DETAILED MICROBIOLOGY (1) CLASS SCHEDULE
Summer semester, academic year 2025/26

All auxiliary materials for classes are available in the University repository
https://materialy.umw.edu.pl/
All other important informations regarding the Clinical Microbiology course are available on the Department's website
https://www.umw.edu.pl/pl/jednostki/katedra-i-zaklad-mikrobiologii

Laboratory microbiology classes occur at the Department of Medical Microbiology at Chałubińskiego 4 .
Written final class tests (10 open questions) will be held strictly according to designated dates. The test schedule can be found in the "Important dates" section on the Department's website.
Test dates of class tests are not subject to change.

The student must theoretically prepare for each class based on the lecture and materials presented on our website.

TUESDAY	**8.00 – 10.15**	room 209	CL6
	10.30 – 12.45	room 209	CL5
	13.30 – 15.45	room 209	CL1 REP
WEDNESDAY	**8.00 – 10.15**	main laboratory	CL1, CL9, CL10
	10.30 – 12.45	main laboratory	CL7, CL8
	11.15 – 13.30	room 209	CL4
	13.45 – 16.00	room 209	CL2 REP
THURSDAY	**8.00 – 10.15**	room 209	CL3
	10.30 – 12.45	room 209	CL2

Summer semester	**Class 1.** Bacterial morphology; Sterilization and disinfection	02.03 – 06.03.2026
	Class 2. Antimicrobials.	09.03 – 13.03.2026
	Class 3. Gram-positive cocci (Staphylococcus, Streptococcus, Enterococcus, Peptostreptococcus)	16.03 – 20.03.2026
	Class 4. Aerobic and anaerobic bacilli (Clostridium, Bacillus), Gram-positive rods (Corynebacterium, Listeria)	23.03 – 27.03.2026
	TEST 1 (Class 2-4)	30.03 – 01.04.2026
	Class 5. Tuberculosis (treatment), Nocardia, Actinomyces	13.04 – 17.04.2026
	Class 6. Antibiotics and resistance of Gram-positive bacteria	20.04 – 24.04.2026
	Class 7. Gram-negative coccobacilli (Haemophilus, Neisseria, Moraxella, Bordetella), Legionella, Helicobacter, Campylobacter	27.04 – 30.04.2026
	TEST 2 (Class 5-7)	04.05 – 08.05.2026
	Class 8. Gram-negative rods (enteric, non-fermenting, anaerobic)	11.05 – 15.05. 2026
	Class 9. Antibiotics and resistance of Gram-negative bacteria.	18.05 – 22.05.2026

	Class 10. Fungi pathogenic to humans. Human microbiota.	25.05 – 28.05.2026
	TEST 3 (Class 8—10)	01.06 – 05.06.2025

CLASS 1
BACTERIAL MORPHOLOGY; STERILIZATION AND DISINFECTION
To familiarize students with bacterial staining techniques.

The student knows:

1. Differences in the structure of the cell wall of Gram-positive (GP) and Gram-negative (GN) bacteria and cell wall antigens playing a role in the pathomechanism of bacterial infections (i.e., LPS and LTA).
2. The role of the most essential bacterial cell structures (i.e., envelope, glycocalyx, adhesins (proteins and fimbriae), cilia, spores) in the pathomechanism of bacterial infections.
3. Differences between anaerobic and aerobic bacteria that influence the results of bacteriological examination.
4. Can describe the viewed microscopic preparation: whether the bacterium is GP or GN, the arrangement of bacterial cells.
5. The concepts of pathogenicity and virulence, and can describe the routes of spread of infections, know the definitions of endogenous infection, reservoir, source of infection, carriage, specific and non-specific prophylaxis, antigenemia, viremia, toxemia, bacteremia, antitoxin, and vaccine antigens.
6. Disinfection methods (temperature, UV, chemical preparations used to disinfect the skin and the environment) and their importance in medicine.
7. Sterilization methods (temperature, chemical preparations, radiation) of diagnostic equipment and apparatus - their importance in medicine.

Theoretical part
laboratory and microbiology class regulations (including assessment rules); bacterial cultures - types of media; staining techniques; types of microscopes; sterilization and disinfection

Experimental/demonstration part
Students prepare slides from bacterial cultures (solid and liquid media available on the bench); observation of prepared slides to demonstrate morphological diversity; UV light exposure; inoculation of swabs taken from the skin

CLASS 2
ANTIBIOTICS. MECHANISMS OF ACTION OF ANTIBIOTICS.
To familiarize students with antibiotics and chemotherapeutics - their mechanism of action, groups, and antibacterial activity.

The student knows:

1. Mechanisms of action of antibiotics on bacteria.
2. Division into bactericidal and bacteriostatic antibiotics and antibiotics with a narrow and broad spectrum of activity; can develop the acronyms MIC and MBC and know their meaning and importance.
3. Can list the groups of antibiotics depending on the mechanism of action: inhibiting cell wall synthesis, inhibiting protein synthesis, disturbing the synthesis of nucleic acids, inhibiting the metabolic pathways of bacteria, and list representatives of antibiotics from specific groups.
4. How to determine the sensitivity of bacteria to antibiotics and read the antibiogram.
5. The concepts of empiric and targeted antibiotic therapy and the drug of choice.

Theoretical part

Determination of bacterial and fungal susceptibility to antibiotics – testing techniques; interpretation of completed antibiograms.

Experimental/demonstration part
Reading culture results after UV exposure and from skin swabs (students prepare slides); interpretation of completed antibiograms for Gram-positive cocci and Gram-negative rods; fungal antibiogram – photographic examples.

CLASS 3
GRAM-POSITIVE COCCI (STAPHYLOCOCCUS, STREPTOCOCCUS, ENTEROCOCCUS, PEPTOSTREPTOCOCCUS)
To familiarize students with the role of the most important species of Gram-positive cocci in human diseases.

The student knows:

1. Staphylococcal species pathogenic to humans (Staphylococcus aureus, S. epidermidis, S. saprophiticus): epidemiology (reservoir and sources of infections, routes of spread; the most important virulence factors involved in the pathomechanism of staphylococcal infections; types of diseases/infections they cause and antimicrobials for their treatment. Knows the basis of diagnosis of staphylococcal infections.
2. Species of streptococci pathogenic to humans (Streptococcus pyogenes, S. agalactiae, S. pneumoniae, streptococci colonizing oral cavity): epidemiology (reservoir and sources of infections, routes of spread; the most important virulence factors involved in the pathomechanism of streptococcal infections; types of diseases/infections which they cause and antimicrobials for their treatment. Knows the basis of diagnosis of streptococcal infections. Knows the specific prevention of pneumococcal infections.
3. Species of enterococci pathogenic to humans (Enterococcus faecalis, E. faecium): epidemiology (reservoir and sources of infections, routes of spread; the most important virulence factors involved in the pathomechanism of infections caused by these bacteria; types of diseases/infections they cause and antimicrobials for their treatment. Knows the basis of diagnosis of these infections.

Diagnostic techniques:
a) **Microscopy** - the student knows whether it is essential in a given infection, and if so, what biological material from the patient it refers to
b) **Cultivation and identification (ID)** - the student knows whether a given microorganism can be cultured on artificial media and when this diagnostic method is necessary
c) **Serology** - the student knows whether serology is helpful in a given infection or not - if not, why, if so, what serological tests can be used to detect the patient's antibody and in what biological materials
d) **Other tests** - e.g., molecular tests (NAAT, **N**ucleic **A**cids **A**mplification **T**est), when they are necessary to be performed to confirm the infection when they can be performed when they are not helpful (e.g., acute systemic infections); this group also includes other specific tests performed in specific infections, e.g., ASO test, tuberculin test, tests detecting specific toxins, etc.

Theoretical part
Diagnosis and treatment of infections caused by Gram-positive cocci

Experimental/demonstration part
Cultures of staphylococci, streptococci, and enterococci on blood agar; types of hemolysis; coagulase test; culture for catalase test; latex agglutination test for β-hemolytic streptococci; microscopic slides – Staphylococcus aureus, Enterococcus, Streptococcus pyogenes, Streptococcus oralis.

CLASS 4
AEROBIC AND ANAEROBIC BACILLI (CLOSTRIDIUM, BACILLUS); GRAM-POSITIVE RODS (CORYNEBACTERIUM, LISTERIA)
To familiarize students with Gram-positive bacilli and their role in human pathogenicity.

The student knows:

1. Types and species of Gram-positive aerobic bacilli pathogenic to humans (Bacillus anthracis, B. cereus). Knows the epidemiology of these infections (reservoirs and sources of infection), the transmission routes, the infections they cause in humans, and the virulence factors involved in the pathomechanism of these infections. He knows how to combat anthrax among animals. Knows diagnostic techniques for these infections.
2. Types and species of Gram-positive anaerobic bacilli pathogenic to humans (Clostridium botulinum, C. tetani, C. difficile, C. perfringens, and other species from the group of gas gangrene bacilli discussed only during the lecture: C. sordeli, C. septicum, C. histolyticum); know the epidemiology of the infections they cause (reservoirs, sources of infections in humans, routes through which they spread), know the diseases/infections they cause and the virulence factors that determine the development of infections. Knows antibiotics effective in treating these infections. Knows the role of bacterial spores in the spread of diseases, especially in the hospital environment. Knows specific (vaccine and its composition) and non-specific prevention measures to combat infections caused by these microorganisms. Knows the role of specific antibodies in limiting the development of infections caused by microorganisms. Knows diagnostic techniques for infections caused by these microorganisms.
3. Types and species of Gram-positive bacilli (Corynebacterium diphtheriae, C. jejuni, C. urealyticum, Listeria monocytogenes, Cutibacterium acnes) pathogenic to humans. He knows their epidemiology (reservoirs, sources of infections in humans, routes by which they spread), the diseases/infections they cause, and the virulence factors that determine the development of infections. Knows the concept of lysogeny and its importance in spreading infections and antibiotic resistance and can discuss them with examples. Knows antibiotics effective in treating these infections. Knows the specific prevention of diphtheria. Knows diagnostic techniques for infections caused by these microorganisms.

Theoretical part

Diagnosis, treatment, and vaccination – tetanus and antibiotic-associated diarrhea (AAD)

Experimental/demonstration part

Boiling of bacterial strains - demonstration of spore resistance;
microscopic slides - Bacillus, Listeria

CLASS 5

TUBERCULOSIS (TREATMENT), NOCARDIA, ACTINOMYCES

To familiarize students with acid-fast bacteria.

Student knows:

1. The species of mycobacteria that cause tuberculosis (Mycobacterium tuberculosis, M. bovis, M. africanum) and atypical mycobacteria (Mycobacterium avium-intracellulare, M. ulcerans, M. marinum, M. fortuitum, M. chelonae) causing opportunistic infections in humans. Knows their epidemiology (reservoirs, sources of infections, routes through which they spread), the diseases/infections they cause, and the virulence factors that determine the development of infections. Knows antibiotics and chemotherapy drugs effective in treating these infections and mechanisms of resistance. Knows specific prevention of tuberculosis. Knows diagnostic techniques for infections caused by these microorganisms and understands the role and application of the tuberculin test.
    1. Species of actinomyces (Actinomyces israeli) responsible for endogenous human infections. Knows the diseases/infections they cause and the pathogenic potential of these microorganisms. Knows how to diagnose and treat these infections.
    2. The acid-resistant species Nocardia asteroides (discussed exclusively during the lecture and the infections it causes in humans). Knows the epidemiology of these infections (reservoir, sources, and routes they spread). He knows what groups of antibiotics are effective in treating infections caused by Nocardia. Knows diagnostic techniques for infections caused by these microorganisms.

Theoretical part

Tuberculosis - diagnosis, IGRA vs tuberculin test; treatment, including MDR strains;
diagnosis of actinomycosis.

Experimental/demonstration part

Slides from Actinomyces and Nocardia cultures; prepared slides stained by the Ziehl–Neelsen method showing filamentous ("rope-like") growth; students perform an antibiogram for Gram-positive cocci demonstrating resistance mechanisms: MRSA, MLSb, HLAR.

CLASS 6

ANTIBIOTICS AND RESISTANCE OF GRAM-POSITIVE BACTERIA

To familiarize students with the mechanisms of antibiotic resistance in Gram-positive bacteria.

Student knows:

1. What mechanisms of antibiotic resistance are presented by Gram-positive bacteria (staphylococci, streptococci, enterococci, pneumococci): knows the mechanisms of resistance such as MRSA, HLAR, MLSB, VRE/GRE, VISA/GISA, VRSA, PRP
2. The clinical consequences of these resistance mechanisms in treating infections caused by Gram-positive bacteria.
3. The groups of antibiotics active against resistant strains of Gram-positive bacteria.

Theoretical part

Discussion of resistance mechanisms in Gram-positive cocci; treatment of infections caused by resistant strains; intrinsic (natural) resistance

Experimental/demonstration part

Reading and interpretation of antibiograms showing resistance mechanisms in Gram-positive bacteria (including prepared reference antibiograms).

CLASS 7

GRAM-NEGATIVE COCCOBACILLI (HAEMOPHILUS, NEISSERIA, MORAXELLA, BORDETELLA), LEGIONELLA, HELICOBACTER, CAMPYLOBACTER

To familiarize students with the Gram-negative cocci and Gram-negative small rods (coccobacilli) that are pathogenic to humans.

Student knows:

1. Types and species of Gram-negative cocci pathogenic to humans: Neisseria meningitidis and N. gonorrhoeae, Moraxella catarrhalis - their epidemiology, pathogenic potential, types of infections they cause and methods of treatment and prevention of these infections. Knows the directions for diagnosing the infections they cause.
2. Types and species of coccobacilli: Haemophilus influenzae, H. parainfluenzae, Bordetella pertussis (and species of bacilli responsible for zoonoses discussed only during the lecture: Brucella, Pasteurella, Francisella; know the term of zoonoses). Knows the epidemiology of these infections (reservoirs, sources of infection, and transmission routes), virulence factors determining their pathogenicity, groups of antibiotics active against these microorganisms, and means of specific and non-specific prevention. Knows diagnostic techniques for infections caused by these microorganisms.
3. Legionella pneumophila species (epidemiology of infections, virulence, types of infections it causes, and antibiotics active against these microorganisms). Knows diagnostic techniques for infections caused by these microorganisms.

Theoretical part

Neisseria, Haemophilus, Bordetella, Moraxella – differentiation; serological diagnosis of pertussis; diagnosis of Helicobacter pylori infections.

Experimental/demonstration part

Helicobacter pylori culture (if available); gastric biopsy – urease test; microscopic preparation from gastric biopsy; treatment of H. pylori infection; differential tests for Haemophilus, Moraxella, and Neisseria;
Legionella antigen test.

CLASS 8

GRAM-NEGATIVE RODS – ENTERIC, NON-FERMENTING, AND ANAEROBIC

To familiarize students with groups of glucose-fermenting and non-fermenting Gram-negative rods and anaerobic rods that cause infections in humans.

Student knows:

1. Types and species of glucose-fermenting rods, the so-called intestinal pathogens: Salmonella enterica, Shigella dysenteriae, S. sonnei, S. flexneri, Yersinia enterocolitica (and the species Y. pestis discussed only during the lecture), pathogenic strains of E. coli - EPEC, EHEC, EIEC, ETEC, DEAC, EAEC, AIEC (can develop acronyms; discussed mainly during the lecture) and non-pathogenic E. coli and potentially pathogenic ones: Klebsiella pneumoniae, Proteus mirabilis, Enterobacter cloaceae, Citrobacter freundii, Serratia marcescens (discussed mainly during the lecture), causing infections in humans. Knows their epidemiology (reservoirs, sources of infection, and transmission routes). Knows the virulence factors that determine their pathogenicity and understands the role of O, K, and H antigens in the pathomechanism of infections and diagnosis. Students can indicate which bacteria cause endogenous infections and which are only exogenous ones. Knows diseases and groups of antibiotics for their treatment. Knows diagnostic techniques for infections caused by these microorganisms. Knows specific and non-specific prevention means and can explain the differences between serotyping and serology.
2. Types and species of non-glucose-fermenting bacilli: Pseudomonas aeruginosa, Acinetobacter baumannii, Stenotrophomonas maltophilia, Burkholderia cepacia - know their epidemiology (reservoirs, sources of infections and routes of transmission to humans), pathogenicity and antimicrobials for treating these infections. Knows the primary virulence factors of these microorganisms and bacteriological diagnostic techniques.
3. Types and species of obligate anaerobic Gram-negative bacilli: Bacteroides fragilis, Prevotella sp., Porphyromonas sp., and Fusobacterium sp., which cause endogenous infections in humans. He knows the pathogenic potential of these microorganisms, the types of infections they cause, and the antibiotics used to treat them. Knows the basics of diagnosing infections caused by obligate anaerobic bacteria.

Theoretical part

Diagnosis of typhoid fever and other infections caused by Gram-negative rods; microscopic preparations from bacterial cultures.

Experimental/demonstration part

Culturing and differentiation of Gram-negative rods;
performing an antibiogram demonstrating resistance mechanisms in Gram-negative bacteria.

CLASS 9

ANTIBIOTICS AND RESISTANCE MECHANISMS IN GRAM-NEGATIVE BACTERIA

To familiarize the student with the mechanisms of antibiotic resistance presented by Gram-negative bacteria.

Student knows:

1. Mechanisms of resistance of Gram-negative bacteria to β-lactam antibiotics: ESBL, KPC, MBL, resistance to aminoglycosides, fluoroquinolones, colistin.
2. The clinical consequences of these resistance mechanisms in treating infections caused by Gram-negative bacteria.
3. The groups of antibiotics active against resistant strains of Gram-negative bacteria.

Theoretical part

Discussion of resistance mechanisms in Gram-negative rods; treatment of infections caused by resistant strains, including intrinsic (natural) resistance

Experimental/demonstration part

Reading and interpretation of antibiograms showing resistance mechanisms in Gram-negative bacteria (including prepared reference antibiograms); cefinase test; hand imprint cultures (before washing, after washing, and after disinfection)

CLASS 10

FUNGI PATHOGENIC TO HUMANS. The HUMAN MICROBIOTA.

To familiarize students with the most essential fungi pathogenic to humans and the basic methods of diagnosing these infections.

Student knows:

1. Classification of pathogenic fungi into yeast-like, molds, and dimorphic fungi. Knows their pathogenic potential and the epidemiology of infections (reservoirs, sources of infection, and routes of spread).
2. The types and species of yeast-like fungi most often causing human infections (Candida and Cryptococcus). Basic techniques for diagnosing infections with yeast-like fungi.
3. The types and species of molds that are pathogenic to humans (dermatophytes: Trichophyton, Epidermophyton, Microsporum; other molds: Aspergillus). Understands the clinical significance of these infections in immunosuppressed people. Knows the term of aflatoxins/mycotoxins and their impact on the human body. Knows the clinical consequences of disseminating fungal spores in the hospital environment.
4. The types of dimorphic fungi (Blastomyces, Coccidioides, Histoplasma) and understand what dimorphism means.
5. Can give examples of local and systemic mycoses. Knows the basics of mycological diagnostics, the tests and cultures used in it, as well as the role of the microscopic slides.
6. The groups of antifungal drugs (and representatives of each group of drugs) and the mechanism of their action: polyenes (nystatin, natamycin, amphotericin B), imidazoles, triazoles, antimetabolites (5-fluorocytosine), echinocandins.
7. Types of bacteria colonizing the human body, divided into colonizing microorganisms: a) mucous membranes of the oral cavity, digestive tract, and urogenital system; b) skin;
8. Knows the role of microbiota in maintaining health and the factors influencing the microbiota of the human body. Knows the concept of dysbiosis and its role in diseases.
9. Knows the concepts of colonization and carriage, endogenous and opportunistic infections, and factors influencing their development and can give examples of these infections

Theoretical part

Diagnosis of fungal infections; discussion of hand culture results.

Experimental/demonstration part

Reading and interpretation of hand culture results.

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