UNICAMILLUS

Degree In Medicine And Surgery

MICROBIOLOGY (8 CFU)

SSD: MED/07; VET/06

Coordinator: Prof. Francesca Pica

LECTURERS

Bacteriology (2 CFU)	Prof.Francesca Pica francesca.pica@unicamillus.org
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EXAM COMMISSION

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PREREQUISITES

Although there are no preparatory prerequisites, it is necessary for the student to know the basic concepts and concepts of biology, genetics, histology and anatomy.

LEARNING OUTCOMES

Upon completion of the Course of Microbiology, Students should be able to:

1. Demonstrate the ubiquity and diversity of microorganisms in the human body and the environment.

2. Illustrate the distinctive features of the different types of microorganisms and their ecological niche.

3. Explore mechanisms by which microorganisms cause disease (microbial pathogenicity and virulence).

4. Show how the human immune system counteracts infection by means of specific and nonspecific mechanisms.

5. Know the main human pathogens (bacteria, viruses, fungi and parasites) and the diseases they cause.

6. Recognize the way of transmission of infectious agents in hospitals, communities and populations and the methods used to control it

7. Demonstrate the principles of vaccine preparation and the use of vaccines in immunization practice.

8. Define the role of disinfection and sterilization in the context of the patient care and the environment.

9. Illustrate the basic principles and functioning of the common antimicrobials (antibiotics, antivirals, antifungal and antiparasite agents) .

10. Be aware of the contribution of the microbiology laboratory to the diagnosis and management of infectious diseases. In particular, to know the diagnostic path including collection, transport, handling an processing of clinical specimen (direct microscopic exam, staining techniques, seeding and isolation, biochemical identification, antimicrobials-sensitivity tests, cell cultures, PCR, genotyping, NGS, serology).

KNOWLEDGE AND UNDERSTANDING

- Assess the ubiquity and diversity of microorganisms in the human body and the environment.

- Describe the morphology and physiology of microorganisms (bacteria, viruses, fungi, parasites) and the diseases they cause.

- Understand the mutual relationship between microbes and human host in health and disease (definition and role of human microbiota).

- Explore the multiple mechanisms by which microorganisms can cause disease (microbial pathogenicity and virulence).

- Describe how human host counteracts infections by means of specific and nonspecific mechanisms (anatomical barriers, physiology of body systems, immune response, inflammation).

- Achieve the ability to integrate knowledge about microbial structure, antigenicity and pathogenicity from the molecular to the clinical level..

- Understand the consequences of alterations at the cellular and organ level in relation to transmission of infectious agents.

- Learn to interpret appropriate laboratory and diagnostic studies for each human pathogen.

- Identify the best practice to prevent and/or counteract the transmission of infectious agents (sterilization, disinfection, asepsis)

- Understand the principles and functioning of antimicrobials, vaccines and serum-prophylaxis actually in use.

APPLYING KNOWLEDGE AND UNDERSTANDING

- Apply the general microbiological knowledge to the clinical setting, being able to understand the basic principles of infectious diseases.

- Approach to the main diagnostic tests to assess infectivity and/or disease in hospital, communities and populations.

- Provide a differential diagnosis of microbial diseases based on the identification of specific signs and symptoms and the interpretation of laboratory data, providing a comprehensive explanation of the underlying reasoning.

- Describe the practical aspects of the diagnostic instruments in microbiology: when to use them and how to perform them in research laboratories and clinical settings.

MAKING JUDGEMENTS

- Recognize the importance of an in-depth knowledge of general and medical microbiology consistent with a proper medical education.

- Identify the fundamental role of a proper theoretical knowledge of microbes and antimicrobials in the clinical practice

- Recognize the relevance of the microbiological research in social politics of promotion of public health and environmental defense.

- Be able to critically argue the findings obtained in the microbiological field in relation to data available in the actual international literature.

COMMUNICATION SKILLS

- Present the topics orally in an organized and consistent manner.

- Use of proper scientific language coherent with the topic of discussion.

- Be capable to have a discussion in class with other students on the microbiological topics addressed in previous lessons and/or topics of public interest on microbiological issues, possibly utilizing different supports such as ppt presentation and consultation of scientific and institutional databases (Pub Med, Scopus, Italian Ministry of Health, etc.)

SYLLABUS

BATTERIOLOGY

General Bacteriology: Criteria for bacterial taxonomy and classification. The architecture of the bacterial cell : the bacterial chromosome, the cytoplasm, the cytoplasmic membrane. Gram staining. Gram positive and gram negative bacteria. Capsule. Flagella. Pili and fimbriae. Metabolism and bacterial growth: the production of bacterial spores. Bacterial genetics: chromosome and plasmids. The transfer of genetic material : transformation, transduction and bacterial conjugation. The pathogenic activity of bacteria and the stages of the infectious process. The bacterial adhesiveness,

the ability to invade hosts, the production of toxins. Structure and mechanisms of action of exotoxins and endotoxins. The role of innate and cell-mediated immunity in bacterial infections. Immune sera and vaccines. General principles for the diagnosis of bacterial diseases. Antibacterial drugs and their mechanism of action. Mechanisms of bacterial resistance to antibacterial drugs.

Special Bacteriology: Staphylococci. Streptococci. Pneumococci and Enterococci. Bacilli and Clostridia. Corynebacteria and Listeria. Enterobacteriaceae. Pseudomonas. Vibrio, Campylobacter and Helicobacter. Emophili, Bordetella and Brucella. Yersinie and Pasteurelle. Neisseria. Anaerobic microorganisms. Legionella. Mycobacteria. Spirochetes. Mycoplasma. Rickettsiae. Chlamydiae. Gardnerella.

MYCOLOGY
Fungi : structure, replication and dimorphism. Mechanisms of fungal pathogenicity.
Fungal infections by opportunistic fungi. Superficial, cutaneous, subcutaneous and systemic mycoses. Mechanisms of action of antifungal agents.

VIROLOGY
General Virology: Nature, origin and morphology of viruses, viral nucleic acids, proteins and lipids viral multiplication of animal viruses, virus-cell interaction. State of persistence and latency of the genome in the cell, host cell cultures, multiplication cycle, virus isolation animals, adaptation and virulence, inactivation of viruses, physical and chemical agents, cell surface antigens encoded by the virus, the immune response to viral infection. Interferons. Vaccines and antiviral chemotherapy.
Special Virology: Adenovirus, Herpesvirus, Poxivirus, Papovavirus, Parvovirus, Picornavirus, Orthomyxovirus, Paramyxovirus, Rhabdovirus. Togavirus and other viruses transmitted by insects. Filovirus. Rubella virus. Reovirus and Rotavirus. Hepatitis A virus. Retroviruses. Human Retroviruses. RNA and DNA tumor viruses. Prions.

PARASITOLOGY
General Parasitology: Systematics and Zoological Nomenclature. Biological associations. General information on the life cycles of parasites, parasitic specificity, host-parasite interactions and pathogenic action of parasites. Parasitic diseases of medical importance. Fight against parasitic diseases.
Special Parasitology: Parasitic protozoans: Amoebe. Flagellates. Ciliates. Sporozoans. Parasitic Metazoans: Trematodes. Cestodes. Nematodes. Vectors of parasitoses.

COURSE STRUCTURE
The course is structured in 80 hours of frontal teaching, divided into lessons of 2 hours according to the academic calendar. Frontal teaching includes theoretical lessons and additional seminars on the topics covered.

COURSE GRADE DETERMINATION
Oral examination. The Commission will assess the ability of the student to apply the concepts and that the skills are adequate to support and solve microbiological problems. The following will also be assessed: making judgements, communication skills and learning skills as indicated in the Dublin descriptors. The examination will be assessed according to the following criteria:
Not passed: important deficiencies and/or inaccuracies in the knowledge and understanding of the topics; limited capacity for analysis and synthesis, frequent generalizations.

18-20: knowledge and understanding of the topics as soon as sufficient with possible imperfections; capacity for analysis, synthesis and autonomy of judgement sufficient.
21-23: Knowledge and understanding of the general topics; Ability to analyse and summarise correctly with consistent logical argumentation.
24-26: Discreet knowledge and understanding of the topics; good capacity for analysis and synthesis with rigorously expressed arguments.
27-29: Comprehensive knowledge and understanding of the topics; considerable capacity for analysis, synthesis. Good autonomy of judgement.
30-30L: Excellent level of knowledge and understanding of the topics. Remarkable capacity of analysis and synthesis and autonomy of judgement. Arguments expressed in an original way

TEXTBOOK Patrick R. Murray et al. Medical Microbiology, Elsevier / Masson Editors _8th Edition.