



MICROBIOLOGIA MOLECOLARE APPLICATA E MICROBIOLOGIA CLINICA

12 CFU - 2° Semester

Teaching Staff

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LEARNING OBJECTIVES

▪ Applied Molecular Microbiology

With the course of Applied Molecular Microbiology, students will broaden and deepen the basic knowledge in the biomolecular field captured with the first degree. The course explores the molecular aspects of pathogenicity, virulence and antibiotic resistance of the major human pathogens, and their clonal relationship. The new identification technologies and study of microorganisms are also addressed (genomes, metagenomes, proteomes etc) as well as the basics of the interaction host parasite including immunological aspects. From the application point of view, they are taken into consideration the vaccine preparations (both traditional and recombinant) as well as some examples of microbial products produced with advanced technologies. The students then, will possess an integrated understanding of biological phenomena and advanced scientific training in morphological / functional level, chemical / biochemical, cellular / molecular and evolutionary aspects of the microbial world.

▪ Clinical microbiology

To acquire fundamental knowledge relating to the morphology and functions of infectious agents of medical and biotechnological interest (viruses, bacteria, fungi and parasites), with particular attention to the structural characteristics, to the molecular features, to microorganism-host interaction, to replicative processes, to pathogenetic mechanisms and the transmission routes of pathogenic infectious agents, throughout the use of different models. Furthermore the course deals with antimicrobial agents and resistance, the use of monoclonal antibodies and vaccines.

COURSE STRUCTURE

▪ **Applied Molecular Microbiology**

Three main parts:

1) Study of microorganisms of bio-medical interest; Taxonomy and identification; Host-pathogen relationship interactions; molecular mechanisms of pathogenicity; Genetic and genomic analysis; phylogenetic reconstruction; What a microbial genome is teaching us; Bacteriocins, RNA and transcriptomic

2) Pharmaceutical compounds, antibodies; Vaccines (traditional and molecular-based preparations)

3) Applied medical microbiology, examples

▪ **Clinical microbiology**

1) The infectious process, etiological agents and normal microbiota

2) Principles of laboratory diagnosis of infectious diseases

3) Emergence and global spread of infections

4) Pathogenesis of viral infections and some insights into pathogenic viruses (chosen on the basis of their morphological and pathogenetic diversity)

5) Pathogenesis of bacterial infections and some insights into pathogenic bacteria

6) Pathogenesis of fungal infections: the Candida model

7) Antibacterial agents and resistance-

8) Prophylaxis, immunity, monoclonal antibodies and vaccines

DETAILED COURSE CONTENT

▪ **Applied Molecular Microbiology**

Study of microorganisms involved in bio-medical and industrial applications.

Overview of taxonomy and identification of microorganisms. Host-parasite relationships. Molecular mechanisms of pathogenicity.

Molecular biotechnology of microbial systems. Phylo-genomics: the benefit between phylogeny reconstruction and genomic analyses.

Genetic and genomic application in the study of new molecular targets for therapeutic agents.

Screening for microbial Products: potential bacteriocins,.

sRNA regulators reprogram bacteria Enzymes, monoclonal and polyclonal antibodies, nucleic acids as therapeutic agents.

Study of molecular mechanisms of antibiotic-resistance. Vaccines. Traditional and recombinant technologies in medical microbiology.

n.6 Microbiology laboratories related to the topics of the course

▪ **Clinical microbiology**

The microbial world, human microbiota, its role in health and disease conditions, infectious diseases, epidemiology, pathogenesis, immunity.

Samples, microscopy and staining, isolation and identification of bacteria, nutrient media; virus isolation and identification; immunological systems; antibody detection; nucleic acid analysis; probes.

Sources, infection and disease, incubation and transmission routes, epidemics and their control.

Characteristics of viruses, pathogenesis of viral infections, antiviral drugs and resistance

Characteristics of bacteria, pathogenesis of bacterial infections, some syndromic examples such as microorganisms associated with biofilm-related infections, bacteremia and sepsis from *S. aureus*, *Neisseriae*, *Enterobacterales*

Pathogenesis of fungal infections: the *Candida* model

Antibacterial agents and resistance-

Prophylaxis, immunity, monoclonal antibodies and vaccines

TEXTBOOK INFORMATION

▪ **Applied Molecular Microbiology**

1. Deho' Galli - *Biologia dei Microrganismi* - Casa editrice EA
2. Brock - *Biologia dei Microrganismi* - vol. 2 Casa Editrice CEA
3. Perry JJ et al - *Microbiologia vol 2* - Casa Editrice Zanichelli
4. Sherris - *Microbiologia Medica* - Edizione EMSI
5. <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470688618> (free for all students)

Da consultare:

1. Glick et al - *Molecular Biotechnology* 3th ed. ASM
2. Brodgen KA et al - *Virulence mechanisms of bacterial pathogens* 3th ed ASM
3. *Lavori in lingua Inglese*

▪ **Clinical microbiology**

One of these texts of your choice:

Medical Microbiology, Antonelli, Clementi, Pozzi, Rossolini, Ambrosiana Publishing House

Medical Microbiology, Murray, Rosenthal, Pfaller, Edra s.p.a.

Medical Microbiology, Sherris EMSI 2017

Articles will be provided by the teacher
