

SEQAFRICA Virtual Training Course

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 is comprised of lectures and hands-on exercises that the participants complete on their own. Self-evaluation is possible through responding to surveys related to the exercises.

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

Speaker/ Presenter	Content	Slides	Video
	Entire day 1 training: incl. Welcome, Introduction, and wrap-up	PDF	Video
Anderson Oaikhena (University of Ibadan, Nigeria)	[1] Introducing the workflow: Going from bacterial isolate to Genome – Synopsis of all the steps.	PDF	Video
Shannon Williams (NICD, South Africa)	[2] DNA isolation: From bacterial culture to high quality DNA. Different methods will be presented covering commercial kits and automated DNA extraction systems. Additional short videos: [2b] Magcore Automated DNA extraction [2c] Qiagen Overview [2d] Qiagen DNeasy protocol [2e] Nanodrop Spectrophotometer [2f] Qubit Fluorometer	n/a	Video
Shannon Williams (NICD, South Africa) & Beverly Egyir (NMIMR, Ghana)	[2E] Exercise: Investigating quality checks on isolated DNA. You will perform the exercise on your own computer and can submit replies through the link to the right to self-evaluate	PDF PowerPoint Quiz	

Day 2: Wednesday – 24 March – Illumina and ONT sequencing

	Day 2 training: incl. Welcome, Introduction, Q&A and wrap-up	PDF	Video
Happiness Kumburu (KCRI, Tanzania)	[3] Illumina library prep: Going from high quality DNA to sequencing libraries.	PDF	n/a
Happiness Kumburu (KCRI, Tanzania)	[4] Illumina sequencing: Hands-on how to load the machine with your prepared libraries.	n/a	Video
Stanford Kwenda (NICD, South Africa)	[5] Downloading data: Once the sequencing run is finished, how do you get your data? (Pre-recorded video / Demonstration)	PDF	Video
Pernille Nilsson (DTU, Denmark)	[5E] Exercise: Introduction to an exercise to recap QC of sequence output.	Video Tutorial Files Exercise sub	

Recording of the Introduction to Nanopore sequencing has been edited out. Up to date introductory videos on ONT technology and much more is available on the ONT website and on the ONT YouTube channel.

Day 3: Friday – 26 March – Recap Bioinformatics, BIGSdb, EnteroBase and protocols

	Day 3 training: incl. Welcome, Introduction and Q&A	PDF	Video*
Marco van Zwetselaar (KCRI, Tanzania)	[7] Recap on bioinformatics: FASTQ, fasta; assembly, mapping, kmer counting, and why do we do it?	PDF	Video
Marco van Zwetselaar (KCRI, Tanzania)	[8] Recap on CGE tools: Refreshing the knowledge on available online tools	PDF	Video
Anthony Smith (NICD, South Africa)	[9] Introduction to BIGSdb and EnteroBase: Demonstration of data analysis at EnteroBase.	n/a	Video
Anthony Smith (NICD, South Africa)	[9E] Exercise: Introduction to an exercise using EnteroBase	PDF	
Jette Sejer Kjeldgaard (DTU, Denmark)	[10] Protocols and ISOs.	PDF	n/a

*Some of the recording is missing (introduction to [9E] and [10]) due to technical issues during zoom recording

Day 4: Monday – 29 March – Data sharing

	Entire day 4 training: incl. Welcome, Introduction, Q&A and wrap-up	PDF	Video
Tolbert Sonda/ Marco van Zwetselaar (KCRI, Tanzania) & Ayorinde Afolayan (UI, Nigeria)	[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.)	PDF PDF	Video Video Video
Shannon Williams (NICD, South Africa), Beverly Egyir (NMIMR, Ghana), Pernille Nilsson (DTU, Denmark) & Anthony Smith (NICD, South Africa)	Going through results from all exercises	n/a	Video
Pernille Nilsson (DTU, Denmark)	Concluding remarks and close		