ANTISUPERBUGS

DETECTION OF RESISTANT MICROORGANISMS IN HOSPITALS

STATE OF THE ART

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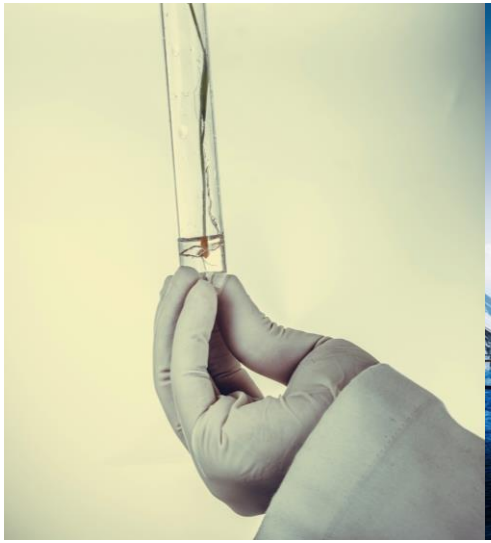
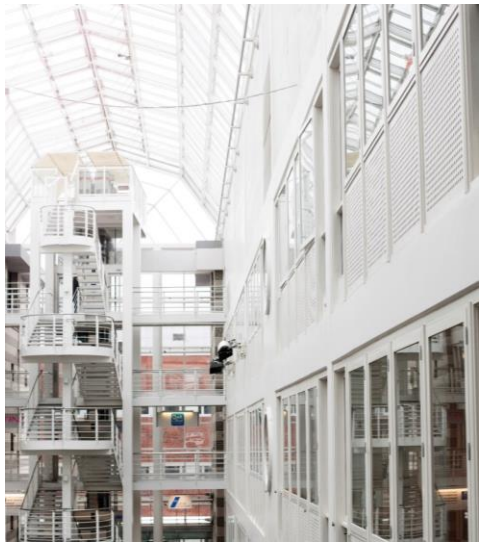
May 2017





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Nosocomial infections - What to detect?

- A number of different infectious agents on the list
- Detect one, or a set, or all at once ?
- Resistance

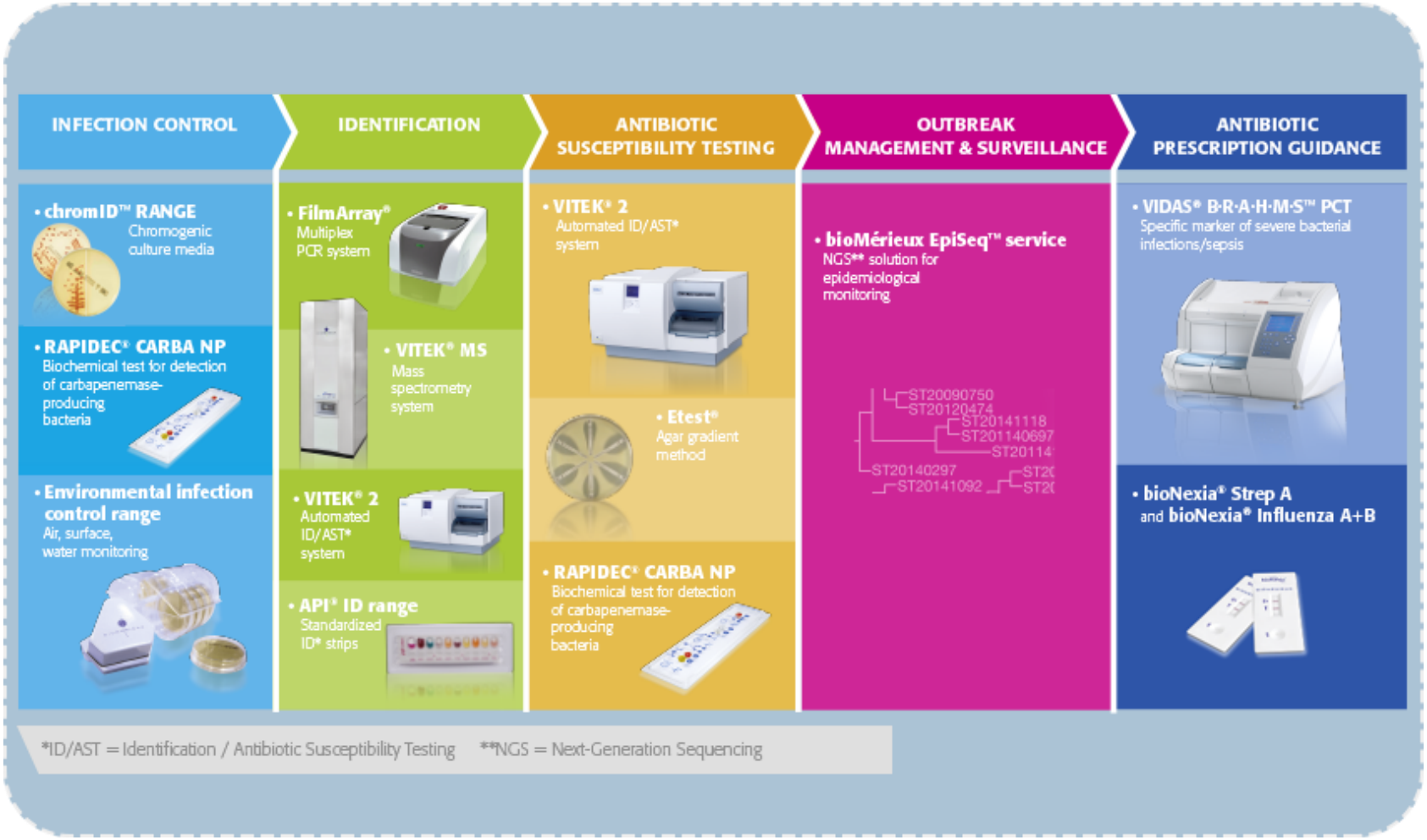
    - Staphyllococcus aureus
    - Methicillin resistant Staphylococcus aureus (MRSA)
    - Candida albicans
    - Pseudomonas aeruginosa
    - Acinetobacter baumannii
    - Stenothrophomonas maltophilia
    - Clostridium difficile
    - Escherichia coli
    - Tuberculosis
    - Vancomycin-resistant Enterococcus
    - Legionnaires disease

Classical methods – in use

- Culture and isolation for identification
  - Selective media
  - Biochemical analyzes (enzymes etc.)
- Culture in presence of antibiotics to detect possible resistance to antibiotics that permits growth

- Amplification/detection of signature genes for the pathogen and possible resistance to antibiotics
  - PCR

Examples of big actors 1) bioMerieux



Examples from big actors 2) Alere

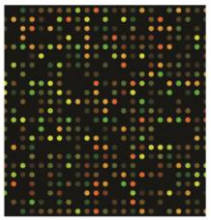
- MRSA from colony in 5 min

- Legionnaires disease in 15 min from urine

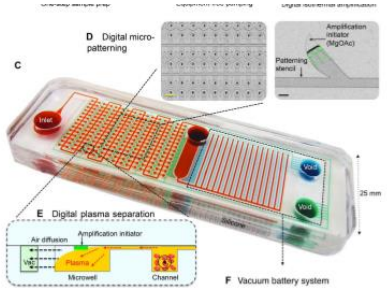
- Clostridium dificille in 30 min

New developments

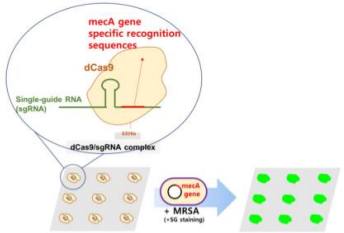
- Detect “everything” - bugs and resistance
  - Whole genome sequencing of tbc for resistance profiling (Lancet 2015)
  - LLMDA - identify 6000 targets within 24 hrs – based on DNA based hybridization array (2013)



- Detect specific infectious agents
  - ISDA (Isothermal strand displacement amplification) 20 min (2015)
  - RPA (Isothermal recombinase polymerase amplification + integrated sample prep on chip (Science Adv. 2017)



- Detection of MRSA using a CRISPR-mediated DNA FISH method in 30 min (Biosensors and Bioelectronics 2017)



In general:

- DNA based methods going from PCR to isothermal amplification opening up for simple equipment (P.o.C.)

- Sample preparation a challenge for point of care device

New developments- continuation

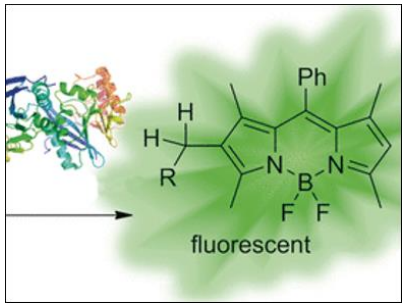
- Antibiotic resistance

- HPLC/MS
  - Detection of ESBL by detecting hydrolysis of β-lactamase

  Within 90 min (EMBL are looking for partner/licensee)

- Light-up probes
  - Modified Carbapenem turn fluorescent

  upon cleavage by β-lactamase



- In summary:
  - New, or modified old methods making analyses faster/simpler
  - However, sample preparation and/or cultivation often required
  - Many publications from universities – but most are still far from the market

Where should the focus be?

- Detection/characterization of infectious agents
  - Important!
- Prevention
  - Reduce spread of nosocomial infections (mention trials with bactericidal surfaces that reduce airborne spread)
  - Minimize use of ab that in itself drives development of resistance
- Routines/efficiency of routines
  - If appropriate routines are followed nosocomial infections will be reduced! (e.g.at Barnes St.Louis VAP down 50 % after training program)

  Thus, it might be equally important with methods for verifying that hospital routines are efficient to prevent nosocomial infections

TACK/THANK YOU!

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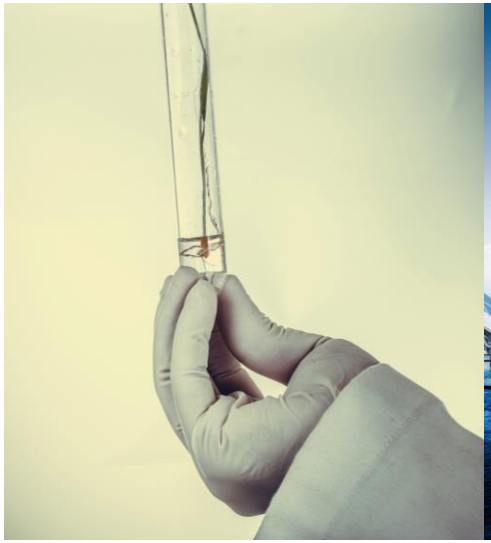

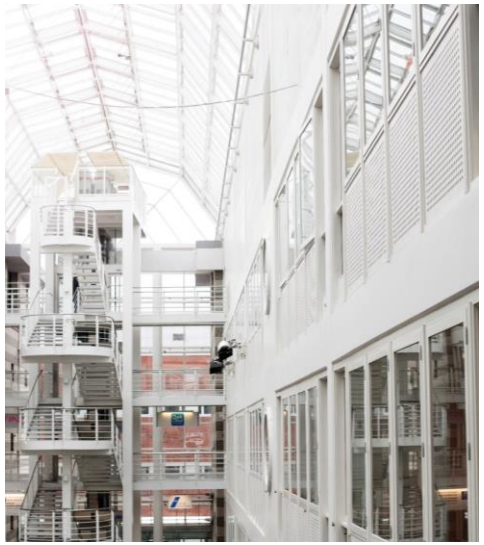

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