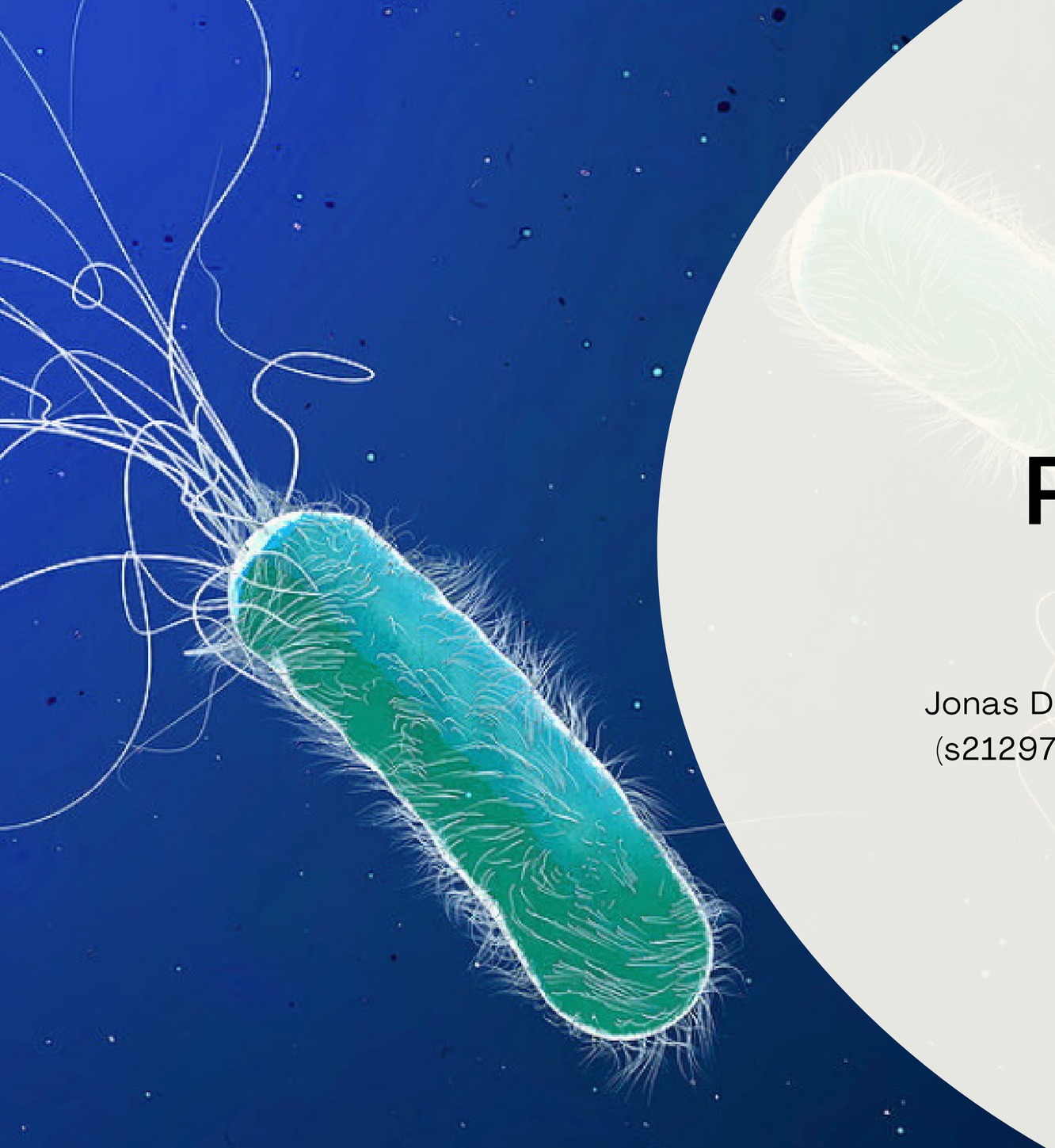


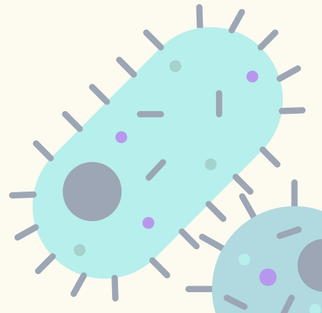
APRIL 2022

PSEUDOMONAS AERUGINOSA

Jonas Dalsberg Jørgensen (s213551), Paolo Federico (s212975), and Anna Keisha M. K. Boateng (s175562)

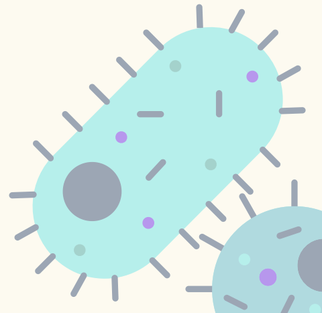
What is Pseudomonas aeruginosa?

- Microbiological characteristic; Gram-negative
- Commonly found in soil and water
- Disease symptoms;
  - infection in blood, lungs, etc.
- Infection numbers (US, 2017);
  - 32,600 hospitalized patients
  - 2,700 estimated deaths
- Spreads through;
  - contaminated water/soil, hands, equipment, surfaces

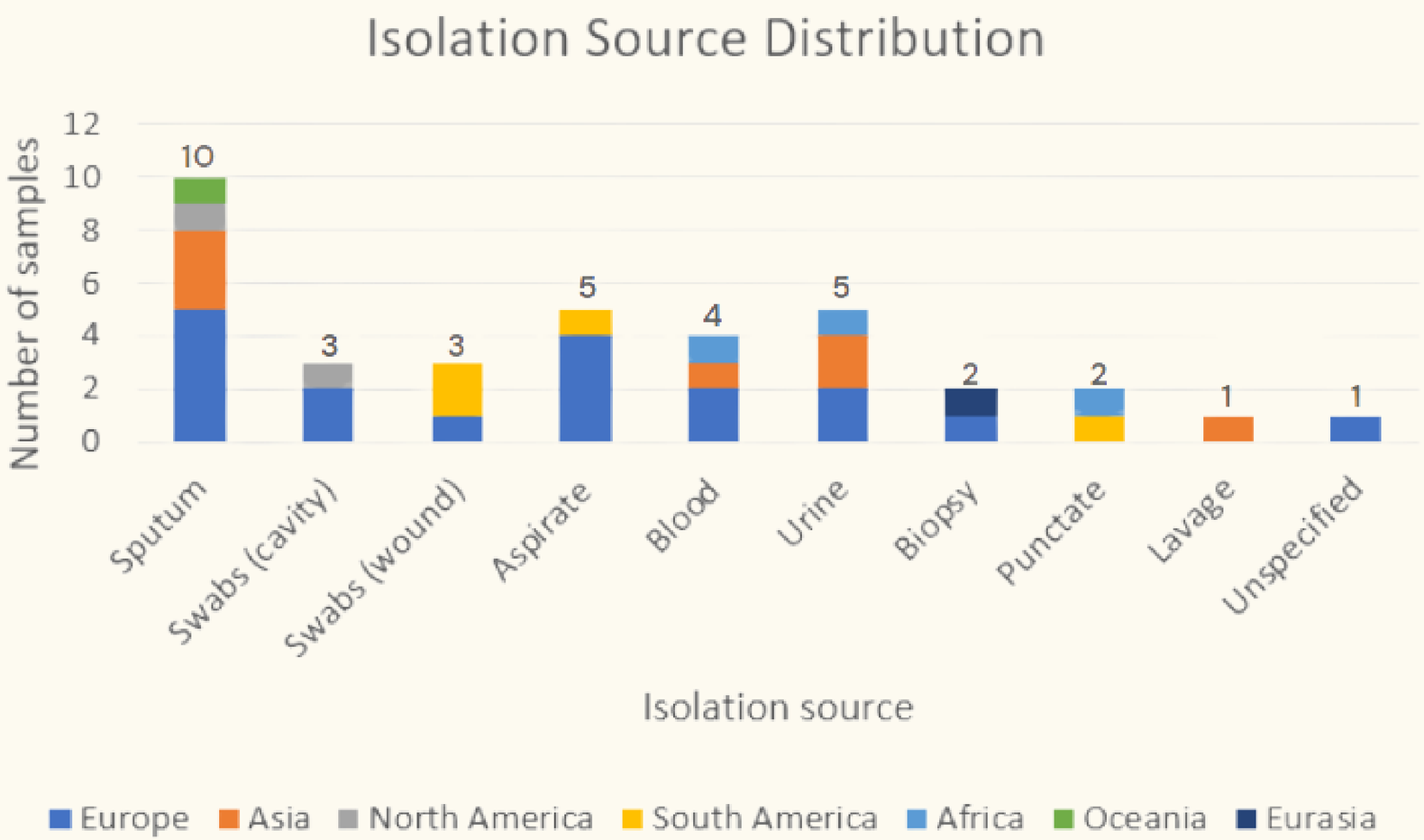


What is Pseudomonas aeruginosa?

- Treatment;
  - Antibiotics
- Drug resistance;
  - ESKAPE - Highly virulent / antibiotic resistant
  - Multi-drug resistance
  - Advanced antibiotic resistance mechanism
- Genome;
  - Relatively large (5.5 - 7 Mb)
  - High GC content (65-67%)



What data were we working with?

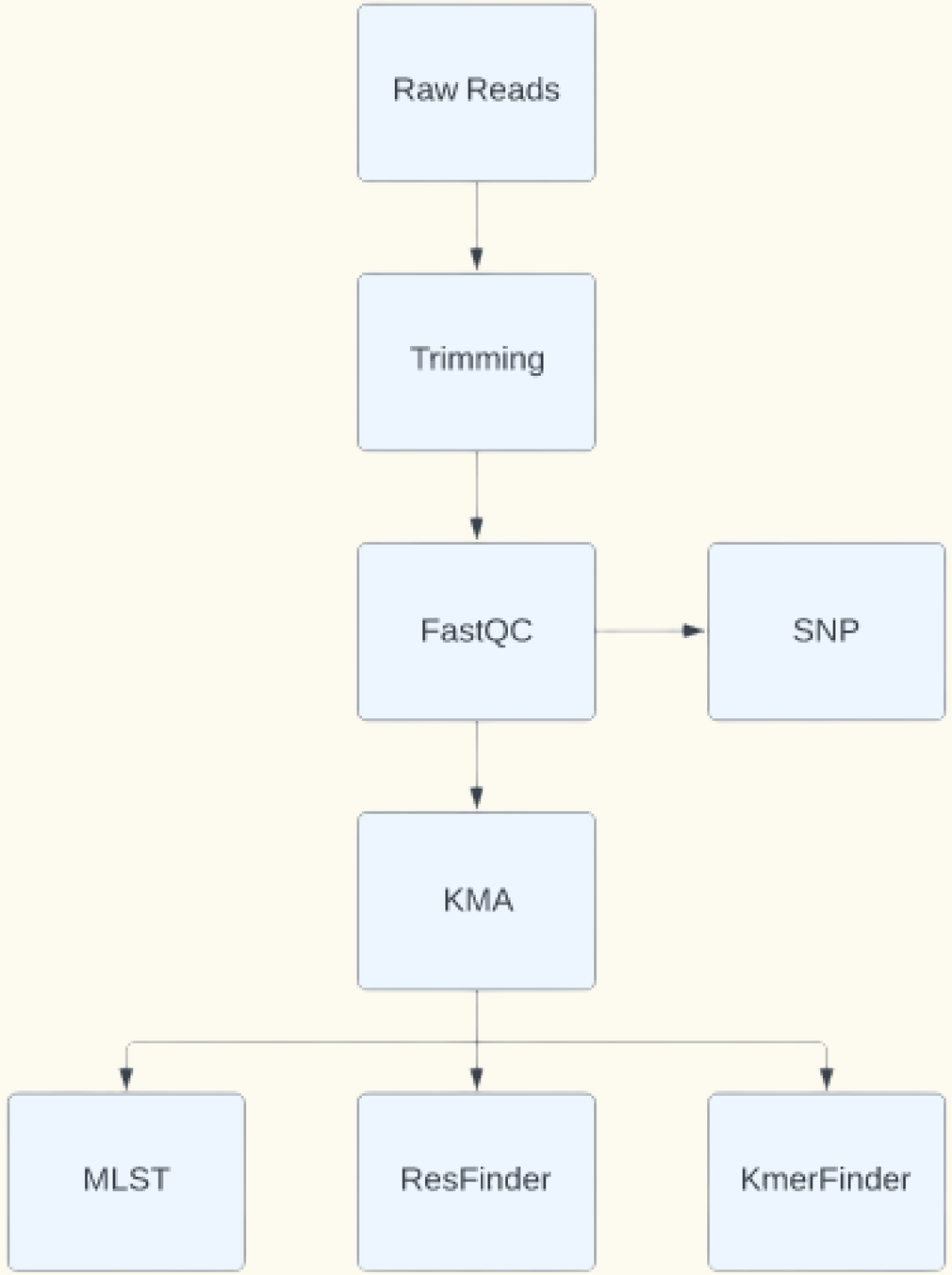


- Data from Two Weeks in The World (TWIW)
- 36 samples
- 25 different countries (from all continents)
- Samples coming from hospitals (humans)
- Sampled between 26/02/2020 - 09/12/2020

HOW DO ANTIMICROBIAL RESISTANCE PROFILES DIFFER ACROSS COUNTRIES?

HOW DOES DEMOGRAPHICS INFLUENCE THE GENETIC MAKEUP OF P. AERUGINOSA?

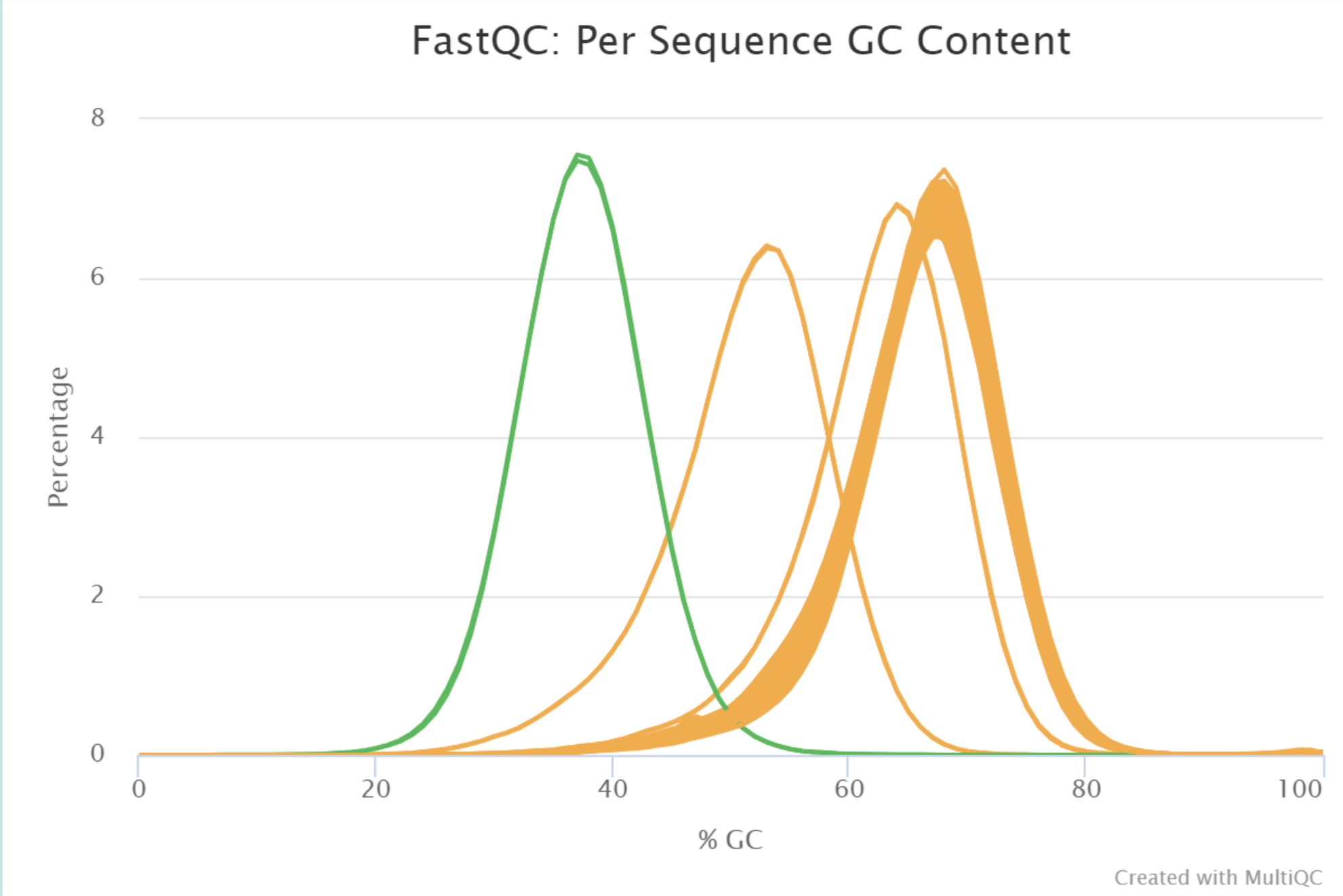
Workflow


Raw Reads
Trimming
FastQC
SNP
KMA
MLST
ResFinder
KmerFinder

Read Trimming and Quality Control

Samples	% Dups	% GC	M Seqs
DTU_2020_1000469	27.7%	50%	01.06
DTU_2020_1001615	6.2%	62%	00.03
DTU_2021_1002458	29.2%	37%	01.05
DTU_2020_1000925	57.2%	64%	12.04
DTU_2021_1002653	16.4%	65%	01.00
DTU_2020_1000631	24.5%	65%	02.01
DTU_2020_1000674	16.4%	65%	01.01

Read Trimming and Quality Control



Species Identification and Typing (KmerFinder)

Species	Samples	Template_Coverage	Depth	TAXID	TAXID Species
Escherichia coli	DTU_2020_1000469	95,61	77,54	562	562
Pseudomonas asiatica	DTU_2020_1001615	85,45	10,59	2219225	2219225
Elizabethkingia anophelis	DTU_2021_1002458	79,26	65,11	1117645	1117645
Pseudomonas aeruginosa	DTU_2020_1000925	257,34	324,54	287	287
Pseudomonas aeruginosa	DTU_2021_1002653	85,13	30,95	381754	287
Pseudomonas aeruginosa	DTU_2020_1000631	90,72	63,13	287	287
Pseudomonas aeruginosa	DTU_2020_1000674	82,52	29,77	287	287

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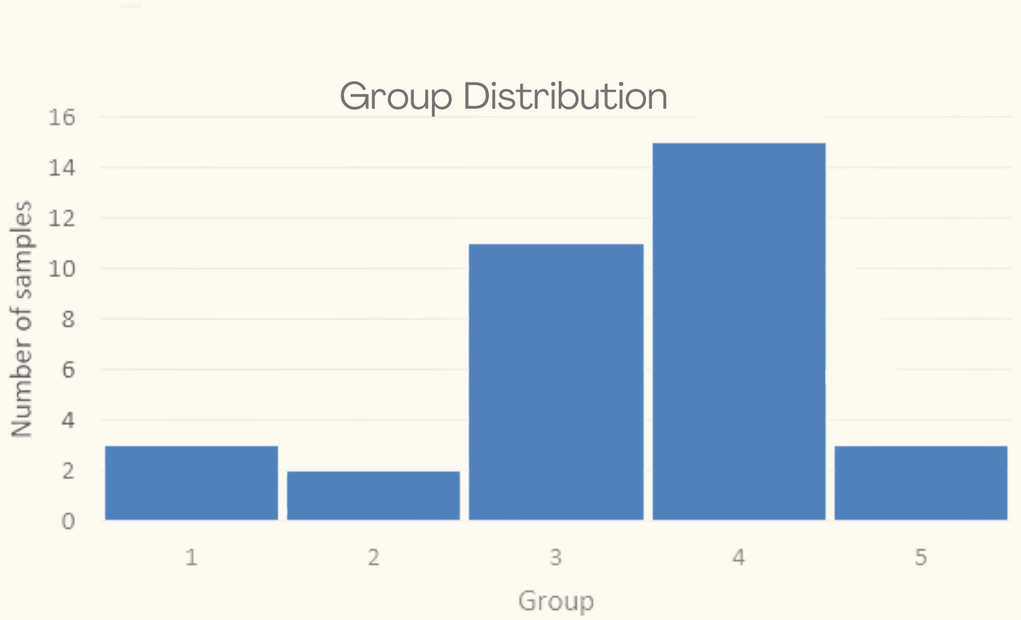
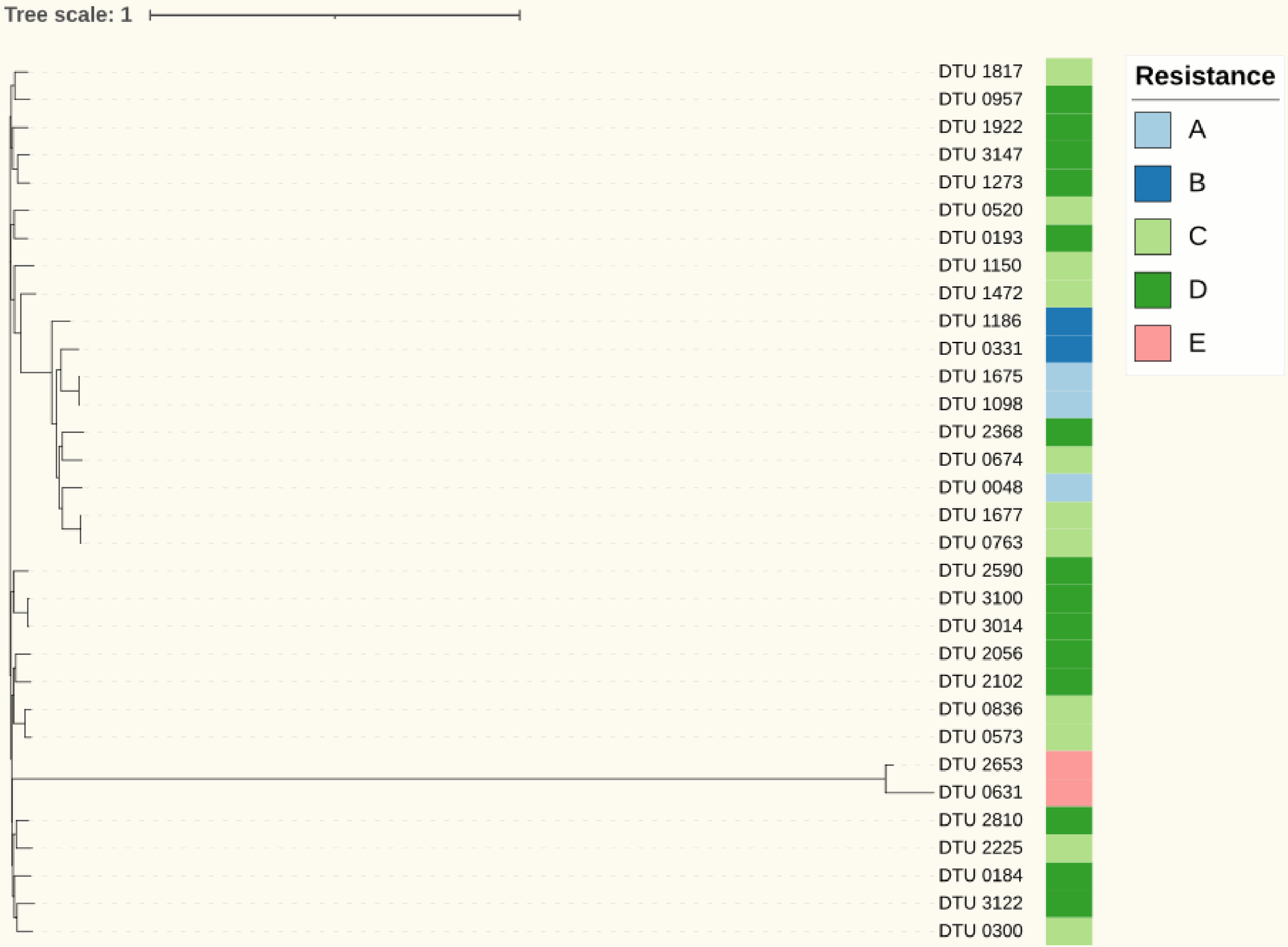
Species Identification and Typing (ResFinder)

	Group 1	Group 2	Group 3	Group 4	Group 5
amoxicillin	+	+	+	+	-
ampicillin	+	+	+	+	-
butiromycin	+	+	-	-	-
cefepime	+	+	+	+	-
ceftazidime	+	+	+	+	-
chloramphenicol	+	+	+	+	-
fosfomycin	+	+	+	+	-
gentamicin	+	+	-	-	-
kanamycin	+	+	-	-	-
meropenem	+	-	+	-	-
neomycin	+	+	-	-	-
paromomycin	+	+	-	-	-
ribostamycin	+	+	-	-	-

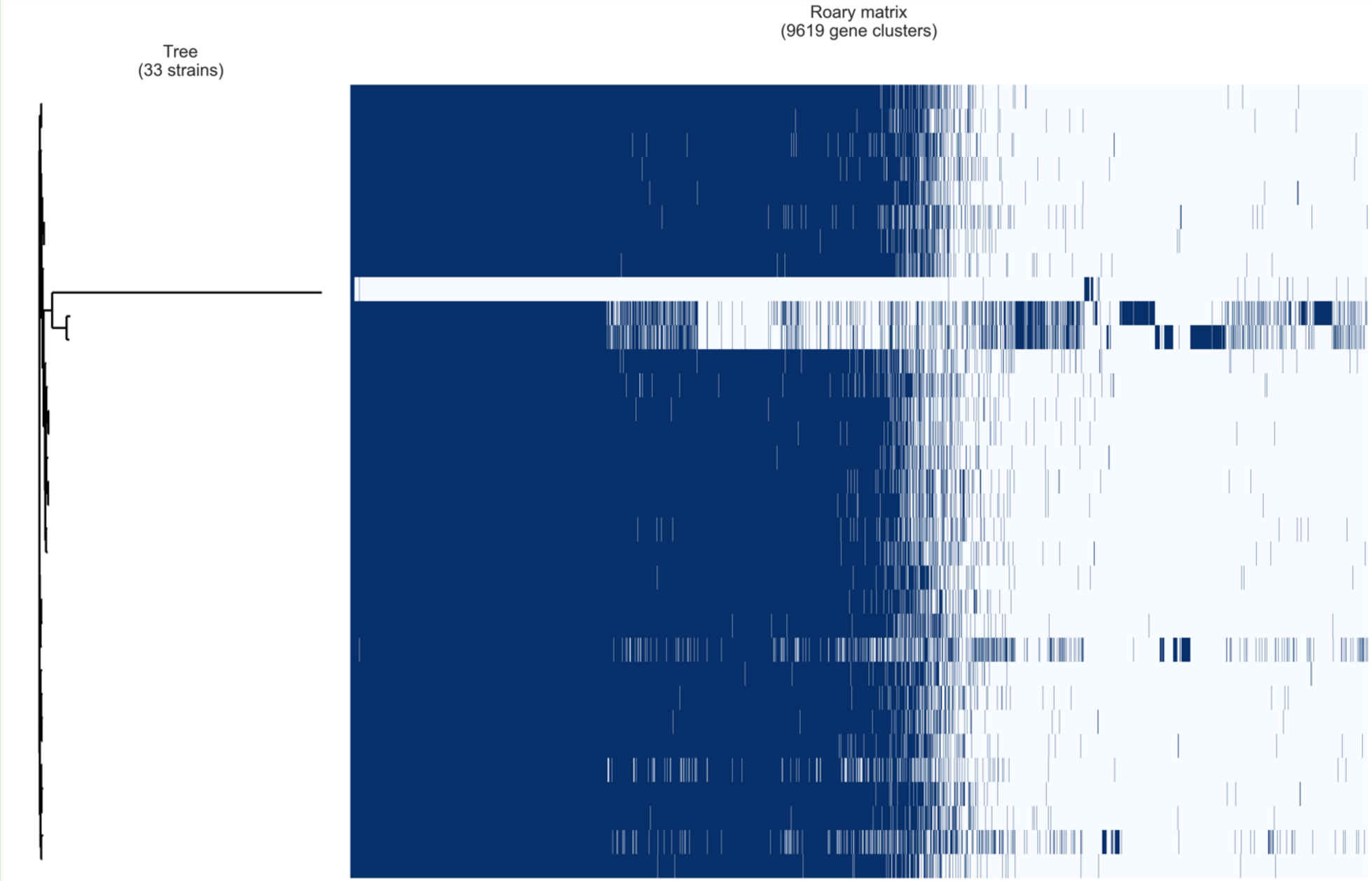
- Resistance gene detection
- 5 different groups



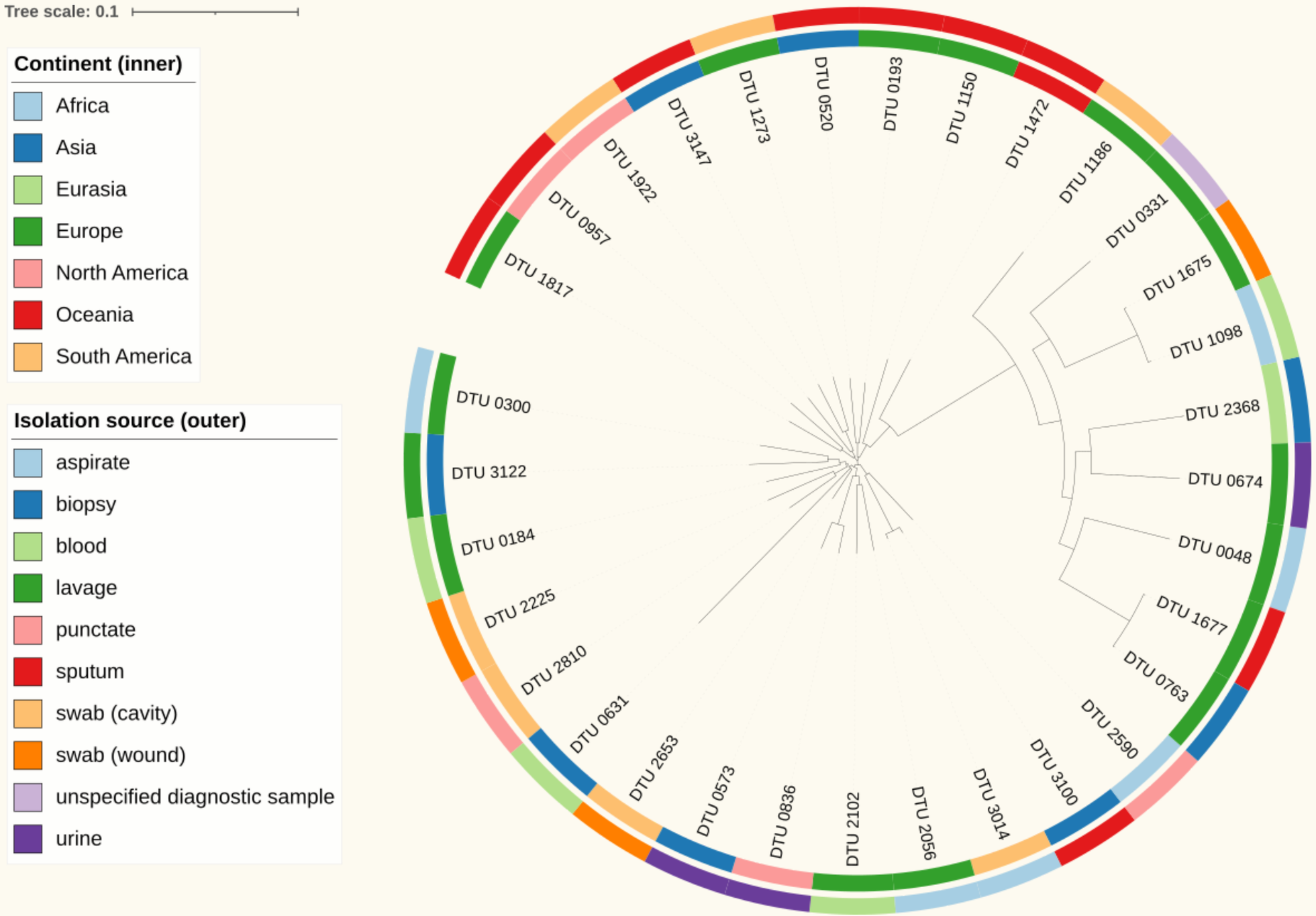
Phylogeny (ResFinder tree)



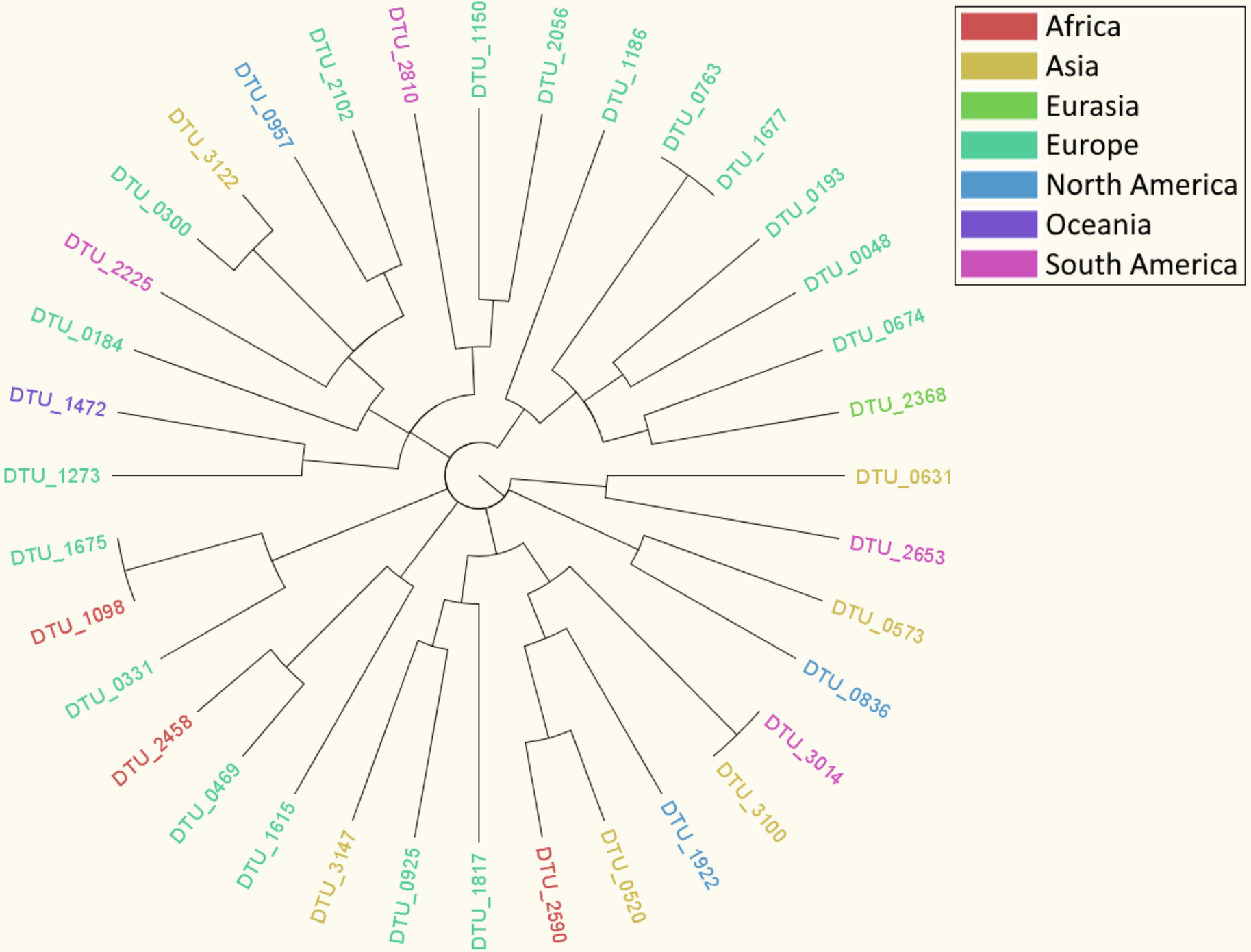
Pan-genome Analysis



Phylogeny (SNP tree)



Phylogeny (MLST tree)

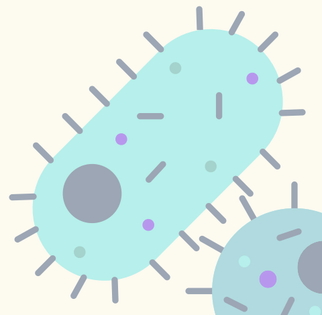


What is our final thoughts?

- Sample size too small (N = 36)
- No clustering

What could future steps be?

- More samples
- Continue in the future to monitor



Thank you!

ANY QUESTIONS?