

Master's Degree Course in Dentistry and Dental Prosthetics 2023/2024

Integrated Teaching: Microbiology and Hygiene

Scientific Disciplinary Sector : MED 42, MED/07

Responsible Professor : Prof. Fausto Ciccacci; email: fausto.ciccacci@unicamillus.org

Number of University Educational Credits (CFU): 12

Module: General Hygiene

SSD : MED/42

CFU Number: 7

Professors:

- Prof. Maria Rosaria Gualano (5 CFU); e-mail: mariarosaria.gualano@unicamillus.org
- Prof. Fausto Ciccacci (2 CFU); e-mail: fausto.ciccacci@unicamillus.org

Module: Microbiology and Clinical Microbiology

SSD Course: MED/07

CFU Number: 5

Professors:

- Prof. Antonino Di Caro (2 CFU); e-mail: antonino.dicaro@unicamillus.org
- Prof. Daniele Armenia (2 CFU); e-mail: daniele.armenia@unicamillus.org
- Prof. Bouba Yagay (1 CFU); e-mail: yagai.bouba@unicamillus.org

PREREQUISITES

Basic concepts of cell biology and immunology are needed.

LEARNING OBJECTIVES

The educational objectives of the Hygiene module include: understanding the concepts of health and disease and their evolution; grasping the concepts of causation, risk factors, and determinants of health/disease; acquiring knowledge of the general epidemiology of infectious diseases; comprehending the concepts of primary, secondary, and tertiary prevention; understanding disinfection and sterilization systems and the prophylaxis of infectious diseases; gaining a foundation in descriptive, analytical, and investigative epidemiological methodology; familiarizing oneself with the purposes, evolution, and organization of the Italian National Health Service, its regional and local structures, as well as its relationships with European and international organizations.

The educational objectives of the Microbiology module encompass: acquiring knowledge of the cellular and molecular bases of microbial pathogenicity, interactions between microorganisms and hosts, the causes and mechanisms underlying major diseases of bacterial, viral, fungal, and parasitic origin, and the applications of biotechnology in diagnosis, prophylaxis, and antimicrobial chemotherapy. These objectives will be achieved through classroom lectures, seminars, and interactive educational activities designed to facilitate learning and enhance the ability to address and resolve key microbiological questions.

LEARNING OUTCOMES

Knowledge and understanding

At the end of the **General Hygiene** module the student must be able to:

- know and be able to discuss the definitions of health and disease
- know the health determinants: individual, behavioral, environmental, social and economic
- know and be able to discuss the definition of prevention (primary, secondary and tertiary) and related strategies, methods and interventions
- know the hygiene of physical, biological and social environments
- describe the hygiene of the patient and the hospital environment
- know the main methods of prophylaxis of infectious diseases
- know the basics of epidemiology and epidemiological methodology
- know the demographic aspects related to public health and health in general
- describe the bases of the general epidemiology of infectious and non-infectious diseases
- know the issues related to global health and health determinants
- know the principles, purposes and models of the national health service, SSN;
- know the essential levels of assistance, LEA;
- know the mechanisms of health planning at national and regional level

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, in particular for the oral cavity
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. Illustrate the basic principles and functioning of the common antimicrobials (antibiotics, antivirals, antifungal and antiparasite agents) .
7. 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 and processing of clinical specimen (direct microscopic exam, staining techniques, seeding and isolation, biochemical identification, antimicrobials-sensitivity tests, cell cultures, PCR, genotyping, NGS, serology).

Applying knowledge and understanding

At the end of the course the student will be able to:

- use the knowledge acquired in the context of his profession, in order to insert his work in the global framework of the health system;
- have the means to evaluate the information provided by epidemiology in order to have an evidence-based approach to the profession.
- Describe the morphology and physiology of microorganisms (bacteria, viruses, fungi, parasites) and the diseases they cause, in particular in oral cavity
- 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).

Communication skills

At the end of the teaching the student should be able to use the terminology acquired with competence and appropriateness.

Making judgements

At the end of the teaching the student should be able to carry out general assessments on the topics covered.

Learning skills

At the end of the course, the student should have acquired independent method for studying and updating through different kind of literature or through scientific literature search on appropriate scientific databases.

COURSE SYLLABUS: General Hygiene

PART I Prof. Maria Rosaria Gualano

HYGIENE AND PUBLIC HEALTH

Definitions of health and evolution of the concept of health.

Data sources: national and international data.

Health indicators: mortality rates, morbidity, population pyramid, birth rate, fertility, life expectancy, population aging measures

Indirect health indicators: health conditions, international comparisons

The determinants of health and disease

Natural history of acute and chronic, communicable and non-communicable diseases.

Concept of cause, risk factor and determinant.

Lifestyles, tobacco smoking, alcohol, physical activity, nutrition.

Primary, secondary and tertiary prevention.

Public health screening and early diagnosis.

Oral health in international programs: periodontal diseases, caries and mouth cancers

The health promotion approach: definition, concepts, principles. The main sectors of intervention.

Intersectoriality, operational settings.

Health education

Healthcare organization and planning: the different health systems.

Organization and evolution of the Italian central, regional and local healthcare service-SSN

Planning in the SSN: Health plans and essential levels of assistance

The main European and international Agencies and Organizations

INTRODUCTION TO EPIDEMIOLOGY

Epidemiological thinking: an introduction. Main measures in epidemiology: frequencies, absolute values, rates, ratios, risk measures. Disease incidence and prevalence rates.
Concepts of absolute, relative and attributable risk. The main risk factors for degenerative diseases
Secondary prevention: organized screening
Objectives and areas of action of epidemiology: descriptive and analytical
Observational and experimental study design.

PART II Prof. Fausto Ciccacci

Physical and chemical biological risk: infections, radiation
Standard precautions and those based on the methods of transmission of infections and their application in the various care settings
Types of vaccines, contraindications and precautions for use
Pediatric vaccination calendar/schedule in use in Italy, National Vaccine Plan
Cleaning and sanitization, disinfection and sterilization with particular regard to dental practices
Use of disinfectants, particularly in dental settings
Sterilization and storage processes of sterile instruments
Epidemiology and prevention of the main parenteral transmitted diseases
Epidemiology and prevention of the main airborne diseases
Notes of hospital hygiene

COURSE SYLLABUS: Microbiology and Clinical Microbiology

PART I prof Antonino Di Caro

General Bacteriology: Criteria for bacterial taxonomy and classification. The architecture of the bacterial cell : the bacterial chromosome, the cytoplasm, the cytoplasmic membrane, capsule, flagella, pili and fimbriae, spores. Bacterial staining. Gram positive and gram negative bacteria. Metabolism and bacterial growth. Bacterial genetics: chromosome and plasmids. The transfer of genetic material : transformation, transduction and bacterial conjugation. The pathogenic activity of bacteria. The bacterial adhesiveness, the ability to invade hosts, the production of toxins. The role of innate and cell-mediated immunity in bacterial infections. 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, Helicobacter. Emophili, Bordetella and Brucella. Yersinia . Neisseria. Anaerobic microorganisms. Legionella. Mycobacteria. Spirochetes. Atypical bacteria (Mycoplasma, Rickettsiae, Chlamydiae).

Oral Microbiology: Oral ecosystem. Main microorganisms of the oral cavity. Acquisition of the microbiota of the oral cavity. Chemical-physical factors. Nutritional factors. Influence of diet on the oral microbiota. Microbial interactions. Habitat of the oral cavity. Plaque formation. Microbiological aspects of dental caries. Microbiological aspects of periodontal diseases

PART II prof. Bouba Yagay

General Bacteriology:

The architecture of the bacterial cell: bacterial chromosome, cytoplasm, cytoplasmic membrane, capsule, flagella, pili, and fimbriae, as well as spores.

Bacterial staining techniques.

Gram-positive and Gram-negative bacteria.

Bacterial metabolism and growth.

Bacterial genetics: chromosomes and plasmids.

Transfer of genetic material: transformation, transduction, and bacterial conjugation.

The pathogenic activity of bacteria, including bacterial adhesiveness, invasiveness, and toxin production.

The role of innate and cell-mediated immunity in bacterial infections.

General principles for the diagnosis of bacterial diseases.

MICOLOGY

Fungi : structure, replication and dimorphism. Mechanisms of fungal pathogenicity.

Fungal infections of medical interest with particular attention to Candidosis

PARASITOLOGY

General characteristics of human parasites.

PART II prof Daniele Armenia

General virology:

Nature, origin and morphology of viruses.

Multiplication of animal viruses, virus-cell interaction.

Routes of transmission of viral infections.

Classification of viruses.

State of persistence and latency of the genome in the host cell.

Viral oncogenesis

Immune response to viral infection and interferons.

Principles of virological diagnostics

Antiviral drugs and vaccines.

Special Virology: Adenovirus, Herpesvirus, Poxivirus, Papovavirus, Parvovirus, Picornavirus, Orthomyxovirus, Paramyxovirus, Coronavirus, Rhabdovirus, Togavirus and notes on zoonotic viruses. Hepatitis Viruses (A, B, C, Delta, E). Retroviruses and HIV. RNA and DNA oncogenic viruses. Prions

COURSE STRUCTURE

The course is divided in 120 hours of frontal lectures, 70 hours of Hygiene and 50 hours of Microbiology and Clinical Microbiology. The lectures will be structured in lessons lasting between 2 and 3 hours, according to the academic calendar. The frontal lectures include theoretical lessons and in-depth seminars.

COURSE GRADE DETERMINATION

The assessment of the achievement of educational objectives will consist of a written exam followed by an oral examination. The portion related to the MED/42 course will be conducted in a written format with multiple-choice questions, while the microbiology part will be assessed through an oral examination.

During the oral examination, the committee will carefully evaluate the student's ability to apply the acquired knowledge, developed communication skills, and essential judgment autonomy as indicated in the Dublin descriptors.

Student evaluation will be based on the results of both the written and oral exams, following a grading system on a scale of thirty, with the following criteria:

- Not Eligible (Non Idoneo): If a student demonstrates severe deficiencies and/or inaccuracies in knowledge and understanding of the topics, accompanied by frequent generalizations, they will receive a "Not Eligible" evaluation.
- 18-20: Students who demonstrate a barely sufficient knowledge and understanding of the topics, with possible imperfections but show adequate analytical, synthesis, and judgment autonomy, will be evaluated in the range of 18 to 20.
- 21-23: Those who exhibit a routine-level knowledge of the topics, with correct analytical and synthesis skills and logically coherent arguments, will receive a evaluation in the range of 21 to 23.
- 24-26: Students with a decent comprehension of the topics, good analytical and synthesis skills, and well-structured arguments, will be evaluated in the range of 24 to 26.
- 27-29: Those who demonstrate a comprehensive knowledge of the topics, remarkable analytical and synthesis abilities, and a good degree of autonomous judgment, will be evaluated in the range of 27 to 29.
- 30-30L: For those who achieve an outstanding level of knowledge and understanding of the topics, showcasing exceptional analytical, synthesis skills, and autonomous judgment, they will receive a "30-30L" evaluation, the highest score.

READING MATERIALS/BOOKLIST

- Teaching materials provided by professors
- Bonita, Ruth, Beaglehole, Robert, Kjellström, Tord & World Health Organization. (2006). Basic epidemiology, 2nd ed. World Health Organization.
<https://apps.who.int/iris/handle/10665/43541>
- Marsh, Filippo D.; Lewis, Michael A. O.; Rogers, Elena; Williams, David; Wilson, Melanie. Marsh and Martin's Oral Microbiology Elsevier Health Sciences.
- Murray, Patrick R.; Rosenthal, Ken S.; Pfaller, Michael A.. Medical Microbiology. Elsevier Science Health Science, IX edition, 2020.