



Global Health Training and Learning Opportunities



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Introduction to APHL and Global Health

Strong laboratory systems are the foundation of disease detection and response, protecting communities, economies, and health everywhere. APHL strengthens laboratory systems worldwide—leveraging scientific expertise, innovation and technical excellence to advance global health security.

With more than 25 years of experience supporting international public health laboratory systems development, APHL applies proven practices and international standards to help countries build sustainable, high-performing laboratory systems. The association operates offices across continents fostering collaboration and rapid response to emerging health threats.

APHL offers a wide range of capacity-building trainings—delivered in person, virtually, or through hybrid formats—that promote technical excellence, leadership and workforce resilience. Each course combines expert instruction, interactive learning and practical application to strengthen skills and ensure country ownership and institutional sustainability.

Training materials are available in multiple languages and can be adapted to local needs while aligning with international standards. Participants receive certificates of completion, and APHL can work with partners to develop custom or accredited certification options.

Training of Trainers (TOT) Programs

Most of the trainings can be conducted as TOTs. The duration of TOTs are generally two weeks—during the first week participants learn the content, and during the second week participants practice teaching content. Typically, APHL will assist in the development of a step-down plan and in the first courses conducted by the newly qualified trainers, as well as provide additional coaching as needed.

eLearning

APHL also offers eLearning courses and webinars for professionals to utilize at their own pace. Current offerings are listed in this brochure, but additional training may be available.

Visit the APHL Learning Center at <https://learn.aphl.org/learn> to see the most current learning opportunities.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.



Biosafety and Biosecurity

APHL brings extensive expertise in biosafety and biosecurity, including risk assessment, laboratory design, best practices, assessment tools, and high-containment laboratory commissioning. We provide technical assistance and training on biological risk assessments, risk mitigation planning, and safety controls, including biological safety cabinets (BSCs), facility design and construction, personal protective equipment (PPE), and safe laboratory practices and procedures. Our work strengthens laboratory capacity to protect staff, safeguard the environment, and ensure the integrity and quality of laboratory operations.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Biosafety and Biosecurity Trainings

Biorisk Assessment

Duration: Four days

Summary: This training provides foundational knowledge in biosafety and biosecurity principles, emphasizing risk assessment, mitigation and performance measures. Through lectures and practical exercises, participants will explore topics such as engineering controls, PPE and biological risk assessments. The course also offers a forum for Biosafety Officers to exchange experiences and network in a small classroom setting.

Learning Objectives: Upon completion of this training, participants will be able to:

- Discuss an effective Laboratory Biorisk Management Program
- Explain the difference between biosafety and biosecurity
- Outline the biological risk assessment process and its role in laboratory biosafety
- Describe the elements in developing and performing a biological risk assessment
- Select appropriate PPE utilized in laboratory
- Demonstrate effective donning and doffing of PPE
- List effective decontamination measures in the laboratory
- List effective engineering controls measures in the laboratory
- Perform proper work practices utilizing a BSC
- Discuss solutions to enhance and improve biosafety

Target Audience: This training is appropriate for laboratory managers and supervisors at all levels.

Biosafety and Biosecurity

Duration: Four days

Summary: This training combines classroom learning with hands-on activities to strengthen understanding of biosafety and biosecurity. Participants will explore biological, chemical and physical safety hazards; PPE use; safe specimen handling; waste management; containment levels and risk assessment. The course emphasizes developing and applying biosafety and biosecurity measures in laboratory settings including the use of BSCs.

Learning Objectives: Upon completion of this training, participants will be able to:

- Describe the difference between biosafety and biosecurity
- Explain biosecurity, providing examples of misuse of pathogens and the components of a biosecurity plan
- Describe the policy and practice aspects of biosecurity
- Develop risk assessments for their laboratories

Target Audience: This training is appropriate for all safety officers and laboratory professionals.

Introduction to Biosafety Cabinet Certification

Duration: Four days

Summary: This Introduction to BSC Certification training consists of an online preparatory phase and an intensive, hands-on in-person session. Participants learn the technical and safety aspects of BSC certification, including airflow measurement, HEPA filter function, and testing procedures, to ensure proper operation and containment performance.

Learning Objectives: Upon completion of this training, participants will be able to:

- Compare Class II, Type A2 BSC and other contamination control devices
- Describe the function and capabilities of BSC HEPA filters
- Measure and calculate air velocity and volumetric flow in Class II BSCs
- Perform certification testing on Class II BSCs utilizing proper procedures, safety preparation, and equipment

Target Audience: This training is appropriate for all laboratory personnel that use BSCs outside of North America.

Biosafety Cabinets Use and Maintenance

Duration: Two days

Summary: This hands-on training provides participants with practical experience in the safe use and routine maintenance of BSCs. Through guided exercises, participants practice correct techniques, maintenance procedures, and recordkeeping for optimal BSC performance and laboratory safety.

Learning Objectives: Upon completion of this training, participants will be able to:

- Describe the purpose of a BSC
- Identify the types of BSCs
- Develop a procedure for safely working in a BSC

Target Audience: This training is appropriate for all laboratory personnel that use BSCs.

Global Health Security

Duration: 3.5 days

Summary: This training provides an overview of the laboratory's role in national and global health security systems. Topics include priority infections and antimicrobial resistance (AMR), integrated disease surveillance and response (IDSR), outbreak and emergency response, and biosafety and biosecurity practices.

Course Objectives: Upon completion of this training, participants will be able to:

- Explain global health security and the laboratory's role in prevention, detection and response
- Describe laboratory networks and partnerships
- Develop a plan to manage priority and zoonotic infections and AMR
- Construct a process to assimilate IDSR and data management
- Explain the role of the laboratory in incident/emergency response, including outbreak response
- Describe key components of biosafety and biosecurity

Target Audience: this training is appropriate for senior national and regional laboratory personnel.

Laboratory Design Matters

Duration: One to three days

Summary: This training equips participants with the knowledge and tools to plan, design and implement effective and safe laboratory facilities. Participants will learn to apply risk assessment principles, pre-design planning, and design guidelines to ensure safe and functional laboratory environments.

Learning Objectives: Upon completion of this training, participants will be able to:

- Perform a thorough laboratory assessment to identify issues, needs, deficiencies or problems
- Discuss how to assemble and synthesize pre-design information appropriate to the development of a laboratory facility, including risk assessment
- Summarize the use and applications of the *APHL Laboratory Facility Construction and Major Renovation Guidelines*
- Explain high containment renovation and construction design principles
- Outline the steps required for renovation or new laboratory construction projects using the laboratory design checklist

Target Audience: This training is appropriate for biosafety professionals, facility operations and maintenance personnel, laboratory management and technical personnel.



Informatics

APHL equips laboratories with digital solutions and workforce development strategies to modernize laboratory informatics systems. We specialize in evaluating and implementing laboratory information systems (LIS) and recommending applications that streamline processes and improve data reporting. Our work focuses on four core areas: automating data to reduce manual processes, enabling interoperability for seamless data exchange, applying advanced data visualization for actionable insights, and building workforce capacity through specialized training. From centralization and standardization to real-time analytics, APHL supports laboratories in effectively leveraging data for timely public health decision-making for public health surveillance of outbreaks. Our comprehensive training portfolio covers software-specific applications, data visualization techniques, LIS evaluation, selection, and implementation, and the technical skills needed to maximize your laboratory's informatics workforce.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Informatics Trainings

Business Process Mapping

Duration: Five days

Summary: This training teaches participants how to document and analyze data exchanges and workflows within a laboratory or public health system. The training covers the components of a business model, introduces tools for business process mapping, and guides attendees in mapping their own data flows. The in-person sessions emphasize the use of Business Process Model and Notation (BPMN), a standardized format for sharing processes across systems. Participants also explore different software options and learn to create BPMN diagrams following industry best practices and standards.

Learning Objectives: Upon completion of this training, participants will be able to:

- Identify tools for business process mapping
- Define what a business process map is and how it is used
- Explain the difference between a process map and a business process map using standard notation
- Demonstrate how to draw a business process map for an informatics application in their laboratory
- Perform an analysis of a business process map to identify gaps and choke points
- Identify solutions to add to a business process map that will make the laboratory workflow more efficient

Target Audience: This training is appropriate for laboratorians, IT staff, and epidemiologists.

Additional Languages Supported: Spanish



Data Integration

Duration: One day

Summary: This training focuses on a laboratory information system's (LIS) ability to automatically exchange information with electronic medical records, surveillance systems, and other health information systems. This automation improves patient outcomes through faster result delivery, enhances public health surveillance capabilities and reduces staff workload. Integrated systems support better decision-making by providing timely, accurate data for clinical care and population health management. During this training, participants learn how to identify data requirements, understand the importance of unique identifiers, establish effective data workflows, leverage data automation to reduce workload, and apply strategies to prevent errors.

Learning Objectives: Upon completion of this training, participants will be able to:

- Discuss the importance of data sharing for public health
- Define reporting needs and requirements
- Develop an integrated laboratory information system process map

Target Audience: This training is appropriate for both laboratory and IT staff responsible for managing data systems in the laboratory.



Data Visualization and Dashboarding

Duration: Two days

Summary: This training combines classroom instruction with hands-on activities to provide a comprehensive overview of data visualization and dashboarding for bioinformatics, epidemiological and laboratory data. Participants learn the fundamentals of structured and unstructured data, explore the differences between genomic and epidemiological data, and practice basic data cleaning techniques, including the use of Notepad++ for initial data preparation. The training also introduces RStudio, covering basic coding for laboratory data visualization and provides an introduction to phylogenetics, including methods for generating phylogenetic visualizations using RStudio.

Learning Objectives: Upon completion of this training, participants will be able to:

- Compare and contrast visualization tools
- Explain data cleaning, providing examples of commands for specific purposes
- Describe the basics of RStudio syntax
- Demonstrate how to use Notepad++, RStudio, Excel, Power Query, and PowerBI to visualize data gathered in their laboratories and organizations

Target Audience: This training is appropriate for laboratory professionals who perform bioinformatics, bioinformaticians and epidemiologists.

Laboratory Information Management Systems

Duration: Five days

Summary: This training combines didactic instruction with hands-on exercises to provide participants with a comprehensive understanding of information management systems in the laboratory. The training covers data collection and usage, comparisons between paper-based and electronic systems, evaluation of different electronic platforms, strategies for central data storage and backup, and methods for planning and assessing new systems.

Learning Objectives: Upon completion of this training, participants will be able to:

- Describe a LIMS and how it supports clinical and public health laboratory processes and surveillance
- Describe the role of data in public health surveillance
- Explain strategies used to support the data management needs of laboratories for COVID-19 testing
- Demonstrate how to reference the *APHL LIS Guidebook*
- Describe types and characteristics of an LIS a public health or hospital laboratory may expect to use
- Discuss the process for establishing an LIS in a laboratory/country

Target Audience: This training is appropriate for IT specialists and managers.

Power BI for Data Visualization

Duration: Five days

Summary: This Power BI for Data Visualization training is a hands-on practical training delivered in two parts. The first part introduces Power BI, covering data import, basic cleaning and transformation, and the creation of fundamental visualizations and dashboards. The second part builds on these skills with advanced topics, including complex calculations and measures, geocoding and georeferencing for map visualizations, and dashboard and data security features.

Learning Objectives: Upon completion of the training, participants will be able to:

- Construct a dashboard using datasets
- Identify the use cases for Power BI as a data visualization tool for public health data
- Demonstrate how to use Power BI for data cleaning, data transformation, and data visualization using public health and laboratory datasets
- Demonstrate how to use Power BI as a tool to effectively communicate public health data effectively to different audiences

Target Audience: This training is appropriate for IT specialists and managers.

Additional Languages Supported: Spanish

Leadership and Management

APHL provides training programs that build the capacity of laboratory leaders and managers to ensure quality services and strengthen national laboratory systems. Trainings cover leadership development, strategic planning, and essential management skills for leading teams, resources, and operations. Our trainings equip laboratory professionals with skills in evidence-based decision-making, strategic planning, resource management, communications and team leadership. APHL offers laboratory-specific leadership and management programs that emphasize both strategic and practical skills, enabling laboratory leaders to inspire change, improve systems, deliver quality services and support laboratory system development and maintenance.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Leadership and Management Trainings

Foundations in Laboratory Leadership and Management

Duration: Five days

Summary: This training offers highly interactive, hands-on learning that encourages participants to apply their skills both during the training and afterward. As part of the training, each participant selects and implements three activities from the training content and reports on their progress within six weeks of completion. The training covers key topics such as organizational structure and management, human resources, communication and conflict resolution, leading effective teams, problem-solving and decision-making, and finance, with additional modules available upon request.

Learning Objectives: Upon completion of this training, participants will be able to:

- Explain the key roles and responsibilities of a laboratory manager
- Demonstrate how to apply effective management skills in the laboratory
 - Develop and implement strategic and operational plans for the laboratory
 - Demonstrate how to manage a team effectively
 - Demonstrate effective communication and problem-solving strategies in laboratory management
 - Explain core principles of finance to support resource planning and decision making in the laboratory
 - Apply ethical principles to decision-making in the laboratory



Target Audience: This training is appropriate for laboratory managers and supervisors at all levels.

Global Laboratory Leadership Programme

Duration: 18 – 24 months

Summary: This Global Laboratory Leadership Programme (GLLP) is a leadership program designed to enhance participants' skills, knowledge and experience in developing and maintaining public health laboratory systems. The program strengthens participants' ability to anticipate and address disease threats, ensure effective laboratory diagnostic capacity, support disease surveillance, detect health risks and respond rapidly to outbreaks and other public health emergencies.

GLLP delivers education through a combination of interactive didactic sessions, project-based learning, and mentorship. During the first portion of the program participants complete academic sessions and assigned projects. During the second portion, they develop a capstone project focused on addressing identified gaps in the laboratory system. Additional information is available on the [GLLP Webpage](#).

Program Objectives: Upon completion of this program, participants will be able to:

- Assess the laboratory system performance and formulate plans to advance and sustain the system
- Recognize, adopt, and apply best practices in the human, animal, and environmental sectors to ensure quality laboratory services
- Advocate for the contribution of human, animal and environmental laboratories
- Demonstrate laboratory management and leadership skills including effective communication
- Mentor laboratory professionals to help build human resource capacity

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Strategic Laboratory Management—Policy, Strategic Planning and Monitoring and Evaluation

Duration: Five days

Summary: This training combines didactic instruction with group exercises to create an interactive learning experience. Participants explore laboratory policy development, practice writing policy statements and objectives, and learn about the hierarchy of national laboratory documents. The training covers the differences between strategic and operational planning, reviews examples of laboratory operational plans, and provides opportunities to practice developing effective vision and mission statements and SMART objectives. Participants also practice conducting SWOT analyses, learn methods for monitoring and evaluation, and gain experience setting relevant targets and indicators.

Learning Objectives: Upon completion of this training, participants will be able to:

- Describe the key steps in development of a laboratory policy and strategic plan
- Develop an operational plan from their strategic plan
- Monitor and evaluate their laboratory strategic plan
- Identify essential leadership behaviors and effective communication

Target Audience: This training is appropriate for laboratory managers and supervisors.

Microbiology and Molecular Detection

APHL enhances laboratory capacity for the timely detection, identification, and response to infectious disease threats. We provide training on key pathogens, including influenza, SARS-CoV-2, RSV, sexually transmitted infections, Mpox, tuberculosis, Ebola, vector-borne, and vaccine-preventable diseases. APHL also strengthens antimicrobial resistance (AMR) detection by assessing laboratory capabilities, offering training, and facilitating collaboration with clinical partners. Training emphasizes laboratory competencies, quality management, and technical methods to improve diagnostic accuracy and surveillance capabilities.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Microbiology and Molecular Detection Trainings

Molecular Detection of AMR Genes in Enterobacterales Bacteria

Duration: Five days

Summary: This training provides participants with a comprehensive understanding of antimicrobial resistance in Enterobacterales and the laboratory methods used to detect it. The training covers bacterial mechanisms of AMR, the principles and practical applications of real-time PCR, and interpretation of real-time PCR data outputs. Participants learn to identify and troubleshoot common PCR-related errors, while applying laboratory safety protocols and proper waste management practices. The training also emphasizes the broader implications of AMR, including its impact on patient treatment, infection prevention and control, and public health surveillance. Participants explore the drivers of antimicrobial resistance and strategies for its control, as well as the critical role of the laboratory in preventing the emergence and spread of resistant organisms. The training includes lecture and laboratory practice.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Describe the bacterial mechanisms of AMR.
- Explain the principles of and application of PCR, components required, the types of real-time PCR, and the interpretation of data output
- Identify common PCR-related errors and explain how to troubleshoot
 - Discuss the concerns and implications of AMR on clinical management of patient antibiotic course of treatment, infection prevention and control, and public health surveillance
 - Explain the drivers of and control AMR
 - Describe the role of the laboratory in the prevention of the emergence and spread of AMR
 - Demonstrate how to apply sample acceptance criteria for AMR identification
 - Demonstrate how to apply laboratory safety guidelines and proper waste management practices



Target Audience: This training is appropriate for county referral hospital laboratory and regional laboratory staff in the AMR Surveillance Network.

Next-Generation Sequencing

APHL supports laboratories in adopting and scaling next-generation sequencing (NGS) for routine and emerging pathogen surveillance, outbreak response, and public health decision-making. NGS provides critical data to guide evidence-based policy and response, but its implementation requires investment in infrastructure, expertise, and workforce development. APHL provides training, technical assistance, and strategic planning to help laboratories build sustainable NGS capacity—from sample preparation and sequencing to data analysis and interpretation for public health action.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Next-generation Sequencing Trainings

Bioinformatics for Microbial Genomics and Metagenomics

Duration: 10 days

Summary: This training equips microbiologists and epidemiologists with both beginner and intermediate-level skills in pathogen genomics. Participants explore the exciting world of NGS, gaining a strong foundation in bioinformatics concepts, tools, and workflows. Through hands-on exercises and practical examples, learners discover how to analyze NGS data and apply these insights to real-world public health decision-making, from tracking outbreaks to understanding microbial communities. This training blends theory with practice, empowering participants to translate complex genomic data into actionable public health knowledge.

Learning Objectives: Upon completion of this training, participants will be able to:

- Compare and contrast the advantages/disadvantages of each NGS platform and apply the appropriate platform for public health purposes
- Discriminate unique and shared genomic characteristics of viruses, bacteria, and fungi and how these characteristics affect the strategies for genomic studies
- Evaluate the quality of NGS data and interpret quality parameters
- Demonstrate the use of major types of bioinformatics tools
- Develop an NGS data management plan
- Explain the concept of genomic epidemiology and apply genomic surveillance data to public health decision-making

Target Audience: This training is appropriate for three different audiences:

Track A: Microbiologists and epidemiologists with limited or no experience in NGS and bioinformatics.

Track B: Microbiologists and Epidemiologists with intermediate experience in NGS and bioinformatic analyses for clinical or public health purposes (such as having performed/used NGS data for SARS-CoV-2, healthcare- or community-associated outbreak investigation, or antimicrobial resistance studies).

Track C: Bioinformaticians with intermediate experience in NGS, but limited experience in pathogen genomics (such as those familiar with genomics in biological systems other than microbiology).

Bioinformatics for Wastewater-based Surveillance

Duration: Five days

Summary: This training provides participants with the knowledge and practical skills necessary to analyze and interpret wastewater-based surveillance (WWBS) NGS data using bioinformatics. The training offers an overview of workflows and tools available for processing and analyzing sequencing data. Participants will gain experience navigating Terra.bio workspaces, managing sequence data, and applying workflows for quality control, variant classification, and identification of other microbial targets of public health concern. Emphasis is placed on troubleshooting, data interpretation, and data integration with public health decision making.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Demonstrate how to navigate Terra.bio workspaces to access, organize, and manage WWBS sequencing data
- Demonstrate how to execute bioinformatics workflows for quality control, variant classification, and microbial target identification using Terra.bio tools
- Show how to interpret WWBS bioinformatics outputs to support public health decision-making

Target Audience: This training is appropriate for laboratory scientists, bioinformaticians, epidemiologists, and public health professionals involved in WWBS and genomic data analysis. It is particularly suited for individuals responsible for processing, analyzing, and interpreting NGS data to inform public health decision making.

Genomic Epidemiology

Duration: Five days

Summary: This training combines classroom instruction with hands-on exercises to teach participants how to leverage genomics for public health applications. Participants gain practical experience using analytical software, including R, CZ Gen Epi, CZ ID, Nextclade, and Auspice, applying concepts in real-time problem-solving scenarios. The training covers key topics such as phylogenetics, AMR, metagenomics, genomic surveillance, and quality control, providing participants with the knowledge and skills to translate genomic data into actionable insights for public health decision making.

Learning Objectives: Upon completion of this training, participants will be able to:

- Explain how wet-laboratory sequencing practices impact sequence data quality
- Demonstrate how to conduct an analysis of sequencing data quality and discuss how quality impacts interpretation
- Explain how viral and bacterial genomes are typed, and demonstrate using NextClade and Auspice for typification
- Describe how phylogenetic trees are constructed and interpreted
- Summarize and communicate the results of genomic epidemiology analyses with diverse audiences

Target Audience: This training is appropriate for intermediate to advanced laboratorians, bioinformaticians and epidemiologists.

Additional Languages Supported: Spanish

Foundations of Next-generation Sequencing

Duration: Five days

Summary: This training introduces participants to the core principles and practices of NGS, including sequencing technologies, preparation of input materials, data output types, and quality assurance processes. The training integrates both wet-laboratory and bioinformatics components, highlighting how pathogen genomic data can inform public health decision-making. Participants engage in classroom instruction and practical demonstrations using Oxford Nanopore, Illumina, and Ion Torrent platforms. Special emphasis is placed on quality management systems (QMS) in laboratory workflows, as well as ensuring data quality and accurate interpretation for public health applications.

The training covers an overview of NGS platforms, proper preparation and handling of biological input materials, and the types of data files generated by each platform, such as FASTQ, FAST5, and BAM files. Participants learn quality control metrics and methods to validate sequencing outputs, gain an introduction to bioinformatics and key analysis steps, and explore how NGS is applied to pathogen genomic characterization. The training also demonstrates how genomic data can be used to support public health surveillance and guide evidence-based decision-making.

Learning Objectives: Upon completion of this training, participants will be able to:

- Describe the core principles and workflows of NGS technologies
- Identify the differences among sequencing platforms and their output file types
- Describe critical steps for biological sample preparation and handling
- Demonstrate how to perform basic quality checks on sequencing output data
- Describe the role of QMS in ensuring reliable and reproducible NGS results
- Define bioinformatics and its application in pathogen genomics
- Explain how genomic data can be used to support outbreak response, AMR tracking, and policy development

Target Audience: This training is appropriate for laboratory scientists, epidemiologists, biosurveillance professionals, and Ministry of Health leadership or decision makers involved in genomic surveillance and public health policy.



Quality Management in Next-generation Sequencing

Duration: Five days

Summary: This training explores quality management principles in NGS to ensure quality results that can be used for public health decision-making. The training can focus on multiple NGS platforms and will use the Clinical Laboratory Standards Institute (CLSI) quality system essentials (QSEs) for clinical laboratories as a framework for quality management in next-generation sequencing workflows. Participants will gain hands-on experience with industry-standard platforms and tools, learning to manage and interpret complex genomic data. Participants will design method evaluation plans and develop quality manuals and implementation guides.

Learning Objectives: Upon completion of this training, participants will be able to:

- Apply quality management system (QMS) principles to NGS
- Design validation/verification methods for NGS
- Differentiate between method evaluation plan, validation and verification
- Apply quality control and assurance to the Illumina NGS workflow
- Identify quality issues in NGS data and areas for improvement
- Develop QMS guidelines for NGS

Target Audience: This training is intended for laboratorians and managers working in public health laboratories that are currently using NGS techniques or are considering implementation in the laboratory.

Wastewater-based Surveillance

Duration: Five days

Summary: This training equips participants with the knowledge and hands-on skills needed to design, implement, and manage wastewater monitoring programs for public health. The training takes participants through the full WWBS workflow, from selecting sampling sites and developing effective collection strategies to concentrating samples and extracting nucleic acids. Learners gain practical experience with molecular detection methods, including real-time PCR and NGS, to identify viral, bacterial and other microbial targets of public health significance. By the end of the training, participants are prepared to translate wastewater data into actionable insights for disease surveillance, outbreak detection and public health decision making.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Explain the principles of molecular detection methods used in WWBS
- Demonstrate proper technique for wastewater collection, concentration, and molecular testing
- Apply PCR and NGS protocols to detect target pathogens in wastewater samples
- Identify quality assurance issues and troubleshoot problems in the WWBS workflow

Target Audience: This training is appropriate for laboratory scientists, molecular data analysts, laboratory managers, and Ministry of Health leadership or decision-makers involved in wastewater-based surveillance, laboratory operations and public health response.

Wastewater-based Public Health Surveillance and Epidemiology

Duration: Five days

Summary: This training offers an immersive introduction to the design, implementation, and analysis of wastewater-based surveillance (WWBS) systems to support public health decision-making. Participants will explore how WWBS integrates with traditional surveillance systems and learn how it can be applied to guide timely public health actions. The training covers all stages of WWBS, including field sampling, laboratory processing, and data analysis, with a strong focus on interpreting results to inform surveillance strategies. Through interactive case studies and outbreak scenarios, participants will practice analyzing data, communicating findings, and making evidence-based recommendations. The training also provides opportunities to engage with guest experts and encourages the formation of ongoing communities of practice to support the establishment and sustainability of WWBS systems.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Explain the purpose of public health epidemiological surveillance and how it integrates with decision making
- Differentiate between different types of surveillance systems, including the advantages and limitations of each
- Describe the key elements of a public health surveillance system that make it effective
- Describe the process of WWBS including sample collection, laboratory and bioinformatics methods, and data management and analysis
- Interpret WWBS data as part of epidemiological and genomic surveillance systems
- Discuss how WWBS can be used to inform public health decision-making
- Identify the biological, methodological, epidemiological, ethical and clinical factors that should be considered when designing and implementing a WWBS system and how each of these impacts the interpretation and actionability of the results
- Demonstrate how to communicate WWBS data and its interpretation to a range of audiences and stakeholders including the public, partners, and the media
- Investigate a mock disease outbreak using WWBS

Target Audience: This training is appropriate for laboratorians, epidemiologists or managers/leaders of public health surveillance programs who are involved or will be involved in implementing, interpreting, and/or making decisions based upon WWBS data. This training is not for laboratory technicians who are only involved in WWBS at the level of sample collection or processing of laboratory specimens.

Trainees should have a basic understanding of surveillance or laboratory methods and may or may not have experience with WWBS.

Quality Management Systems

APHL advances a culture of quality in public health laboratories by supporting the development and implementation of Quality Management Systems (QMS) aligned with international standards such as ISO 15189 and ISO 17025. QMS encompasses the 12 quality system essentials, which guide laboratory policies, processes, and procedures to ensure regulatory compliance, efficiency, and continuous improvement. APHL provides assessment, training, and technical assistance in internal auditing, method validation and verification, and ISO accreditation processes to strengthen laboratory quality and reliability.

APHL supports the assessment, training, and development of public health laboratories to build and maintain their quality management system in part by providing training on ISO standards, quality management systems, with focus on internal auditing and method validation and verification.

For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Quality Management Systems Trainings

Internal Auditing

Duration: Three days

Summary: This training provides an in-depth look at ISO 15189 internal audits and their critical role in ensuring medical laboratories maintain effective quality management systems and technical competence. Participants will learn how audits can uncover areas for improvement, prevent non-conformities, enhance the accuracy and reliability of laboratory results, and prepare laboratories for accreditation. The training walks participants through the full audit process, including planning and scoping, establishing audit criteria, conducting assessments, documenting findings, implementing corrective actions and compiling comprehensive reports. Through practical exercises and real-world examples, learners gain the skills and confidence to carry out internal audits that drive continuous quality improvement.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Define terminologies associated with internal audit as per ISO 19011
- Explain the principles and approaches to an audit
- Plan and execute an audit
- Develop an audit report

Target Audience: This training is appropriate for medical laboratory scientists, laboratory directors, laboratory administrators, laboratory technologists, quality managers, phlebotomists, other medical laboratory personnel, pathologists, nurses and doctors (POCT) and diagnostic imaging staff involved in the internal audit of the laboratory under ISO 15189 standard.



ISO 15189 Accreditation

Duration: Five days

Summary: This training immerses participants in the principles and requirements of the ISO 15189 standard, providing a practical roadmap for achieving and maintaining laboratory accreditation. The training explores the 12 quality system essentials (QSEs) that form the foundation of an effective quality management system (QMS) and demonstrates how the Stepwise Laboratory Quality

Improvement Process Towards Accreditation (SLIPTA) checklist can guide laboratories in meeting ISO 15189 requirements. Participants learn to apply risk management strategies and internal audits, and identify gaps in their current QMS, with actionable guidance on how to address these gaps. The training culminates in a leadership-focused session where participants develop strategies and plans to prepare their laboratories for successful accreditation, ensuring sustainable quality and compliance.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Describe the general requirements for a QMS in the laboratory
- Explain and interpret the requirements of ISO 15189
- Identify gaps in current QMS for compliance with ISO standards
- Conduct an internal audit for preparation for ISO accreditation
- Plan and prepare for ISO accreditation process
- Develop documents and processes to address identified gaps and plan for ISO accreditation
- Develop a risk management plan that follows ISO standards

Target Audience: This training is appropriate for laboratory leadership, management and quality officers.

Quality Management System (QMS)

Duration: Five days

Summary: This training is an interactive, hands-on program designed to immerse participants in the principles and practices of laboratory quality management. The training guides learners through the process of continuous quality improvement and explores the 12 essential elements of an effective QMS. Participants gain practical experience using quality indicators, understanding the importance of quality control and external quality assurance, and differentiating between licensure, certification, and accreditation. Through interactive exercises and real-world examples, learners develop the skills needed to implement and maintain robust quality management systems that support reliable laboratory operations and public health outcomes.

Learning Objectives: Upon completion of this training, participants will be able to:

- Explain the importance of implementing a continuous QMS at their laboratories
- Describe processes and procedures for the 12 essential elements of a QMS



- Demonstrate how to establish, monitor and evaluate quality indicators to assess laboratory performance and identify areas for improvement
- Summarize the use of quality control and external quality assessment
- Explain the difference between licensure, certification and accreditation

Target Audience: This training is appropriate for all laboratory professionals, specifically laboratory managers, quality officers and biosafety professionals.

Method Validation and Verification

Duration: Four days

Summary: This training explores the essential methods and equipment that ensure the accuracy, reliability, and clinical relevance of laboratory results. Participants learn how these processes support patient safety, strengthen diagnostic confidence, and maintain regulatory compliance. Through practical examples and interactive discussions, the training demonstrates how rigorous validation and verification practices form the backbone of a high-quality laboratory, enabling consistent, trustworthy results that inform critical clinical and public health decisions.

Learning Objectives: Upon completion of this training, the participant will be able to:

- Describe the performance characteristics requirements for a laboratory examination method
- Define the performance characteristics requirements for examination methods
- Demonstrate how to interpret validation and verification results for each of the performance characteristics
- Explain verification and validation results

Target Audience: This training is appropriate for laboratories implementing ISO 15189.



eLearning and Webinars

APHL offers high quality educational activities on a variety of topics in convenient formats, from laboratory-specific resources to those serving the broader public health community. APHL offers on-demand trainings you can take at your convenience through our web-based learning center.

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For more information or to schedule a training, please email global.health.training@aphl.org or a country office staff member in your region.

Global Laboratory Leadership Programme (GLLP) Course Content

Introduction to Laboratory Systems

Duration: One hour

Summary: This Introduction to Laboratory Systems training introduces participants to the structure and function of national health laboratory systems and laboratory networks, highlighting how sectors collaborate to support quality testing, surveillance, and emergency response. Learners can use this knowledge to examine their own country's laboratory system, identify key stakeholders, and explore the importance of cross-sector, "One Health" coordination for effective pathogen detection and response.

This course supports Module 1.A.2 in the GLLP Course Materials. It does not take the place of an in-person session but can be used prior to the session to help provide context and reduce didactic session time. This course can be taken as a stand-alone course for anyone interested in learning more about this topic.

Training Objectives: Upon completion of the training, the participant will be able to:

- Define laboratory network and laboratory system
- Recognize the importance of inter-sectoral collaboration and communication for effective pathogen detection and response
- Indicate their knowledge of their sector through completion of the GLLP Laboratory Sector Questionnaire

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Partnerships and Coalition Building

Duration: One hour

Summary: This course is designed to enhance laboratory leadership competencies within the context of public health systems. It guides participants through conducting a stakeholder analysis and understanding key concepts such as partnerships, collaboration, and coalitions. The module emphasizes the importance of multidisciplinary

and multisectoral collaboration, particularly within a One Health approach. It also explores the value of information sharing and the role of laboratory leaders as advocates, providing practical steps for effective advocacy. Through interactive activities and strategic frameworks, the presentation provides participants with the foundation to build sustainable partnerships, influence policy, and strengthen laboratory systems.

This course supports Module 3.A.5 in the GLLP Course Materials. It does not take the place of an in-person session but can be used prior to the session to help provide context and reduce didactic session time. This course can be taken as a stand-alone course for anyone interested in learning more about this topic.

Training Objectives: Upon completion of the training, the participant will be able to:

- Perform a stakeholder analysis
- Define a coalition and describe the coalition-building process
- Apply a One Health approach to partnerships
- Explain the value of information sharing
- Describe advocacy and advocacy skills
- Describe the role of a laboratory leader as an advocate

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Critical Thinking, Problem-Solving, and Decision-Making in the Laboratory

Duration: One hour

Summary: This training explores the role of critical thinking, problem-solving, and decision making in health laboratories. The training equips participants with how to define these terms, apply them effectively to situations in the laboratory, and examine ways to develop these skills as a laboratory leader.

This training includes three online modules. The first module focuses on critical thinking in the laboratory. The second module focuses on problem solving in the laboratory. The third module focuses on decision making in the laboratory.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Discuss the role of critical thinking, problem solving, and decision making in laboratories
- Identify strategies for developing critical thinking, problem solving, and decision making skills
- Apply improved critical thinking skills for improved problem solving and decision making

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Ethics in the Laboratory

Duration: One hour

Summary: This training examines components of a code of ethics and a code of conduct. Additionally, participants will analyze strategies to identify, mitigate, manage and resolve conflicts of interest in the laboratory.

This online training includes three modules. Module 1 focuses on ethical principles. Module 2 focuses on code of conduct. Module 3 focuses on conflict of interest.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Discuss components of a code of ethics and a code of conduct
- Describe codes of ethics and conduct for laboratories
- Identify appropriate responses to ethical challenges and violations in the laboratory

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

General Communication Skills

Duration: One hour

Summary: This training explores communication strategies that can be used to ensure that messages are received by audiences in formal and informal settings, both in writing and orally.

This training includes three online modules. The first module focuses on fundamentals of communication. The second module focuses on active listening and supportive communication. The third module explores the SOCO method.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Identify strategies for active listening and effective communication
- Apply fundamentals of communication in the laboratory
- Identify communication methods to use in laboratory-related situations

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.



General Leadership Skills

Duration: One hour

Summary: This training explores the roles and responsibilities of managers and leaders, to determine how these aspects align with current roles and future development.

This training consists of three modules. The first module focuses on defining the characteristics and styles of a leader. The second module focuses on comparing leadership and management roles and responsibilities. The third module focuses on leadership development resources and tools.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Identify managerial and leadership roles and responsibilities
- Analyze managerial and leadership skills
- Identify managerial and leadership areas for personal development

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.



Laboratory Policy and Strategic Planning

Duration: One hour

Summary: This training explores the policy development process by examining the role and function of laws, regulations, and policies. Participants will also analyze the strategic planning process and review how organizations use monitoring and evaluation data to improve their operations.

This training includes three online modules. The first module focuses on laws, regulations and policies that govern laboratory operations. The second module examines strategic and operational planning. The third module explores monitoring and evaluation.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Discuss the role and function of laws, regulations and policies
- Discuss the policy development process
- Identify best practices for policy writing, strategic and operational planning, and monitoring and evaluation

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Organizational Leadership

Duration: One hour

Summary: This training explores how organizational structure impacts information exchange, how to effectively communicate with employees, and how to motivate employees in different situations.

This training includes three online modules. The first module focuses on organizational structures. The second module focuses on motivation strategies and tools. The third module focuses on managing organizational change.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Describe the impact of organizational structure on information exchange
- Discuss the role of leaders in facilitating organizational change
- Develop communication and motivation strategies to support organizational change in your laboratory or health care system

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Introduction to the Global Laboratory Leadership Programme (GLLP)

Duration: One hour

Summary: This training orients learners to the concept of the Global Laboratory Leadership Programme (GLLP), its origin, the founding partners and the GLLP competency-based curriculum. The relationship between the GLLP and the critical role of laboratory systems is covered and the justification for adopting a One Health approach is presented. To receive a certificate of completion, the learner must complete all lessons and earn a grade of 80% or better on the quiz.

This training supports Module 1.A.1 in the GLLP Course Materials. It does not take the place of an in-person session but can be used prior to the session to help provide context and reduce didactic session time. This training can be taken as a stand-alone training for anyone interested in learning more about the GLLP.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Describe health governance and international health standards
- Define health laboratory, health laboratory system and networks
- Outline the benefits of a One Health approach
- Recognize the GLLP vision and mission
- Identify the six GLLP Partner organizations
- Summarize the Laboratory Leadership Competency Framework

Target Audience: Mid- to upper-level career laboratory professionals with managerial and decision-making experience.

Adult Learning Concepts and Facilitation Skills

Duration: One hour

Summary: This training strengthens facilitation skills for adult learning by providing basic knowledge on the different learning styles, the roles of a facilitator, facilitation good practices and tips to manage difficult participants.

This training is the third in a series developed for the Global Laboratory Leadership Programme (GLLP) Training of Trainers (TOT) curriculum. Learners who will participate in the GLLP as an instructor or mentor may be required to receive a certificate of completion for the training. Learners must complete all lessons and earn a grade of 80% or better on the quiz at the end of the training to receive a certificate of completion.

This training can also be taken as a stand-alone training for anyone interested in consultancy or training of adult learners.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Explain basic concepts of learning theory and how they support adult learning
- Identify four key learning styles
- Explain facilitators' roles and competencies
- Describe facilitation good practices including facilitation of group activities
- Identify key types of facilitation challenges and how to handle them

Target Audience: This training is appropriate for individuals who will serve as GLLP instructors and mentors.

Introduction to the GLLP

Duration: One hour

Summary: This training orients learners to the concept of the Global Laboratory Leadership Programme (GLLP), its origin, the founding partners and the GLLP competency-based curriculum. The relationship between the GLLP and the critical role of laboratory systems is covered and the justification for adopting a One Health approach is presented.

This training is the first in a series of trainings developed for the GLLP Training of Trainers/Mentors (TOT/TOM) curriculum. Learners who will participate in the GLLP as an instructor or mentor may be required to receive a certificate of completion for the training. To receive a certificate of completion, the learner must complete all lessons and earn a grade of 80% or better on the quiz.

This training can be taken as a stand-alone training for anyone interested in learning more about the GLLP including prospective participants, implementers and partners.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Describe health governance and international health standards

- Define health laboratory, health laboratory system and networks
- Outline the benefits of a One Health approach
- Recognize the GLLP vision and mission
- Identify the six GLLP Partner organizations
- Summarize the Laboratory Leadership Competency Framework

Target Audience: This training is appropriate for individuals who will serve as GLLP instructors and mentors.

The GLLP Learning Package

Duration: One hour

Summary: This training introduces the Global Laboratory Leadership Programme (GLLP) and the learning package. It is the second in a series of trainings developed for the GLLP Training of Trainers/Mentors (TOT/TOM) curriculum. Learners who will participate in the GLLP as instructors or mentors may be required to receive a certificate of completion for the training. To receive a certificate of completion, the learner must complete all lessons and earn a grade of 80% or better on the quiz.

During this training participants will need to access the World Health Organization (WHO) Health Security Learning Platform (HSLP) to download documents in the GLLP Welcome kit and Implementation toolbox. These documents are open access. If interested in being an instructor for the GLLP access will be given to the training materials which is available upon request. Email gllp@who.int to request permission to training materials. The implementing organization should request access through the WHO to these materials. This training can be completed without access to the training materials, but it is useful to have them available.

This training can be taken as a stand-alone training for anyone interested in learning more about the GLLP Learning Package for GLLP implementation.



Learning Objectives: Upon completion of the training, the participant will be able to:

- Explain the goal and objectives of the GLLP
- Describe the four components of the GLLP and their interrelatedness
- Review and adapt didactic content for country-specific needs
- Explain how the GLLP learning package is structured
- Explain how the didactic and the mentorship components complement each other in GLLP
- Identify relevant tools for GLLP delivery and participant evaluation

Target Audience: This training is appropriate for individuals who will serve as GLLP instructors and mentors.

Training of Mentors

Duration: One hour

Summary: This course provides training to potential mentors for a national or regional GLLP programme. The training covers the roles and responsibilities of mentors in the context of the GLLP. It provides a discussion of best practices and skills of a mentor as well as practice scenarios. An overview of GLLP mentor tools is also provided.

This training is part of a series of trainings developed for the GLLP Training of Trainers/Mentors (TOT/TOM) curriculum. Learners are encouraged to take Introduction to GLLP and The Learning Package trainings before taking this training. Learners who will participate in the GLLP as a mentor may be required to receive a certificate of completion for the training. To receive a certificate of completion, the learner must complete all lessons and earn a grade of 80% or better on the quiz.

This training can be taken as a stand-alone training for anyone interested in learning more about mentorship or the mentorship component of the GLLP.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Define what a mentor is in the context of the GLLP
- Describe mentoring skills for both mentees and mentors
- Identify and use tools needed for formalizing the mentor/mentee relationship in the context of the GLLP
- List the criteria for pairing mentors and mentees
- Explain mentor's role in support of mentees throughout the GLLP
- Explain how to evaluate the mentoring component of the GLLP

Target Audience: This training is appropriate for individuals who will serve as GLLP mentors.

Informatics

Life of a Result

Duration: 1.5 hours

Summary: This training is the second in a two-part introductory module on laboratory informatics. It provides information on the role and processes of laboratory informatics through exploration of the “life of a result” as data and results move through the laboratory and outside the laboratory. Topics covered include characterization of the recipients of laboratory data, data and results storage, and the communication of data and results (especially electronically) to various stakeholders

Traininig Objectives: Upon completion of this training, participants will be able to:

- Identify where and how data and results are stored inside the laboratory
- Recognize how data and results are transmitted inside and outside the laboratory to stakeholders



- Identify two paths that data and results can follow to impact the health of individual patients and the public
- Recognize how the proper recording, coding, storage, and transmission of data and results can impact patient care and public health
- Identify what data standards are used, their purpose, and components involved
- Explain what electronic test orders and results (ETOR), electronic laboratory reporting (ELR) and electronic health record (EHR) are and how they differ

Target Audience: This training is appropriate for public health and clinical laboratory staff.

Additional Languages Supported: Thai

Life of a Specimen

Duration: 1.5 hours

Summary: This training is the first of a two-part module on laboratory informatics. It provides information on the role and processes of laboratory informatics through exploration of the “life of a specimen” as a specimen moves through the laboratory. Topics covered include the roles of various personnel in the laboratory informatics enterprise, data relationships, data quality and standards, and the generation and flow of information as a specimen progresses through the pre-analytic, analytic, and post-analytic phases.

Learning Objectives: Upon completion of this training, participants will be able to:

- Recognize what laboratory informatics is and how it directly supports patients care and public health goals
- Identify who plays a role in laboratory informatics and explain the purpose of each role
- Identify the sequence of data and information flow within the laboratory from specimen collection/receipt to specimen storage/disposal
- Recognize the importance of data quality and the factors that impact data quality
- Identify the different types of data standards and the importance of using those standards
- Define what a laboratory information management system (LIMS) and laboratory information system (LIS) are, their capabilities and how they differ from other systems used in the laboratory

Target Audience: This training is appropriate for public health and clinical laboratory staff.

Additional Languages Supported: Thai

Microbial Pangenomes and Molecular Typing

Duration: 1.5 hours

Summary: This Microbial Pangenomes and Molecular Typing training introduces the foundations of microbial pangenomes, including terminology and categorization of pangenomes. It emphasizes how recombination and mobile genetic elements drive genomic diversity. Learners explore the applications of pangenome analysis and how it relates to key fields of study. Practical applications and tools for analysis are described.

Training objectives: Upon completion of the training, the participant will be able to:

- Define key terminology of pangenomes
- Explain how recombination and mobile genetic elements (e.g., plasmids, phages) contribute to gene flow and genomic diversity among bacterial strains
- Differentiate between open and closed pangenomes, and explain how ecological lifestyle (e.g., free living vs. obligate intracellular) influences pangenome openness
- Describe the importance of pangenome analysis for epidemiology, host or environmental niche adaptation, and bacterial taxonomy
- Relate molecular typing methods to whole genome sequencing methods
- Identify bioinformatic tools for pangenome analysis

Target Audience: This training is appropriate for public health and clinical laboratory staff.

Microbial Genomics Series

Bayesian Phylogenetics & Coalescent Analysis for Public Health Laboratorians

Duration: One hour

Summary: This introductory course gives public health laboratorians a clear, accessible foundation in how genomic data reveals pathogen evolution, transmission, and spread. Through practical, plain language modules, participants learn the basics of Bayesian phylogenetics, molecular clocks, and coalescent theory, and how these tools support outbreak investigations and real world public health decisions.

Training Objectives: Upon completion of the training, participants will be able to:

- Interpret phylogenetic trees in a public health context
- Explain the fundamentals of Bayesian analysis for genomic data
- Explain how molecular clocks help estimate timing in pathogen evolution
- Describe the fundamentals of coalescent theory
- Recognize how genomic data informs population dynamics and real-world public health decisions

Target Audience: This training is appropriate for public health or clinical laboratory staff with beginner level knowledge of NGS.



Introduction to Phylogenetics

Duration: One hour

Summary: This Introduction to Phylogenetics training introduces the core concepts and methods used in phylogenetics. It reviews how phylogenetic trees are built and interpreted, including branches, nodes, clades, tree topology, and approaches for rooting trees. The course also provides an overview of computational methods for inferring evolutionary relationships from whole genome sequencing data, including distance based clustering, parsimony, maximum likelihood, and Bayesian models. By the end of the course, learners will understand how to evaluate phylogenetic trees, compare common inference methods, and understand how model assumptions shape evolutionary conclusions.

Training Objectives: Upon completion of the training, the participant will be able to:

- Explain the purpose of phylogenetic trees and how they represent evolutionary relationships among taxa
- Identify the main parts of a phylogenetic tree, including branches, nodes, clades, and root
- Differentiate between rooted and unrooted trees and describe methods for determining the root (outgroup and midpoint rooting)
- Interpret tree topology and understand what branch lengths and patterns indicate about relatedness
- Describe the steps in constructing a phylogenetic tree, including sequence collection, multiple sequence alignment, model selection, and tree building
- Compare different phylogenetic inference methods, such as clustering (UPGMA, Neighbor-Joining) and optimality approaches (Parsimony, Maximum Likelihood, Bayesian)

Target Audience: This training is appropriate for public health or clinical laboratory staff with beginner level knowledge of NGS.

Bioinformatics and High-performing Computing

Duration: One hour

Summary: This training is an introduction to bioinformatics and bioinformatic pipelines. The training will introduce high-performance computing and describe how it can be used for next-generation sequencing data analysis.

This training is one in a series of microlearning trainings that cover topics in next-generation sequencing and microbial genomics.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Define bioinformatics and high-performance computing (HPC)
- Differentiate between serial and parallel computing
- Define HPC terminology: core, node, cluster, jobs, terminal, bash
- Summarize bioinformatics workflows (submission scripts) on HPC

Target Audience: This training is appropriate for public health or clinical laboratory staff with beginner level knowledge of NGS.

Genome Assembly

Duration: One hour

Summary: This training introduces genome assembly analysis as part of the bioinformatics workflow for NGS. It reviews the different methods for genome assembly and provides the bioinformatic tools needed to complete each step.

This training is one in a series of micro-learning trainings covering topics in NGS and microbial genomics. It can be taken as a standalone or in conjunction with the other trainings in the series. Each training is designed to be completed in less than one hour.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Explain reference-based genome assembly
- Describe hybrid genome assembly
- Outline process for genome annotation

Target Audience: This training is appropriate for public health or clinical laboratory staff with beginner level knowledge of NGS.

Introduction to Microbial Genomics

Duration: One hour

Summary: This training is an introduction to the field of microbial genomics. The training discusses the importance of microbial genomic studies and the breadth of information that can be learned from these studies. The training also reviews the steps in microbial genomic studies which is an outline for the trainings in this series. Each subsequent training will provide more detail on a different topic within microbial genomics.

This training is the first in a series of micro-learning trainings covering topics in next-generation sequencing and microbial genomics. It can be taken as a standalone or in conjunction with the other trainings in the series.

Learning Objectives: Upon completion of the training, the participant will be able to:

- List examples of the application of microbial genomics in each of the categories: Human Health, Food Science, Animal and Plant Health, Environmental Health, and Energy and pollution
- Describe the basic analytical steps in microbial genomic studies
- Recognize fields of science that are involved with the field of microbial genomics
- Discuss levels of resolution in microbial genomic studies
- Examine different definitions of species and methods of analysis for species identification

Target Audience: This training is appropriate for public health or clinical laboratory staff with beginner level knowledge of NGS.



Next-generation Sequencing Technology

Duration: One hour

Summary: This training is an introduction to NGS technology. The training will review the history of sequencing, NGS workflow and platforms, and the pros and cons of current sequencing platforms.

This training is one in a series of microlearning trainings that cover topics in next-generation sequencing and microbial genomics.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Describe the history of sequencing and the current applications of NGS
- Compare the pros and cons of various sequencing platforms based on application
- Explain the basic data generation and analysis pipeline for whole genome sequencing

Target Audience: This training is appropriate for anyone who works in a public health or clinical laboratory. The level of instruction is for beginner or entry-level learners.

Introduction to Genomic Epidemiology

Duration: One hour

Summary: Whole genome sequencing is used to detect and investigate infectious disease outbreaks. This practice has given rise to the field of genomic epidemiology. In combination with epidemiological data (host risk factors, demographics and geography), the transmission dynamics of a pathogen of interest can be elucidated. This training will discuss the details of how genomic epidemiology is applied in public health laboratories and how it can be used in outbreak investigations.

This training is one in a series of microlearning trainings that cover topics in next-generation sequencing and microbial genomics.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Define genomic epidemiology
- Describe the applications of genomic epidemiology
- Outline the steps in a genomic epidemiology investigation
- Identify challenges and considerations for using genomic epidemiology in outbreak investigations

Target Audience: This training is appropriate for anyone who works in a public health or clinical laboratory. The level of instruction is for beginner or entry-level learners.

Prokaryotic Genomes

Duration: 1.5 hours

Summary: This training is an introduction to prokaryotic genome cells and genomes. It describes prokaryotic cells, cellular functions and replication. This training also provides a review of DNA structure and function as well as discussing DNA recombination and mutations in prokaryotes.

This training is the third in a series of microlearning trainings that cover topics in NGS and microbial genomics. It can be taken as a standalone or in conjunction with the other trainings in the series.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Differentiate between eukaryotic and prokaryotic cells
- Describe prokaryote cellular characteristics, organization, and replication
- Describe DNA structure and function
- Classify DNA mutations and phenotypic effects of each
- Discuss bacterial genetics including genetic elements and genetic recombination

Target Audience: This training is appropriate for anyone who works in a public health or clinical laboratory. The level of instruction is for beginner or entry-level learners.

Microbial Population Genomics

Duration: One hour

Summary: This training is a short introduction to population genetics with focus on microbial populations.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Define population genetics
- Discuss underlying theories in population genetics
- Describe the different mechanisms driving genetic variation
- Apply a mathematical equation to determine if selection has occurred in a population

Target Audience: This training is appropriate for anyone who works in a public health or clinical laboratory. The level of instruction is for beginner or entry-level learners.



Wastewater-based Surveillance

Silent Signals: A Webinar Series on Wastewater Surveillance for Public Health – Part 1

Duration: One hour

Summary: This three-part wastewater webinar series, in partnership with the US Centers for Disease Control and Prevention and Water Environmental Federation, will focus on various aspects of wastewater surveillance to enhance wastewater collaboration between public health laboratories, academic laboratories and industries producing wastewater surveillance reagents and supplies. Part one will feature a presentation from Kenya Ministry of Health and a highlight of a US Wastewater Laboratory Community of Practice.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Explain the methodologies and achievements of Kenya’s Ministry of Health COVID-19 Wastewater Pilot Project
- Evaluate collaborative approaches within the US Wastewater Laboratory Community of Practice

Target Audience: The training is appropriate for public health laboratory staff, epidemiologists and researchers involved in or seeking to implement wastewater surveillance.



Silent Signals: A Webinar Series on Wastewater Surveillance for Public Health – Part 2

Duration: One hour

Summary: This three-part wastewater webinar series, in partnership with the US Centers for Disease Control and Prevention and Water Environmental Federation will focus on various aspects of wastewater surveillance to enhance wastewater collaboration between public health laboratories, academic laboratories and industries producing wastewater surveillance reagents and supplies. Part two will feature a presentation from National Institute for Communicable Diseases of South Africa and an introduction to the GLOWACON conference.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Describe the role of wastewater surveillance in public health in South Africa through the National Institute for Communicable Diseases of South Africa
- Discuss the benefits of attending the GLOWACON conference for establishing a wastewater surveillance Community of Practice

Target Audience: This training is appropriate for public health laboratory staff, epidemiologists, and researchers involved in or seeking to implement wastewater surveillance.

Silent Signals: A Webinar Series on Wastewater Surveillance for Public Health – Part 3

Duration: One hour

Summary: This three-part wastewater webinar series, in partnership with the US Centers for Disease Control and Prevention and Water Environmental Federation will focus on various aspects of wastewater surveillance to enhance wastewater collaboration between public health laboratories, academic laboratories and industries producing wastewater surveillance reagents and supplies. Part three will feature a presentation from Africa Centres for Disease Control and Prevention and Ceres Nanosciences.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Identify key strategies in wastewater surveillance in Africa from Africa CDC's presentation
- Describe a simplified wastewater surveillance workflow for multiple pathogens of interest (e.g. viruses, bacteria, fungi and parasites)
- Examine when to use a manual vs an automated workflow

Target Audience: This training is appropriate for public health laboratory staff, epidemiologists and researchers involved in or seeking to implement wastewater surveillance.

Terra.bio

Terra.bio: Genomic Characterization

Duration: 1.5 hours

Summary: This training evaluates quality control metrics during characterization of SARS-CoV-2 genomes using the Terra platform.

*Note that it is recommended to complete this training prior to enrolling in the [Terra.bio Genomic Epidemiology](#) course.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Explain how to upload data to Terra
- Explain how to run TheiaCoV genomic characterization workflows
- Interpret the TheiaCoV workflow outputs
- Demonstrate where to locate Terra Theiagen documentation

Target Audience: This training is appropriate for bioinformaticians and molecular biologists performing NGS.

Additional Languages Offered: French, Portuguese, Russian and Spanish

Terra.bio: Genomic Epidemiology

Duration: 1.5 hours

Summary: The goal of this training is to utilize genomics to understand the epidemiology of SARS-CoV-2 using the Terra platform.

*Note that it is recommended to complete the [Terra.bio Genomic Characterization](#) training prior to enrolling in this training.

Learning Objectives: Upon completion of the training, the participant will be able to:

- Identify the parts of a phylogenetic tree
- Construct phylogenetic trees for SARS-CoV-2
- Make use of Nextstrain to visualize phylogenetic trees

Target Audience: This training is appropriate for bioinformaticians and molecular biologists performing NGS.

Additional Languages Offered: French, Portuguese, Russian and Spanish





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