CONCEPT NOTE

Update 18 Feb 2026

Activity Title:	**PATHOGEN GENOMICS FOR PUBLIC HEALTH LABORATORIES**
Proposed Dates:	**May 11-15, 2026**
Facilitated by:	**RITM – Advanced Molecular Technologies Laboratory**

I. BACKGROUND

Importance of pathogen genomics

Pathogen genomics has become a cornerstone of modern public health practice, transforming the detection, monitoring, and control of infectious diseases through high-resolution characterization of pathogens using whole-genome sequencing and bioinformatics analysis. Genomic approaches enable accurate species and strain identification, detection of antimicrobial resistance determinants, monitoring of pathogen evolution, and reconstruction of transmission dynamics. Globally, genomic data are increasingly integrated into routine surveillance systems to support outbreak investigations, guide public health interventions, evaluate vaccine effectiveness, and inform evidence-based policy decisions. International organizations, including the World Health Organization (WHO), recognize genomic surveillance as a critical component of health security and pandemic preparedness.

The COVID-19 pandemic underscored the operational value of pathogen genomics for real-time surveillance, early detection of variants of concern, and assessment of public health impact. Beyond viral pathogens, genomic approaches are now essential for bacterial, parasitic, and fungal pathogens, particularly in the context of antimicrobial resistance, vaccine-preventable diseases, zoonotic infections, and re-emerging diseases influenced by climate change and ecological disruption. Sustained investment in both wet-laboratory sequencing capabilities and dry-laboratory bioinformatics expertise is therefore essential to strengthen public health systems across all members of the Regional Public Health Laboratory Network.

Pathogen Genomics Training Overview

This training is designed for public health professionals from member countries of the Regional Public Health Laboratory Network and is implemented in collaboration with Regional Public Health Laboratories (RPHLs). It adopts a dual-track structure to ensure both foundational knowledge and practical skills development. All participants will undertake a common two-day lecture-based program covering core concepts in pathogen genomics, sequencing technologies, bioinformatics principles, data quality considerations, and public health applications.

The hands-on component will focus on viral genomics track. SARS-CoV-2 whole-genome sequencing using the Oxford Nanopore Technologies (ONT) platform will serve as a model

workflow for training. This exemplar pathogen and platform will be used to demonstrate transferable laboratory and analytical principles that can be adapted to other priority pathogens within participants' respective national and regional contexts.

II. RATIONALE

Across the globe, interest in applying pathogen genomics to routine public health surveillance and outbreak response has increased substantially, particularly in Southeast Asia and South Asia. However, access to structured, hands-on training that integrates both sequencing and bioinformatics, and that is tailored to public health use cases, remains limited. As a result, the application of genomic data in routine surveillance, outbreak investigations, and antimicrobial resistance monitoring is inconsistent, and genomic outputs are often underutilized for decision-making.

In addition, opportunities for regional collaboration, peer learning, and harmonization of genomic approaches among countries within South/Southeast Asia are still limited. Many public health laboratories continue to rely on external or centralized reference laboratories for sequencing and data analysis, which can delay access to results, limit local ownership of data, and affect sustainability. This training contributes to addressing these gaps by strengthening regional capacity, promoting the sharing of best practices, and fostering collaboration among public health professionals from member countries of the Regional Public Health Laboratory Network, with the long-term goal of enhancing the timely and effective use of pathogen genomics for regional health security.

III. ACTIVITY OBJECTIVES

The training aims to strengthen pathogen genomics capacity among public health professionals from the RPHL network through a structured, hands-on, and track-specific approach. Specifically, the activity seeks to:

1. Provide participants with a common **foundationa**l understanding of pathogen genomics, including sequencing technologies, bioinformatics workflows, quality considerations, and public health applications relevant to viral and bacterial pathogens.
2. Deliver **practical training utilizing a viral genomics track** — using SARS-CoV-2 whole-genome sequencing on the ONT platform as a model workflow; and
3. Strengthen **bioinformatics** capacity for genomic data quality control, analysis, interpretation, and reporting to support surveillance, outbreak response, and antimicrobial resistance monitoring.
3. Promote regional collaboration and exchange of best practices among RPHL network public health laboratories to support harmonized and sustainable implementation of pathogen genomics.

IV. LEARNING OBJECTIVES

This section describes the learning objectives for participants.

A. Common Learning Objectives (Day 1 Lecture Sessions)

By the end of the lecture sessions, participants will be able to:

- Explain the fundamental principles of next-generation and third-generation sequencing and bioinformatics as applied to public health surveillance of viral and bacterial pathogens.
- Describe the end-to-end pathogen genomics workflow, from specimen processing and sequencing to data analysis, interpretation, and reporting.
- Recognize the role of pathogen genomics in surveillance, outbreak investigation, antimicrobial resistance monitoring, and regional health security.

B. Wet Laboratory Learning Objectives

By the end of the training, participants will be able to:

- Perform whole-genome sequencing workflows for viral pathogens, including cDNA synthesis, multiplex PCR, library preparation, and sequencing using the ONT platform.
- Apply quality control measures and troubleshoot common technical issues encountered during sequencing workflows.
- Generate sequencing outputs and run documentation suitable for downstream bioinformatics analysis and reporting.

C. Dry Laboratory (Bioinformatics) Learning Objectives

By the end of the bioinformatics component, participants will be able to:

- Perform basic bioinformatics operations, including Linux-based workflow execution, data handling, and NGS data quality control for viral and bacterial datasets.
- Conduct standardized genomic analyses, including consensus sequence generation, lineage or strain assignment, and interpretation of key outputs.
- Organize, document, and archive genomic data and analysis outputs in a structured and reproducible manner.
- Communicate bioinformatics results effectively to laboratory and public health stakeholders to support data-driven decision-making.

V. TARGET PARTICIPANTS

The training is intended for selected laboratory professionals from member laboratories of the Regional Public Health Laboratory (RPHL) network who are, or will be, directly involved in the establishment, implementation, or expansion of pathogen genomics activities within their respective institutions.

Eligibility Criteria:

Essential Qualifications

Nominees must meet the following minimum criteria:

- Current employment in a public health, hospital, veterinary, academic, or research laboratory within the RPHL Network.
- **At least five years of experience** in molecular diagnostics, microbiology, virology, genomics, or related laboratory fields.
- Foundational understanding of:
    - PCR and molecular biology workflows
    - DNA/RNA extraction procedures
    - Biosafety and biosecurity principles
- Demonstrated involvement in, or clear upcoming role in:
    - genomic surveillance and public-health investigations
    - whole-genome sequencing (WGS) workflows
    - antimicrobial resistance (AMR) surveillance
    - molecular epidemiology or data interpretation

Target Participants:

- Laboratory scientists, medical technologists, or technical supervisors designated to perform wet-laboratory sequencing workflows.
- Laboratory, bioinformatics, or data management staff designated to conduct genomic data analysis, interpretation, and reporting for public health applications.

Training Completion Requirements:

To successfully complete the training program, participants must fulfill the following requirements:

1. Attend and actively participate in all activities throughout the training, including lecture sessions and laboratory hands-on tracks of their choice;
2. Deliver an oral presentation showcasing their individual case study or present findings, results, and troubleshooting insights;
3. Complete both the pre-test and post-test, achieving a score of at least 80% on the post-test and;

4. Complete the evaluation/feedback survey.

VI. PROPOSED TRAINING SCHEDULE

SESSION 1: May 11, 2026 | MONDAY

Venue: Hotel

TIME	ACTIVITY TYPE	TOPIC/ACTIVITY	SPEAKER/FACILITATOR
8:00 - 8:20		*Registration*	Officer of the day
8:20 - 9:00		Opening Ceremonies, RITM Video, and Welcome Address	Atty. Ana Liza Hombrado-Duran, MD, MMHoA [RPHL representative]
9:00 - 9:30		Introduction to AMTL, the Course, and House Rules	Timothy John R. Dizon, MD, MBA
9:30 - 9:45		Introduction of the Participants and AMTL staff	Timothy John R. Dizon, MD, MBA and Facilitators
9:45 - 10:00		**AM Snack and Pictorial**	
10:00 - 10:30	Exam	*Pre-Test*	Facilitators
10:30 -12:00	Lecture	Genomics in Public Health	Timothy John R. Dizon, MD, MBA
12:00 - 13:00		**Lunch Break**	
13:00 - 14:00	Lecture	Case Studies On Genomics Applications	Lei Lanna M. Dancel, RMicro and Nina Natalia L. Bautista, MD, DPSP
14:00 - 15:00	Lecture	Sequencing Platforms	Allen Anthony P. Larano, PhD
15:00-15:15		**PM Snack**	
15:15 - 17:00	Lecture	Pathogen Characterization using ONT	Niquitta B. Galap

SESSION 2: May 12, 2026 | TUESDAY (WET LAB)

Venue: RITM-AMTL

TIME	ACTIVITY TYPE	TOPIC/ACTIVITY	SPEAKER/FACILITATOR
8:00 - 8:30	Lecture	Pre-lab discussion for Day 2	*TBD*
8:30 - 9:30	Hands-on	cDNA synthesis	AMTL Wet Lab Facilitators
9:30 - 10:30	Lab Hands-on	Multiplex PCR	AMTL Wet Lab Facilitators
10:30 - 11:00		**AM Snack**	
11:00 - 12:00	Discussion	Discussion, Q&A	*TBD*
12:00 - 13:00		**Lunch Break**	
13:00 - 14:00	Lecture	Pre-lab discussion for Day 3	*TBD*
14:00 - 14:15		**PM Snack**	
14:15 - 17:00	Lab Hands-on	DNA clean-up, QC and normalization	AMTL Wet Lab Facilitators

SESSION 3: May 13, 2026 | WEDNESDAY (WET LAB)

Venue: RITM-AMTL

TIME	ACTIVITY TYPE	TOPIC/ACTIVITY	SPEAKER/FACILITATOR
8:00 - 12:00	Lab Hands-on	Library Preparation	AMTL Wet Lab Facilitators
12:00 -13:00		**Lunch Break**	
13:00 - 16:00	Lab Hands-on	Library Preparation and Initiation of Sequencing Run	AMTL Wet Lab Facilitators
16:00 - 16:30		**PM Snack**	
16:30 - 17:00	Lab Hands-on	Monitoring of Sequencing Run Progress	AMTL Wet Lab Facilitators

SESSION 4: May 14, 2026 | THURSDAY (DRYLAB)
Venue:Hotel

TIME	ACTIVITY TYPE	TOPIC/ACTIVITY	SPEAKER/FACILITATOR
8:00 - 9:00	Lecture	Basic Linux Command-Line and Linux Text Processing	Bioinformatics and Data Management Unit
9:00 - 9:45	Hands-on		
9:45-10:00		**AM Snack**	
10:00-10:30	Lecture	Intro to ONT data, Quality Control, and Bioinformatics Working	Bioinformatics and Data Management Unit

		Environment	
10:30-12:00	Hands-on	Creating Bioinformatics Working Environment, QC	
12:00-13:00		**Lunch Break**	
13:00-13:30	Lecture	Bioinfomartics Workflows - Metagenomics	Bioinformatics and Data Management Unit
13:30-14:30	Hands-on	Kraken2, Minimap2, Samtools, iVar	
14:30-15:00	Lecture	Bioinformatics Workflows - Tiled Amplicon Sequencing	
15:00-15:15		**PM Snack**	
15:15-16:15	Hands-on	Artic Pipeline	Bioinformatics and Data Management Unit
16:15-17:00	Lecture and Hands-on	Downstream Analyses - Nextclade	

SESSION 5: May 15, 2026 | FRIDAY (DRY LAB)

Venue: Hotel

TIME	ACTIVITY TYPE	TOPIC/ACTIVITY	SPEAKER/FACILITATOR
8:00-8:30	Lecture	Recap of Dry lab Day 1 activities and Introduction to Case Studies	Bioinformatics and Data Management Unit
8:30-10:00	Hands-on	Case Study Analysis and preparation of presentations per group	
10:00-10:15		**AM Snack**	
10:15-12:00	Hands-on	Continuation of Case Study Analysis and preparation of presentations per group	Bioinformatics and Data Management Unit
12:00-13:00		**Lunch Break**	
13:00-14:00	Group Presentation	Case Study Presentation	
14:15-15:15	Presentation	Post-lab discussion and Q&A	Bioinformatics and Data Management Unit
15:15-15:45	Exam	Post-test	Facilitators
15:45-16:00	Lecture	Post-test discussion	TBD
16:00-16:30		Awarding of Certificates	RITM Leadership and RPHL Representatives
16:30-16:45		Closing Ceremonies	RITM Leadership

VII. NUMBER OF ATTENDEES PER DAY

Please note that the number of attendees per day is subject to change depending on the finalization of the designation of facilitators and lecturers per day.

DAY	NUMBER OF PAX	LOCATION
DAY 0		
Participants	15 pax	Conference Room
DAY 1 (Lecture Series)		
Participants	15 pax	Conference Room
DAY 2 (Wet Lab)		
Participants	15 pax	RITM-AMTL
DAY 3 (Wet Lab)		
Participants	15 pax	RITM-AMTL
DAY 4 (Dry Lab)		
Participants	15 pax	Conference Room
DAY 5 (Dry Lab)		
Participants	15 pax	Conference Room