Module 3
SARS-CoV-2 whole genome sequencing

Day 1

The Fleming Fund
Regional Grants

17 May 2021

Pernille Nilsson

Virtual Housekeeping

Please **turn off your cameras and microphones** – this will help with bandwidth and maximise audibility.

Do frequently **use Slack** to share comments and ask questions. Keep the chat constructive, respectful and on topic!

For Q&A's **use Slack to submit your questions!** Please upvote (give a thumbs-up) to the questions that you like.

The session is being **recorded for distribution to participants** as a post course resource as well as for future iterations of the course.

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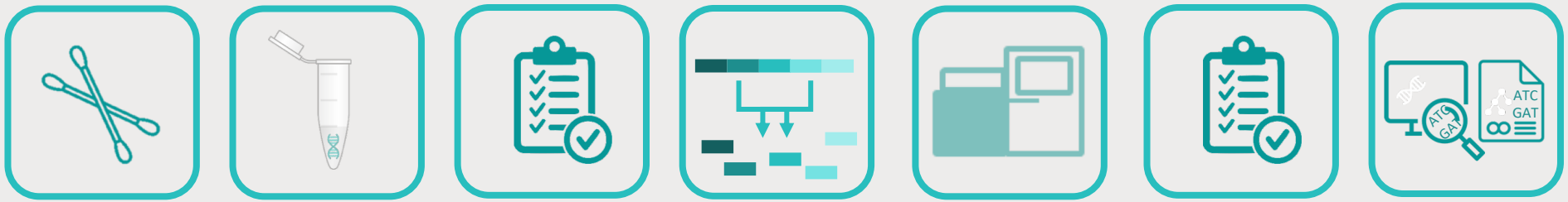
SARS-CoV-2 whole genome sequencing



Course program

- 4 x ½ days
- Use Slack channel for questions
- Access Jottacloud – for videos, presentations and exercise material

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Agenda

Monday 17th May 09.00 – 13.00 CET

Lectures

Exercises

SurveyMonkey

Day 1: Monday – 17 May 2021 – Sequencing workflow overview and wet lab methods Join Zoom call and Slack channel to attend		
Time (CET)	**Content**	**Lecturer/ Facilitator**
08.45 – 09.00	**Joining the call** – Assistance will be provided at this time to help participants join	
09.00 – 09.15	**Welcome and Introduction** (Live)	Pernille Nilsson (DTU, Denmark)
09.15 – 09.45	**[1] SARS-CoV-2 genomic surveillance:** From respiratory sample to SARS-CoV-2 genome (Pre-recorded)	Jinal Bhiman (NICD, South Africa)
09.45 – 10.00	**BREAK**	
10.00 – 10.30	**[2] RNA extraction:** From respiratory sample to RNA. (Pre-recorded)	Noxolo Ntuli (NICD, South Africa)
10.30 – 11.00	**[3] cDNA synthesis and tiling PCR:** Method and background for cDNA synthesis using random hexamers followed by tiling PCR using primer pools with >170 individual primers (Pre-recorded)	Boitshoko Mahlangu (NICD, South Africa)
11.00 – 11.15	**[4] Amplicon generation and quantification** (Pre-recorded)	Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)
11.15 – 11.45	**BREAK**	
11.45 – 12.15	**[5a] Library preparation:** Going from high quality DNA to sequencing libraries. "Hands-on" and theory. Description of library preparation using the Nextera Flex kit (Pre-recorded)	Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)
12.15 – 12.45	**[5b] Library preparation:** Going from high quality DNA to sequencing libraries. "Hands-on" and theory. Description of library preparation using the COVIDSeq and the Thermo Fisher kits (Pre-recorded)	Thabo Mohale, Zama Khumalo (NICD, South Africa)
12.45 – 13.00	**Q&A and Wrap-up** (Live)	Pernille Nilsson (DTU, Denmark)

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Who we are

- Led by the Research Group for Global Capacity Building at the National Food Institute (DTU Food).
- Established and currently support a consortium of **regional** and **national** sequencing centres

1. **Nigeria, University of Ibadan (UI)**
2. **Tanzania, Kilimanjaro Clinical Research Institute (KCRI)**
3. **South Africa, National Institute for Communicable Diseases (NICD)**
4. **Ghana, Noguchi Memorial Institute for Medical Research (NMIMR)**
5. **South Africa, NICD, SARS-CoV-2**

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Bringing WGS into AMR surveillance

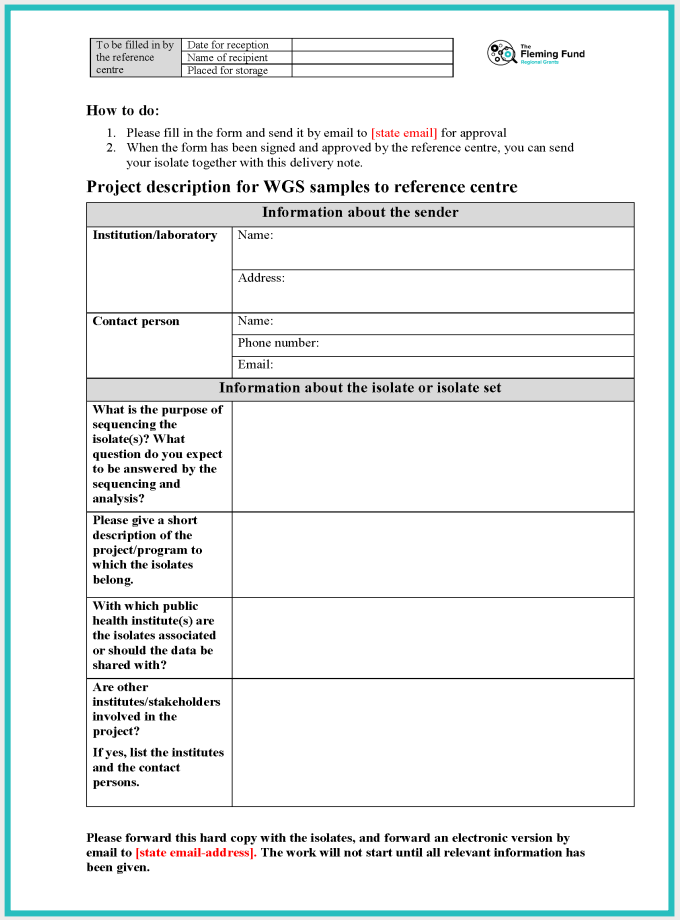
- Develop and support WGS and bioinformatics capacity for AMR surveillance across Africa

- Sequencing efforts are focused on several key pathogens
  - E.g. *Streptococcus pneumoniae*, *E. coli. Salmonella spp.*, *Klebsiella pneumoniae*
  - Contemporary (and archived isolates)
  - Sequence goal of 14.000 genomes

- Contribute to the global pandemic surveillance efforts of SARS-CoV-2

Resources we provide

- **WGS and data analysis services to the African region**
- Support genomic surveillance and investigation of
  - Outbreaks
  - Unusual resistance phenotypes
  - Delineation of the flow of organisms/genes in a One Health framework



To be filled in by the reference centre	Date for reception	
	Name of recipient	
	Placed for storage	

How to do:

1. Please fill in the form and send it by email to [state email] for approval
2. When the form has been signed and approved by the reference centre, you can send your isolate together with this delivery note.

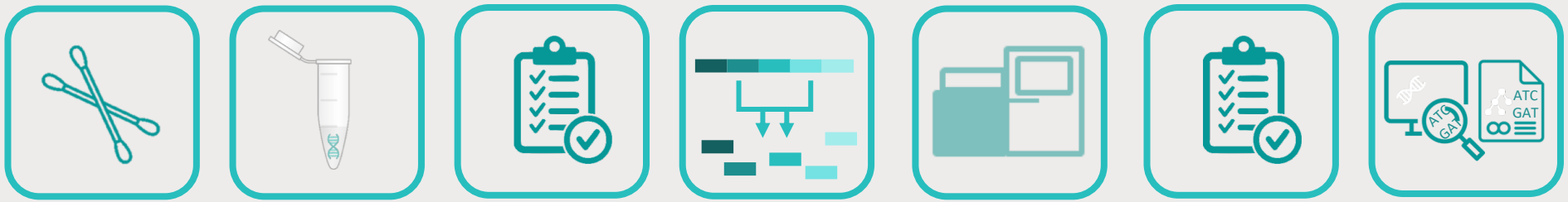
Project description for WGS samples to reference centre

Information about the sender	
Institution/laboratory	Name:
	Address:
Contact person	Name:
	Phone number:
	Email:
Information about the isolate or isolate set	
What is the purpose of sequencing the isolate(s)? What question do you expect to be answered by the sequencing and analysis?	
Please give a short description of the project/program to which the isolates belong.	
With which public health institute(s) are the isolates associated or should the data be shared with?	
Are other institutes/stakeholders involved in the project? **If yes, list the institutes and the contact persons.**	

Please forward this hard copy with the isolates, and forward an electronic version by email to [state email-address]. The work will not start until all relevant information has been given.

[1] SARS-CoV-2 genomic surveillance
From respiratory sample to SARS-CoV-2 genome

Jinal Bhiman (NICD, South Africa)



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BREAK

09.45 – 10.15 CET

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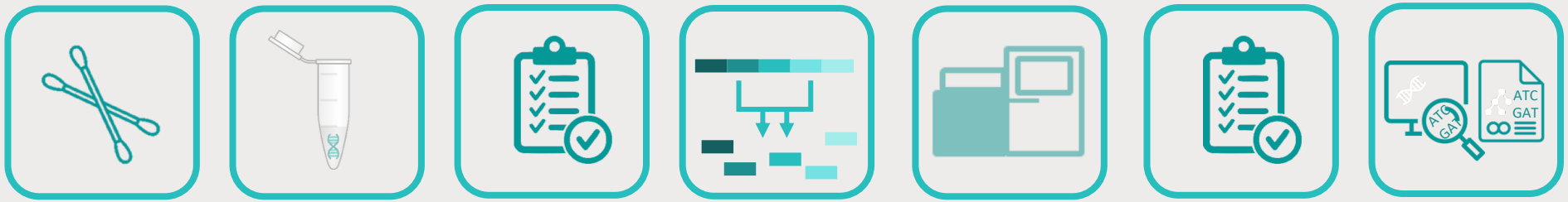
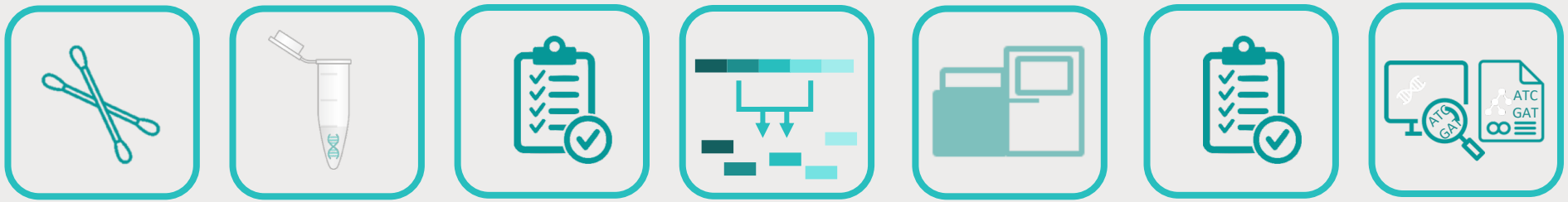
[2] RNA extraction

Noxolo Ntuli (NICD, South Africa)



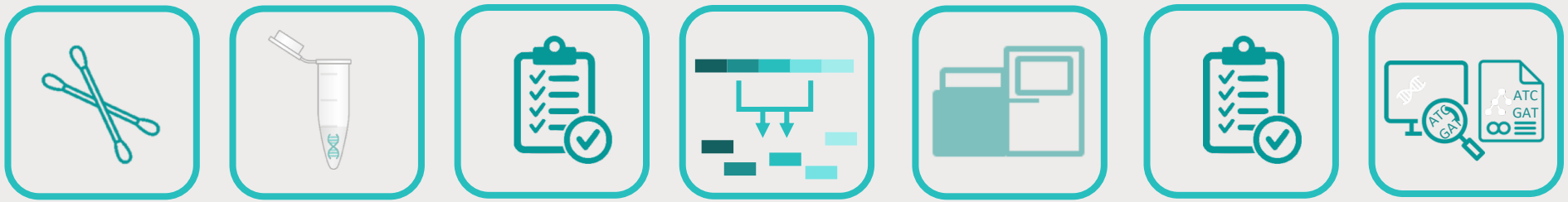
[3] cDNA synthesis and tiling PCR

Boitshoko Mahlangu (NICD, South Africa)



[4] Amplicon Generation and Quantification

Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)



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BREAK

11.45 – 12.00 CET

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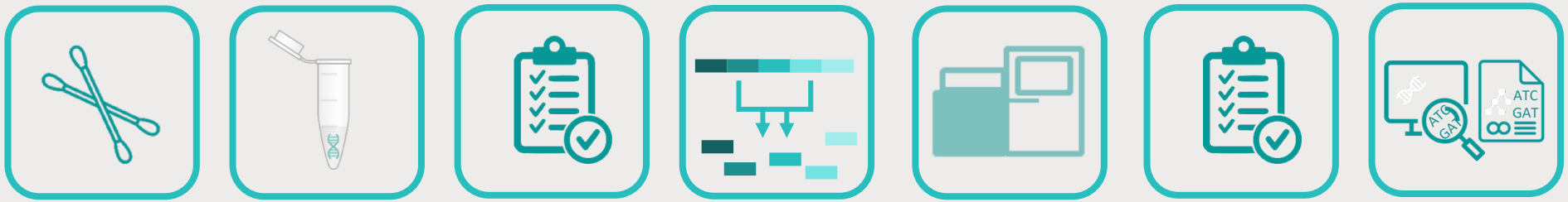
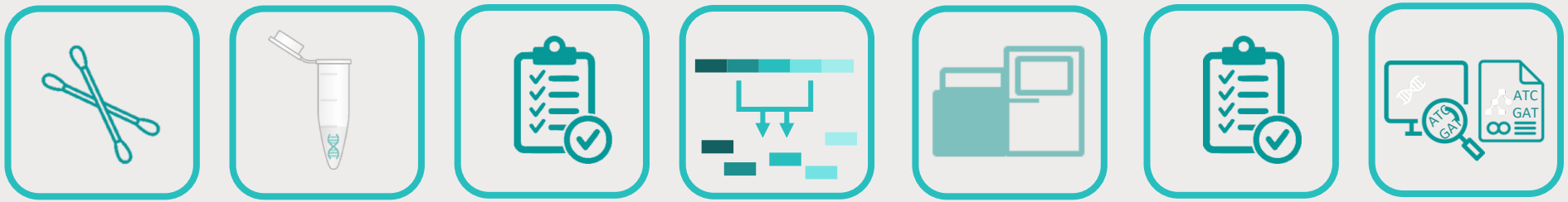
[5a] Library preparation: Nextera Flex and QC using Agilent Bioanalyzer

Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)



[5b] Library preparation: COVIDSeq

Thabo Mohale, Zama Khumalo (NICD, South Africa)



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Q&A

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Agenda

Wednesday 19th May 10.00 – 12.30 CET

Day 2: Wednesday – 19 May 2021 – Illumina sequencing Join Zoom call and Slack channel to attend		
09.45 – 10.00	Joining the call – Assistance will be provided at this time to help participants join	
10.00 – 10.15	**Welcome and Introduction** (Live)	Pernille Nilsson (DTU, Denmark)
10.15 – 10.35	**[6a] Illumina sequencing**: Hands-on how to load the NextSeq machine with your prepared libraries (Pre-recorded video).	Arshad Ismail, Zama Khumalo (NICD, South Africa)
10.35 – 10.55	**[6a] Illumina sequencing**: Hands-on how to load the MiSeq machine with your prepared libraries (Pre-recorded video).	Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)
10.55 – 11.30	**BREAK**	
11.30 – 12.00	**[7] Downloading data**: Once the sequencing run is finished, how do you get your data? (Pre-recorded video / Demonstration)	Stanford Kwenda (NICD, South Africa) (Bright Adu, Frank Oteng/Noguchi team (NMIMR, Ghana)?)
12.00 – 12.15	**[7Q] Quiz:** Introduction to quiz covering the wet lab steps QC of samples through in-house and COVIDSeq methods following and/or prior to library prep. To be handed in via this Survey Monkey Link prior to attending Day 4	Arshad Ismail, Zama Khumalo, Thabo Mohale (NICD, South Africa) Bright Adu, Frank Oteng and Noguchi team (NMIMR, Ghana)
12.15 – 12.30	**Q&A and Wrap-up** (Live)	Pernille Nilsson (DTU, Denmark)

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antimicrobialresistance.dk/seqafrica.aspx

@AfricaSeq

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Thank you

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Division of the National Health Laboratory Service

KCRI Kilimanjaro Clinical Research Institute
Academic Centre for Evidence Based Health Interventions
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