

SPECIES IDENTIFICATION

MIST TYPING

RESISTANCE GENE DETECTING

SENDTYPING

BACTERIAL ANALYSIS PIPELINE

SNP TREE CONSTRUCTION →

SINGLE NUCLEOTIDE
POLYMORPHISM

WGS RESULTS

- 1) WHAT DOES "TYPING MEAN"?
- HOW DO WE PERFORM GENOTYPING?
- WHAT METHODS SHOULD WE USE?

BACTERIAL TYPING


CHARACTERIZING BACTERIAS

• DNA BANDING-PATTERN

DNA FRAGMENTED, FRAGMENTS SEPARATED
PATTERN ARE ANALYZED

TYPING DIFFERENTIATIONS BEYOND
SPECIES & SUB-SPECIES

EX: ALL HUMANS ARE DIFFERENT, YET THEY
ARE FROM THE SAME SPECIE HOMO SAPIENS SAPIENS

PHENOTYPIC METHODS	GENOTYPING METHODS
EXPRESSED TRAITS (OLD WAY)	GENETIC CONTENT (DNA)
<ul style="list-style-type: none"> - FERMENTATION - CHANGE IN COLOR IN MEDIUM - MICROBIAL RESISTANCE PATTERNS 	
BASED ON WHAT WE SEE	

FROM ISOLATE TO STRAIN

ISOLATE PURE CULTURE DERIVED FROM SINGLE COLONY
THAT ARISES FROM A SINGLE BACTERIUM

STRAIN SET OF ISOLATE THAT WHEN TYPED ARE
INDISTINGUISHABLE FROM EACH OTHER

GENOTYPING

IN BOTH CASES WE
START W/ BACTERIAL CELLS

LAND BASED

ELECTROPHORESIS

EACH LANE = BACTERIAL ISOLATE
W/ SAME RESTRICTION
ENZYMES

SOLVE DNA IN BANDS

— AMPLIFICATION BY PCR

— CUTTING W/ RESTRICTION ENZYMES

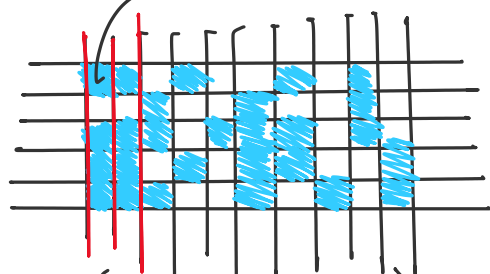
OUTPUT

DNA FRAGMENTED IN

PIECES OF DIFFERENT SIZE

ELECTROPHORESIS

FRAGMENTS OF DNA CUT
WITH SAME R. ENZYME



SAME PATTERN

DNA CUT IN
THE SAME PLACES

=

STRAINS ARE
RELATED TO
EACH OTHER

SEQUENCE BASED

PCR ORGANISM
SEQUENCE

NEEDS TO BE ANALYZED

DNA EXTRACTED FROM
CELL AND THEN SEQUENCE

STANDARD WGS: WHOLE GENOME SEQUENCING

WHAT TO ANALYZE?

SNP

REPEAT TRAITS

AAAATCG AAATTGG
AAGAGAGAGAGAGAGAGAGAG

YOU CAN CHARACTERIZE
ON MANY DIFFERENT LEVELS

HOW TO CHOOSE A GENOTYPING METHOD

- | | | | |
|------------------------|-------------|---|---|
| • TYPEABILITY | _____ | ABILITY TO TYPE MANY STRAINS | FINE RESOLUTION
BETWEEN BACTERIAL
INDIVIDUALS |
| • DISCRIMINATORY POWER | _____ | $P(\text{DIFFERENT TYPES FOR 2 UNRELATED STRAINS IN POPULATION})$ | |
| • REPRODUCIBILITY | _____ | SAME RESULTS OVERTIME | |
| • RAPIDITY | } PRACTICAL | | |
| • COST | | | |
| • LAB CAPACITY | | | |

PURPOSE?

• TRACING AN OUTBREAK (PANDEMIC)

— HIGH DISCRIMINATORY POWER

WE WANT TO KNOW IF STRAINS IN
DIFFERENT INDIVIDUALS ARE RELATED OR NOT

• LONG-TERM SURVEILLANCE

WE DON'T WANT FINE DETAILS
ONLY GENERAL PICTURE

SURVEILLANCE OF ANTIMICROBIAL RESISTANCE USING WGS

- SURVEILLANCE
- BIOINFORMATICS TOOL
- GENOTYPING MONITORING

WHY → OBTAINING DATA FOR ACTION

MOLECULAR DIAGNOSTIC

PHENOTYPIC DATA — RELIABLE BUT TAKE LONGER TO DO
IT ARE PRONE TO MISTAKES

OLD CONVENTIONAL MICROB