

# INFECTIOUS DISEASES AND CLINICAL MICROBIOLOGY

**Academic year:** 2024-2025

*Fourth year, second semester*

**Mandatory**

**Language:** English

**Credits:** 6 CFU

**Disciplines:** Infectious Diseases (5 CFU), Clinical Microbiology (1 CFU)

**Faculty:** Valeria Cento, Michele Bartoletti, Paola Morelli, Federica Tordato, Linda Bussini, Davide Bavaro

## OBJECTIVES

The course (6 CFU) will offer an integrated description of the main human diseases sustained by infectious agents (Infectious Diseases), and the major diagnostics tools used in the clinics (Clinical Microbiology).

### Application of knowledge and understanding:

At the end of the course students who attend to class regularly, participate actively in discussions and complete assigned readings will improve their ability to:

- Recognize the relationship to infectious agents, host and the environment in causing colonization, infection and disease.
- Apply basic infection control interventions and understand the principles of antibiotic use and stewardship.
- Analyze the diagnostic dilemmas and management opportunities of a broad range of major syndromes affecting the neurological, respiratory, cardio-vascular, digestive, and urinary systems.
- Understand the clinical and public health implications of major global endemic diseases, including HIV/AIDS, tuberculosis and malaria.

### Making judgements; Communication skills; Learning skills

By the end of the course students will have developed abilities to communicate and work in team, and acquired learning skills such as study in a group, organize knowledge, revise and retain information, select information.

## CONTENTS

### INFECTIOUS DISEASES (Prof. BARTOLETTI, MORELLI, TORDATO, BUSSINI, BAVARO; 5 CFU)

#### Lectures

##### 1. Introduction to Infectious Diseases

- Definition of Infectious Diseases and transmission routes
- How to get infected
- Community/Hospital acquired Infections
- Prophylactic measures and isolation procedures for epidemiological control of ID
- Principles of appropriate antibiotic use

- Antimicrobial stewardship

## 2. Upper and lower respiratory tract infections

- Community-acquired and hospital-acquired pneumonia: deepened knowledge of the disease. Definition, incidence, risk factors, epidemiology, clinical findings, diagnosis and principles of treatment
- Ventilator associated pneumonia (VAP): Definition, incidence, epidemiology, clinical findings, diagnosis and principles of treatment
- Legionellosis: Incidence, prevention, clinical findings, diagnosis and principles of treatment
- Influenza: Incidence, prevention, clinical findings, diagnosis and principles of treatment of

## 3. Tuberculosis

- Deepened knowledge of the disease. Epidemiology, pathogenesis, clinical presentation of pulmonary and extra-pulmonary tuberculosis. Diagnosis and principles of treatment.

## 4. Central nervous System Infections

- Acute bacterial meningitis. Deepened knowledge of the disease. Epidemiology, microbiology, pathogenesis, clinical features, diagnosis, principles of treatment, chemoprophylaxis
- Viral infections of the CNS. Epidemiology, microbiology, clinical features, diagnosis, principles of treatment

## 5. HIV and AIDS

- History and social stigma. Deepened knowledge of the disease. Pathogenesis, diagnosis, clinical presentation, principles of therapy
- AIDS-related opportunistic infections: "don't miss" diagnosis.
- Pneumocystis jirovecii pneumonia, cytomegalovirus infection, toxoplasmosis, progressive multifocal leukoencephalopathy, Kaposi's sarcoma, esophageal candidiasis: Clinical presentation and principles of therapy

## 6. Cardiovascular Infections

- Endocarditis: Deepened knowledge of the disease: definition, incidence, risk factors, epidemiology, clinical findings, diagnosis and principles of treatment

## 7. Urinary tract infections (UTI)

- Knowledge of the main clinical features and key-points in order to distinguish the different forms. Epidemiology, diagnosis, principles of treatment
  - Inappropriate use of antibiotics in UTI*
  - UTI in special populations*

## 8. Sepsis

- Deepened knowledge of the disease. Definition, clinical management and principles of treatment

## 9. Gastrointestinal and intrabdominal infections

- Clostridium difficile colitis: deepened knowledge of the disease. Epidemiology, pathogenesis, risk factors, control strategies and isolation, clinical findings, diagnosis, principles of treatment
- Infectious diarrhoea and enteric fever: Epidemiology, risk factors, control strategies, clinical findings, diagnosis, principles of treatment

## 10. Cutaneous and Soft tissue Infections

- Knowledge of the main clinical features and key-points in order to distinguish the different forms. Epidemiology, diagnosis, principles of treatment
  - Impetigo, Cellulitis, Erysipelas*
  - Staphylococcal Toxic Shock Syndrome*
  - Necrotizing fasciitis and gas gangrene*

### **11. Pediatric infections**

- Knowledge of the main clinical features and key infectious diseases in children
- Childhood exanthems

### **12. Sexually transmitted infections (STI)**

- Syphilis: Deepened knowledge of the disease. Epidemiology, pathogenesis, clinical presentation, diagnosis and principles of treatment. Prevention strategies.
- Herpes simplex virus (type 1 and type 2), Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis: clinical presentation, diagnosis and principles of treatment. Prevention strategies.

### **13. Systemic Infections**

- Epidemiology, clinical presentation. Diagnosis and principles of treatment.
- Toxoplasmosis
- EBV Infection
- CMV infection

### **14. Bone and joint infections**

- Haematogenous and non-haematogenous osteomyelitis: pathogenesis, clinical findings, diagnosis and principles of treatment
- Infective arthritis: Clinical findings, diagnosis, treatment

### **15. Zoonosis and Vector borne diseases**

- Malaria. Deepened knowledge of the disease. Epidemiology, control strategies, parasite life cycle, clinical findings, diagnosis, principles of treatment, prophylaxis
- Epidemiology, microbiology, clinical presentation. Diagnosis and principles of treatment of:
- Rickettsiosis
- Brucellosis
- Leishmaniasis
- Lyme disease
- American and African trypanosomiasis

### **16. Emerging Infectious Diseases**

- Epidemiology, transmission, knowledge of the main clinical features and key-points of the different diseases. Principles of diagnosis.
- West Nile
- Zika Virus
- Ebola
- Dengue
- Chikungunya

### **17. Travel Medicine**

- Preparing before travel
- After travel: differential diagnosis of possible diseases
- Pyogenic and amoebic hepatic abscess: Epidemiology, pathogenesis, risk factors, clinical findings, diagnosis and principles of therapy of liver abscesses

### **18. Antibiotics**

- Principal classes and spectra of action
- Mechanisms of action (general)
- New molecules
- Empirical and targeted therapies

## **CLINICAL MICROBIOLOGY (prof. CENTO; 1 CFU)**

### **Learning objectives**

At the end of these lectures, students should be able to:

- Describe the gold-standard diagnostic approaches in infectious diseases.
- Describe the most advanced molecular diagnostic approaches that are facing clinical routine.
- Identify most promising areas of further technological and medical development to fulfil unmet need in microbiological diagnosis.
- Describe basic approaches of diagnostic work-out in specific clinical condition, currently applied in IRCCS Humanitas Research Hospital.

#### **1. Introduction to microbiological diagnosis – from specimen to drug resistance profile**

- Principles of microbiological diagnosis and current techniques
- Microscopic and cultural diagnosis
- Identification
- Phenotypic susceptibility testing
- Basic concepts of molecular diagnosis

#### **2. Advanced molecular diagnosis – Syndromic approach, Next Generation Sequencing**

- Multiplex and syndromic approaches in clinical practice
- NGS theory and main applications

#### **3. Focus on - Diagnosis of bloodstream infections**

- Microscopic and cultural diagnosis
- Multiplex and rapid phenotypic assessments
- T2 technology

#### **4. Focus on - Diagnosis of TB and other mycobacterial infections**

- Microscopic and cultural diagnosis
- IGRA
- Drug-resistance testing

#### **5. Focus on - Diagnosis of invasive fungal infections**

- Proven, probable and possible invasive fungal infections
- Diagnostic algorithms
- Drug resistance issues
- Future perspectives

#### **6. Drug resistance testing in clinical practice**

- Principles of microbial genetic variability
- Drug resistance testing in clinical practice

## **COLLABORATIVE LECTURE:**

1. Interactive cases – drug resistance.

## **TEACHING METHODS**

**Lectures:** the main purpose of lectures is to transfer knowledge to students by guiding them through the most relevant subjects of the disciplines. Collaborative lessons on clinical cases will be done in order to increase the integration of the different modules. All lectures will be held synchronously, either in presence or using Teams.

**Attendance is mandatory, an absence rate of 25% will be tolerated. For higher absence rates university rules will be followed.**

## **ASSESSMENT**

Students' evaluation will be assessed through one multiple choice exam at the end of the year. The faculty reserves the possibility to have also an oral exam.

### **Exam content and evaluation**

33 questions (26 of Infectious Diseases and 7 of Clinical Microbiology) each question is worth 1 point, for a total of 33 points. To pass the test you need to answer to at least 18 questions correctly (mark 18/30).

At least 31 correct answers = 30 *cum laude*

Oral exam can be requested upon achievement of at least a 18/30 mark in the written exam.

**Registration to final exam is mandatory through LMS**

## **TEXTS**

- Elaine C. Jong, Dennis L. Stevens. Netter's Infectious diseases. Second Edition
- Harrison's Principles of Internal Medicine, 21th Edition
- Microbiology with Diseases by Taxonomy, Bauman RW 4th edition, Pearson
- Murray Medical Microbiology, 9th Edition, 2020; Elsevier
- Updated scientific literature and clinical guideline (EBM, Evidence Based Medicine)

**Readings:** Supplemental course readings and journal articles will be listed on the LMS