



Course: Medical Microbiology

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Department: Dept. Microbiology and Parasitology Faculty of Medicine Rijeka

Study program: University Integrated Undergraduate and Graduate Study of Dental Medicine (in English)

Study year: 2nd year

Academic year: 2024./25.

SYLLABUS

Course description (a brief description of the course, general instructions, where and in what form the lessons are organized, necessary equipment, instructions for attendance and preparation for classes, student obligations, etc.):

The Medical Microbiology course is a compulsory course at second year of the University Integrated Undergraduate and Graduate Study of Dental Medicine, which is carried out through 30 hours of lectures, 30 hours of seminars and 15 hours of laboratory exercises, a total of 75 hours (6 ECTS). Theoretical classes are held in lecture halls, and practical laboratory work is held in the training rooms of the Department of Microbiology and Parasitology of the Faculty of Medicine in Rijeka.

The goal of the course is for students to learn the basic biological characteristics of microorganisms that cause infections in humans, the pathogenic properties of these microorganisms, their prevalence and resistance to environmental conditions and ways of their transmission, their sensitivity to antimicrobial drugs, and ways to prevent their spreading. Particular attention will be paid to those microorganisms that are the cause of oral cavity infections or are of significance in dental practice.

Course content:

General bacteriology: The structure of a prokaryotic cell. Classification, metabolism and genetics of bacteria. Bacterial virulence factors and the pathogenesis of bacterial infection. Bacterial vaccines. The influence of physical and chemical factors on bacteria and their spores. Mechanisms of action of antibiotics on bacterial cells. Mechanisms of bacterial resistance. Principles of direct and indirect bacteriological diagnostics.

Special bacteriology: Gram positive cocci (Staphylococcus; Streptococcus). Gram negative cocci (Neisseria). Gram positive rods (Corynebacterium); sporegenous bacteria (Clostridium, Bacillus). Anaerobic asporogenous bacteria. Gram-negative hemophilic bacteria (Haemophilus, Bordetella); gram negative bacteria (Legionella). Enterobacteria and non-fermenting bacteria (Pseudomonas). Atypical bacteria (Mycoplasma, Chlamydia, Rickettsia, Mycobacterium, Actinomyces). Twisted (Vibrio, Campylobacter, Helicobacter) and spiral bacteria (Treponema, Borrelia, Leptospira)

General virology: Structure, reproduction and classification of viruses. The influence of environmental factors on viral particles. Viral vaccines and antiviral drugs. Principles of diagnosis of viral diseases: direct and indirect diagnostic procedures; molecular diagnostics. Subviral particles.

Special virology: Herpesviridae; Hepatitis viruses; Oncogenic viruses (HPV); HIV; Paramyxoviridae; Orthomyxoviridae; Togaviridae; Rhabdoviridae

Mycology: Structure and reproduction of unicellular and multicellular fungi. Fungal virulence factors. Diseases caused by fungi. Basic principles of diagnosis and treatment of fungal diseases. Candida, Cryptococcus, mycoses with orofacial manifestations, dermatophytes

Microbiology of the oral cavity: Ecology of the oral cavity. Bacterial biofilm. Caries as an infectious disease. Viridans streptococci. Periodontopathogenic bacteria. Microorganisms of the oral cavity related to infections of distant organs and/or organ systems. Cross-infections in dental medicine and prevention of



their spread. Sterilization and disinfection.

Conducting classes:

Teaching is conducted in the form of lectures, seminars and exercises. The estimated duration of the course is a total of 4 weeks. During the exercises, the teacher demonstrates and supervises the active participation of the students in performing the exercises. Teachers discuss with students the specifics of performing individual exercises. During the class, there will be mandatory intermediate tests/colloquiums, and at the end of the class, a written test and an oral final exam. By completing all teaching activities, participating in mandatory colloquiums and the final exam, the student acquires 6 ECTS points.

Assigned reading:

1. Samaranayake LP.: Essential Microbiology for Dentistry, 5th ed, Elsevier, 2018.
2. Exercise book in medical microbiology - internal practicum, Department of Microbiology and Parasitology

Optional/additional reading:

COURSE TEACHING PLAN:

The list of lectures (with topics and descriptions):

L1 Introduction to the course

Learning outcomes:

- to get acquainted with the aim of the course and the historical development of microbiology
- remember the rules for naming living organisms, including microorganisms
- grouping bacteria and give an example of bacterial classification.

L2 Antibiotics: mechanism of action

Learning outcomes:

- group and give examples of individual antimicrobial drugs depending on their activity and mechanism of action on the bacterial cell

L3 Antibiotics: mechanisms of bacterial resistance; Bacterial genetics

Learning outcomes:

- discuss the most important mechanisms of bacterial resistance
- give examples of resistant bacteria of medical importance
- state the basics of bacterial genetics and methods of gene transfer in bacteria

L4 General virology; Prions

Learning outcomes:

- describe the structure of viruses and group them into families depending on the nucleic acid they contain and other characteristics
- briefly show the ways of virus reproduction
- describe prions as infectious agents

L5 Viral hepatitis

Learning outcomes:

- group hepatitis viruses into families and list the most important characteristics and ways of transmission
- connect viruses with the infections they cause and possible consequences
- specify diagnostic possibilities, specific therapy and prevention

L6 Herpes viruses; Corona viruses

Learning outcomes:

- describe the characteristics, structure and method of reproduction of the HIV virus and human papilloma viruses and connect them with the infection they cause
- list and describe the most important ways of transmission
- discuss the emergence of new viruses and the development of pandemics; describe the characteristics of



human coronaviruses

L7 General mycology. Antimycotics.

Learning outcomes:

- describe the structure and reproduction of unicellular and multicellular fungi
- state the characteristics of yeasts and molds
- give examples of the most common causes of mycosis
- list antimycotics and group them according to the mechanism of action on the fungal cell

L8 Infections of the respiratory system

Learning outcomes:

- name the most common causes of infections of the upper respiratory system and relate them to the diseases that cause, describe samples for microbiological diagnosis of these infections
- name the most common causes of infections of the lower respiratory system and relate them to the diseases they cause and describe samples for microbiological diagnosis of these infections

L9 Normal flora and ecosystem of the oral cavity; Biofilm

Learning outcomes:

- list and describe the characteristics of the bacteria that make up the normal microbiota of the oral cavity and discuss their role in defense against pathogens
- interpret the term "biofilm" and relate it to different human infections

L10 Microbiology of dental caries

Learning outcomes:

- explain the occurrence of caries as an infectious disease, list the microorganisms that are responsible for the development of caries
- describe the formation of dental plaque

L11 Anaerobic bacteria and anaerobic infections

Learning outcomes:

- bacterial classification by their need and tolerance for oxygen
- discuss the presence of anaerobes in commensal microbiota and in infectious processes
- list clues to anaerobic infection

L12 Periodontal infections and periodontopathogenic bacteria

Learning outcomes:

- list the bacteria responsible for periodontal disease, describe their virulence factors and the pathogenesis of the infection

L13 Dentoalveolar infections; Infections of the mucous membrane of the oral cavity and salivary glands

Learning outcomes:

- list the characteristics of bacteria found in dentoalveolar infections
- name the most common causes of infections of the oral cavity, salivary glands
- associate bacteria with the infection they cause

L14 Infections of the heart and circulatory system; Infections of the central nervous system

Learning outcomes:

- name the most common causes of blood and central nervous system infections
- associate bacteria with the infection they cause

L15 Nosocomial infections and their control; Prevention of cross infection

Learning outcomes:

- describe the characteristics of microorganisms that are the most common causes of hospital infections.
- understand the risk factors for the occurrence of hospital infections, the most common sources of microorganisms and the ways of their spread.
- discuss ways to prevent hospital infections.

The list of seminars with descriptions:

S1 Bacterial cell structure; Pathogenesis of bacterial infections; Virulence factors

Learning outcomes:

- describe the structure of a bacterial cell and compare the structure of gram-negative and gram-positive bacteria



- connect the structure of the bacterial cell with virulence factors and pathogenesis

S2 Antimicrobials Part I

Learning outcomes:

- explain the terms antibiotic, selective toxicity, bactericidal and bacteriostatic action, broad and narrow spectrum antibiotic
- group and give examples of individual antimicrobial drugs depending on their activity and mechanism of action on the bacterial cell

S3 Antibiotics part II

Learning outcomes:

- list and describe antimicrobial agents that are often used in dentistry
- discuss the mode of action and use of penicillins, cephalosporins
- describe the mode of action in the use of erythromycin, clindamycin, metronidazole
- describe the most commonly used antifungal drugs

S4 Antiviral agents (prevention and therapy); Vaccines

Learning outcomes:

- list and describe the mechanisms of action of the most important antiviral drugs
- list the antiviral drugs used in practice
- group viral vaccines and give examples of individual types of vaccines

S5 HIV, HPV

Learning outcomes:

- describe the characteristics, structure and method of reproduction of the HIV virus and human papilloma virus and connect them with the infection they cause
- list and single out the most important ways of transmission

S6 Other viruses of importance in dental medicine (influenza virus, mumps virus, measles virus)

Learning outcomes:

- describe the characteristics, structure and reproduction method of selected viruses, the diseases they cause
- list diagnostic procedures for proving these viral infections and antiviral drugs that can be used in clinical practice

S7 Fungi important in dental medicine

Learning outcomes:

- distinguish those fungi that are the most common causes of mycosis in clinical practice
- list the virulence factors of fungi and relate them to the diseases they cause
- list the most common types of fungal infections of the oral cavity
- list mycoses with orofacial manifestations

S8 Gram-positive cocci: staphylococci and streptococci

Learning outcomes:

- describe the micromorphology and ways of grouping gram-positive spherical bacteria
- list the virulence factors of staphylococci and streptococci and relate them to the infections they cause
- discuss microbiological procedures for the identification of staphylococci and streptococci

S9 Mycobacteria and Legionella

Learning outcomes:

- know the basic properties of mycobacteria and legionellae and the diseases they cause
- state the specificities of mycobacteria and describe the pathogenesis of tuberculosis

S10 Clostridia

Learning outcomes:

- know the basic characteristics of the mentioned bacteria
- explain how infections with anaerobic bacteria occur
- know the role of anaerobes in dental medicine

S11 Fusobacteria, actinomyces and anaerobic periodontopathogens

Learning outcomes:

- know the basic characteristics of these bacteria
- know their role in dental medicine

S12 Neisseria and lactobacilli

Learning outcomes:



- name the most important species of these genera
- describe their virulence factors and relate them to the infections they cause
- describe the micromorphology of the neiseriae
- list the most common virulence factors and relate them to the infections they cause

S13 Atypical bacteria. Coiled and spiral bacteria

Learning outcomes:

- list the most important representatives/species from the genera Chlamydia and Chlamydophila
- describe the way chlamydia reproduces and discuss the differences compared to "typical" bacteria
- describe the characteristics of mycoplasmas
- describe the micromorphology and ways of grouping spiral bacteria (vibrio, campylobacter and helicobacter)
- state the characteristics of vibrio, campylobacter and helicobacter

S14 Corynebacteria and coryneforming bacteria

Learning outcomes:

- list the most important representatives (species) from the genus *Corynebacterium*
- describe the micromorphology and ways of grouping coryneforming bacteria

S15 Sterilization and disinfection

Learning outcomes:

- state sterilization procedures and give examples of the use of individual procedures in dental practice
- list and describe the control procedures of sterilization procedures
- list and group disinfectants according to their effect and use
- describe disinfection methods applicable in dental practice

The list of practicals with descriptions:

Exc.1 Microbiological laboratory diagnostics. Hand hygiene.

Learning outcomes:

- state and describe direct and indirect diagnostic methods in microbiology
- know how to carry out procedures related to hand hygiene

Exc.2 Antibiogram.

Learning outcomes:

- know how to make an antibiogram and read the created antibiogram
- observe some peculiarities of the antibiogram of multi-resistant bacteria

Exc.3 Laboratory diagnostics of fungal infections

Learning outcomes:

- list the characteristics of yeasts and molds and discuss fungi that are the most common causes of mycosis in clinical practice
- describe the characteristics of candida and aspergillus and relate them to sensitivity/resistance to available antifungals

Exc.4 Microbiological diagnosis of respiratory system infections, diagnostic procedures for detecting staphylococci and streptococci

Learning outcomes:

- discuss the processing of samples from the respiratory system
- perform throat and nose swabs
- determine the type of the most common pathogens of the upper respiratory system, according to the microscopic preparation or other characteristics

Exc.5 Dental biofilm: detection and quantification

Learning outcomes:

- define biofilm
- describe the differences between bacteria in the biofilm and planktonic bacteria
- assess the amount of plaque on the teeth
- describe different methods for plaque detection

Exc.6 Processing of primary sterile clinical specimens

Learning outcomes:

- discuss processing of primary sterile samples



- make microscopic preparations and recognize the micromorphology of bacteria in positive blood cultures and cerebrospinal fluid

Exc.7 Laboratory diagnostics of anaerobic bacteria; Spiral bacteria

Learning outcomes:

- present methods for routine laboratories, which carry out anaerobic diagnostics on different levels
- discuss anaerobe culture techniques
- laboratory diagnostic tools for syphilis - streponemal and non-treponemal serologic tests

Students' obligations:

COURSE SCHEDULE (for the academic year 2023/2024)

Date	Lectures (time and place)	Seminars (time and place)	Practicals (time and place)	Instructor
10.02.2025.	L1 (9-11) Lr6			Maja Abram
		S1 (11-13) Lr		Marina Šantić
11.02.2025.	L2 (8-10) Lr6			Mirna Mihelčić
		S2 (10-12) Lr6		Maja Abram
			Exc.1 (12,30-15,30)	Ina Viduka
12.02.2025.	L3 (9-11) Lr6			Bojana Mohar Vitezić
		S3 (11-13) Lr6		Marina Šantić
			Exc.2 (13,30-15,30)	Maša Knežević
13.02.2025.	L4 (9-11) Lr6			Marina Šantić
		S4 (11-13) Lr6		Mirna Mihelčić
14.02.2025.	L5 (9-11) Lr6			Mirna Mihelčić
		S5 (11-13) Lr6		Maja Abram
17.02.2025.	L6 (9-11) Lr6			Bojana Mohar vitezić
		S6 (11-13) Lr6		Maja Abram
18.02.2025.	L7 (8-10) Lr6			Ivana Gobin
		S7 (10-12) Lr6		Maja Abram
			Exc.3 (12,30-14,30)	Mirna Mihelčić
19.02.2025.	no classes			
20.02.2025.	Midterm 1 (9-10) Lr6			
	L8 (10-12) Lr6			Maja Abram
21.02.2025.		S8 (12-14) Lr6		Ivana Gobin
		S9 (9-11) Lr6		Ivana Gobin
			Exc.4 (11-13)	Ivana Gobin
24.02.2025.	L9 (8-10) Lr6			Maja Abram
	L10 (10-12) Lr6			Marina Šantić



			Exc.5 (12,30-14,30)	Ina Viduka
25.02.2025.	L11 (8-10) Lr6			Maja Abram
	L12 (10-12) Lr6			Ivana Gobin
		S10 (12,30-114,30) Lr6		Ivana Gobin
26.02.2025.	L13 (9-11) Lr6			Mirna Mihelčić
		S12 (11-32) Lr4		Mirna Mihelčić
27.02.2025.	L14 (8-10) Lr6			Maja Abram
		S12 (10-12) Lr6		Bojana Mohar Vitezić
			Exc.6 (12,30-14,30)	Maša Knežević
28.02.2025.		S13 (8-10) Lr6		Ivana gobin
		S14 (10-12) Lr6		Mirna Mihelčić
			Exc.7 (12,30-14,30)	Ina Viduka
03.03.2025.	Midterm 2 (9-10)			
	L15 (10-12) Lr6			Maja Abram
		S15 (10-12) Lr6		Bojana Mohar Vitezić
07.03.2025.	FINAL EXAM			

List of lectures, seminars and practicals:

	LECTURES (Topics)	Teaching hours	Location/Lecture room
L1	Introduction to the course	2	Lecture rooms at Faculty of Medicine (Braće Branchetta 20)
L2	Antibiotics: mechanism of action	2	
L3	Antibiotics: mechanisms of bacterial resistance; Bacterial genetics	2	
L4	General virology; Prions	2	
L5	Viral hepatitis	2	
L6	Herpes viruses; Corona viruses	2	
L7	General mycology. Antimycotics	2	
L8	Infections of the respiratory system	2	
L9	Normal microbiota and ecosystem of the oral cavity; Biofilm	2	
L10	Microbiology of dental caries;	2	
L11	Anaerobic bacteria	2	
L12	Periodontal pathogens and infections	2	
L13	Dentoalveolar infections;	2	
L14	Infections of the heart and circulatory system; Infections of the central nervous system	2	
L15	Nosocomial infections and their control; Prevention of cross infection	2	
	TOTAL TEACHING HOURS	30	



	SEMINARS (Topics)	Teaching hours	Location/Lecture room
S1	Bacterial cell structure; Pathogenesis of bacterial infections; Virulence factors	2	Lecture rooms at Faculty of Medicine (Braće Branchetta 20)
S2	Antimicrobials Part I	2	
S3	Antibiotics part II	2	
S4	Antiviral agents (prevention and therapy); Vaccines	2	
S5	HIV, HPV	2	
S6	Other viruses of importance in dental medicine (Infections of the mucous membrane of the oral cavity and salivary glands)	2	
S7	Fungi important in dental medicine	2	
S8	Gram-positive cocci: staphylococci and streptococci	2	
S9	Mycobacteria and Legionella	2	
S10	Clostridia	2	
S11	Fusobacteria, Actinomycetes and anaerobic periodontopathogens	2	
S12	Neisseria and lactobacilli	2	
S13	Atypical bacteria. Coiled and spiral bacteria	2	
S14	Corynebacterium spp.	2	
S15	Sterilization and disinfection	2	
	TOTAL TEACHING HOURS	30	

	PRACTICALS (Topics)	Teaching hours	Location/Lecture room
Exc. 1	Microbiological laboratory diagnostics. Hand hygiene.	3	Department of Microbiology and Parasitology. Faculty of Medicine Rijeka
Exc. 2	Antibiogram.	2	
Exc. 3	Laboratory diagnostics of fungal infections	2	
Exc. 4	Microbiological diagnosis of respiratory system infections, diagnostic procedures for detecting staphylococci and streptococci	2	
Exc. 5	Dental biofilm: detection and quantification	2	
Exc. 6	Processing of primary sterile samples	2	
Exc. 7	Laboratory diagnostics of anaerobic bacteria; Spiral bacteria	2	
	TOTAL TEACHING HOURS	15	



	FINAL EXAM DATES
1.	07.03.2025.
2.	03.07.2025.

	Lectures	Seminars	Practicals	Total
Total number	30	30	15	75
On-line	0	0	0	0
Percentage				