

Biosafety in Public Health Laboratories





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INTRODUCTION

Advances in biotechnology and biomedical research have led to the establishment of highly sophisticated laboratories with different biorisk levels in several fields such as microbiology, immunology, genetics, and nanotechnology among others.

These biological risks can be controlled and contained by the correct implementation of internationally recognized procedures such as proper handling of laboratory equipment, adequate facilities, recognition and containment of laboratory emergencies, and the proper training and education of laboratory personnel.

Biosecurity, on the other hand, ensures the protection, control and accountability for valuable biological materials within laboratories to prevent their unauthorized access, loss, misuse or intentional release.

Implementing the appropriate safety procedures and secure measures will ensure the protection of the laboratory staff, and through them, the environment and public health.

Short Courses: There are 14 courses under three programs:

Biosafety and Biosecurity in
Public Health Laboratories

Course 1: Introduction to Public Health

Course 2: Biosafety in Public Health
Laboratories

Course 3: Biorisk Classification

Course 4: Biorisk Assessment and
Management

Risk Management in Public Health
Laboratories

Course 5: Laboratory Acquired Infections

Course 6: Risk Mitigation: Engineering Controls

Course 7: Risk Mitigation: Safe Practices

Course 8: Shipping the Biological Material

Course 9: Applied Research in Laboratory
and Biosafety

Management of Public Health
Laboratories

Course 10: Introduction to Public Health
Laboratories Management

Course 11: Biosecurity Management

Course 12: Biological Waste Management

Course 13: Chemical Waste Management

Course 14: Emergency Management in
the laboratory

Each training course is delivered in (30) Learning Hours. These courses can be taken as part of the three-month programs for a Technical Diploma, or as stand-alone courses. Upon meeting the course requirements, the participant will be awarded a Successful Completion Certificate by the International Academy of Public Health (IAPH) and accredited by the Agency for Public Health Education Accreditation (APHEA).

Training Delivery Methods:

- In-class method
- Online method

Course Outline

- ## Description

History to the public health is a review of accomplishments and errors of health care. The critical analysis of the past events allows for accelerating the improvement of health. The restructuring of the health services necessitates the tracing of health problem through their historical development. It is therefore imperative that candidates be equipped with the knowledge of the establishment of modern health care and the understanding of current debate and thinking.

This course is designed to fill the gaps in the knowledge and skills for the health practitioners in the field of public health, and to enhance critical thinking on various public health challenges along with the exploration of different public health approaches and models. It covers important topics like public health ethics, global health and health security



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Evaluate a range of public health definitions and their relative advantages
- 2- Explain the phases in the development of this discipline and make a difference between traditional and new public health
- 3- Assess the benefit of a framework for essential public health functions
- 4- Recognize the basic fields of public health research together with quantitative and qualitative methods used in the investigation of public health problems
- 5- Analyze the comprehensive system of public health within the current threats and challenges at national and regional level

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Overview of Biosafety in Medical Laboratories
- Biosafety Practices
- Biological Safety Cabinets
- Chemical Safety
- Electrical and Fire Safety
- Biosafety for Laboratory Animals

Description

This course serves as a good introduction and gives a general overview on the different aspects of biosafety in medical laboratories. It discusses general safety requirements such as general housekeeping including storage requirements, tidiness and the safe use of the general lab equipment.

Other concepts such as biological and chemical biosafety that deal with the handling of biological/clinical samples, laboratory animals, and certain chemicals use will also be discussed briefly. This course will also provide the participants with an overview of the potential electrical and fire risks and suitable preventive measures.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Identify the general potential risks in laboratories and the appropriate preventive measures
- 2- Explain the potential risk and handling methods associated with working with biological samples such as clinical samples.
- 3- Explain the risk associated with handling certain types of chemicals in a laboratory.
- 4- Identify potential electrical and fire associated risks in medical laboratories
- 5- Explain how to handle animals' laboratories where animals are maintained and used for research

Duration: 30 Learning Hours
25 CPD Points

BIOSAFETY LEVELS

basic classes of laboratory risks from low to high



BSL-1



BSL-2



BSL-3



BSL-4

Course Outline

- Introduction to Risk Groups and Biosafety Levels
- Biosafety Level 1 Laboratory
- Biosafety Level 2 Laboratory
- Biosafety Level 3 Laboratory
- Biosafety Level 4 Laboratory

Description

This course will enable the participants to differentiate between laboratories with different biosafety levels. With four biosafety levels, otherwise known as biocontainment levels, the rules, regulations, and precautions increase accordingly.

These labs range from the basic teaching laboratories to laboratories that handle highly infectious biological samples such as HIV and Ebola viruses. Understanding the difference between these laboratories will allow participants to take the appropriate precautions to implement the right safety procedures that will protect them as well as their surrounding environment.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Differentiate between laboratories that handle different biorisk levels.
- 2- Explain the rules and regulations that govern working in laboratories with different biorisk levels.
- 3- Implement the appropriate safety measures associated with each biorisk level.

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Introduction to Biorisk Management
- Introduction to Hazard, Risk, and Threat
- Biorisk Management AMP Model
- Risk Assessment, Characterization and Evaluation
- Biosafety Risk Assessment
- Risk Mitigation Strategies
- Biosecurity Risk Assessment
- Incident Management and Response
- International Standards and Guidelines

Description

In this course the participants will learn the major concepts of Biosafety and Biorisk Management. The previous lectures were meant to build a good foundation for the understanding and appreciation of this course. This course will introduce participants to the basic aspects of Biosafety and Biosecurity. The participants will learn about biorisk management by understanding its 3 main concepts: Risk Assessment, Mitigation, and Performance.

With these 3 main concepts participants will learn how to identify risks, prepare for preventive actions through multiple procedures, and to master incident management and response. Since this is an introductory course the basic concepts will be discussed, and more details will be discussed in more advanced courses.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Explain the main concepts of Biosafety and Biosecurity
- 2- Assess the risks and hazards associated with medical laboratories and learn how to implement a prevention plan to maintain safety.
- 3- Explain the main practices that should be implemented by the workers and administration to address potential risks.
- 4- Describe the main steps to respond and manage incidents such as lab emergencies.

5 Laboratory Acquired Infections

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Introduction to Microbiology
- Bacteriology and Methods of Transmission
- Virology and Mechanisms of Transmission
- Laboratory-Associated Infections
- Medical Surveillance Program & Risk of Bloodborne Pathogens
- Risk Group Agents and Principles of Containment

Description

This course introduces participants to the major challenges that face laboratories worldwide dealing with potentially infectious agents or samples. To understand the intense of the challenge, participants must understand the biology and primary basics of microbiology such as the development, life cycle, and mechanisms of infection that common pathogens exhibit.

Accordingly, students will learn how to identify risk groups and the respective laboratories that are required to contain respective samples.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Explain the basic concepts of pathogens biology and their transmission.
- 2- Identify the challenges associated with laboratory acquired infections and containment procedures
- 3- Explain the basics of bloodborne pathogens
- 4- Apply strategies to prevent and control the laboratory acquired infections

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Bio-containment and Facility Features
- Laboratory Commissioning and Certification
- Ventilation and HEPA Filters
- Biological Safety Cabinets Basic Concepts
- Cases of Laboratory Safety Incidents

Description

This course will introduce students to the different engineering controls associated with the maintenance of proper containment and safe practices. In the beginner's level course, participants were introduced to the laboratories with different biosafety levels.

According to the respective level of biosafety, in this course, participants will learn how building design and operation, the choice of biosafety cabinets, and proper ventilation are essential to ensure safe practices, the safety of the workers and the environment.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Identify the major characteristics of biosafety cabinets.
- 2- Explain the engineering controls involved in the construction of biosafety cabinets.
- 3- Explain the building design and operation requirements needed for the respective laboratories with different biosafety levels.
- 4- Apply the engineering controls to maintain proper ventilation systems in medical laboratories

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Laboratory Work Practices
- Personal Protective Equipment (PPE)
- Standard Operating Procedures
- Incident Response in the Laboratory

Description

This course will enable the participants to develop safety protocols and procedures necessary to maintain safe practices in medical laboratories. This course will teach participants the different methods for developing material safety data sheets and standard operating procedure documents in medical laboratories.

It will also introduce participants to the different procedures that entail disinfection, sterilization and decontamination which are essential to maintain sterile, clean, and safe space for the workers and the outside environment as well. Since this course will focus on safe practices, it will go in depth into the details of personal protective equipment, lab equipment handling, and safe handling and disposal of sharp objects.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Develop and Apply Standard Operating Procedures
- 2- Develop Material Safety Data Sheets.
- 3- Apply disinfection, sterilization, and decontamination procedures
- 4- Identify the different personal protective equipment needed for respective labs with different biosafety levels.
- 5- Explain the main concepts of handling laboratory equipment and sharps

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Specimen Collection, Storage and Transport
- Specimen Collection, Packaging and Transport Guidelines
- Shipping Infectious Substances and Diagnostic Specimens
- Triple Packaging and Institutional Program Management
- Shipping Risk Mitigation

Description

In this course the participants will learn the major challenges that face the process of transport and shipping of biological materials. Therefore, this course will introduce participants to the different classes of dangerous goods and provide a description of hazardous/infectious substances that can be transported and the regulations on their transportation.

This is essential to ensure the safety of the workers in the transportation chain and the safety of the public. This course is intended for the technicians and the researchers who package and ship diagnostic or clinical human and animal specimens and regulated biohazards.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Identify the main challenges that face the transport process of hazardous biological materials
- 2- Analyze the risks and hazards associated with the transport of the biological materials and identifying the population at risk
- 3- Apply the main practices for packaging different biological materials
- 4- Explain the main regulations and paperwork involved in the shipment and transport of biological materials
- 5- Explain the emergency response procedures involved in the event of an incident during the shipment process

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Materials and Methods, Study Designs
- Study Design Selection, Study Area/Setting
- Study Population and Sampling
- Basics of Sample Size
- Study Variables, and Data Collection Tools and Techniques
- Data Analysis and Presentation
- Potential Errors in Research and Critical Appraisal

Description

This course allows participants to learn and use various concepts in research methods in Laboratory and Biosafety. The course also contains in-class exercises that allow participants to match learnt concepts to their prospective research projects.

It builds the capacity to correctly frame their samples, calculate the sample size and use suitable tools and techniques to collect the data.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Define research variables
- 2- Identify study population
- 3- Utilize appropriate sampling techniques
- 4- Identify and differentiate between random sampling error and bias
- 5- Calculate sample size for different study designs
- 6- Use various data collection technique and tools

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Introduction to Laboratory Management and Administration
- Laboratory Personnel & Financial Management
- Quality Control and Evaluation
- Bioethics and Legal Aspects

Description

This course covers the principal foundations in laboratory management. It will cover topics that include laboratory organization, regulations, quality control assessment, cost analysis, inventory control, and laboratory information systems.

Participants will also be introduced to basics of biostatistics as well as bioethics and legal requirements. After this course participants should be able to identify the major role played by the management in maintaining a regulated and safe environment in medical laboratories.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Explain the major role of the laboratory administration in managing and maintaining medical laboratories.
- 2- Explain the concepts of personnel management, workload, staffing and motivation procedures.
- 3- Explain the financial aspects involved in maintaining medical laboratories
- 4- Apply quality control programs.
- 5- Explain the ethical and legal aspects of laboratory performances.

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Physical Security
- Personnel Security Management
- Material Control and Accountability
- Transport Security
- Information Security

Description

This course will introduce participants to the safe practices designed to prevent the introduction and transmission of diseases and disease-causing agents to the surrounding environment. This course will cover major aspects of biosecurity starting with physical security dealing with access controls, personnel biosecurity, material controls, transport security and the maintenance of information security.

Participants will learn to develop, maintain, and sustain security regulations to ensure a safe and secure working environment.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Explain the main factors of physical security
- 2- Explain the main principles of personnel security management
- 3- Maintain material control and accountability
- 4- Explain the important regulatory factors in transporting infectious samples
- 5- Maintain and control information security

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Introduction to Biological Waste
- Biological Waste Packing, Labeling, and transport
- Radioactive Biological Waste Disposal
- Infectious vs Noninfectious Biological Waste Disposal
- Animal Waste Disposal

Description

This course will cover the major aspects of managing biological waste. Participants will be introduced to the different types of biological waste as well as their handling, storing, labelling and disposal procedures.

Participants will also learn how to handle and segregate infectious vs. noninfectious biological waste and treatment strategies before disposal. This course will also cover the main regulations involved in the disposal of animal waste.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Classify the different types of biological waste
- 2- Describe the different regulations involved in storing, labelling, and transporting biological waste.
- 3- Explain the process of radioactive biological waste disposal
- 4- Segregate infectious vs non-infectious waste and handle different methods of disposal
- 5- Explain the process involved in animal waste disposal.

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Introduction of Chemical Waste
- Labelling and Storage Procedures for Chemical Waste
- Chemical Waste Treatment and Disposal
- Effect of Hazardous waste on environmental biology
- Hazardous waste inspection and minimization

Description

In this course, participants will learn the main aspects of chemical waste management. The participants will be first introduced to the various types of chemical waste and their categorizations. Participants will also learn how to label, store, and treat chemicals for disposal and the main rules and regulations involved in this process.

This course will also shed a light on the consequences of chemical waste to the environment and hence teach the participants inspection and minimization strategies of chemical waste.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Differentiate between the different types of chemical waste and their characteristics
- 2- Explain the strategies of labelling and storing chemicals for disposal
- 3- Describe the treatment process of chemicals before disposal
- 4- Discuss ways in which hazardous (chemical) waste is inspected and minimized.
- 5- Explain the consequences of chemical waste to the environment.

Duration: 30 Learning Hours
25 CPD Points



Course Outline

- Incident Management Response Overview
- First Aid Training
- Biological Incidents
- Disaster Management
- Disaster Management Cycle
- Preventing and Planning for Emergencies
- Introduction to Incident management and Response
- Recovery and Reconstruction

Description

This course is intended to introduce the participants to one of the major challenges that face laboratory management and handling strategies. In this course, participants will learn how to manage, assess, deal, and prevent emergencies by mastering several incident management skills.

Participants will get introduced to First Aid training, disaster management, strategies to prevent and plan for emergencies as well as recovery and reconstruction procedures. By the end of this course, participants would have covered all the major aspects that contribute to correct management and sustainability of biosafety in medical laboratories.



Learning Outcomes

By the end of this course, participants will be able to:

- 1- Identify emergency risks and deal with different emergency incidents .
- 2- Conduct first aid techniques in response to different emergencies
- 3- Explain the important concepts underlying disaster management
- 4- Explain the strategies involved in the prevention and planning of emergencies
- 5- Discuss ways in which labs could recover and get reconstructed after emergency incidents



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