

SEQAFRICA Virtual Training Course

Zoom and Slack Online Platforms

March 2021

Course information

Title: WGS workflow: from isolate to analysis.

Language of instruction: English.

Offered as: Webinar with lectures and exercises.

Duration of course: 4 x ½ days.

Responsible: Rene S. Hendriksen (DTU), rshe@food.dtu.dk

Course co-responsible: Pernille Nilsson (DTU), Anthony Smith (NICD, South Africa), Jinal Bhiman (NICD, South Africa), Marco van Zwetselaar (KCRI, Tanzania), Beverly Eygir (NMIMR, Ghana), Iruka N. Okeke (UI, Nigeria).

General course objectives:

The course introduces and cover all aspects of the entire WGS workflow starting with a bacterial isolate and finishing with completely analysed DNA sequence/genome.

The participant will upon completion of the course i) know all the steps included in preparing and conducting WGS using Illumina short read technology and ii) similarly know the steps included in preparing and conducting long read sequencing using the Minlon from Oxford Nanopore Technologies (ONT).

Learning objectives:

A participant who has met the objectives of the course will be able to:

- Describe the sequencing workflow for both short read (Illumina) and long read (ONT) technologies.
- Perform drag-and-drop bioinformatics using online analysis tools and interpret the results.
- Be familiar with data sharing practises and the most common public repositories and know how to submit data to them.

Content:

The course covers a detailed run through the sequencing workflow, starting with a bacterial isolate to completed analysis of raw reads or assembled genome and will give the participants a thorough understanding of the process both for short read technologies and long read technologies.

The course will comprise of lectures and hands-on exercises that the participants will have to complete and submit answers to in between course days.

Course literature:

No literature required.

Audience:

Users with some experience/knowledge of WGS and WGS data (e.g. attended SEQAFRICAs Introduction to WGS in AMR surveillance).

Day 1: Monday – 22 March 2021 – Sequencing workflow**Join Zoom**

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)	
09.15 – 09.45	[1] Introducing the workflow: Going from bacterial isolate to Genome – Synopsis of all the steps. (Pre-recorded Lecture)	Anderson Oaikhena (University of Ibadan, Nigeria)
09.45 – 10.00	BREAK	
10.00 – 10.30	[2] DNA isolation: From bacterial culture to high quality DNA. Different methods will be presented covering commercial kits and automated DNA extraction systems. (Pre-recorded Lecture)	Shannon Williams (NICD, South Africa)
10.30 – 10.45	[2E] Exercise: Investigating quality checks on isolated DNA. (Live introduction to the exercise). Results are to be handed in via this SurveyMonkey link prior to Day 4.	Shannon Williams (NICD, South Africa) & Beverly Egyir (NMIMR, Ghana)
10.45 – 11.00	Q&A and Wrap-up (Live)	

Day 2: Wednesday – 24 March – Illumina and ONT sequencing**Join Zoom**

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)	
09.15 – 09.45	[3] Illumina library prep: Going from high quality DNA to sequencing libraries. (Pre-recorded Lecture)	Happiness Kumburu (KCRI, Tanzania)
09.45 – 10.00	BREAK	
10.00 – 10.30	[4] Illumina sequencing: Hands-on how to load the machine with your prepared libraries. (Pre-recorded video)	Happiness Kumburu (KCRI, Tanzania)

10.30 – 10.45	[5] Downloading data: Once the sequencing run is finished, how do you get your data? (Pre-recorded video / Demonstration)	Stanford Kwenda (NICD, South Africa)
10.45 – 11.00	[5E] Exercise: Introduction to an exercise to recap QC of sequence output. (Live introduction to the exercise). To be handed in via SurveyMonkey prior to Day 4.	Pernille Nilsson (DTU, Denmark)
11.00 – 11.30	BREAK	
11.30– 12.30	[6] Introduction to Nanopore sequencing: (Live Lecture/ Demonstration).	Charles Kayuki (ONT)
12.30 – 12.45	Q&A and Wrap-up (Live)	
Day 3: Friday – 26 March – Recap Bioinformatics, BIGSdb, EnteroBase and protocols Link to Teams/Zoom/Platform		
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)	
09.15 – 09.45	[7] Recap on bioinformatics: FASTQ, fasta; assembly, mapping, kmer counting, and why do we do it? Pre-recorded	Marco van Zwetselaar (KCRI, Tanzania)
09.45 – 10.15	[8] Recap on CGE tools: Refreshing the knowledge on available online tools Live	Marco van Zwetselaar (KCRI, Tanzania)
10.15 – 10.30	BREAK	
10.30 – 11.30	[9] Introduction to BIGSdb and EnteroBase: Demonstration of data analysis at EnteroBase	Anthony Smith (NICD, South Africa)
11.30 – 11.45	[9E] Exercise: Introduction to an exercise using EnteroBase. Results to be handed in via this Survey Monkey link prior to day 4.	Anthony Smith (NICD, South Africa)
11.45 – 12.00	BREAK	
12.00 – 12.30	[10] Protocols and ISOs: Present the different available protocols and ISOs including DTUs modified Illumina Nextera XT kit for generating twice as many libraries from the same amount of	

	reagents compared to the standard protocol. (Pre-recorded Lecture).	
12.30 -12.45	Q&A and Wrap-up (Live)	
Day 4: Monday – 29 March – Data sharing Link to Teams/Zoom/Platform		
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)	
09.15 – 09.45	[11] Data sharing practices and repositories: Introducing how and where to make raw sequencing data and assembled genomes publicly available. GenBank (NCBI, ENA, Enterobase etc.) (Pre-recorded Lecture).	Tolbert Sonda/Marco van Zwetselaar (KCRI, Tanzania) & Ayorinde Afolayan (UI, Nigeria)
09.45 – 10.00	BREAK	
10.00 – 10.30	Going through results from all exercises (Live)	<ul style="list-style-type: none"> • Shannon Williams (NICD, South Africa) • Beverly Egyir (NMIMR, Ghana) • Pernille Nilsson (DTU, Denmark) • Anthony Smith (NICD, South Africa)
10.30 – 11.00	Q&A and Wrap-up (Live)	
11.00 – 11.15	Concluding remarks and close (Live)	