Plan of practical classes in Microbiology, Virology, Immunology
2025-2026 academic year, Specialty "Farmacy" 5th semester

Learning Session: from **01.09.2025–** to **26.12.2025**.

Practical classes begin on 01.09.2024.

Public holidays: November 7, December 25, January 1 and 2. Classes for these days are not planned, but are shifted a week later (if there are enough training weeks).

LABORATORY CLASS 1 **Date: 01.09.2025–05.09.2025**

Topic: Methods for microbiological diagnosis of purulent infections caused by staphylococci, streptococci, and *Pseudomonas aeruginosa*

Staphylococci: Properties. Pathogenicity factors. Etiological and pathogenetic role of staphylococci in purulent-inflammatory processes, sepsis, nosocomial infections. Laboratory diagnostics, specific prevention and etiotropic therapy of staphylococcal infections.

Streptococci: Properties. Pathogenicity factors and toxins. Role in human pathology. Laboratory diagnosis, prevention and etiotropic therapy of streptococcal infections.

The concept of enterococci and enterococcal infections.

Pseudomonas: Properties. Ecology. Pathogenicity factors. The role of Pseudomonas aeruginosa in nosocomial infections. Laboratory diagnostics. Prevention, etiotropic therapy.

LABORATORY CLASS 2 **Date: 08.09.2025–12.09.2025**

Topic: Methods for microbiological diagnosis of purulent infections caused by Proteus, Bacteroides, Clostridia tetanus, causative agent of gas gangrene

Proteus: classification, properties. The role of Proteus in human pathology.

Clostridia are causative agents of wound anaerobic infection. Toxins and their characteristics. The role of clostridia toxins and tissue breakdown products in the pathogenesis of wound infection. Microbial associations in wound anaerobic infection. Antitoxic immunity. Laboratory diagnosis, specific prevention and etiotropic therapy of wound anaerobic infection.

Clostridia are the causative agents of tetanus. Tetanospasmin and tetanolysin, their pathogenetic effect. Tetanus in newborns. Antitoxic immunity. Laboratory diagnosis, specific prevention and etiotropic therapy of tetanus.

Bacteroides, characteristics, role in human pathology. Principles of diagnosis of non-clostridial anaerobic infections.

LABORATORY CLASS 3 **Date: 15.09.2025–19.09.2025**

Topic: Methods for microbiological diagnosis of meningococcal infection, whooping cough, diphtheria

Meningococci. Properties. Pathogenicity factors. Etiological and pathogenetic role in epidemic cerebrospinal meningitis, meningococcemia and nasopharyngitis. Bacterial carriage. Immunity for meningococcal infection. Laboratory diagnostics. Prevention, etiotropic therapy.

The causative agent of diphtheria. Properties. Pathogenicity factors. Diphtheria toxin, its properties. Mechanism of action. Genetic control of toxin production. Anatoxin. Antitoxic immunity and methods for its detection. Bacterial carriage. Laboratory diagnosis, specific prevention and etiotropic therapy of diphtheria.

The causative agent of whooping cough. Properties. Pathogenicity factors. Pathogenesis and immunity. Laboratory diagnostics, specific prevention, etiotropic therapy of whooping cough.

LABORATORY CLASS 4 **Date: 22.09.2025–26.09.2025**

Topic: Methods for microbiological diagnosis of diseases caused by pathogenic mycobacteria, hemoglobinophilic (hemophilic) bacteria, Klebsiella, Nocardia, Actinomycetes.

The causative agent of tuberculosis. Properties. Pathogenicity for humans and localization in the body. Pathogenicity factors of Mycobacterium tuberculosis. Tuberculin. Immunity and its features. Allergy. Laboratory diagnosis of tuberculosis, specific prevention (BCG vaccine), etiotropic therapy.

The causative agent of leprosy. Biological features. Pathogenicity for humans. Laboratory diagnosis of leprosy. Prevention of leprosy, etiotropic therapy.

Nocardia. Systematic position, properties, role in human pathology.

Actinomycetes. Systematic position, general characteristics, distribution. The role of actinomycetes in the cycle of substances, the production of antibiotics. Etiology, pathogenesis, microbiological diagnosis of actinomycosis.

Hemoglobinophilic (hemophilic) bacteria. Haemophilus influenzae and its role in the pathology of children

and adults. Microbiological diagnosis and specific prevention of Hib infection.

Klebsiella, general characteristics. Opportunistic Klebsiella (*K. pneumoniae, K. oxytoca*) and their role in human pathology. K. pneumoniae and their role in infectious pathology. Microbiological diagnosis of klebsiellosis.

Legionella. Systematic position, properties, role in human pathology

LABORATORY CLASS 5 **Date: 29.09.2025–03.10.2025**

Topic: Methods for microbiological diagnosis of acute intestinal infections caused by enterobacteria

Escherichia. Properties, physiological role and sanitary-indicative value. Escherichia serogroups and their role in the etiology of acute intestinal diseases (escherichiosis): enteritis of early childhood, dysentery-like diseases, cholera-like diseases. Enterohemorrhagic Escherichia is the causative agent of hemolytic-uremic syndrome. The etiological and pathogenetic role of Escherichia in urinary tract infections, appendicitis, cholecystitis and nosocomial infections. Immunity. Laboratory diagnosis of escherichiosis. Prevention, etiotropic therapy.

Shigella. Classification of Shigella. Etiological role in dysentery. Pathogenesis of the disease. Intracellular persistence of the pathogen. Laboratory diagnosis of dysentery. Prevention and etiotropic therapy.

Salmonella. Serological classification of Salmonella Kaufman-White. Pathogenicity for humans. Causative agents of typhoid fever and paratyphoid fever. Pathogenesis and immunology of typhoid fever. Salmonella is the causative agent of acute gastroenteritis. Pathogenesis of diseases. Salmonella are causative agents of nosocomial infections. Laboratory diagnosis of typhoid fever and salmonellosis. Prevention and etiotropic therapy.

Yersinia is the causative agent of pseudotuberculosis and enterocolitis. Morphological and physiological features. Pathogenicity for humans and rodents. Laboratory diagnosis of yersiniosis. Prevention, etiotropic therapy.

LABORATORY CLASS 6 **Date: 06.10.2025–10.10.2025**

Topic: Methods for microbiological diagnosis of bacterial intestinal infections caused by Vibrio cholerae, Clostridia botulinum, Campylobacter, Helicobacter, Listeria

Vibrio cholerae. Morphological, cultural and biochemical characteristics. Antigenic structure, O- and H-antigens. *Vibrio cholerae* biovars. Serovars. Ecology. Resistance. Pathogenicity factors. Genetic control of pathogenicity factors. Enterotoxin (cholerogen), properties and mechanism of pathogenetic action. Pathogenesis and immunity in cholera. Laboratory diagnostics, specific prevention, etiotropic therapy of cholera.

Clostridia are the causative agents of botulism. Botulinum toxins. Characteristics and pathogenetic effect. Laboratory diagnostics, specific treatment, prevention of botulism.

Clostridium difficile: natural (species) antibiotic resistance. Clostridioides difficile-associated infections, methods of diagnosis and therapy.

Campylobacter: systematic position, properties, role in human pathology.

Helicobacter. Properties, role in the development of gastric and duodenal ulcers, stomach cancer, maltoma. Laboratory diagnosis, prevention and etiotropic therapy.

Listeria: systematic position, properties, role in human pathology.

LABORATORY CLASS 7 **Date: 13.10.2025–17.10.2025**

Topic: Methods for microbiological diagnosis of sexually transmitted infections

The causative agent of syphilis. Properties. Pathogenesis and immunity. Laboratory diagnostics. Prevention, etiotropic therapy.

Gonococci. Etiological and pathogenetic role in urethritis and conguctivitis in children. Prevention of blenorrhea in newborns. Immunity. Laboratory diagnosis of gonorrhea. Prevention, etiotropic therapy.

Chlamydia. Morphological and biological features. Resistance. Obligate intracellular parasitism. Chlamydia pathogenicity factors. The causative agent of urogenital chlamydia. Role in pregnancy pathology and fetal damage. Material and diagnostic methods. Laboratory diagnosis of chlamydia, prevention, etiotropic therapy.

Mycoplasmas, general characteristics, pathogenicity for humans, diseases caused, role in the pathology of pregnancy and damage to the fetus. Laboratory diagnosis of mycoplasmosis, prevention, etiotropic therapy

LABORATORY CLASS 8 **Date: 20.10.2025–24.10.2025**

Topic: Methods for microbiological diagnosis of bacterial zoonotic infections

Classification of microorganisms and poisons of biological origin according to the degree of danger. Anti-epidemic regime when working with pathogens of risk groups IV-III.

The causative agent of plague. Morphological and physiological features. Pathogenicity for humans. Pathogenicity factors and toxins. Pathogenesis of plague. Immunity. Laboratory diagnostics, specific prevention, etiotropic therapy of plague.

The causative agent of tularemia. Morphological, cultural and biochemical characteristics. Ecology. Resistance. Pathogenicity for humans. Pathogenicity factors. Pathogenesis and immunity in tularemia. Diagnostic methods. Live tularemia vaccine (B.Ya. Elbert, N.A. Gaisky). Medicines for chemotherapy of tularemia.

Brucella. Morphological, cultural, biochemical and antigenic properties. Ecology. Resistance. Pathogenicity factors. Pathogenesis and immunity in brucellosis. Laboratory diagnostics, specific prevention, etiotropic therapy.

Bacilli. The causative agent of anthrax. Morphological, cultural and biochemical properties. Ecology. Spore resistance to environmental factors. Pathogenicity factors. Toxins, their pathogenetic effects. Laboratory diagnosis, prevention and etiotropic therapy of anthrax.

Aerobic bacilli are the causative agents of food poisoning.

Leptospira: general characteristics, pathogenicity for humans. Pathogenesis of leptospirosis. Immunity. Laboratory diagnostics. Specific prevention, etiotropic therapy.

Borrelia: general characteristics, pathogenicity for humans. Characteristics of pathogens, transmission routes, basis of pathogenesis, laboratory diagnostic methods and etiotropic therapy of Lyme borreliosis.

LABORATORY CLASS 9 **Date: 27.10.2025–31.10.2025**

Topic: Methods for microbiological diagnosis of rickettsial infections

Rickettsia. Classification of rickettsia and rickettsioses. Causative agents of typhus and Brill-Zinsser disease, endemic rickettsioses. Ecology. Resistance. Hosts and carriers. Obligate intracellular parasitism of Rickettsia. Laboratory diagnosis of rickettsioses. Specific prevention, etiotropic therapy.

LABORATORY CLASS 10 **Date: 03.11.2025–07.11.2025**

Topic: Fundamentals of medical mycology and protozoology. Final session: "special bacteriology"

Systematic and classification of fungi.

Fungi pathogenic to humans, morphology, pathogenicity factors. Features of mycotic infection. Principles of diagnosis and features of chemotherapy for mycoses.

Systematic, general characteristics and classification of protozoa. Features of chemoprophylaxis and chemotherapy of protozoal invasions

FINAL SESSION: "SPECIAL BACTERIOLOGY". A list of questions and practical skills will be included in the educational module.

LABORATORY CLASS 11 **Date: 10.11.2025–14.11.2025**

Topic: General virology. Methods of virological research. Bacteriophages

Classification and morphology of viruses. Viruses as an independent form of life. The main features that distinguish viruses from other forms of organic matter. Classification of viruses. Morphology of virions of simple (non-enveloped) and complex (enveloped) viruses. Chemical composition of viruses. Viroids. Prions.

Reproduction of viruses. Strict parasitism and cytotropism of viruses. Stages of reproduction (reproduction) of viruses. Features of the reproduction of DNA and RNA viruses. Mechanisms of virus variability. Productive, abortive and integrative cell infection.

Ecology of viruses. Human and animal viruses. Sensitivity of viruses to physical and chemical environmental factors.

Bacterial viruses (bacteriophages). Morphology of phage particles, chemical composition, properties. Virulent and temperate phages and features of their interaction with bacteria. Lysogenic infection. Phage conversion. Defective phages. Use of phages for diagnosis, treatment and prevention of bacterial infections. Phage typing of bacteria. Sanitary and indicative significance of bacteriophages.

Viral infections. Viruses as a cause of the development of tumor and infectious diseases. Distribution, features of viral infections. Types of viral infections. Mechanisms of viruses infecting animal cells. Slow infections.

Antiviral immunity. Factors of innate immunity. Cellular unresponsiveness. Antiviral inhibitors. Natural killers. Viral interference. Interferonogens. Interferons, types, classes, properties, antiviral, antitumor, immunomodulatory effects.

Features of immunity in viral infections. Immunoprophylaxis and immunotherapy of viral infections.

Chemotherapy and chemoprophylaxis of viral infections. Antiviral chemotherapeutic drugs and their mechanisms of action. Antiviral antiseptics.

Study of the morphology of viruses. Detection of viral inclusions. Methods for isolating, indicating and identifying viruses in chicken embryos, cell cultures, and laboratory animals. Serological methods for diagnosing viral infections

LABORATORY CLASS 12 **Date: 17.11.2025–21.11.2025**

Topic: Causative agents of respiratory viral infections: orthomyxoviruses, paramyxoviruses, coronaviruses, adenoviruses. Rubivirus. Parvoviruses

Orthomyxoviruses: Characteristics and classification of the family. Influenza viruses: structure of the virion, properties, antigenic structure and serotypes, antigenic variation and its implications. Influenza: distribution, pathogenesis, immunity, virological diagnostic methods. Medicines for specific therapy, immuno- and chemoprophylaxis of influenza. "Bird" and "swine" influenza viruses. Influenza pandemics.

Paramyxoviruses: Characteristics and classification of the family. Parainfluenza viruses: structure, properties, serotypes. Pathogenesis, immunity, diagnosis of parainfluenza. Mumps virus: structure, properties. Pathogenesis,

immunity, diagnosis, specific prevention of mumps. Measles virus: structure, properties. Measles: distribution, pathogenesis, immunity, virological diagnosis. Medicines for active and passive immunoprophylaxis of measles. Mitigated measles, subacute sclerosing panencephalitis. Measles eradication program in the Republic of Belarus.

Coronaviruses: Classification and role in human pathology, structure of the virion, properties. SARS and MERS viruses. COVID-19: pathogenesis, features of immune status, virological diagnosis, specific prevention.

Rubiviruses: Rubella virus, structure, biological properties, teratogenic effects. Rubella: pathogenesis, virological diagnosis, principles of prevention. Congenital rubella syndrome.

LABORATORY CLASS 13 **Date: 24.11.2025–28.11.2025**

Topic: Methods of virological diagnosis of diseases caused by togaviruses, flaviviruses, bunyaviruses, arenaviruses, filoviruses, and rhabdoviruses.

Togaviruses: Structure of the virion, biological properties, role in human pathology. General features of arboviruses, group composition, characteristics of diseases caused. Arboviral and roboviral infections endemic to the Republic of Belarus.

Flavivirus: Characteristics and classification of the family, natural foci of diseases caused, transmission routes. Antigenic groups of flaviviruses. Tick-borne encephalitis: distribution, characteristics of the causative agent, pathogenesis, immunity, virological diagnosis, immunoprophylaxis. Other diseases caused by flaviviruses (Dengue fever, yellow fever, Japanese encephalitis, Zika fever).

Bunyaviruses: Structure of the virion, biological properties of viruses. Distribution, causative agents, pathogenesis of Crimean hemorrhagic fever and hemorrhagic fever with renal syndrome. Causative agent of hantavirus fever.
Arenaviruses: Structure of the virion, biological properties of viruses, causative agent of Lassa fever.
Filoviruses: Ebola and Marburg viruses.

Rhabdoviruses: Characteristics. Rabies virus: properties, routes of transmission to humans, pathogenesis, and virological diagnosis of rabies. Negri bodies. The role of L. Pasteur in vaccine development. Fixed rabies virus. Modern post-exposure rabies vaccine and gamma globulin for rabies prevention, indications for use.

LABORATORY CLASS 14 **Date: 01.12.2025–05.12.2025**

Topic: Methods of virological diagnosis of diseases caused by herpesviruses, adenoviruses, papillomaviruses, parvoviruses.

Herpesviruses: Characteristics and composition of the family, resistance to physical and chemical factors, biological properties, oncogenicity. Human herpesviruses (HHV): HHV-1, HHV-2, HHV-3, HHV-5, HHV-4, their properties. Pathogenesis of herpes infections, immunity, virological diagnosis, chemotherapy, and immunotherapy. HHV-6, 7, role in human pathology.

Adenoviruses: Characteristics, family composition. Human adenoviruses, structure of the virion, properties, serotypes. Pathogenesis, immunity, virological diagnosis, specific prevention of adenoviral infections.

Parvoviruses: Structure of the virion, biological properties, role in human pathology. Bocaviruses.

Polyomaviruses and papillomaviruses: High-risk human papillomaviruses. The history of development regarding the etiology of malignant tumors. Viral hypothesis of carcinogenesis. Concept of "viral oncogenicity".).

LABORATORY CLASS 15 **Date: 08.12.2025–12.12.2025**

Topic: Methods of virological diagnosis of diseases caused by picornaviruses, reoviruses, noroviruses, hepatitis A, E, B, C viruses.

Picornaviruses: Characteristics and family classification.

Enteroviruses: Structure, properties, neurotropism, genus composition. Features of enterovirus infections. Etiology, pathogenesis, immunity, diagnosis, and immunoprophylaxis of poliomyelitis. Success in the fight against poliomyelitis. Coxsackie and ECHO viruses, their role in human pathology. Rhinoviruses: structure of the virion, serological types, biological properties. Distribution, pathogenesis, immunity, diagnosis of acute contagious rhinitis.

Reoviruses: General characteristics of the family. Rotaviruses, structure of the virion. Rotavirus infection in humans: pathogenesis, immunity, diagnostic methods. Noroviruses: structure of the virion, biological properties, role in human pathology.

Hepatitis viruses classification (HAV, HBV, HCV, HDV, HEV): Other viruses with hepatotropic effects.

Hepatitis A virus: Structure and properties of the virion. Modes of infection, pathogenesis, immunity, diagnosis, specific and non-specific prevention of hepatitis A.

Hepatitis E virus: Characteristics of the virion. Pathogenesis and virological diagnosis of hepatitis E.

Hepatitis B virus: Morphological and antigenic structure of the virion, oncogenicity. Routes of transmission, pathogenesis, immunity, virological diagnosis, treatment principles. Specific and non-specific prevention of hepatitis B. Delta infection, pathogenesis, diagnosis.

Hepatitis C virus: Structure of the virion. Pathogenesis, immunity, virological diagnosis, outcomes of hepatitis C. Medicines for specific therapy of hepatitis C.

.

LABORATORY CLASS 16 **Date: 15.12.2025–19.12.2025**

Topic: Methods of virological diagnosis of diseases caused by retroviruses. Etiology of slow infections. Prions and prion diseases.

Retroviruses: Characteristics and classification of the family. Human immunodeficiency viruses (HIV-1, HIV-2): structure, interaction with susceptible cells. HIV infection, epidemiology. Formation of immunodeficiency and its characteristics. Pre-AIDS. AIDS-associated diseases. Diagnosis of HIV infection, etiological therapy. Primary and secondary prevention of AIDS and its complications. Features of HIV infection in the context of ART.

Slow infections of viral etiology: (HIV infection, subacute sclerosing panencephalitis, rabies, congenital rubella, chronic viral hepatitis B and C, herpes encephalitis).

Prions: History of discovery, properties, pathogenesis, clinical manifestations, and laboratory diagnosis of prion diseases (Creutzfeldt-Jakob disease, Gerstmann-Sträussler-Scheinker syndrome, Kuru, fatal familial insomnia, transmissible spongiform encephalopathy of cattle).

LABORATORY CLASS 17 **Date: 22.12.2025–26.12.2025**

Topic: FINAL SESSION ON THE TOPIC: "General and Special Medical Virology." A list of questions and practical skills will be included in the educational module.

Plans for laboratory classes were reviewed and approved at a meeting of the department on August 29, 2025, protocol No. 1.