for Instructor

Poison symbol – often seen on hazardous chemicals; it serves as a warning to handle carefully and with precautions as stated on the label.

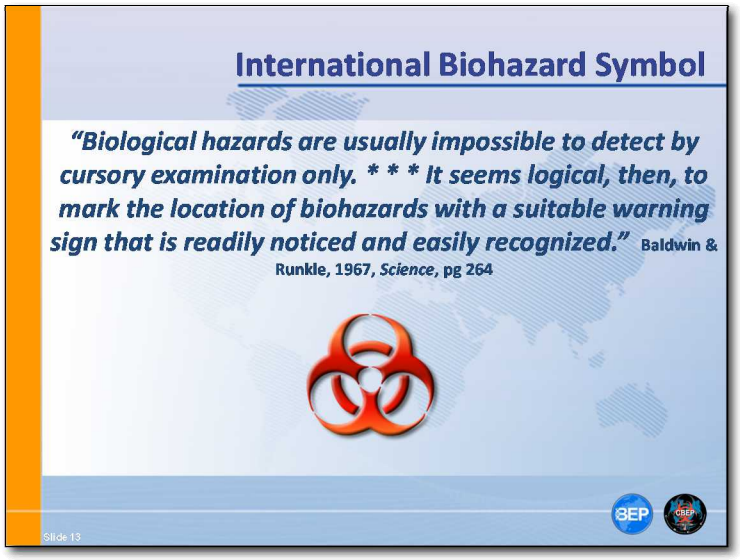
Radiation warning symbol – displayed on items that might be radioactive or areas where radiation might be emitted.

Biohazard warning symbol – displayed on items or areas that might be contaminated with biohazards (more on this later)

For Rad and Bio – a warning symbol means not to enter (or handle) if not trained; if trained, it means to proceed according to training and provided procedures.

International Warning Symbols

Slide 13



Background Information for Instructor

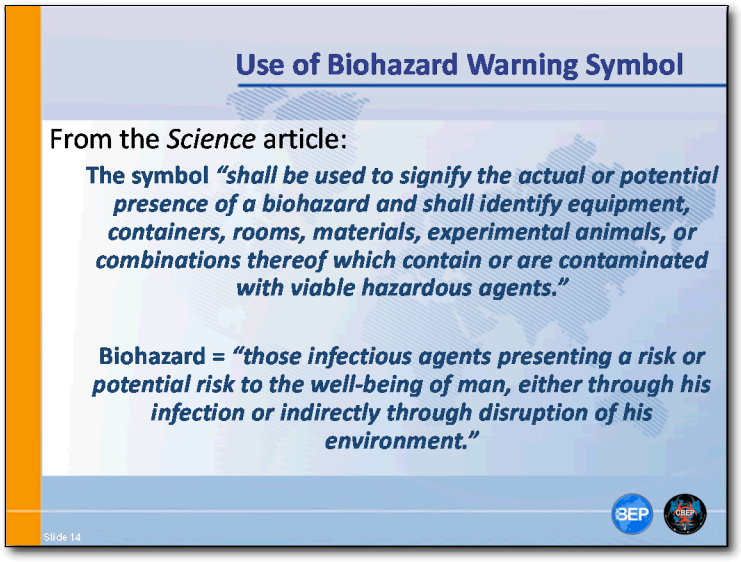
The *** are there to prompt the discussion on how biological materials are unique in that they are very hard to detect, hard to determine characteristics upon visual inspection, and can replicate. These characteristics make biological materials harder to handle compared to say radiological materials.

The design was developed through a survey of over 300 people who answered questions regarding the "meaningfulness" and then re-surveyed later for "memorability" of the symbol.

Ask the students why "meaningfulness" and "memorability" were the two qualities that the developers sought. Relate this discussion back to the initial conversation about effective warning signs.

International Warning Symbols

Slide 14

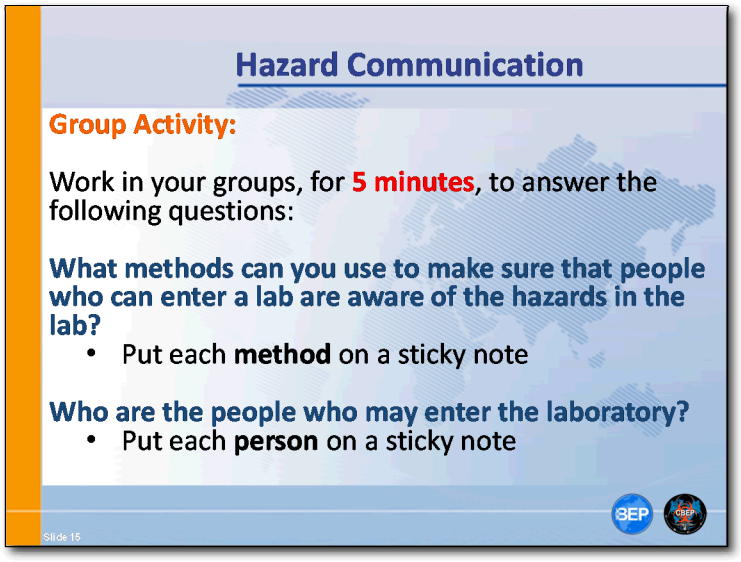


Background Information for Instructor

More information from the Science article regarding biohazards.

Methods of Hazard Communication

Slide 15



Methods of Hazard Communication

Small group activity (10 minutes).

Activity Instructions (to students)

- Work in your groups, for 5 minutes, to answer the following questions: What methods can you use to make sure that people who can enter a lab are aware of the hazards in the lab? Who are the people who may enter the lab?
- Put each method and person on a sticky note and place them on your flip charts.

You have 10 minutes to complete this activity

Directions for Instructor:

- Allow students 5 minutes to discuss their answers to the questions.
- Ask each group for one method and one person. Post those notes on a flip chart or wall surface where everyone can see. See if the other groups also had that answer. If so, ask them to place their note on top of the same answer (or similar). Ask the groups to proceed to place all the sticky notes up and match them.

Methods of Hazard Communication

Expected Responses

Methods

- Signs on entry to lab
- Require escort and laboratory orientation when entering lab.
- Make sure to explain hazards at an appropriate level (a student intern may need different instructions than a postdoc)
- Instruct researchers on how to be their own safety advocate (ask questions, learn how to choose appropriate PPE, etc.)
- Training program
- Show where MSDS forms are located in the lab
- Awareness of emergency response plan
- Periodic audits of knowledge
- Documentation
- SOPs
- Inventory
- Universal precautions
- Access control

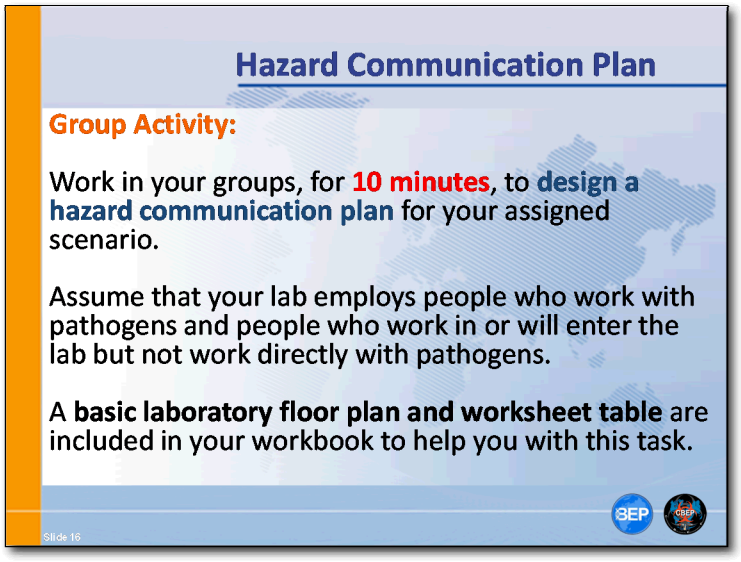
People

- Visitors (scientists, tour groups)
- Lab personnel (students, technicians, post docs, PIs)
- Maintenance personnel (custodial or facilities staff - may have little or no contact with lab personnel)
- Service personnel (equipment installation, repair etc.)
- Delivery personnel

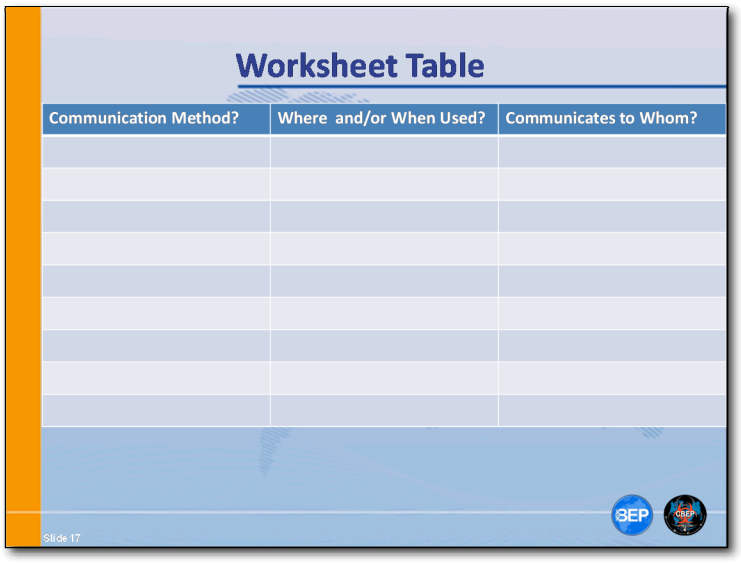
New Responses from Students:

Methods of Hazard Communication

Slide 16

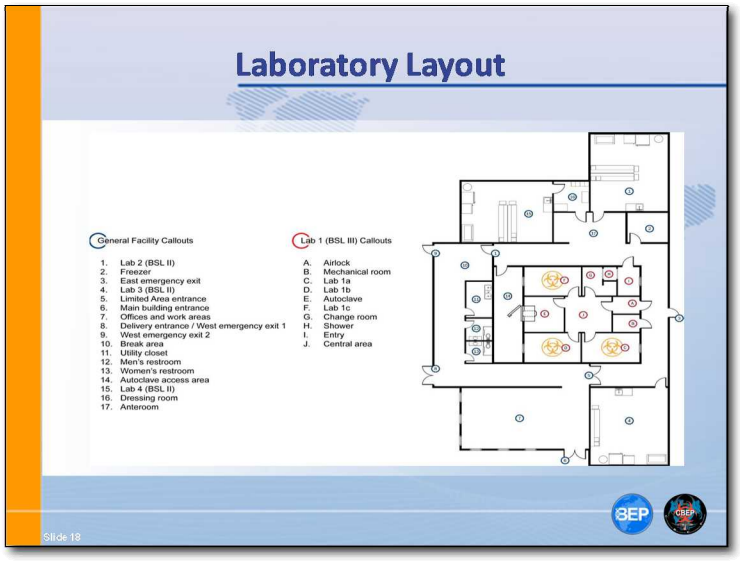


Slide 17



Methods of Hazard Communication

Slide 18



Methods of Hazard Communication

Small group activity (20 minutes).

Activity Instructions (to students)

- Work in your groups, for 5 minutes, to design a hazard communication plan for your assigned scenario.
- Assume that your lab employs people who work with pathogens and people who work in or will enter the lab but not work directly with pathogens.
- A basic laboratory floor plan and worksheet table are included in your workbook to help you with this task.

You have 20 minutes to complete this activity

Directions for Instructor:

- Assign one of the four scenarios to each group to work on (the scenario slides are in the student guide).
- Allow students 10 minutes to develop their hazard communication plan.
- After the students have developed their plan have them present their work to the class.
- During the presentation make sure that the students have considered a variety of communication methods and that they have accounted, at least once, for a lab worker who uses the pathogen, for a lab worker who does not, and for someone from outside the lab who may need to enter the lab.

Methods of Hazard Communication

Expected Responses

The following responses are applicable to every scenario. Scenario specific responses are included with the slides.

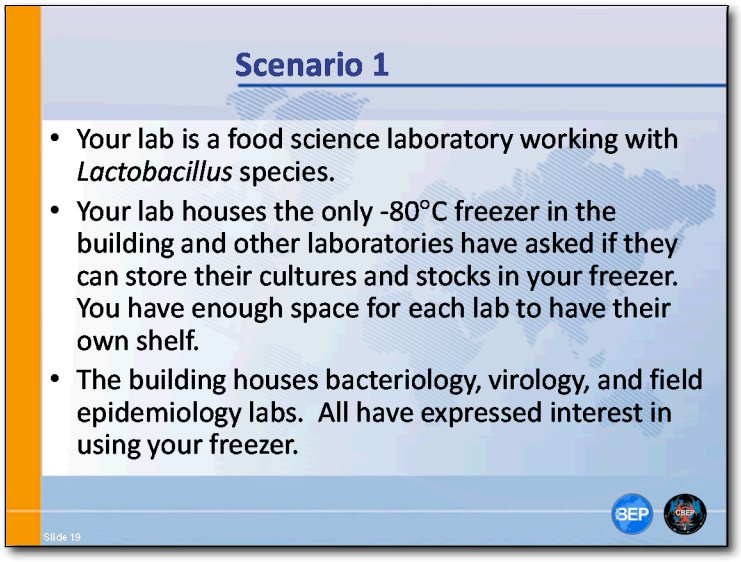
1. Method: Communicate biohazard and safety practice information during training (PPE, cleanliness [label appropriately], hygiene [wash hands – when/where], etc)
   When/Where: Upon entrance to laboratory (occasion reminders)
   To Whom: All personnel who work in the laboratory

2. Method: Communicate via signs (presence of organisms, PPE required, emergency contact numbers)
   When/Where: Post information of laboratory entrance, also post emergency contact info and procedures in the laboratory
   To Whom: All people who enter the lab

New Responses from Students:

Methods of Hazard Communication

Slide 19



Methods of Hazard Communication

Expected Responses

Labeling with warning signs, color-coding for each lab, training on what hazards may be in each lab's inventory, inventory, training on signs and symptoms of exposure to all pathogens stored, how to report a spill or accident with materials in the freezer, what to do if the freezer stops working. . . .

- Method: require that each lab inventories what they store and posts the BSL clearly on the freezer door.
  - When/Where: Post inventories near fridge and post BSL clearly on freezer door, also post emergency contact information
  - To Whom: Personnel who use the freezer

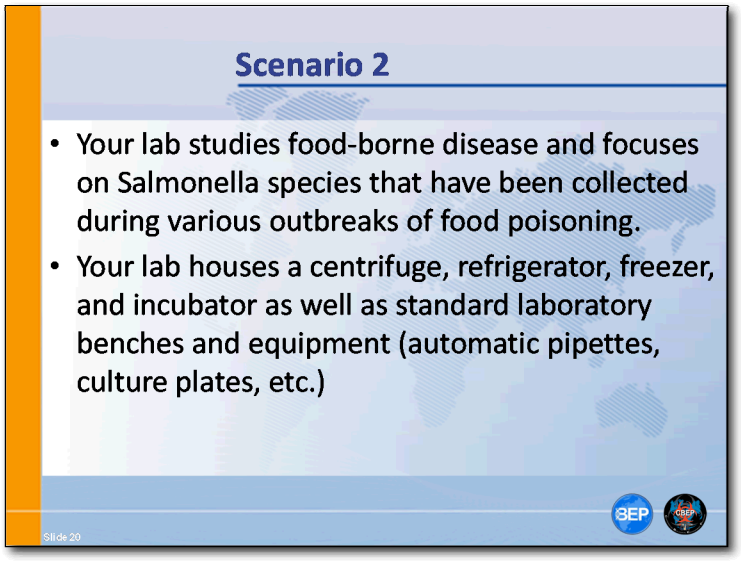
- Method: Require secondary containment for storage and transport of material
  - When/where: communicate requirement by speaking to people who will use freezer. Post a sign on the freezer
  - To whom: all personnel who use the space. Remind violators of the rule

- Method: communicate emergency spill/exposure procedures
  - When/where: talk to users of freezer/lab personnel or send email with procedures. Post emergency contact info on freezer or near phone
  - To whom: all users of laboratory.

New Responses from Students:

Methods of Hazard Communication

Slide 20



Expected Responses

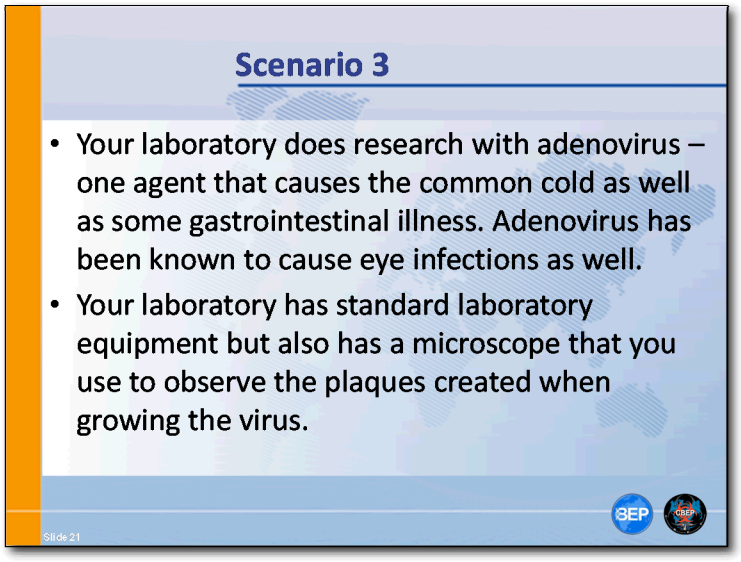
Labeling with biohazard warning signs on all equipment that may be used for *Salmonella*, "no food or drink" signs, inventory, training on signs and symptoms of exposure to *Salmonella*, posted procedures for emergencies and incidents, system to communicate to occupational health providers if anyone in the lab is potentially exposed to materials.

- Method: communicate the symptoms of infection and what to do if exposed
  - When/where: post emergency contact info. Communicate symptoms during orientation
  - To whom: all laboratory workers

New Responses from Students:

Methods of Hazard Communication

Slide 21



Expected Responses

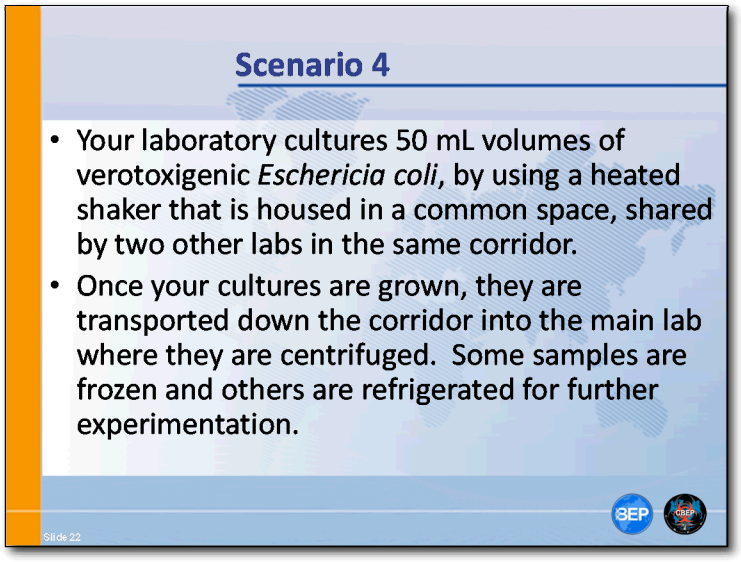
Same as for *Salmonella*, but with special attention to labeling of the microscope and procedures for cleaning (manufacturer may need to be consulted to determine how the scope can be decontaminated – and an SOP posted for proper cleaning.)

- Method: Communicate SOP for microscope cleaning
  - When/Where: describe in verbally during training and also post a written copy of the procedure.
  - To whom: all microscope users

New Responses from Students:

Methods of Hazard Communication

Slide 22



Methods of Hazard Communication

Expected Responses

Similar to freezer scenario, but additional emphasis on transport and on possibility of spills during transport, so clear communication to all who share (and maintain) the common space on spill procedures.

- Method: Common room – communicate that biohazard is present and what do in case of a spill/exposure
  - When/Where: post signs in common room
  - To whom: all people who enter common room

- Method: communicate need for secondary containment when transporting culture
  - When/Where: post sign in common room, communicate during training
  - To whom: all laboratory personnel.

- Method: train personnel so that they know what to do in the event of a spill in all locations (common room, hallway, laboratory)
  - When/where: communicate verbally during training. Have a procedure in the lab
  - To whom: all laboratory personnel

New Responses from Students:

Ask: Any questions on Methods of Hazard Communication?

Take a Break (10 minutes)

Time Check

You should be approximately __ hour and __ minutes into the course.
You have __ hours of the course remaining.

Transition to Review

Review & Wrap-Up

Goal

The purpose and goal of this section is to recap the key messages of the course and to conduct a “What? So What? Now What?” review of the course and key messages.

Time

Allow 20 minutes to get through the Review section.

Slide 23

Review & Wrap-Up

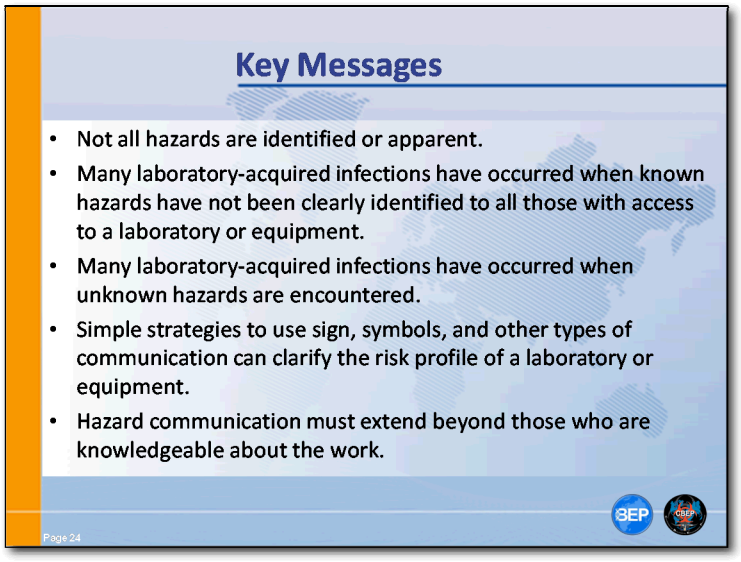
Lecture

If a lab does not practice hazard communication, what might be some of the outcomes? (this question is never directly addressed in the presentation)

What do you see as the areas of hazard communication requiring most improvement in your lab?

What next steps would you take to make that improvement? Remember to jot this down on your action plan and to give yourself a due date for accomplishing these steps.

Slide 24

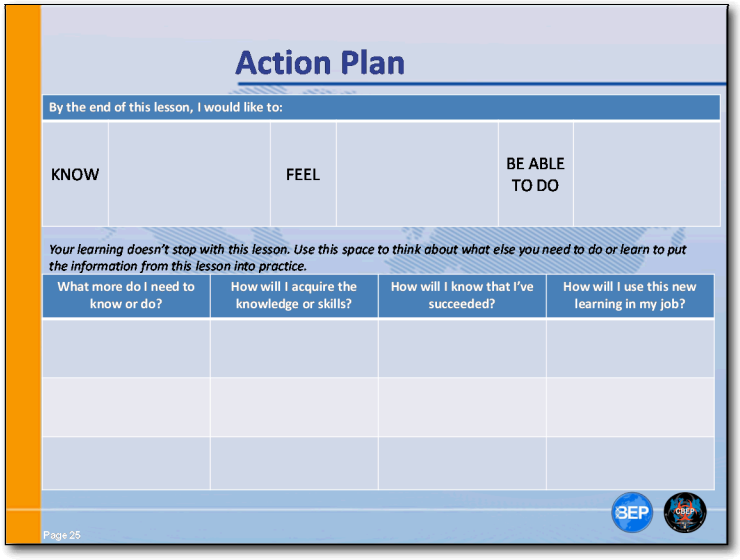


Review & Wrap-Up

Key Messages for Instructor

1. Not all hazards are identified or apparent.
2. Many laboratory-acquired infections have occurred when known hazards have not been clearly identified to all those with access to a laboratory or equipment.
3. Many laboratory-acquired infections have occurred when unknown hazards are encountered.
4. Simple strategies to use sign, symbols, and other types of communication can clarify the risk profile of a laboratory or equipment.
5. Hazard communication must extend beyond those who are knowledgeable about the work.

Slide 25



Ask students to spend a few minutes reviewing and completing their action plan.

Review & Wrap-Up

Slide 26

Level 1 Evaluation

- Ask students to complete the course evaluation and to put it in the evaluation box (alternately, give students instructions for completing the evaluation on-line).