



## **Degree in Biomedical Laboratory Techniques**

**INTEGRATED TEACHING NAME: MICROBIOLOGICAL DIAGNOSTICS (Bacteriological diagnostics; Virological Diagnostic; Parassitological Diagnostic, Micological Diagnostic and Diagnostic Laboratory Techniques) SSD : MED/07-VET/06-MED/46**

**CFU: 6**

**RESPONSIBLE: Fabbio Marcuccilli**

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**MODULE : Bacteriological diagnostics, Micological Diagnostic and Virological Diagnostic**

SSD: MED/07

CFU Number: 3

Teacher name: [Antonino Di Caro](#)

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**MODULE: Parassitological Diagnostic**

SSD: VET/06

CFU Number: 1

Teacher name: [Lorenza Putignani](#)

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**MODULE : Microbiological Techniques-Bacteriology**

SSD: Med/46

CFU Number: 1

Teacher name: [Fabbio Marcuccilli](#)

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**MODULE : Microbiological Techniques- Virology**

SSD: Med/46

CFU Number: 1

Teacher name: [Fabbio Marcuccilli](#)

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## **PREREQUISITES**

The program takes place in the first semester of the third year, so the course requires knowledge related to General Microbiology, Special and Clinical Microbiology, Immunology, as well as the principles of operation of Laboratory instruments related to the most common analyses, applied in the microbiological field.

## **LEARNING OBJECTIVES**

The main educational objective of this teaching is to provide the student with the basic knowledge of microbiological diagnosis, referring to basic and innovative techniques. This enables the student

to gain an overview of diagnosis by understanding in which biological matrices microorganisms should be sought and what precautions to take in order to make accurate laboratory diagnoses in microbiology

The main pathogens implicated in human pathogenesis and which laboratory techniques to adopt according to the pathogen will be covered. Diagnostic algorithms will be explained so that the student will be able to understand the steps of microbiological diagnosis

By the end of the course, the student will have acquired the main methods and techniques to be applied in the identification of bacteria, viruses, fungi, parasites and protozoa, with the ability to apply the most appropriate diagnostic technique

### **LEARNING OUTCOMES**

Knowledge and understanding skills:

Knowledge of the major pathogens implicated in the human pathogenesis of infectious diseases, and laboratory techniques to be applied for their proper search and identification. Knowledge of the biological matrices on which to search for microbiological agents.

- Know and understand in which biological matrices the following should be sought: viruses, protozoa, bacteria, parasites and fungi
- Know and understand the main basic laboratory techniques
- Know and understand molecular techniques, for microbiological diagnosis
- Know and understand diagnostic techniques for the detection and identification of bacteria
- Know and understand diagnostic techniques for the detection and identification of viruses
- Know and understand diagnostic techniques for the search and identification of mycetes
- Know and understand the diagnostic techniques for the search and identification of parasites
- Know and understand the advantages and disadvantages of laboratory techniques
- Know and understand the correct interpretation of analytical data
- Know and describe diagnostic algorithms in the field of microbiological diagnosis

### **Ability to apply knowledge and understanding**

Upon completion of the course, the student will be able to independently and competently perform the various methods learned in the course of study and during practical classes. He/she will be able to independently use the various equipment in the Clinical Microbiology laboratory.

The student must demonstrate knowledge and ability to apply the main methods of investigation designed to identify types of pathogenic microorganisms. In addition, the student must know the methods of the pre-analytical, analytical and post-analytical phases for accurate laboratory diagnosis

### **Communication Skills.**

The student will be able to describe a microbiological diagnostic process, and must demonstrate that he or she has learned appropriate scientific language for the purpose of correct and rigorous communication necessary to perform his or her clinical-microbiological laboratory activities, including through the use of appropriate terminology in microbiology.

### **Autonomy of judgment.**

At the end of the course, the student should be able to independently develop the logical procedures and strategies that allow the application of the experimental method for both diagnostics and research aimed at correctly analyzing and interpreting experimental data. Will have acquired based on the clinical question, the ability to apply the correct microbiological laboratory test, and knowledge of the diagnostic algorithm of various pathogens

### **Learning skills:**

The student will have acquired learning skills and methods appropriate for the deepening and improvement of his or her skills in the field of microbiological diagnosis, including by consulting scientific literature and up-to-date articles

## **COURSE SYLLABUS**

### **BACTERIOLOGICAL DIAGNOSTIC, VIROLOGICAL DIAGNOSTIC AND MYCOLOGICAL DIAGNOSTIC**

Bacteria, viruses and fungi of medical interest.

- Microbiological diagnostics: pathological samples, collection, transport, storage and processing of samples.
- Bacterial infections, direct microscopic examination and culture.
- Viral infections, direct examination and culture.
- Methods of detection of microbial macromolecules. Latex agglutination test. Elisa. Immunofluorescence. Immunohistochemistry.
- Serological diagnosis of infection: methods for documenting the presence and titre of specific antibodies.
- Molecular microbiological diagnostics: extraction of nucleic acids, hybridization methods, amplification of the hybridization signal, post-amplification detection.
- Automation in the clinical microbiology laboratory: automation in serology, identification of bacteria and antibiogram, extraction of nucleic acids and in amplification of nucleic acids.
- Respiratory tract infections: the main clinical manifestations and the laboratory diagnosis of upper and lower respiratory tract infections.
- The most common central nervous system infections (meningitis, encephalitis) and their laboratory diagnosis.
- Infections of the genitourinary system, in relation to the microbes ( bacteria, viruses and fungi) involved and to the various types of laboratory diagnosis. Sexually transmitted diseases (STDs) and urinary tract infections (UTIs).
- Gastrointestinal tract infections: the main infections of the stomach, intestines and liver in relation to their etiologic agents and laboratory diagnosis.
- Skin, bone and joint infections: laboratory diagnostic methods.

- Vascular and cardiac infections, bacteremia, sepsis: main infectious agents and laboratory diagnosis.
- Opportunistic infections and healthcare-related infections (ICA): definitions, risk factors, routes of transmission, prevention and treatment.

### **PARASITOLOGICAL DIAGNOSTIC**

- Introduction to the course: Concepts of ecology applied to parasites and zoonoses
- General parasitology
- Protozoa
- Nematodes
- Cestodes
- Trematodes
- Notes on arthropods
- Techniques of isolation and direct and indirect characterization of the main parasites of human interest

### **DIAGNOSTIC TECHNIQUES OF BACTERIOLOGY AND VIROLOGY**

- Basic concepts in pre-analytical sample in the bacteriology laboratory.
- Sepsis
- Urine culture,
- Liquor and infectious enteritis
- Extraction of nucleic acids. PCR Real-Time. PCR end-point.
- Practical application of manual and automatic methods in the field of molecular virology.
- Description and discussion on the technical validation of the diagnostic reports produced during the practical sessions.

### **COURSE STRUCTURE**

The course consists of face-to-face lectures for a total of 60 hours, including 30 hours of Bacteriological, Virological and Mycological Diagnostics, 10 hours of Parasitological Diagnostic Techniques, and 10 hours of Virology Diagnostic Techniques. During teaching, lecturers make use of teaching tools such as presentations organized in powerpoint files, with explanatory diagrams, illustrations, pictures and some videos. In addition in order to foster learning for the Diagnostic Techniques of Bacteriology and Virology Techniques modules, interactive lectures are provided, as well as on-the-job tests. Attendance is mandatory

## **COURSE GRADE DETERMINATION**

The examination of the integrated teaching consists of an examination with the oral mode only, during which the committee will assess the student's ability to apply the knowledge learned and ascertain that the skills are adequate to solve the problems that arise in the specific disciplinary field and also taking into account the objectives and programs of the teaching. The student will be expected to demonstrate subject knowledge, reasoning skills and express himself/herself with appropriate scientific language. The final grade is derived from the weighted average of the various modules, and the examination may be passed with a mark of 18/30.

The examination will be graded overall according to the following criteria:

**Unsuitable:** major deficiencies and/or inaccuracies in knowledge and understanding of topics; limited analytical and synthesis skills, frequent generalizations

**18-20:** barely sufficient knowledge and understanding of topics, with possible imperfections; sufficient skills of analysis, synthesis and independent judgment.

**21-23:** routinized knowledge and understanding of topics; correct analysis and synthesis skills with coherent logical argumentation.

**24-26:** fair knowledge and understanding of topics; good analytical and synthesis skills with rigorously expressed arguments.

**27-29:** complete knowledge and understanding of topics; remarkable skills of analysis, synthesis. Good autonomy of judgment.

**30-30L:** excellent level of knowledge and understanding of topics. Remarkable analytical and synthesis skills and autonomy of judgment. Arguments expressed in an original way

## **SUPPORT ACTIVITIES**

No support activities are planned

## **RECOMMENDED TEXTS AND BIBLIOGRAPHY**

“Lippincott® Illustrated Reviews: Microbiology (Lippincott Illustrated Reviews Series) [Cynthia Nau Cornelissen Ph.D.](#) (Editor), [Marcia Metzgar Hobbs PhD](#) (Editor). Series Editor: Harvey RH, Walters Kluwer”

-“Bibliografia e materiale didattico scelti dal docente (presentazioni, articoli scientifici, dispense)”

-“Microbiologia medica, Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller, Editore EDRA”