

Degree in Biomedical Laboratory Techniques

INTEGRATED TEACHING NAME: MICROBIOLOGICAL DIAGNOSTICS (Bacteriological diagnostics; Virological Diagnostic; Parassitological Diagnostic, Micological Diagnostic and Diagnostic Laboratory Techniques)

SSD: MEDS-03/A. MVET-03/B. MEDS-26/A

Responsible Teacher: [Fabbio Marcuccilli](mailto:fabbio.marcuccilli@unicamillus.org)

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CFU: 6

MODULE : Bacteriological diagnostics, Micological Diagnostic and Virological Diagnostic

SSD: MEDS-03/A

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CFU Number: 3

MODULE: Parassitological Diagnostic

SSD: MVET-03/B

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CFU Number: 1

MODULE : Microbiological Techniques-Bacteriology

SSD: MEDS-26/A

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CFU Number: 1

MODULE : Microbiological Techniques- Virology

SSD: MEDS-26/A

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CFU Number: 1

PREREQUISITES

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

LEARNING OBJECTIVES

The main training objective of this teaching is to provide the student with the basic knowledge of microbiological diagnosis, referring to basic and innovative techniques, aimed at achieving the training objectives of the professional profile. This enables the student to acquire an overview of diagnosis by understanding in which biological matrices microorganisms must be sought and what precautions must be taken in order to make accurate laboratory diagnoses in the microbiological field

The main pathogens involved in human pathogenesis will be covered and which laboratory techniques to adopt depending on the pathogen. Diagnostic algorithms will be illustrated 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 for the identification of bacteria, viruses, fungi, parasites and protozoa, with the ability to apply the most appropriate diagnostic technique.

LEARNING OUTCOMES

Knowledge and understanding:

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

- Knowledge and understanding of the biological matrices in which viruses, protozoa, bacteria, parasites and fungi are to be researched
- 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 detection and identification of fungi
- Know and understand diagnostic techniques for the research 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 the diagnostic algorithms in the field of microbiological diagnosis
- Be able to recognise the biological matrix suitable for microbiological testing
- Be able to recognise the most suitable laboratory technique for pathogen isolation and identification

Ability to apply knowledge and understanding

At the end of the course, the student will be able to independently and competently perform the various methods learned in the course of studies and during practical lessons. 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 investigation methods for identifying types of pathogenic microorganisms. In addition, the student must know the methods of the pre-analytical, analytical and post-analytical phases for an accurate laboratory diagnosis.

Communication Skills.

The student will be able to describe a microbiological diagnostic process, and will have to demonstrate that he/she has learnt the appropriate scientific language for the purposes of correct and rigorous communication necessary to carry out his/her clinical-microbiological laboratory activities, including through the use of appropriate microbiological terminology

Autonomy of judgment.

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

Learning skills:

The student will have acquired learning skills and methods suitable for deepening and improving his or her skills in the field of microbiological diagnosis, also 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: General parasitology and ecology concepts applied to parasites and zoonoses
- Enteric parasites: main parasites (Protozoa: *Giardia intestinalis*, *Amoeba-Entamoeba histolytica*, Sporozoa- *Cryptosporidium* sp. Cestodes: *Taenia solium*, *Taenia saginata*, *Diphilobothrium latum*, Digenei hepato-biliary Trematodes- *Opisthorchis felinus*, *Clonorchis sinensis*, Nematodes- *Trichuris trichiura*, *Ascaris lumbricoides*, *Ancylostoma duodenalis/Necator americanus*, *Strongyloides stercoralis*, *Enterobius vermicularis*), life cycles, diagnostic assessment and prevention
- Blood parasites: main parasites (Protozoa: *Plasmodium*; *Trypanosoma* sp., Nematodes: *Wuchereria bancrofti*, *Brugia malayi*) and life cycles, diagnostic investigation and prevention
- Parasites in other locations: major parasites (Protozoa: *Toxoplasma gondii*, - *Leishmania* sp
- *Trichomonas vaginalis*, free-living amoebae: *Acanthamoeba*, *Naegleria*, Cestodes: *Echinococcus granulosus*, Nematodes: *Trichinella spiralis*, *Anisakis* sp., Platyhelminthes: *Schistosoma* sp.), life cycles, diagnostic investigation and prevention
- Arthropods: main parasites and vectors; identification and evaluation of epidemiologically relevant parameters
- The main direct and indirect isolation and characterisation techniques (microscopic, molecular

examination, serodiagnosis) will be illustrated for each class

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 lectures for a total of 60 hours, including 30 hours of Bacteriological, Virological and Mycological Diagnostics, 10 hours of Parasitological Diagnostics and 10 hours of Virological Diagnostic Techniques. During teaching, the lecturers use teaching aids such as presentations organised in powerpoint files, with explanatory diagrams, illustrations, images and videos. In-depth seminars with a maximum duration of three hours are scheduled as part of the face-to-face teaching. In addition, in order to promote learning for the modules of Diagnostic Techniques of Bacteriology and Virology Techniques, interactive lectures are planned, as well as ongoing tests. Attendance is compulsory

COURSE GRADE DETERMINATION

The examination of the integrated teaching is conducted in ordinary and extraordinary sessions and to be admitted, the student must reach 75% of the course attendance. The examination consists of an oral test, during which the board will assess the student's ability to apply the knowledge he/she has learnt and will ascertain that the skills are adequate to solve the problems that arise in the specific disciplinary field, also taking into account the teaching objectives and programmes. The assessment parameters include the student's ability to organise a logical discourse, problem solving, critical and constructive reasoning skills, quality of oral exposition and competence in scientific vocabulary, effectiveness and linearity. In particular the examination will be assessed 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

The final mark is derived from the weighted average of the various modules and the examination can be passed with a mark of 18/30

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”