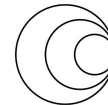# Session 5: Design genomics training - from specimen to sequencing

Instructors:
Alice Matimba, Liã Bárbara Arruda, Luria Leslie Founou, Linzy Elton, Shavanthi Rajatileka, Kareemah Suleiman
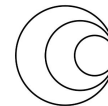
Session outline

This module will cover tools and approaches to designing activities for effective training in sampling, molecular microbiology and sequencing using an outbreak response as example

- Concepts of pathogen surveillance
- Strategies used to teach these concepts

Session outcomes

At the end of this session participants will be able to:

- Differentiate methodologies and skills required for an effective pathogen identification and monitoring

- Determine appropriate topics and sub-topics for training in pathogen genomics
- Outline training activities which apply adult learning and active learning strategies
- Identify appropriate tools and resources required to deliver training in pathogen surveillance
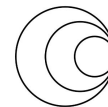
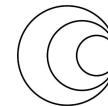# Developing modules - Step 1: list of main topics

Training in Sampling to Sequencing
Topics:

- Specimen and data collection
- Molecular microbiology
- Sequencing

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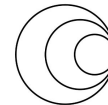
Developing modules - Step 2: define sub-topics

Teaching topic (Module)	Sub-topics in module
Sampling and data collection	Sample collection and types of samples
	Sample processing
	Nucleic acid extraction and quality control
	Storage and documentation
Molecular Microbiology	Molecular microbiology for diagnostics and monitoring
	Molecular biology methodologies
	Interpretation of results and troubleshooting
Sequencing	Sequencing methodologies
	Pathogen genome whole-genome sequencing
	Sequencing and data quality control

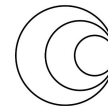# Design training - Step 3: strategies and activities

1. What sub-topics are more important/urgent to be covered at this moment?
   - Emergency, refresher, new starters?

1. What training strategies and activities can be applied?
   - Slides presentation, shadowing experiments, reading manuals+discussion

1. Assessment
   - How to evaluate the training reached its goal?

1. Provide resources and tools
   - Indicate where to find further information, who are the people to seek advice

1. Feedback strategy
   - How the feedback will be collected, assessed and implemented?

Example 1. Sampling

Why?	What?	How?	When?
Sickness Outbreak Discovery	Condition Sample source Sample type	Collection Preservation Ethics Processing	Time frequency
Diagnosis Monitor treatment Infection control Research Disease surveillance	Faeces, water, soil Human, animal, environment Sputum, blood, urine	Volume Storage Transport Collection tubes PPE Labelling Database linkage	Spot, hourly, daily Early morning, Weekly, monthly, quarterly

wellcome connecting science

COG-TRAIN COVID-19 GENOMICS GLOBAL TRAINING
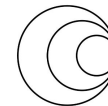
Example 1. Sampling

Refine sub-topics, objectives and learning outcomes

- Outline session objectives e.g.

  This session will cover aspects involved to determine sample types and sampling strategies

- Refine learning outcomes (dependant on target audience, goals, resources)
  E.g. For a mixed audience of laboratory scientists and bioinformaticians in your team

  Example LOs - By the end of the session attendees should be able to:
  - *Understand basic concepts of sampling strategies in public health emergencies*
 - *Define sample types for the relevant analyses available in our laboratory*

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COG-TRAIN
COVID-19
GENOMICS
GLOBAL TRAINING
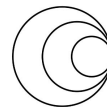
Example 1. Sampling

What: *Topic: Sampling, Sub-topic: Sample types*

Why: *Training of new staff*

When: *at the next monthly meeting*

How: *Presentation*
- *Present the test analyses available in the laboratory and the sample types used for each.*
- *Explain the importance of the correct sample type for each methodology*
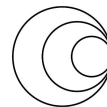
Example 1. Sampling

Outcome-based strategies to teach sample types

Expected (Learning) Outcome	Activities and assessment
Understand basic concepts of sampling strategies in public health emergencies	Provide learners with a mixture of the real-world good and bad examples of sampling strategies. Explain the consequences of good and bad sampling strategies. Invite them to criticise if the strategies are adequate and propose alternatives.
Define sample types for the relevant analyses available in our laboratory	Present the samples collected and/or used in your laboratory. Explain the importance of using the correct sample types for each method/test/analisis. Indicate where to find information about standard procedures and troubleshooting. Ask the participants to correlate samples and tests.
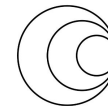
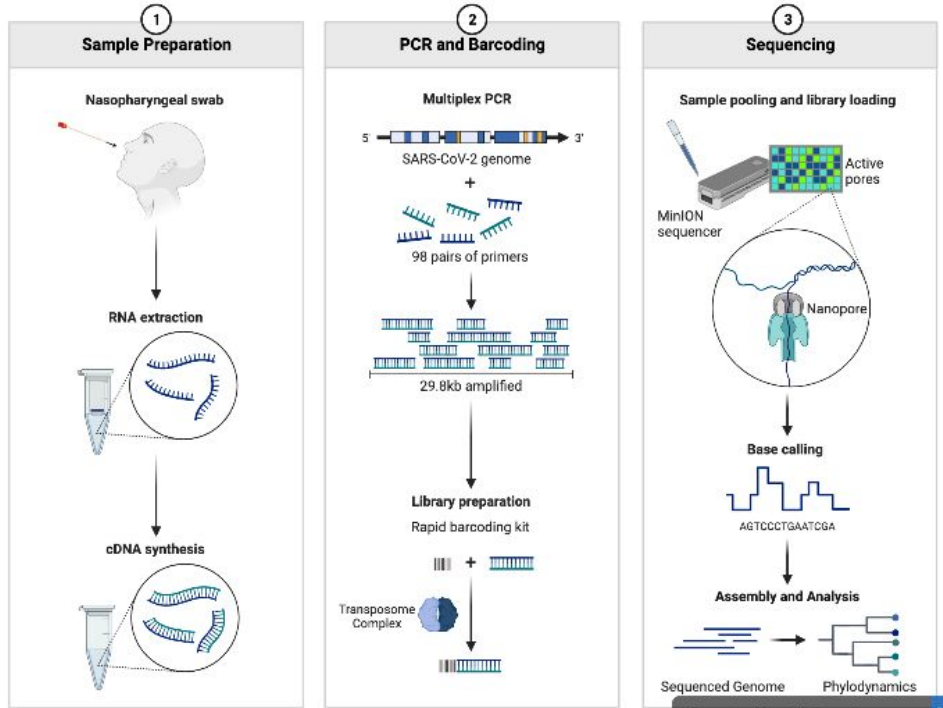# Group activity - Propose an activity for sample types

What activities you could apply to evaluate if the participants can determine sample types for each test/analysis? (10 min discussion)
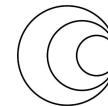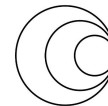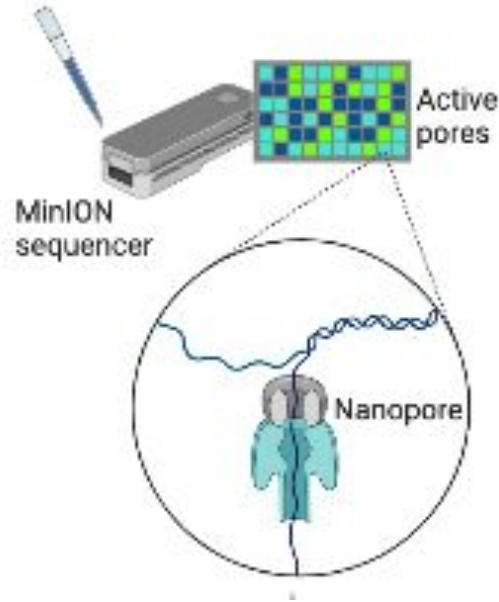
Example 2. Sequencing

SARS-CoV-2 Genome Sequencing using Oxford Nanopore Technologies

Example 2. Sequencing

Example 2. Sequencing

Refine sub- topics, objectives and learning outcomes

- Outline session objectives e.g.
  This practical training will teach how to load a MinION flowcell

- Refine learning outcomes (dependant on target audience, goals, resources)
  E.g. For a laboratory scientist audience

  Example LO - By the end of the session attendees should be able to:
  - *Reproduce good practices of pipetting when loading a flow cell*
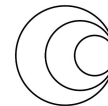
Group activity - Propose learning outcomes

What other learning outcomes (LO) this session could have?
How would you design activities and evaluation for each LO?
In group, propose **one** new learning outcome, activity and assessment (10 min discussion)

Example:

Expected (Learning) Outcome	Activities and assessment
Reproduce good practices of pipetting when loading a flow cell	Show the trainee(s) good practices when pipetting the how it affects the loading of flowcells, including potential pitfalls and troubleshooting. Ask the trainee to load a dummy flowcell and observe their technique. Ask what they could do to improve their technique or to avoid mistakes. Ask them to repeat the loading 3 times and to identify if they are improving and becoming more confident on the technique.
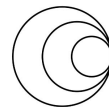
Key considerations

- Using outcome based approaches is key to developing appropriate sub-topics for the target audiences
- Each sub-topic requires tailoring of tools and approaches for effective delivery of content
- Identify appropriate sets of freely available tools, software and resources - latest tools
- Emphasise troubleshooting and real-world examples
- Use what, why, where and how to guide your planning and training