GENERAL MICROBIOLOGY WITH MICROBIOLOGY OF THE ORAL CAVITY

WL-S English Division, the academic year 2025-2026

Meeting Times and Room Assignments

Laboratory Exercises (30 hours); WEDNESDAY
GROUP 1: 12.15-13.45 (12.15 p.m. - 1.45 p.m.)
GROUP 2: 13.45-15.15 (1.45 p.m. - 3.15 p.m.)

lab #209, the Department of Microbiology, Street Chalubińskiego 4

Exercise Schedule

DATE		TESTS	TOPICS
1.10.2025	1		Principles of laboratory work. Morphology of bacteria. Staining methods. Methods of cultivation and differentiation of microorganisms.
8.10.2025	2		Gram positive cocci of *Staphylococcus, Micrococcus*
15.10.2025	3		Gram positive cocci of *Streptococcus, Enterococcus*
22.10.2025	4		Gram-positive bacilli of *Corynebacterium, Rothia, Lactobacillus* and acid-fast *Mycobacterium.*
29.10.2025	5	**TEST 1 topics 1-4**	Gram-negative bacilli of *Haemophilus, Bordetella, Legionella.* Gram-negative cocci of *Neisseria, Moraxella.*
5.11.2025	6		Gram-negative bacilli of *Enterobacterales* and nonfermenters of *Pseudomonas, Acinetobacter , Stenotrophomonas.*
19.11.2025	7		Gram positive sporulating anaerobic bacilli of *Clostridium* and *Clostridioides.*
26.11.2025	8		Gram-positive and Gram-negative anaerobic, non-spore-forming bacteria.
3.12.2025	9	**TEST 2 topics 5-8**	Antibiotics and chemotherapeutics. Laboratory methods of sensitivity testing.
10.12.2025	10		Mechanisms of antimicrobial resistance
17.12.2025	11	**TEST 3 topics 9-10**	Fungal infections of the oral cavity.
7.01.2026	12		Oral microbiota. Microbiology of dental caries and periodontal diseases. Part 1.
14.01.2026	13		Oral microbiota. Microbiology of dental caries and periodontal diseases. Part 2.
21.01.2026	14		Infection control. Sterilization, disinfection and antisepsis.
28.01.2026	15		Antibacterial effectiveness of selected disinfection methods. PRACTICAL SKILLS TEST.

A DETAILED PROGRAM OF LABORATORY EXERCISES

EXERCISE # 1 PRINCIPLES OF LABORATORY WORK MORPHOLOGY OF BACTERIA. STAINING METHODS. METHODS OF CULTIVATION AND DIFFERENTIATION OF MICROORGANISMS

The theoretical part*:*
Organization, rules and regulations of laboratory work
Staining methods (simple, differentiation, positive, negative, negative-positive)
The culture conditions - effects of temperature, pH, oxidation-reduction potential, nutrients, exogenous compounds (growth factors).
Type of microbiological media (simple, enriched, selective-differential, differential).

Practice:
Preparation of slides (Gram staining) and microscopy analysis of microbial morphology and Gram reaction
Demonstration of bacteriological media and the morphology of microbial coloniestests for identification of microorganisms

EXERCISE # 2 GRAM-POSITIVE COCCI OF *STAPHYLOCOCCUS, MICROCOCCUS*

Theoretical part*:*
Medical importance
Phenotypic characteristics of:
Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus, Staphylococcus lugdunensis and *Micrococcus* spp.
Principles of laboratory diagnostics

Practice:
Demonstration of cultures on blood agar, characterization of colony morphology, haemolysis.
Identification tests (detection of: catalase, CF, free coagulase , ID32 Staph, Crystal GP)
Preparation and analysis of microscopic slides (from selected cultures).
Clinical case study

EXERCISE # 3 GRAM-POSITIVE COCCI OF *STREPTOCOCCUS AND ENTEROCOCCUS*

The theoretical part:
Medical importance
Phenotypic characteristics of:
a) *Streptococcus* groups (oral streptococci):

1. MUTANS group *(S. mutans S. sorbinus S. ratti)*
2. SALIVARIUS group *(S. salivarius, S. vestibularis)*
3. MITIS group *(S. mitis, S. oralis, S. cristatus, S. pneumoniae, S. pseudopneumoniae,* S. *sanquinis)*
4. ANGINOSUS group *(S. anginosus S. intermedius S. constellatus)*

b*) Streptococcus pyogenes*, *S. agalactiae*,
c) *Enterococcus faecalis, Enterococcus faecium*
Principles of laboratory diagnostics

Practice:
Laboratory methods of *Streptococcus spp.* and *Enterococcus spp.* identification
Preparation and analysis of microscopic slides (from selected cultures).
Clinical case study

EXERCISE # 4 GRAM-POSITIVE BACILLI OF *CORYNEBACTERIUM, ROTHIA, LACTOBACILLUS and* ACID-FAST *MYCOBACTERIUM.*

The theoretical part:
Medical importance
Phenotypic characteristics of: *Corynebacterium diphteriae, Rothia dentocariosa, Lactobacillus* spp. and *Mycobacterium tuberculosis)*
Principles of laboratory diagnostics
Immunoprophylaxis (vaccination)

Practice
Demonstration of culturing on selective and standard media
Analysis of prepared microbiological slides using a light microscope.
Preparation and analysis of slides from selected bacteria
Discussion of a clinical case.

EXERCISE # 5 TEST 1 (topics 1-4) GRAM-NEGATIVE BACILLI OF *HAEMOPHILUS BORDETELLA, LEGIONELLA.* GRAM-NEGATIVE COCCI OF *NEISSERIA, MORAXELLA*.

The theoretical part:
Medical importance
Phenotypic characteristics of:
- cocci: *Neisseria, Moraxella*
- fastidious *bacilli: Haemophilus, Bordetella* and *Legionella*
Principles of laboratory diagnostics
Immunoprophylaxis (vaccination)

Practice
Clues to *Neisseria gonorrhoe, Neisseria meningitidis, Haemophilus influenzae, Bordetella pertussis and Legionella pneumophila* culturing and identification.
Preparation and analysis of microscopic slides (from selected cultures).
Discussion of a clinical case.

EXERCISE # 6. GRAM-NEGATIVE BACILLI OF *ENTEROBACTERALES* AND NONFERMENTERS *OF PSEUDOMONAS, ACINETOBACTER, STENOTROPHOMONAS*

The theoretical part:
Medical importance
Phenotypic characteristics of members of *Enterobacterales (Escherichia, Proteus, Klebsiella, Salmonella, Shigella)* and nonfermentative bacilli (*Pseudomonas, Acinetobacter, Stenotrophomonas)*
Principles of laboratory diagnostics

Practice
Laboratory methods (media, identification tests) used to isolate and identify members of *Enterobacterales* and nonfermentative bacilli
Preparation and analysis of microscopic slides (from selected cultures).
Discussion of a clinical case.

EXERCISE # 7 GRAM-POSITIVE ANAEROBIC SPORULATING BACILLI OF *CLOSTRIDIUM, CLOSTRIDIOIDES.*

The theoretical part:
Medical importance
Principles of diagnostics
Phenotypic characteristics of *B. anthracis, Bacillus cereus,*

Clostridium tetani, Clostridium botulinum, Clostridioides difficile, Clostridium perfringens
Immunoprophylaxis (vaccination)

Practice
Laboratory methods of identification.
Preparation and analysis of microscopic slides (from selected cultures).
Discussion of a clinical case.

EXERCISE # 8 GRAM-POSITIVE AND GRAM-NEGATIVE ANAEROBIC NON-SPORULATING BACTERIA

The theoretical part:
Clinical significance
Phenotypic characteristics of anaerobes:
a) Gram-positive bacteria of: *Actinomyces, Cutibacterium, Eubacterium, Peptostreptococcus*
b) Gram-negative bacteria of: *Tannerella, Porphyromonas, Prevotella, Veillonella, Fusobacterium, Leptotrichia, Treponema* (oral), *Selenomonas, Bacteroides,*
Principles of laboratory diagnostics

Practice
Methods for cultivation and identification of anaerobic isolates (presumptive identification, simple observation, tests, definitive identifications)
Preparation and analysis of microscopic slides (from selected cultures).
Discussion of a clinical case

EXERCISE # 9 TEST 2 (topics 5-8) ANTIBIOTICS AND CHEMOTHERAPEUTICS. LABORATORY METHODS OF SENSITIVITY TESTING

The theoretical part:
1. General mechanisms of antimicrobial action, antimicrobial spectrum of: β-lactams, aminoglycosides, macrolides and ketolides, lincosamides, glycopeptides, tetracyclines, oxazolidinones, quinolones, nitroimidazoles, sulfonamides.

2. Susceptibility testing:
- disc diffusion method,
- serial dilutions method (MIC, MBC determination)
- E-test
- ATB - susceptibility testing for anaerobic bacteria - demonstration

Practice:
Students prepare susceptibility tests for:
Staphylococcus aureus MRSA , *Enterococcus faecalis* HLAR, *Klebsiella pneumoniae* ESBL

EXERCISE # 10 MECHANISMS OF ANTIMICROBIAL RESISTANCE

The theoretical part:
Overview of selected mechanisms of bacterial resistance to antibiotics: MRS (MRSA, MRCNS), VISA, VRSA, VRE, GRE, HLAR, ESBL, MBL, KPC, MLS_B based on the results of the previous exercise.

Practice:
Reading of susceptibility tests (from the previous exercise)
Demonstration of resistance phenotypes: ESBL, MBL, MRS, MLS_B, VRE, GRE, HLAR
Detection of β-lactamase producing strains (cefinase method)

EXERCISE # 11 TEST 3 (topics 9-10)
FUNGAL INFECTIONS OF THE ORAL CAVITY

The theoretical part:

collection and transportation of specimens; laboratory testing; principles of the culture of pathogenic fungi:

- Characteristics of yeasts*: Candida* spp. and *Cryptococcus*s pp.

a) Oral Candidiosis:

- acute pseudomembranous candidiasis (thrush),
- acute atrophic candidiasis,
- chronic atrophic candidiasis,
- chronic hyperplastic candidiasis,
- inflammation of the mouth corner;
- prosthetic stomatopathy

b) Cryptococcosis

- **Characteristics of molds and dimorphic fungi (mouth ulcers in AIDS patients)**
- Laboratory diagnosis of fungal infections (collection and transport of clinical materials for mycological testing; methods of fungal identification)

Practice:

Identification of yeast (demonstration):
- morphology of *Candida* colonies on Sabouraud agar and CHROMagar
- germ tube test (microscopy)
- *Candida* chlamydospores in microcultures,
- ID 32 C test.

Identification of moulds
- demonstration of slides (lactophenol Blue) and cultures

Preparation and analysis of microscopic slides (from selected cultures of yeasts).
Discussion of a clinical case

EXERCISE # 12. ORAL MICROBIOTA. MICROBIOLOGY OF DENTAL CARIES AND PERIODONTAL DISEASES, PART 1.

Theoretical part:

Analysis of etiological factors and microbiological diagnostics in cases of:

a) dental caries
b) gingivitis:
   - plaque-related
   - non-plaque-related (specific bacterial, viral, fungal)
c) acute necrotizing ulcerative gingivitis (ANUG) and its aggressive form - NOMA
d) chronic periodontitis:
   - localized and generalized
e) aggressive periodontitis:
   - localized and generalized
f) necrotizing periodontal disease:
   - necrotizing ulcerative periodontitis (NUP)
g) periodontal abscesses
h) peri-implantitis and peri-implant mucositis

Practice:

1. Inoculation of oral specimens on selected media (streak plate method) / individual work
2. Inoculation of clinical materials from selected clinical cases (analysis conducted in pairs)

EXERCISE # 13. ORAL MICROBIOTA. MICROBIOLOGY OF DENTAL CARIES AND PERIODONTAL DISEASES, PART 2.

Practice:

Reading and interpretation of oral cultures; preparation and analysis of Gram-stained slides, microscopic analysis.
Reading of clinical culture results: analysis of colony morphology, preparation of slides and their microscopic evaluation; performance of rapid identification tests.
Presentation of results; final case analysis

EXERCISE # 14. INFECTION CONTROL. DISINFECTION, STERILIZATION AND ANTISEPSIS

The theoretical part:
Physical and chemical methods of sterilization and disinfection (with particular emphasis on sterilization of dental equipment).

Demonstration:
- Tests for biological control of sterilization,
- equipment for sterilization: packages, sleeves, etc.

Practice
Experimental performance (antibacterial effectiveness of selected disinfection methods):
1. Bactericidal effect of UV radiation
2. Effects of disinfectants for hygienic hand washing (1 plate per 2 students)

ASSESSMENT AND DISCUSSION OF THE STUDENT REVIEW OF THE SCIENTIFIC ARTICLE.

EXERCISE # 15. PRACTICAL SKILLS TEST.

a) Reading and interpretation of the results from Exercise 14
b) PRACTICAL SKILLS TEST (acc. the worksheet No. 15)
(initial identification of microorganisms based on their microscopic analysis)

Two preparations should be evaluated:
1. Prepared by the teacher
2. Prepared by a student from the given solid culture

Both preparations should specify (written answers):

1. Staining technique used
2. Morphology and arrangement of the observed cells
4. Suspected group of microorganisms (Latin names)