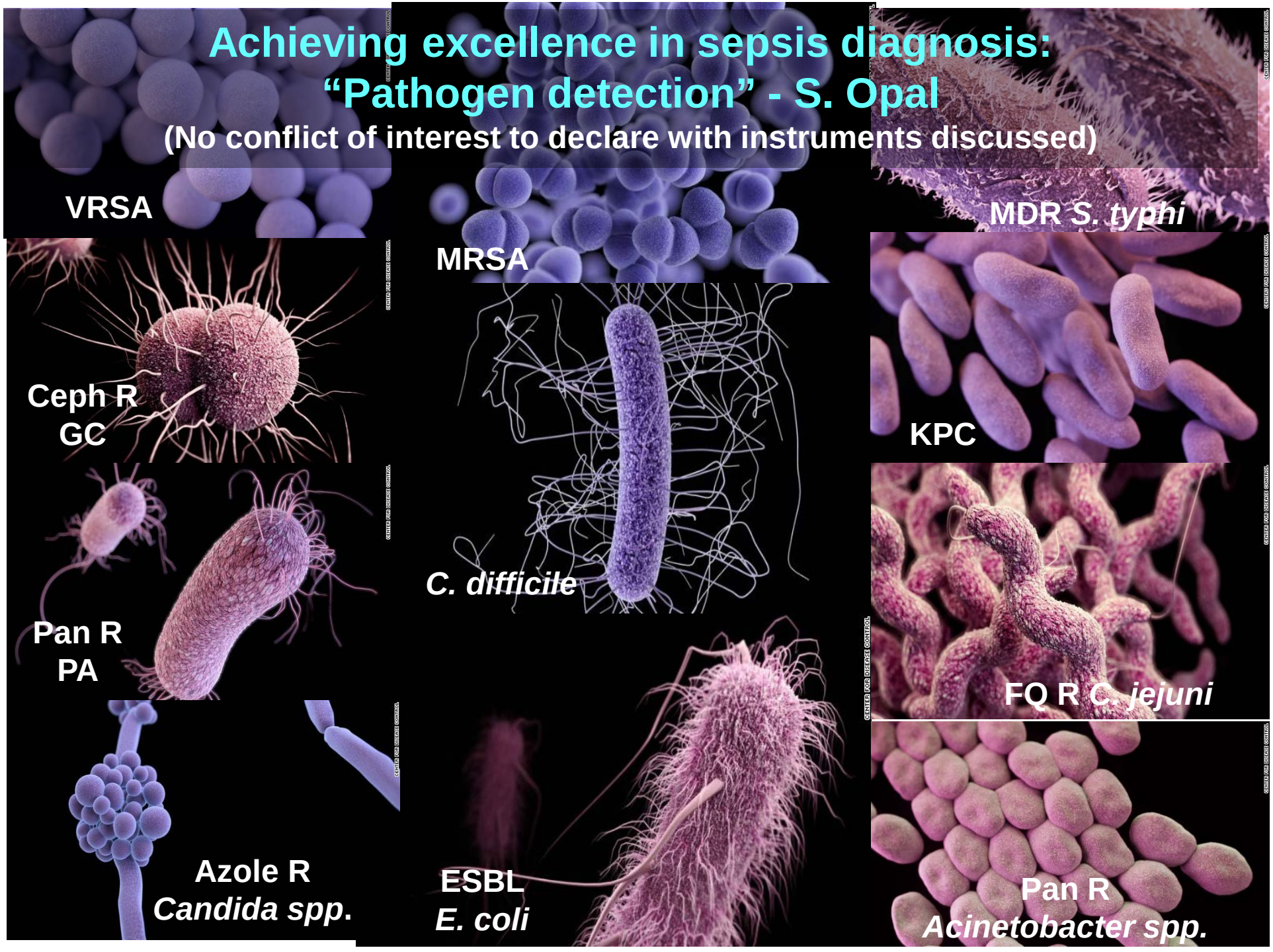
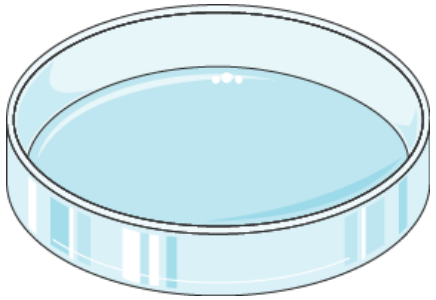
Achieving excellence in sepsis diagnosis: "Pathogen detection" - S. Opal

(No conflict of interest to declare with instruments discussed)



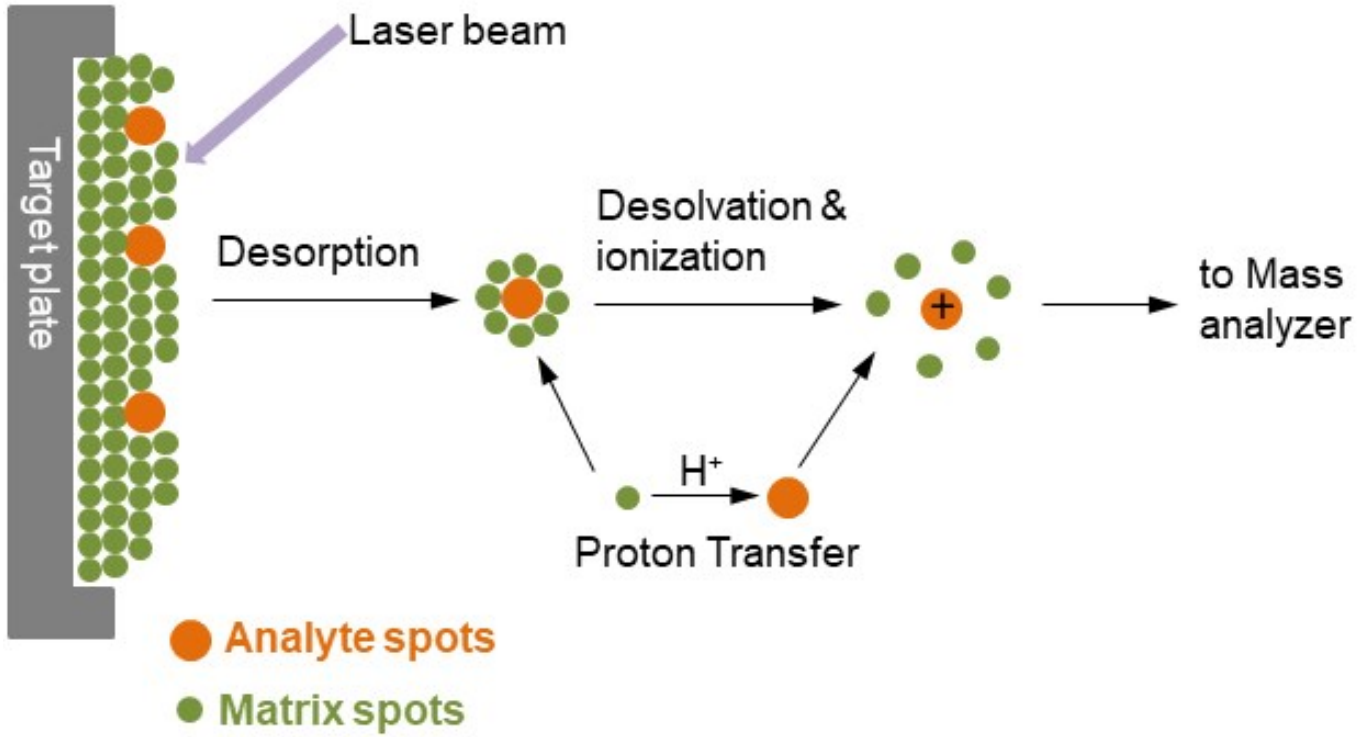
Great moments in clinical diagnostic microbiology



Julius Petri and Fanny Hess: the Petri dish
(Working in Robert Koch's lab circa 1887)

Sepsis by definition is initiated by an infectious disease-but what is the causative pathogen and how quickly can we detect and treat the pathogen? Up until the last 10 years, the answer was about 48-72 hours

MALDI t-o-f Mass Spectroscopy



As soon as growth detected in blood culture-PCR for *Mec* Gene in *S. aureus* pathogen detection followed by Mass Spec: results in 2-5 min. Highly accurate to Genus/species level, can run up to 96 samples simultaneously

Accelerate Pheno™ System

Rapid antimicrobial susceptibility testing

www.acceleratediagnostics.com

- FDA cleared Feb 2017
- Direct from positive blood culture
- Antimicrobial Susceptibility in ~ 6 hr
  - Gm-neg: 15 antibiotics
  - Gm-pos: 8 antibiotics
- Entire process contained in 1 kit

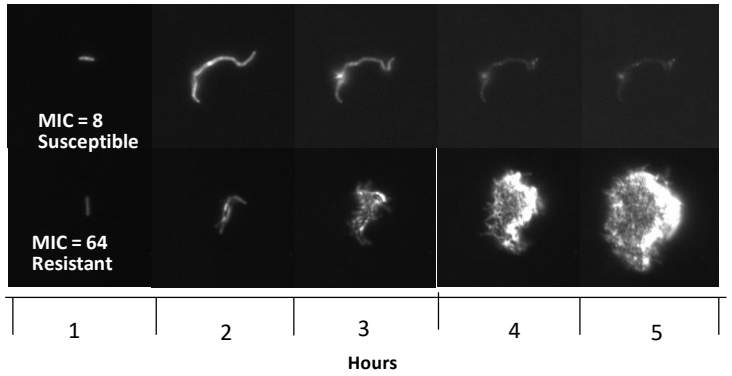
provided by
Bobenchik and Chapin

AST Methodology: Automated Microscopy and PNA FISH (Peptide-nucleic acid fluorescence in situ hybridization)

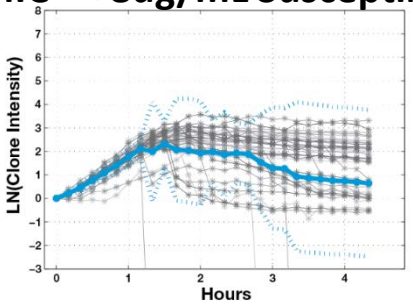
Morphokinetic Cellular Analysis (MCA)

Measures morphological and kinetic changes over time of organisms exposed to antibiotics

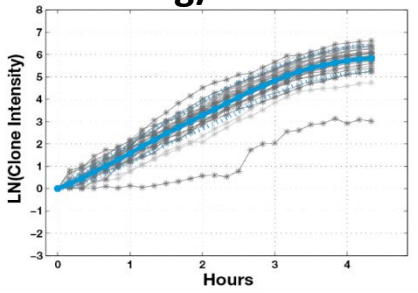
***E. coli* samples vs. piperacillin-tazobactam**



MIC =< 8ug/mL Susceptible



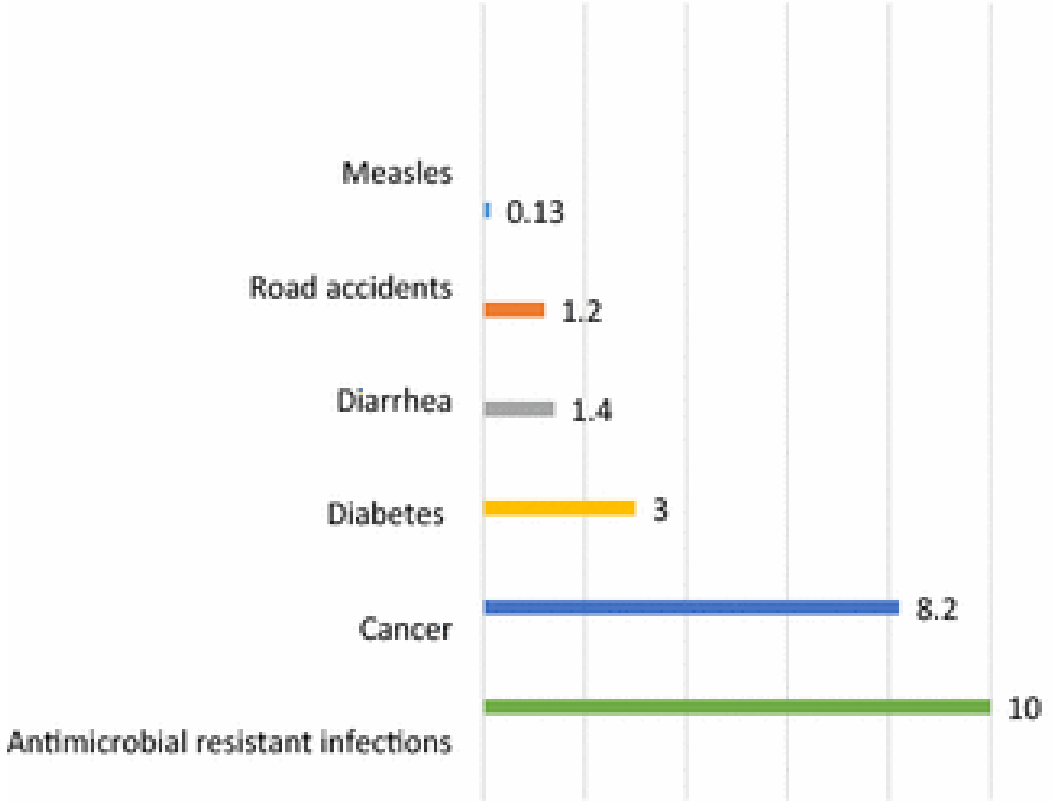
MIC = >64ug/mL Resistant



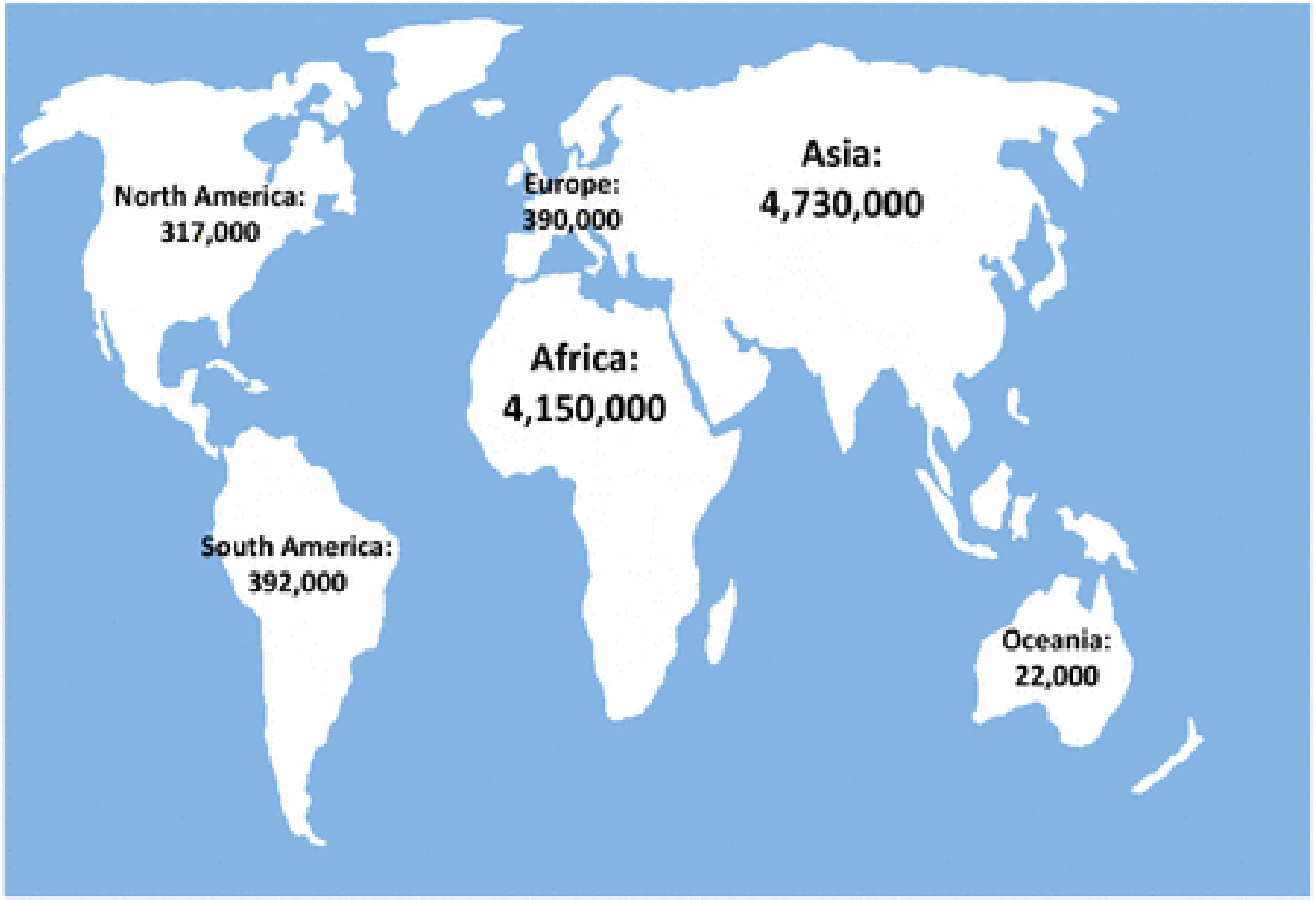
- **Bacteria are grown up in presence of single concentration of antibiotic[1]**
- **Growth response is measured using time-lapse imaging.**
- **MICs determined by matching growth patterns to reference growth profiles**

The impact of antimicrobial resistance in 2050

DEATHS PER ANNUM FOR ANTIMICROBIAL RESISTANT INFECTIONS AND OTHER CAUSES BY 2050 IN MILLIONS. [1] AND HTTP:// AMR-REVIEW.ORG/



Death attributable to antimicrobial resistance every year by 2050 in different countries [1]

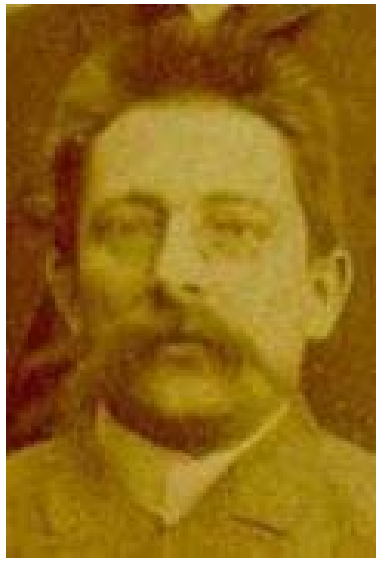


Impact of MDR pathogens; >10 million excess deaths worldwide: costing >100 trillion USD/yr

Bassetti M et al. *Intensive Care Med* 2017; 10.1007/s00134-017

Milestones in clinical Microbiology
from Robert Koch's laboratory

circa 1887



We still have work to do in the field of rapid pathogen identification, but real progress has been made to assist in sepsis diagnosis and treatment