FELLOWSHIP TRAINING ACTIVITY GUIDE

SAFETY

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES

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ABOUT SAFETY, EMERGENCY MANAGEMENT AND RESPONSE

Safety focuses on the occupational and personal safety of staff members and the environments in which they work.

A safety culture is fundamental to ensuring the protection of the laboratory facility, its staff and the surrounding environment from hazards and risks related to laboratory operations and services. Safety is the background against which all staff members must perform all aspects of their job. A culture of safety recognizes that to err is human and establishes procedures and processes to minimize errors and avoid harm. To be effective, all staff members are expected to be part of the culture of safety.

Emergency management and response addresses the need to mitigate, prepare for, respond to, and recover from laboratory-specific emergency events and situations.

LEARNING OBJECTIVES

Once you have completed all the activities in this training guide and met with your mentor, you should be able to:

- Identify and describe policies, practices and procedures required to mitigate safety hazards in a public health laboratory.
- Describe public health laboratory emergency response protocols.
- Describe public health laboratory incidence response plan and any other necessary emergency preparedness activities.

REFLECTION

Describe how the objectives above can help you in your position as a fellow:

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_____

_____

FELLOW PROFILE: SHERRY

Sherry has been working in her public health laboratory for a few months.

During her time there, there have been no safety incidents and she has gotten comfortable working with the various samples, even though many of them can be potentially dangerous.

Let's see what happens on this particular day.

LABORATORY ACCIDENT

When working with dangerous materials, safety is a major concern not only for the public but for the laboratory workers as well.

Sherry was using an autoclave to destroy Mycobacterium tuberculosis cultures after specimen testing was completed. She was using a biosafety containment unit and was wearing a lab coat and gloves. However, she was not wearing any respiratory protection. Gaskets on the autoclave failed and contaminated steam was released into the room, exposing Sherry and her co-workers to the TB pathogen.

OUTCOME

Investigation of both the incident and existing procedures determined that it was unclear who was responsible for maintaining the autoclave.

It was also determined that there was no personal protective equipment (PPE) requirement sufficient to protect an operator from exposure, should the autoclave fail. Several of Sherry's co-workers noticed the gaskets needed replacement but did not report it to management. The equipment was left in disrepair until it failed. Subsequently, Sherry and her laboratory co-workers had to be tested for tuberculosis

CORRECTIVE ACTION

Management instituted revised operating procedures for the autoclave. Procedures required operators to wear respiratory protection whenever operating an autoclave. They also required that operators must stop using an autoclave anytime there was a deviation in the condition of the gaskets and report the need for maintenance to a designated equipment manager.

DEBRIEF

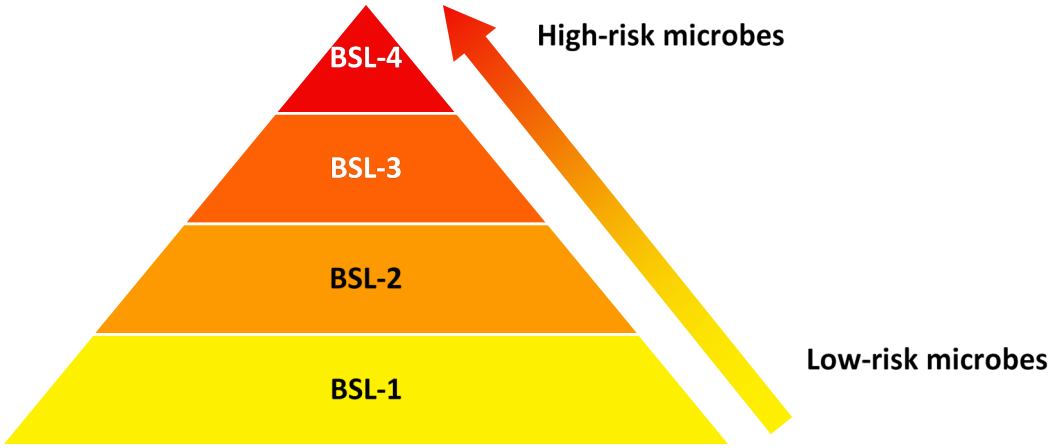
The cause of this incident was a deficiency or breakdown in the "psychology of safety" or as it's more commonly called, "safety culture".

Safety culture can be defined as the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management.

BIOLOGICAL SAFETY LEVELS

Biological Safety Levels	Description	Examples
BSL-4	Microbes are dangerous and exotic, posing a high risk of aerosol-transmitted infections, which are frequently fatal without treatment or vaccines. Fe labs are at this level.	Ebola and Marburg viruses
BSL-3	Microbes are indigenous or exotic and cause serious or potentially lethal diseases through respiratory transmission.	*Mycobacterium tuberculosis*
BSL-2	Microbes are typically indigenous and are associated with diseases of varying severity. They pose moderate risk to workers and the environment.	*Staphylococcus aureus*
BSL-1	Microbes are not known to cause disease in healthy hosts and pose minimal risk to workers and the environment.	Nonpathogenic strains of E*scherichia coli*

CDC CLASSIFICATION



Biological safety (or biosafety) levels (BSL) are based on the types of organisms or agents being housed at a facility and range from Level 1 to 4.

The higher the level, the more risk posed to the public and danger involved in working with the organisms/agents housed there.

The laboratories that students use in high school and college are Level 1, while most public health laboratories are typically biosafety Level 2 or 3.

The Centers for Disease Control and Prevention, which conducts research on life threatening illnesses such as smallpox, and the US Army Medical Command laboratories at Fort Detrick, Maryland, which studies potential bioterrorism agents, are examples of Level 4 laboratories.

See the Additional Resources section of this document if you would like to learn more about the various biosafety levels.

HAZARD VS RISK

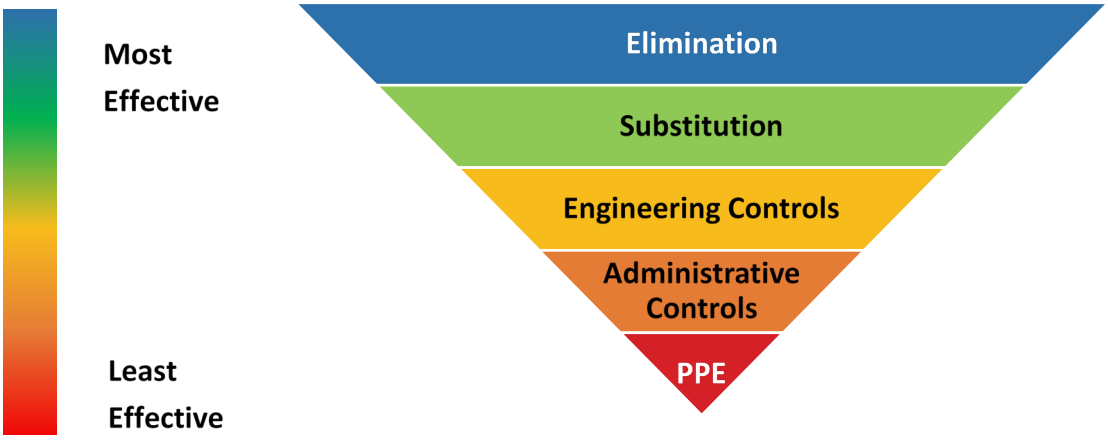
Key terms in an occupational safety context:

- **Hazard** – any source of potential damage, harm or adverse health effects. Exposure to a hazard will not necessarily always cause harm.
- **Risk** – the chance or probability that a person will be harmed if exposed to a hazard. Risk is the combination of the likelihood of the occurrence of harm and the severity of that harm.

Lab related example: Brucelosis – a BSL 3 organism that is highly infectious. It is the hazard.

- If worked up in a biological cabinet, there is decreased risk.
- If worked up in a cabinet with gloves and lab coat, risk is decreased further.
- If worked up in a cabinet with respiratory protection, risk is decreased to low to moderate.

HIERARCHY OF HAZARD CONTROLS



The Hierarchy of Hazard Controls is a system of control methods used to minimize or eliminate exposure to hazards. Control methods at the top of the graphic are potentially more effective and protective than those at the bottom.

Following this hierarchy normally leads to the implementation of safer systems, where the risk of illness or injury has been substantially reduced.

Elimination and Substitution entails physically removing or replacing the hazard and are the most effective controls. This is not always possible in a public health laboratory context, as one purpose of the laboratory is to test dangerous pathogens. However, other hazards such as trip hazards, overloaded electrical plugs and malfunctioning equipment can be removed or replaced.

Engineering precautions do not eliminate hazards but rather isolate people from them or provide tools to help them mitigate the effects.

This includes solutions such as locked doors restricting access to the laboratory, eye wash and shower stations and specialized cabinets and ventilation systems.

Administrative controls are controls for or changes to the way people work. This can include standard operating procedures, equipment manuals, staff training and installation of signs and warning labels.

Personal Protective Equipment (PPE) includes gloves, laboratory coats, safety glasses and respirators. These are considered the last line of defense because personal protective equipment may fail without warning. Gloves can be punctured, or respirators can malfunction. A PPE program should be in place specifying how and what PPE should be worn.

See the Additional Resources section of this document to learn more about each level.

ADMINISTRATIVE CONTROL EXAMPLE: SAFETY DATA SHEETS

Safety data sheets describe the properties and potential hazards of a hazardous material or product. It includes information on how to use the product or material, as well as instructions on storage, use, transportation and what to do in an emergency. Sheets can be created by manufacturers or government agencies.

Safety data sheets should be available for all chemicals, reagents, and bio-organisms. Data sheet information should be updated every 3-5 years at minimum or immediately, if there are any changes made to the product. Laboratory staff should consult this information about the materials in their own labs, before using them.

See the Additional Resources section of this document for specific examples of safety data sheets.

ACTIVITY: KNOWLEDGE CHECK

1. Identify one engineering control and one administrative control in place for a hazard at your lab.

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_____

2. Locate and read a safety data sheet for a chemical or reagent commonly used in your laboratory. What topic did your data sheet cover?

_____

_____

RISK MITIGATION

Risk mitigation are steps taken to reduce the likelihood and severity of harm. It is the final product of a risk assessment strategy.

Steps of Risk Assessment:

Hazard Identification – finding, listing and characterizing hazards such as biohazards, fire, physical hazards such as trip hazards or other potential injury, workplace violence and external hazards such as adverse weather, natural disaster, nearby industrial accidents or terrorism.

Risk Analysis – determine the likelihood and potential severity of harm of identified hazards. Identifying who may be at risk – staff, contractors, visitors, etc.

Risk Evaluation – estimating the likelihood and potential severity of harm posed by each hazard.

Hazard controls are then planned, implemented and periodically evaluated. At this stage risk is considered mitigated.

INFORMATION SECURITY

Information security is a hazard in a public health lab. Like safety culture, labs need to foster a "security culture", as laboratory information systems contain sensitive information.

Engineering controls include restricted access to computer systems as well as technological safeguards for the computer network.

Administrative controls include restricting access to certain areas to authorized personnel only, work practices such as restricting the use of USB flash drives and general security considerations, such as being aware of who is in the lab at all times.

Laboratory staff are prevented by law from examining individual patient information unless specifically necessary.

WORKPLACE VIOLENCE

The Occupational Safety and Health Administration (OSHA) defines workplace violence as "any physical assault, threatening behavior or verbal abuse occurring in the work setting" and it is a hazard.

Engineering controls such as building security, adequate parking lot lighting and restricted access can mitigate external risks posed.

However, internal risks can be encountered and can include bullying, verbal and emotional abuse and sexual harassment. Administrative controls should include zero-tolerance policies for employees and visitors who display these behaviors.

Workers should also be responsible for their own safety and be aware of potential areas of risk, such as working alone after usual business hours or allowing unauthorized people into secured areas.

Public health care workers can also be exposed to violence while working in emergency conditions out in the community, especially in areas of political unrest or places that have suffered a catastrophe and people are panicked.

See the Additional Resources section of this document for more information.

ACTIVITY: SUSPICIOUS PACKAGE

You have discovered a duffel bag or suspicious package in a corridor.

1. How could this kind of hazard have been prevented?

_____

_____

_____

2. What would you do?

_____

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3. What policies or procedures are in place at your laboratory that would deal with this situation?

_____

_____

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4. Who could you ask to find out what to do?

_____

_____

ACTIVITY RESPONSE: SUSPICIOUS PACKAGE

1. Consider the security arrangements at your laboratory. What doors are locked? Is there a guard desk? What are your policies regarding visitors?
2. Move away. Notify your supervisor. Follow your local procedures for evacuating the building.
3. Ask your supervisor about your laboratory's procedures and familiarize yourself with them.
4. Speak with your supervisor about proper protocols for your laboratory.

NOTE: You will be discussing this further when you meet with your mentor.

NEXT STEPS: MENTOR MEETING

Meet with your mentor to:

1. Discuss Activity: You have discovered a duffel bag or suspicious package in a corridor. How could this kind of hazard have been prevented? Think of possible engineering and administrative controls that could be useful in this situation.

   What would you do?

   What policies or procedures are in place at your lab?

   Who could you ask to find out what to do?

2. Discuss Activity: Have there been any emergency incidents, internal or external, that your laboratory has been involved with?

   How was the situation handled?

ADDITIONAL RESOURCES

Resource Name/Title	Institution	Website/Periodical Information
System Built for Responding to Bioterrorism Confirms Plague in Colorado Girl	APHL	Online article describing equipment used for multiple emergency types.
Lab Safety: Responding to an Emergency at Berkley Lab	Berkley Lab	Video showing response to a laboratory emergency.
Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition	CDC	An advisory document recommending best practices for the safe conduct of work in biomedical and clinical laboratories from a biosafety perspective.
Learning Biosafety Levels	CDC	This "Quick Learn Lesson" will take approximately 15 minutes to complete. When the learner has completed this lesson, they will be able to recognize characteristics of the four biological safety levels.
Examples of the Laboratory Response Network (LRN) in Action	CDC	This webpage provides examples of emergency situations when labs played an integral part.
Hierarchy of Controls	CDC/NIOSH	A chart discussing the Hierarchy of Controls.

Resource Name/Title	Institution	Website/Periodical Information
Water Laboratory Alliance - Response Plan	EPA	An example of a plan based on the common elements of the Regional Laboratory Response Plans, which were developed by EPA in collaboration with state environmental and public health laboratories, drinking water utility laboratories, emergency responders, and other state and federal agencies.
Publications and Forms - Safety Data Sheets	Health and Safety Authority	This webpage provides PDFs of Safety Data Sheets by industry.
Laboratory Emergency Response Planning - Laboratory Assessment Document	Missouri Department of Health and Senior Services	An example of a lab assessment planning document.
Safety & Health Topics - Laboratories	OSHA	A webpage that outlines laboratory safety topics, which are governed by numerous local, state and federal regulations. Over the years, OSHA has promulgated rules and published guidance to make laboratories increasingly safe for personnel. There are several primary OSHA standards that apply to laboratories as well as other OSHA standards that apply to various aspects of laboratory activities.
Laboratory Safety Guidance	OSHA	This Laboratory Safety Guidance booklet deals specifically with laboratories within the jurisdiction of Federal OSHA.
Workplace Violence in Healthcare	OSHA	This page gives an overview and explanation of dangerous situations in the workplace.

Resource Name/Title	Institution	Website/Periodical Information
Shelter Management Toolkit	Prepare Iowa	This toolkit provides an introductory sample of training classes, online courses, web links, and publications related to emergency shelter management. The tools in this kit cover the topics of animals in disaster, shelter planning, shelter operations, environmental health and shelters, volunteer management, and family preparedness.
Pathogen Safety Data Sheet - Infectious Substances	Public Health Agency of Canada	Example of a safety data sheet
Incident Response Planning for Biocontainment Facilities in the Department of Energy National Laboratory Complex	Mary Ann Liebert, Inc., publishers	This article discusses one example of incident response planning for a biocontainment facility.