UNICAMILLUS

# Degree Course in Dentistry and Dental Prosthetics 2022/2023

**Course:** Microbiology and Hygiene
**CFU number:** 12
**Course coordinator:** Prof. Fausto Ciccacci**,** email: fausto.ciccacci@unicamillus.org

**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 (3 CFU) ; e-mail: antonino.dicaro@unicamillus.org;
- Prof. Daniele Armenia (2 CFU) ; e-mail: daniele.armenia@unicamillus.org.

## PREREQUISITES

Basic concepts of microbiology, immunology and general pathology are needed.

## LEARNING OBJECTIVES

Learning objectives of the Hygiene module are: knowledge of concepts of health and illness and their evolution; the concepts of cause, risk factor and determinant of health / disease; knowledge of the general epidemiology of infectious diseases; the concept and application of primary, secondary and tertiary prevention; disinfection and sterilization systems and the prophylaxis of infectious diseases; the bases of the descriptive, analytical and investigative epidemiological methodology; knowledge of the purposes, evolution and organization of the Italian national health service SSN, its regional and local organization, as well as its relations with European and international organizations.

Learning objectives of the microbiology module are: knowledge of the cellular and molecular basis of microbial pathogenicity, of the interactions between microorganism and host, of the causes and mechanisms of onset of the main diseases of bacterial, viral, fungal and parasitic etiology and of biotechnology applications in diagnosis, prophylaxis and antimicrobial chemotherapy. These objectives will be achieved through lectures, seminars and interactive teaching activities, designed to facilitate learning and improve the ability to face and solve the main topics of Microbiology.

**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.
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).

**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. Yersinie . Neisseria. Anaerobic microorganisms. Legionella. Mycobacteria. Spirochetes. Athypical 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

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 verification of the achievement of the learning objectives will be performed with a written exam, followed by an oral exam.

During the oral exam, the Commission will assess the student's ability to apply the knowledge acquired, the communication skills developed and the autonomy of basic judgment on the topics covered as indicated in the Dublin descriptors.

**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.