Interactions between microbiology and all other stakeholders

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Introduction

Microbiological diagnosis?
Main tasks of the laboratory

To IMPROVE the management of infectious diseases

→ 1. CONTRIBUTE TO THE DIAGNOSIS
   ◦ Presence / absence of pathogens?
   ◦ Identify the causative agents of infection (count) / colonization

→ 2. CONTRIBUTE TO THE CHOICE OF ANTIBIOTIC
   (Targeted and probabilistic)
   ◦ Perform tests of antibiotic susceptibility of clinically significant microorganisms

→ 3. CONTRIBUTE TO THE DECREASE OF EPIDEMIC

The good use of AB depends on the good use of the laboratory
Main tasks of the laboratory

- Produce "quickly" specific, useful, significant and reliable results

**IMPACT**
- On therapeutic decision?
- On optimized management of patients?
- On morbidity, mortality?
- On duration of hospitalization?
- On the control of nosocomial infections?
  - On antibiotic use?
  - On epidemiology of resistance?

Rapid obtaining and communication of results

Interaction with pharmacist, hygienist, doctor, specialist in infectious diseases
The ability to achieve precise identification of the causative agent depends on:

- Interaction between clinician and microbiologist
- Clinician must be aware of the complexity of the tests and the time required to achieve a result
- Microbiologist must appreciate the nature of the patient’s condition and be able to assist the clinician in interpreting laboratory reports
Whole process of laboratory tests
Pre-analytical
Pre-analytical considerations

- Quality of the sample
- What samples?
- When taking?
- How to take?
- Sampling equipment and transportation
- Preservation

Choice analysis, 
Quality of samples and transport conditions are essential

manual sampling 
edemiological and clinical data,
M.D. orders

- Specify the particular pathogens suspected
  - Legionella, Vibrio cholerae, C.diphteriae ...
- Communicate about
  - Clinical data
  - Antibiotic
  - Notion of travel – country….

Choice of techniques, culture media, interpretation of the results
Type of samples

- From normally sterile sites
  - Any infectious agent identified is significant

- From or through sites with commensal flora
  - Differentiate pathogenic or opportunistic infectious agents from the commensal flora

!!! Contamination ➔ False positive

Identification Quantification
When take samples?

- **As soon as possible** in the disease
- **Before** the administration of **AB**, if possible
  - A single dose of AB can "decapitate" the culture
  - Examples:
    - *N. meningitidis* and *S. pneumoniae* meningitis
    - Acute urinary tract infection
- **If necessary, after "therapeutic window"**
  - Examples:
    - Culture-negative endocarditis
    - Bone infection,
Conservation and transport

Always transfer to the laboratory as soon as possible

⇒ Less than 2 hours at room temperature

• If not less than 24 (48) hours at 4 °C
  Exceptions: LCR, blood cultures

Delay in transporting specimen to laboratory

- Prolongs time to result
- Impacts specimen integrity:
  False-negative and false-positive results
  False-negative results can be life-treatening: meningococci in CNS
Pre-analytical considerations

- The quality of the sample determines the quality of the results

- Always inform the laboratory of precious samples
ANALYSIS
Analysis

- Direct examination: **GRAM**
  - To assess the quality of the sample (rejection?)
  - To evaluate the inflammatory response
  - To evaluate the presence of bacteria, fungi, yeast

- First diagnostic indications

Meningit to *N. meningitidis*

Pneumonia to *S. pneumoniae*

Blood culture with *S. pyogenes*
Impact of laboratory detection and reporting on management of bloodstream infection

Prospective study, 14 months

Iowa Univ. Hosp.
509 bacteremic episodes
(59% nosocomial origin)

50% empiric AB therapy within 2-4 h post-blood culture sampling

Impact of transmission of preliminary result of Gram stain >> final AST result

Munson et al. JCM 2003
Analysis

- **Culture**
  - Isolate *all* the bacteria in an infection
  - Differentiate bacteria probably responsible for the infection from contaminating or colonizing bacteria
  
  ➔ Choice of media and culture conditions
    - type sample
    - suspected organism
    - Gram informations
Analysis

- **Antibiogram**
  - Impact on AB choice

**Good AB use:**
- to conserve their efficacy
- to limit emergence of resistance
- to control the healthcare costs
Good use on AB

- **Empirical therapy**
  - Based on local epidemiology
  - Need for local guidelines

- **!!! Reassess the indication and choice of AB after 48h**

  ➔ According microbiological documentation
Limit epidemic

- Microbiologist-Hygienist

1. Promotion of hand hygiene

2. Active monitoring of patients
   - screening
     - MRSA: nasal swab, perineal swab
     - Resistant gram negative bacilli: rectal swab
   - early notification of new cases

3. Contact Precautions
   - Single room isolation or cohorting
   - Use of gloves, gowns, ...
   - Dedicated equipment

4. Carriers decontamination
POST-

ANALYTICAL
Communication of results

- Phone, paper, computer
- At the different steps of the diagnosis

Time to results from 48 to 96h

$\Rightarrow$ Limited impact of laboratory on infectious disease management in starting initial therapy
Different partners of the microbiologist
Microbiologist - Prescribers

- Repeated contact with the prescriber
  - Information about the samples, the pathogen suspected, clinical data
  - Communication of the results

- Report of results: introduce comments, mask some AB... → help the prescriber to interpret the microbiological results
Microbiologist-Infection control

- Role of the laboratory in the surveillance and control of nosocomial infections
  - Epidemiological surveillance
    - Incidence of nosocomial infections
    - Resistance to antibiotics
    - Detection of epidemics
    - Impact of intervention measures
  - Search for human and environmental reservoirs
    - Carrier screening for resistant pathogens (MRSA, CPE ...)
    - Water, food, air, surfaces, instruments (endoscopes, ...)

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Hygienist

- Guidelines for isolation precautions (strict isolation, contact isolation, respiratory isolation…)
- Promote hand hygiene
- Carrier decolonization
- Control of patient environment
- Healthcare equipment decontamination
- Control and stop epidemic
Microbiologist- Infectious diseases

- Daily contact to inform and discuss about the precious samples (BC, LCR, biopsy…)

- Infectious diseases specialist:
  - **Intervention on specific request/according the samples** (Blood cultures)
    - Optimization of treatment indication, dosage and selection of molecules, therapeutic deescalation, treatment duration
  - **Infectious disease round in specific units** (chirurgical unit, neurology…)


Microbiologist - Pharmacist

- Monitoring of AB consumption
- Antibiotic drug information
- Antibiotic use information
All together

- **Antibiotics management group**
  - **Multidisciplinary team**
  - **Goals: optimize prescribing and use of AB**
    - Edit local guidelines (therapeutic form - recommendation for empirical and etiological treatment and prophylaxis)
    - Implementation of guidelines
    - Antibiotic policy intervention (specific prescription, automatic stop order)
    - Initiative to reduce the excessive consumption of AB
    - Training of medical, nursing and healthcare
    - Analysis of the consumption AB
    - Resistance Surveillance
Conclusion

Antimicrobial-Resistant Pathogen

Prevent Transmission

Prevent Infection

Infection

Antimicrobial Resistance

Optimize Use

Effective Diagnosis & Treatment

Antimicrobial Use
Conclusion