

DANYLO HALYTSKY LVIV NATIONAL MEDICAL UNIVERSITY

Department of Microbiology

«APPROVED»

Tempor. appoint. First vice-rector for
scientific and pedagogical work
Assos. Prof. I.I. Solonynko

« _____ » _____ 2022

**EDUCATION CURRICULUM OF DISCIPLINE
VB 1 36 “Microbiological aspects of periodontal disease”
(elective course)
preparation of specialists of the second (master's)
level of higher education
field of knowledge 22 "Healthcare"

specialty 221 «DENTISTRY»**

Discussed and approved
at the methodical meeting of the
department microbiology
Protocol No 15
Dated 21 June 2022
Head of the department:
prof. Olena. KORNIYCHUK, MD

«APPROVED» at the sitting of the cyclic
methodical commission
on the preventive medicine
Protocol No 5
Dated 27 June 2022
Head of the commission
Professor Vira FEDORENKO. MD

Lviv-2022

PROGRAM DEVELOPERS :

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REVIEWERS :

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Explanatory Note

The program of microbiology, virology and immunology for higher educational medical institutions of Ukraine of III-IV levels of accreditation is made for the specialty "Dentistry" 7.110106, direction 1101 "Medicine", the subject is studied during III-IV semesters of the 2nd year of study. in accordance with the following regulations: the Law on Higher Education, 2014), educational and qualification characteristics (OKH) and educational and professional programs (OPP) of training, approved by the order of the Ministry of Education and Science of Ukraine from 16.04.03.№ 239"On approval of the components of industry standards of higher education in the direction of training 1101" Medicine "; Decree of the President of Ukraine of 17.02.2004 №199 "On measures to improve the system of higher education of Ukraine", Order of the Ministry of Health of Ukraine of 24.02.2000 №35 "On approval of the Regulations on the peculiarities of medical education", registered in the Ministry of Justice of Ukraine on 25.06.2000 № 370/4591 and the order of the Ministry of Education and Science of Ukraine dated 09.07.2009 № 642 "On the organization of the study of humanities at the student's free choice"; recommendations on the development of curricula of academic disciplines, approved by the order of the Ministry of Health of Ukraine dated 24.03.2004 on №152 12.10.2004 and on №492 "On making changes and additions to the recommendations on the development of curricula of academic disciplines"; by the order of the Ministry of Health of Ukraine dated 07.12.09 under №929 "On approval and introduction of a new initial plan for training specialists of educational qualification level" specialist "qualification" dentist "in higher educational institutions of the IV level of accreditation in the specialty" dentistry "; instructions on the system of assessment of students' educational activity under the condition of credit-modular system of organization of educational process (Medical education in the world and in Ukraine, approved by the Ministry of Health of Ukraine .- Kyiv. Book plus. 2005) and in accordance with the standard program agreed with the Central methodical office on higher medical education of the Ministry of Health of Ukraine and approved by the Department of Personnel Policy of Education and Science of the Ministry of Health of Ukraine.

Description of the curriculum on the discipline “Microbiology, Virology and Immunology” elective course “Microbiological aspects of periodontal disease” for students of Faculty of Dentistry

Structure of the discipline	Quantity of hours			SEW	Year of study	Types of control
	Total	Auditorium				
		lecture	Practices			
Microbiological aspects of periodontal disease Thematic module1-5	3credits ECTS 90 hrs.	-	30	60	Second year IV semesters	Credit
on semesters						
Thematic module	90 (3credits)	-	30	60	IV semesters	Credit

The purpose and objectives of the discipline

The purpose - to study the microbiological aspects of periodontal disease - and the ultimate goals - is set on the basis of OPP training of a dentist in accordance with the block of its content module - (natural science training) and is the basis for building the content of the discipline. The description of goals is formulated through skills in the form of target tasks (actions). On the basis of the ultimate goals to the module or content module, specific goals are formulated in the form of certain skills (actions), target tasks that ensure the achievement of the ultimate goal of studying the discipline.

As a result of studying the discipline the student must know:

- biological properties of microorganisms from the standpoint of their interaction in the oral cavity and with the macroorganism

- morpho-physiological bases of functioning of nonspecific protective factors and immune system, explanation of mechanisms of immune response and immunopathological reactions that are important in the development of dental diseases and other pathological conditions in the oral cavity.

Be able:

- have the basic methods of microbiological diagnosis, interpret the principles of etiotropic therapy and specific prevention of periodontal disease.

1.2. The main tasks of studying the discipline "Microbiological aspects of periodontal disease " are:

- to interpret the biological properties of pathogenic and non-pathogenic microorganisms, patterns of their interaction with macroorganism and the external environment;
- to define methods of microbiological and virological diagnostics, etiotropic therapy and specific prevention of infectious diseases, as well as non-infectious diseases of microbial genesis;
- explain the role and functions of the immune system of the human body;
- to interpret the basic mechanisms of the formation of the immune response of the human body;
- identify the main types of pathological response of the immune system and the relationship with the emergence of the most common human diseases.

1.3. Competence and learning outcomes, the formation of which is facilitated by discipline (the relationship with the normative content of the training of higher education graduates, formulated in terms of results of study in the Standard of Higher Education).

In accordance with the requirements of the Standard of Higher Education, discipline ensures students' acquisition of competences:

- general: the ability to apply knowledge in practical situations. Ability to make decisions in non-standard situations. Ability to choose a communication strategy; ability to work in a team; interpersonal skills. Skills in the use of information and communication technologies. Ability to abstract thinking, analysis and synthesis, the ability to learn and to be modernly trained. Determination and persistence in relation to the tasks and established responsibilities. Ability to act socially responsible and with public consciousness. Ability to lead a healthy lifestyle. The desire to save the environment. Universal competencies that are important for successful further professional and social activities, as well as personal development.

- special (professional, subject): Ability to evaluate the results of laboratory research. Ability to perform sanitary and preventive measures. Ability to plan preventive and anti-epidemic measures against infectious diseases. Ability to process state, social, economic and medical information. Ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population. Ability to apply scientifically grounded psychological methods of effective work with colleagues, medical staff, patients and their relatives, readiness to interact with other people. Awareness of the individual in the field of culture of other peoples.

Detail of competencies according to the descriptors of the NRC form the "Matrix of competencies".

№	Competence	Knowledge	Ability	Communication	Autonomy and responsibility
1	2	3	4	5	6
GENERALCOMPETENCES					
1	Ability to apply knowledge in practical situations	Have specialist conceptual knowledge gained during the learning process.	Be able to solve complex problems and problems of professional activity.	A clear and unequivocal report of their own conclusions, knowledge and explanations that justify them, to specialists and non-specialists.	Responsible for making decisions in difficult conditions
2	Ability to learn and master modern knowledge.	Know the current trends in the industry and analyze them.	Be able to carry out an analysis of professional information, make informed decisions, acquire modern knowledge.	Establish appropriate connections for achievement of the goals.	Be responsible for the timely acquisition of modern knowledge.
3	Knowledge and understanding of the subject area and understanding of	Have a profound knowledge of the structure of professional activity.	Be able to carry out professional activities that require updating and integration of	Ability to effectively form a communication strategy in professional activity	To be responsible for professional development, the ability to

	professional activity.		knowledge.		further professional training with a high level of autonomy.
4	Skills in the use of information and communication technologies.	Have deep knowledge in the field of informational and communication technologies that are relevant to professional activities.	To be able to use informational and co-munication technologies in the professional field that needs to be updated. and the integration of knowledge.	Use information and communication technologies in professional activities	To be responsible for the development of professional knowledge and skills.
5	Definedness and ease-about the set tasks and responsibilities.	Know the ways and means of fulfilling post-office tasks.	Being able to define the purpose and the task of being persistent and conscientious in carrying out the duties.	Establishing interpersonal connections for the effective fulfillment of duties and duties.	Responsible for high-quality performance of tasks
6	Ability to communicate in foreign language	Have basic knowledge of the foreign language.	Be able to communicate in foreign languages.	Use a foreign language in the professional activities	To be responsible for the development of professional knowledge using a foreign language.
7	Ability to communicate in the state language both verbally and in writing.	Have knowledge of the state language.	To be able to use knowledge of the state language, both verbally and in writing.	Use in professional and business communication and in preparation of documents a state language.	To be responsible for the full possession of the state monopoly, for the development of professional knowledge.
Special (professional, subject) competence					
1	Ability to evaluate laboratory and instrumental results research	Have specialized knowledge of a person, his organs and systems, to know the standard method of conducting laboratory and instrumental research (on list 4: Serologic reactions at infectious diseases; Express tests for viral diseases; Amplification methods in infectious diseases;	Be able to analyze the results of laboratory and instrumental studies and, on the basis of them, to evaluate the information on the patient's diagnosis (on the list 4)	It is justified to assign and evaluate the results of laboratory and instrumental studies (in list 4).	Be responsible for making decisions on evaluating the results of laboratory and instrumental studies

		Serological reactions in autoimmune diseases; Chemical and bacteriological studies of biological fluids and emissions).			
2	Ability to develop preventive and anti-epidemic measures for infectious diseases	Know the principles of organizing and conducting a system of prevention and anti-epidemic measures on infectious diseases and preventing their spread in typical conditions and in the worsening of the epidemic situation. Know the methods of detection and early diagnosis of infectious diseases, organization of primary anti-epidemic measures in the cell of infectious diseases..	Be able to identify risk groups in the development of infectious diseases..	Inform employees of clinical institutions about timely medical and preventive measures.	To be responsible for quality and timely results of diagnosis (including early diagnosis), adherence to the rules of evidence-based medicine.
3	Ability to process state, social, economic and medical information	Know standard methods, including modern computer information technologies, processing of state, social and medical information	Ability to determine the source of finding the necessary information depending on its type; the ability to perform statistical processing of the material and analysis of the information obtained	Form conclusions based on the analysis and statistical processing of the information received	To be responsible for the quality and timely implementation of statistical processing and analysis of the information obtained
4	Ability to estimation state, social- economic and biologicaldeterminantsonhealthyofindividual,family, population	Know the socio-economic and biological determinants that affect the health of the population; types and methods of prevention to	To be able to calculate health indicators based on data of epidemiological and medical-statistical researches Be able to assess	To obtain the necessary information from identified sources regarding the health status of the population and its individual groups and to formulate conclusions on the	To be responsible for the justification of preventive measures to prevent the negative impact of socio-economic factors

		prevent the negative impact of socio-economic factors on the health of the population and its individual groups.	the relationship and the impact of socio-economic and biological factors on the health of the individual, family, health population Be able to plan preventive measures to prevent the negative impact of socioeconomic factors on the health of the population and its individual groups.	impact of socio-economic and biological factors on health. population	on the health of the population and its individual groups
5	Ability to provide a medical, ethical and legal assessment of specific cases from the standpoint of confidentiality and medical secrecy in solving situational problems in patients with HIV infection.	Know the Law of Ukraine "On the counteraction to the spread of diseases caused by the human immunodeficiency virus (HIV), the legal and social protection of people living with HIV."	Take into account the varieties of human rights and citizen	Apply the norms and principles of biomedical ethics and deontology	To bear responsibility for the preservation of medical secrets.

Curriculum of the discipline

Microbiological aspects of periodontal disease as an elective course is based on knowledge gained in the study of microbiology, virology and immunology, including microbiology of the oral cavity, general biology, a complex of chemical disciplines, biophysics, disciplines of morphological and physiological cycle. Microbiology, in turn, is the basis for the study of general pathology, hygiene, epidemiology, subjects of surgical and therapeutic cycle. Medical microbiology, virology and immunology are the science of origin, evolution and properties of pathogenic microorganisms of normal microflora of the human body, patterns of interaction of microorganisms with macroorganisms, immune system and mechanisms against infectious immunity, diagnostic methods, principles of treatment and specific prevention of infectious diseases.

The study of microbiological aspects of periodontal disease is necessary to understand the role of microorganisms in the pathogenesis of dental diseases, the importance of microbiological methods in diagnosis, the knowledge gained is used to study the treatment and prevention of dental and related diseases. The applied value of this discipline is to develop methods of microbiological diagnosis, microbiological basis of asepsis and antiseptics. Taking into account the specifics of the faculty, special attention is paid to the importance of microflora in the development of periodontal diseases and general pathological processes of stomatogenic and odontogenic origin.

The organization of the educational process is carried out according to the credit-module system in accordance with the requirements of the Bologna process.

The program of the discipline is structured in a module, which includes blocks of content modules.

Microbiological aspects of periodontal disease.

Content modules:

1. General characteristics of the microbiocenosis of the oral cavity.
2. Morphology and structure of prokaryotes and parasitic unicellular eukaryotes of dental plaque.

3. Periodontal disease.
4. Immune system of the oral cavity.
5. Fundamentals of clinical microbiology of dental diseases.
6. Microbiological bases of antimicrobial therapy

Types of student activities according to the curriculum are

a) practical classes, b) independent work (VTS), in the organization of which teachers' consultations play a significant role. Thematic plans of practical classes and VTS ensure the implementation in the educational process of all topics that are part of the content modules.

The topic of the elective course reveals the problematic issues of the relevant sections of microbiology, virology and immunology.

Practical knowledge includes:

1. Research by students of morphological, tinctorial, cultural, enzymatic, antigenic and other properties of microorganisms.

2. Mastering the techniques of microscopy, preparation of stained drugs and in vivo research of microorganisms, cultivation and sterilization, isolation of pure cultures of bacteria, their identification, determination of sensitivity to antibiotics, serological reactions, sensitivity to bacteriophages, pathogenicity for laboratory animals, methods of culturing viruses, etc.

3. Determining the role of microorganisms in the pathology of the oral cavity, discussing the pathogenesis of the most common periodontal diseases and studying modern methods of microbiological diagnosis, including material microscopy, bacteriological and virological methods, enzyme-linked immunosorbent and radioimmunoassay, immune electron microscopy, immunetome method etc.

4. Study of modern methods of development and use of antibiotics, diagnostic sera, and specific therapeutic and prophylactic drugs.

CONTENT OF THE PROGRAM.

Microbiological aspects of periodontal disease.

Content module 1. General characteristics of the microbiocenosis of the oral cavity.

Specific goals:

- Analyze the stages of development of the oral microbiocenosis of healthy individuals.
- Describe the main groups of oral biotopes for original methods of microbiological research.
- To interpret features of structure, morphology, physiology of separate groups of microbes of an oral cavity

Topic 1. Types of microscopes, modern methods of microscopic examination of microorganisms.

Preparations for microscopy, methods of their manufacture. Aniline dyes, their properties. Method of manufacturing dye solutions. Simple methods of staining microorganisms.

Methods of research of morphology of microorganisms (microscopy). Light microscopy using immersion lenses. Dark-field, phase-contrast, luminescent and other methods of microscopy. Electron microscopy. (translucent, raster).

Methods of microscopy in the diagnosis of infectious diseases.

Topic 2. Microbial colonization of the oral cavity.

The concept of colonization resistance and its role in infectious pathology. Dysbacteriosis. Methods of determination. Probiotics, prebiotics - drugs to restore the normal microflora of the human body (bifidumbacterin, lactobacterin, colibacterin, bifikol, aerococobacterin, biosporin, bactisubtil, multibiotics of the group "Symbiter", etc.). Mechanism of action. Dynamics of normal microflora in human ontogenesis. Pathogenic role of normal microflora and mechanisms of their acquisition of pathogenic properties.

Biocorrection of oral dysbiosis.

Topic 3. Characteristics of the microbiocenosis of the oral cavity of healthy individuals.

Microbiocenoses of healthy and pathologically changed habitats of the oral cavity. Dysbacteriosis (dysmicrobiocenosis). Conditions of occurrence. Consequences of development. Classification by pathogen and localization. Methods of diagnosis and rehabilitation (rehabilitation).

Definition. Conditions of origin, features: multiorgan tropism of pathogens, polyetiology, low specificity of clinical manifestations, tendency to generalization.

Topic 4. Age-related changes in the microflora of the oral cavity.

Microbiocenosis of the oral cavity at different ages. Change in quantitative and qualitative indicators. Unstable microflora of the oral cavity. The condition of the oral mucosa, structural features (mucous folds, gingival pockets, squamous epithelium). Hygienic condition of the oral cavity. Normal functions of salivation, chewing and swallowing. Natural resistance of the organism.

Topic 5. The main habitats of the oral cavity.

Normal microflora of the oral cavity. Indigenous and allochthonous microflora. The microflora of the skin, respiratory tract, digestive system, its anti-infective, detoxifying, immunizing, metabolic role. Methods of studying the role of normal microflora of the human body. Gnotobiology, the importance of gnotobiological principles in the clinic. Factors that affect the quantitative and qualitative composition of the microflora of the human body.

Content module 2. Morphology and structure of prokaryotes and parasitic unicellular eukaryotes of dental plaque.

Specific goals:

- Master the method of preparation of drugs from bacteria.
- To draw conclusions at microscopic research.
- Master the method of microscopy using an immersion system.
- Describe the morphological forms of bacteria.
- Explain the structure of the bacterial cell, permanent and non-permanent elements.
- Explain the relationship between the chemical composition, structure and function of the structural elements of a bacterial cell.
- Interpret the results of microscopic examination of microorganisms.
- Analyze the morphology and structure of spirochetes, actinomycetes, fungi and protozoa.

Topic 6. Changes in the microflora of the oral cavity in pathological processes.

Oral microflora as an indicator of human health. The oral cavity as a unique open ecosystem for a wide variety of microorganisms. Quantitative and qualitative changes in microbiota in pathological conditions. Morphophysiological features of gram-positive and gram-negative bacteria. Properties of microorganisms, which determine their species. Methods for determining the type of microorganisms.

The role of microorganisms in the infectious process. Pathogenicity of microbes, determination. Pathogenicity as a consequence of the evolution of parasitism. Obligatory-pathogenic, conditionally - pathogenic, non-pathogenic microorganisms.

Topic 7. Dental plaque as a microbiological factor of periodontal disease. Bacteriological method of dental plaque examination.

Definitions and mechanisms of plaque formation. The nature of microbial populations (biofilms). Colonial organization and intercellular communication in microorganisms. Formation of bacterial grouping of the oral cavity. Dynamics of dental plaque formation. Mechanisms of plaque formation. The process of plaque formation. Localization of dental plaque. Features of the microflora.

Nutrient media for the cultivation of microorganisms. Requirements for nutrient media. Classification of nutrient media. Preparation and main components (peptone, agar-agar, gelatin, rolled whey, etc.). Types of nutrient media.

Methods of studying the enzymatic activity of bacteria and using them to identify bacteria. Modern methods of accelerated identification of bacteria using automated indicators of enzymatic activity.

Topic 8. Changes in the microbiological number of periodontal pockets in diseases of the oral cavity.

Microbiological indicators of periodontal pockets. Changes in the microbiological content of periodontal and gingival pockets in periodontal disease. Dysbiosis of periodontal pockets. Methods of microbiological diagnosis of periodontal pockets.

Topic 9. Morphology and structure of gram-positive and gram-negative cocci and enterobacteria.

Evolution of the coccal group of bacteria, their general characteristics.

Genus of staphylococci (Staphylococcus). Classification. Biological properties. Pathogenicity factors. The role of staphylococci in the development of human pathology. Pathogenesis of the processes caused by them. Staphylococcal lesions of the oral cavity. Role in the development of nosocomial

infection. Immunity and its features. Drugs for specific prevention and therapy. Methods of microbiological diagnosis of staphylococcal infections.

Genus of streptococci (*Streptococcus*). Classification, biological properties. Toxins, enzymes of pathogenicity. Role in human pathology. Pathogenesis of streptococcal diseases. Cariogenic streptococci. Methods of their selection and identification. Immunity. Methods of microbiological diagnosis of streptococcal diseases.

Etiological and pathogenetic role of group A streptococci in respiratory infections, erysipelas, sore throat, scarlet fever, acute glomerulonephritis, rheumatism, sepsis, etc.

Streptococcus pneumoniae - pneumococcus, biological properties. Pathogenicity factors. Etiological and pathogenetic role of pneumonia streptococcus in human pathology. Microbiological diagnostics. Pathogenicity to humans and animals.

Oral streptococci, their role in the development of caries and other dental diseases.

Genus *Neisseria*. Biological properties. Classification. Evolution of pathogenicity.

Meningococci (*Neisseria meningitidis*). Biological properties, classification. Pathogenesis and microbiological diagnosis of meningococcal diseases and bacteriocarriers. Differentiation of meningococci and gram-negative diplococci of the nasopharynx. Prevention of meningococcal infection.

Gonococci (*Neisseria gonorrhoeae*). Biological properties. Pathogenicity for humans, variability. Acute and chronic gonorrhea. Immunity. Microbiological diagnosis of gonorrhea. Prevention and specific therapy of gonorrhea and blenorrhea.

Neisseria of the oral cavity.

Classification and general characteristics of members of the family Enterobacteriaceae. Modern views on the evolution of intestinal bacteria. Antigenic structure. Virulence factors and their genetic determinism. Pathogenic and conditionally pathogenic enterobacteria. Distribution and ability to survive in the environment. Enterobacteria of the oral cavity.

Topic 10. Morphology and structure of spirochetes, actinomycetes, fungi, protozoa.

Spirochetes (*Treponema*, *Borrelia*, *Leptospira*). Features of morphology and structure (shell, fibrils, blepharoplast), mobility.

Actinomycetes, features of morphology. Air and substrate mycelium, fronds. Spore formation.

The structure of the cell of fungi. The main forms of fungi: yeast, yeast-like fungi, filamentous fungi. Hyphae, mycelium. Dimorphism of fungi. Features of the structure of the cytoplasmic membrane and cell wall. Mechanisms of reproduction of fungi: budding, spore formation. Vegetative spores, endospores, exospores, sexual spores. Methods of studying the morphology of fungi.

Features of the structure of protozoa: pellicle, endoplasm, ectoplasm, cysts. Life cycles of the simplest, pathogenic to humans. Methods of studying morphology. Staining according to Romanovsky-Gimza.

Pathogenic fungi. Classification. Biological properties. Resistance. Pathogenicity factors, toxins. Sensitivity to antibiotics.

Dermatophytes - pathogens of dermatomycosis (epidermophytia, trichophytia, microsporia, favus). Properties. Pathogenicity to humans. Microbiological diagnostics.

Pathogens of deep mycoses: blastomycosis, histoplasmosis, cryptococcosis. Properties. Pathogenicity to humans. Microbiological diagnostics.

Fungi of the genus *Candida*. Properties. Pathogenicity to humans. Factors that cause candidiasis (dysbacteriosis, etc.). Microbiological diagnostics. Antimicrobial drugs.

Pathogens of aspergillosis and penicillinosis. Properties. Pathogenicity to humans.

Mycotoxicosis.

Pneumocystis carinii. *Pneumocystis pneumonia* in AIDS patients.

Actinomycetes (family Actinomycetaceae) General characteristics of the genus Actinomycetes. The causative agent of actinomycosis. Ecology. Resistance. Properties. Pathogenesis of the disease. Immunity. Microbiological diagnostics. Chemotherapeutic drugs. Immunotherapy. Prevention of actinomycosis.

Nocardia Classification. Ecology. Biological properties. Pathogenesis of nocardiosis. Microbiological diagnostics. Antimicrobial drugs.

Content module 3. Periodontal disease.

Specific goals:

- Analyze the biological properties of infectious agents and their relationship to the pathogenesis of the disease.

- Explain the etiological and pathogenetic features of infectious processes caused by pathogenic prokaryotes and eukaryotes, their relationship with diagnosis, specific prevention and therapy, as well as the relationship with pathological processes in the oral cavity.
- Identify methods of microbiological diagnosis, etiotropic therapy and prevention of infectious diseases caused by pathogenic prokaryotes and eukaryotes.
- Identify methods of microbiological diagnosis, etiotropic therapy and prevention of odontogenic infectious diseases.

Topic 11. Periodontal disease. Periodontopathogenic microorganisms.

The role of microorganisms in the etiology and pathogenesis of dental diseases (pulpitis, periodontitis), periodontitis, oral mucosa, hard and soft tissues of the dental apparatus (abscesses, phlegmons, cysts, etc.). Lesions of the oral mucosa in various bacterial and viral infections. Fungal stomatitis. Methods of microbiological diagnosis of infectious pathology of the oral cavity.

Topic 12. Microflora of combined periodontitis with gingivitis and periodontitis.

Relationships in the microbial (bacterial) community of the oral cavity. Drug treatment of periodontal diseases. Dominant representatives of microorganisms in diseases of gingivitis, periodontitis, periodontitis. Features of metabolism and energy in bacteria of the oral cavity (metabolic intensity, variety of types of metabolism, metabolic plasticity, excessive synthesis of metabolites and energy). Constructive and energy exchange, their relationship.

Topic 13. Opportunistic periodontitis. Modern methods of rapid diagnosis of infectious diseases.

Prevalence of opportunistic infections. Exogenous opportunistic infections (legionellosis, pseudotuberculosis, listeriosis, seraciosis). Endogenous opportunistic infections, the role of the resident microflora of the organism in their occurrence. Microbiological diagnostics. Criteria for the etiological role of opportunistic pathogenic microbes isolated from the pathological focus.

Opportunistic iatrogenic infections. Etiological structure. Hospital strains and ecovars of opportunistic pathogens. Opportunistic infections associated with medical intervention.

Serological reactions, their varieties, specificity, sensitivity, two-phase nature, reversibility. The mechanism of interaction of antigens and antibodies in serological reactions. The main components of serological reactions. Practical use of serological reactions: antigen identification, diagnostic detection of antibodies.

Content module 4. Immune system of the oral cavity.

Specific goals :

- Analyze the forms and types of immune response.
- Interpret the phases of the immune response.
- To draw conclusions about the use of microbial antigens in medical practice.
- Draw conclusions about the use of antibodies in medical practice.
- Interpret the involvement of immune system cells in the immune response and the immune response phase.

Topic 14. The immune system of the human body. Cellular and humoral factors. Immunoglobulins of the oral cavity.

The structure of the immune system.

Central organs of the immune system: thymus, bone marrow. Peripheral organs of the immune system: spleen, lymph nodes and lymphoid clusters associated with the mucous membrane. Immunocompetent cells. T-lymphocytes, ontogenesis. Subpopulations of T-lymphocytes: Th0, Th1, Th2, their comparative characteristics. Surface markers and receptors of these cells: CD4 + - lymphocytes (helpers), CD8 + - lymphocytes (cytotoxic, effector), their functions. B-lymphocytes, ontogenesis. B-lymphocyte subpopulations. Surface markers and receptors. Cooperation between immunocompetent cells in the process of forming an immune response. The concept of immunomodulators. Immunostimulants and immunosuppressants.

Topic 15. Immunopathological processes in the oral cavity.

Immunodeficiency states. Classification of immunodeficiency states at birth and acquired, primary and secondary.

Autoimmune processes. Autoimmune diseases associated with the violation of histohematological barriers for extrabarrier organs, cross-reactive antigens, impaired immunological tolerance due to dysfunction of the body's immune system in lymphoproliferative diseases and immune system defects. Principles and prospects of treatment of autoimmune diseases.

Topic 16. Factors of specific and nonspecific protection of the oral cavity.

Factors of nonspecific protection of the organism from microorganisms. Nonspecific factors of oral protection.

Barrier and antimicrobial properties of the skin, mucous membranes. Normal microflora. Reactivity of cells and tissues. Physico-chemical factors, function of excretory organs and systems.

Phagocytosis. The role of I. Mechnikov in the development of the doctrine of phagocytosis. Classification of phagocytic cells. The main stages of phagocytosis. Biochemical mechanisms of bacterial damage by phagocytes. Complete and incomplete phagocytosis. Methods of studying phagocytic activity: phagocytic index, phagocytic activity, phagocytic index. The importance of phagocytosis in the implementation of natural immunity and in the development of the immune response.

Killing system of the human body: natural killers, large granular lymphocytes (VGL), K-cells, LAC - cells (leukinactivated killers), their role in immunological surveillance of genetically (pathologically) altered cells of the human body.

Macrophages (migrating and tissue), granulocytes - neutrophils, eosinophils, basophils (migrating and tissue). Humoral factors of nonspecific protection: complement system, lysines, interferons, leukins, antiviral inhibitors, lysozyme, plakin, properdin, fibronectin, cytokines, etc.

Topic 17. Immunoglobulins as a product of humoral immune response.

Structure and functions of antibodies (immunoglobulins).

Constant and variable regions of H- and L-polyptide chains, domains. Structure of active centers of immunoglobulins. Heterogeneity of molecules. The concept of valence of antibodies. Fc - (cellular) receptors. The mechanism of interaction of antibodies with antigens. Classes of immunoglobulins, their structure and properties. Antigenic structure of immunoglobulins: isotype, allotypic, idiotypic determinants. Anti-idiotypic antibodies. Pathological immunoglobulins. Genetics of immunoglobulins. Autoantibodies. The concept of polyclonal and monoclonal antibodies. Principles of obtaining monoclonal antibodies. Hybridomas as producers of monoclonal antibodies.

Immunoglobulins of the oral cavity.

Topic 18. Allergies. Methods of allergy diagnosis. Immunopathological processes in the oral cavity. Assessment of the immune status of the oral cavity

Allergy. The concept of allergies. Allergens. Classification of allergic reactions according to Jel and Coombs. Allergic reactions of humoral (immediate) type - GNT. Reagin type of GNT. Development mechanism. Clinical manifestations: anaphylactic shock, urticaria, Quincke's edema. Atopy: bronchial asthma, hay fever. Cytotoxic type of GNT. Mechanism of development, clinical detection. Ways to prevent. Immunocomplex type of GNT. Development mechanism. Clinical detection. Diagnostic tests to detect humoral allergies. Allergic reactions of cellular (delayed) type - GUT. Mechanism of development, clinical forms of detection: infectious, contact allergy. Methods of detection of GUT, skin allergy tests. Clinical detection. Immunodiagnosics. Manifestations of allergic reactions in the oral cavity.

Comprehensive assessment of the immune status of the organism on the indicators of non-specific protection factors, the state of T- and B-systems. The role of assessing the immune status of the organism in the diagnosis of infectious diseases and pathology of the body's immune system.

Content module 5. Fundamentals of clinical microbiology of dental diseases.

Specific goals:

- Analyze the biological properties of pathogenic viruses for humans; biological properties of infectious agents and their relationship to the pathogenesis of the disease
- Know the role of viruses in human pathology; features of serological reactions used in virology, cell cultures in virology.
- Interpret methods of diagnosing viral infections and draw conclusions from research results;
- Analyze drugs used for the specific prevention of viral infections and inflammatory diseases of the oral cavity.

Topic 19. Combination of periodontitis with viral infections. Methods of virological diagnosis. Isolation and identification of viruses. Serological diagnosis of viral infections. Express - diagnostic methods.

Features of serological reactions used in virology. Method of paired sera. Features of viral diagnostics. Complement binding reaction and its application in virology. Reactions used exclusively in virology - hemagglutination and hemadsorption inhibition reaction, virus neutralization reaction.

Topic 20. Purulent - inflammatory diseases in dental practice (abscesses, phlegmons, thrombophlebitis, osteomyelitis). Septic conditions, microbiological diagnosis and prevention.

The role of microorganisms in the etiology and pathogenesis of dental diseases (pulpitis, periodontitis), periodontitis, oral mucosa, hard and soft tissues of the dental apparatus (abscesses, phlegmons, cysts, etc.). Lesions of the oral mucosa in various bacterial and viral infections. Fungal stomatitis. Methods of microbiological diagnosis of infectious pathology of the oral cavity.

Topic 21. Features of the microflora of the oral cavity in periodontitis with concomitant pathologies.

The role of microorganisms in the etiology and pathogenesis of dental diseases (pulpitis, periodontitis), periodontitis, oral mucosa, hard and soft tissues of the dental apparatus (abscesses, phlegmons, cysts, etc.). Lesions of the oral mucosa in various bacterial and viral infections. Fungal stomatitis. Methods of microbiological diagnosis of infectious pathology of the oral cavity.

Topic 22. Nosocomial infections in dental institutions. Coronaviruses. COVID-19. Virological diagnosis.

Microorganisms that most often cause nosocomial infection (staphylococci, streptococci, proteas, Escherichia coli, sera, salmonella, pseudomonads, Escherichia coli, vibrios, Citrobacter, Branchamela, Moraxella, Cloisteriosis, Mycobacterium, Mycobacterium, Mycobacterium, Mycobacterium, Mycobacteria, etc.). The most common pathology - wound infections, purulent-inflammatory processes of the skin, respiratory system, central nervous system, gastrointestinal tract, genitourinary system, eyes, ears, sepsis, septicemia.

Etiology, pathogenesis, clinical forms of nosocomial infection caused by obligate pathogenic microbes (nosocomial toxicoseptic salmonellosis, nosocomial cholenteritis, hepatitis B, adenoviral conjunctivitis, local and generalized forms of herpes and cytomegalovirus, cytomegalovirus and cytomegalovirus). Conditions for diagnosis of nosocomial infections. Criteria for the etiological role of microorganisms isolated in the bacteriological diagnosis of nosocomial infections.

Coronaviruses (family Coronaviridae). General characteristics and classification. The structure of the virion. Antigens. Cultivation. Sensitivity to physical and chemical factors. Biological properties. Role in human pathology. Laboratory diagnosis, specific prevention and treatment of COVID-19.

Topic 23. Retroviruses. Human immunodeficiency virus, properties, pathogenesis of HIV infection and AIDS, virological diagnosis. Prevention and treatment.

Retroviruses (family Retroviridae) General characteristics. Classification. Representatives of the subfamilies Oncovirinae, Lentivirinae. Human immunodeficiency virus (HIV). Morphology and chemical composition. Genome features. Variability, its mechanisms. Types of HIV. Origin and evolution. Cultivation, stages of interaction with sensitive cells. Sensitivity to physical and chemical factors.

Pathogenesis of HIV infection. Target cells in the human body, characteristics of surface receptors. The mechanism of immunodeficiency development. AIDS-associated pathology (opportunistic infections and tumors). Laboratory diagnostics. Chain polymerase reaction in the diagnosis of HIV infection and Western blot (immunoblot) - test. Treatment (etiologic, immunomodulatory, immunomodulatory agents). Prospects for specific prevention.

Topic 24. Hepatitis viruses. Virological diagnosis of hepatitis. Prevention of hepatitis during dental manipulations.

Hepatitis A virus (family Picornaviridae), features. Approaches to specific prevention of hepatitis A. Laboratory diagnosis of hepatitis A.

Hepatitis B virus (family Hepadnaviridae). History of study. The structure of the virion. Antigens: HBs is the surface antigen of Dane particles. Internal antigens: HBc, HBe, their characteristics. Sensitivity to physical and chemical factors. Features of the pathogenesis of the disease. Persistence. Immunity. Microbiological diagnostics, methods of detection and diagnostic value of markers of hepatitis B (antigens, antibodies, nucleic acids). Specific prevention and treatment.

Other pathogens of hepatitis: C, D, E, G, TTV, SENV, their taxonomic position, properties, role in human pathology, methods of laboratory diagnosis.

Topic 25. Herpes viruses. Herpetic lesions of the mouth. Virological diagnosis of herpes. Antiherpetic drugs.

Herpesviruses (family Herpesviridae). General characteristics and classification. The structure of the virion. Antigens. Cultivation. Sensitivity to physical and chemical factors.

Herpes viruses pathogenic to humans: b - herpesvirus of ordinary or simple herpes of the 1st and 2nd types, b - herpesvirus of chickenpox - shingles; in - cytomegalovirus herpesvirus (CMV); g - Epstein-Barr herpesvirus (EBV) - the causative agent of infectious mononucleosis, human cancer. Human herpes viruses of 6, 7, 8 types. Biological properties. Role in human pathology. The mechanism of persistence of herpes viruses. Laboratory diagnosis, specific prevention and treatment of herpes infections.

Topic 26. Methods and means of sterilization of dental material.

Sterilization, definition. Thermal methods (in an autoclave, oven). Chemical method of sterilization (gas and solutions). Filtration and radiation methods. Sterilization control.

Disinfection, definition. Methods (physical, chemical). Disinfectants, mechanism of action. Disinfection and sterilization of dental instruments.

Topic 27. Asepsis and antiseptics in the treatment of periodontitis.

The effect of chemical and physical environmental factors on microorganisms. Influence of temperature, reaction of environment, drying, radiation, ultrasound, atmospheric and osmotic pressures, chemicals of different classes. The mechanism of damaging action of these factors.

Antiseptics and asepsis. Development of scientific principles of antiseptics (I. Ziemelweiss, D. Lister). Antiseptics, mechanisms of action. Acquired resistance of microorganisms to antiseptics. Modern antiseptic drugs used in dental practice.

Content module 6. Microbiological bases of antimicrobial chemotherapy.

Specific goals :

- Analyze the phenomenon of microbial antagonism.
- Explain the effects of antibiotics on microbial cells.
- Evaluate methods for determining the sensitivity of microorganisms to antibiotics.
- Draw conclusions about the sensitivity of microorganisms to antibiotics.
- To interpret the mechanism of resistance of microorganisms to antibiotics.
- Explain the mechanism of complications of antibiotic therapy.

Topic 28. Antibiotics and chemotherapeutics. The main antimicrobial drugs in dental practice.

History of development of ideas of antimicrobial therapy. Periods of development of chemotherapy. Works by DL Romanovsky, P. Ehrlich, G. Domagko. Discovery of sulfonamides. Basic principles of rational chemotherapy. The concept of chemotherapeutic drug, chemotherapeutic index. Microbial antagonism, its mechanisms. Microbial antagonists are producers of antibiotics. II Mechnikov's doctrine of the physiological role of lactic acid bacteria in the intestine. History of the discovery of the first antibiotics: O. Fleming, Z. Waxman. Antibiotics, definition, biological role in nature. Principles of obtaining antibiotics. Classification of antibiotics by origin, chemical composition, mechanism and spectrum of antimicrobial action. Natural, semi-synthetic and synthetic antibiotics. The mechanism of action of antibiotics on the microbial cell. Antibiotics are inhibitors of cell wall peptidoglycan synthesis, protein synthesis, nucleic acids, as well as those that disrupt the function of the cytoplasmic membrane of bacteria and fungi. Bactericidal and bacteriostatic action of antibiotics. Units of measurement of antimicrobial activity of antibiotics. Methods for determining the sensitivity of bacteria to antibiotics. The concept of minimum inhibitory concentration. Antibiotic chart. Complications of antibiotic therapy. Dysbacteriosis.

Topic 29. Mechanisms of development of resistance of microorganisms to antibiotics.

Antibiotic-resistant, antibiotic-dependent and antibiotic-tolerant strains of bacteria. Natural and acquired resistance to antibiotics. Genetic and biochemical mechanisms of antibiotic resistance. The role of plasmids and transposons in the formation of drug resistance of bacteria. Ways to prevent the formation of bacterial resistance to antibiotics. Principles of rational antibiotic therapy. Intercellular communication in bacteria ("sense of quorum") and prospects for the creation of a new generation of antimicrobial drugs based on it. The value of the discovery of antibiotics (twentieth century) for the etiologic therapy of bacterial, spirochetal, fungal, protozoal infections. Requirements for antimicrobial chemotherapeutic drugs used in dental practice.

Topic 30. Immunoprophylaxis and immunotherapy of infectious diseases.

Development of the doctrine of immunoprophylaxis. E. Jenner, L. Pasteur, E. Bering, G. Ramon and others. Active and passive immunoprophylaxis. Drugs for active immunoprophylaxis. Modern classification of vaccines: live, inactivated, chemical, toxoids, subcomponent, genetically engineered, synthetic, anti - idiotypic, DNA - vaccines. Methods of manufacture, evaluation of efficiency and control. Associated vaccines. Adjuvants. Autovaccines, vaccine therapy.

Therapeutic and prophylactic immune sera, principles of their production, control, classification, use. Promising immunosuppressants.

The structure of the discipline

The distribution of study time by forms of study and types of classes according to the working curriculum is provided.

№	Topic	lecture	Practices	SEW	Individual SEW
<i>Content module 1. General characteristics of the microbiocenosis of the oral cavity.</i>					
1	Types of microscopes, modern methods of microscopic examination of microorganisms.			3	
2	Microbial colonization of the oral cavity.		3		
3	Characteristics of the microbiocenosis of the oral cavity of healthy individuals.		3		
4	Age-related changes in the microflora of the oral cavity.			3	
5	The main habitats of the oral cavity.			3	
<i>Content module 2. Morphology and structure of prokaryotes and parasitic unicellular eukaryotes of dental plaque.</i>					
6	Changes in the microflora of the oral cavity in pathological processes.		3		
7	Dental plaque as a microbiological factor of periodontal disease. Bacteriological method of dental plaque examination.		3		
8	Changes in the microbiological number of periodontal pockets in diseases of the oral cavity.		3		
9	Morphology and structure of gram-positive and gram-negative cocci and enterobacteria.			3	
10	Morphology and structure of spirochetes, actinomycetes, fungi, protozoa.			3	
<i>Content module 3. Periodontal disease.</i>					
11	Periodontal disease. Periodontopathogenic microorganisms.		3		
12	Microflora of combined periodontitis with gingivitis and periodontitis.		3		
13	Opportunistic periodontitis. Modern methods of rapid diagnosis of infectious diseases.		3		
<i>Content module 4. Immune system of the oral cavity.</i>					
14	The immune system of the human body. Cellular and humoral factors. Immunoglobulins of the oral cavity.			3	
15	Immunopathological processes in the oral cavity.			3	
16	Factors of specific and nonspecific protection of the oral cavity.			3	
17	Immunoglobulins as a product of humoral immune response.			3	
18	Allergies. Methods of allergy diagnosis. Immunopathological processes in the oral cavity. Assessment of the immune status of the oral cavity			3	
<i>Content module 5. Fundamentals of clinical microbiology of stomatological diseases.</i>					

19	Combination of periodontitis with viral infections. Methods of virological diagnosis. Isolation and identification of viruses. Serological diagnosis of viral infections. Express - diagnostic methods.		3		
20	Purulent - inflammatory diseases in dental practice (abscesses, phlegmons, thrombophlebitis, osteomyelitis). Septic conditions, microbiological diagnosis and prevention.			3	
21	Features of the microflora of the oral cavity in periodontitis with concomitant pathologies.			3	
22	Nosocomial infections in dental institutions. Coronaviruses. COVID-19. Virological diagnosis.			3	
23	Retroviruses. Human immunodeficiency virus, properties, pathogenesis of HIV infection and AIDS, virological diagnosis. Prevention and treatment.			3	
24	Hepatitis viruses. Virological diagnosis of hepatitis. Prevention of hepatitis during dental manipulations.			3	
25	Herpes viruses. Herpetic lesions of the mouth. Virological diagnosis of herpes. Antiherpetic drugs.			3	
26	Methods and means of sterilization of dental material.			3	
27	Asepsis and antiseptics in the treatment of periodontitis.			3	
<i>Content module 6. Microbiological bases of antimicrobial chemotherapy.</i>					
28	Antibiotics and chemotherapeutics. The main antimicrobial drugs in dental practice.		3		
29	Mechanisms of development of resistance of microorganisms to antibiotics			3	
30	Immunoprophylaxis and immunotherapy of infectious diseases.			3	
	Total		30	60	
Credits ESTS 3,0		Total SEW – 90 h.			

Thematic plan of practical classes

№	Topic	Quantity of hours
1.	Microbial colonization of the oral cavity.	3
2.	Characteristics of the microbiocenosis of the oral cavity of healthy individuals.	3
3.	Changes in the microflora of the oral cavity in pathological processes.	3
4.	Dental plaque as a microbiological factor of periodontal disease. Bacteriological method of dental plaque examination.	3
5.	Changes in the microbiological number of periodontal pockets in diseases of the oral cavity.	3
6.	Periodontal disease. Periodontopathogenic microorganisms.	3
7.	Microflora of combined periodontitis with gingivitis and periodontitis.	3
8.	Opportunistic periodontitis. Modern methods of rapid diagnosis of infectious diseases.	3
9.	Combination of periodontitis with viral infections. Methods of virological diagnosis. Isolation and identification of viruses. Serological diagnosis of viral infections. Express - diagnostic methods.	3
10.	Antibiotics and chemotherapeutics. The main antimicrobial drugs in dental practice.	3
	Total	30
	Credit	

Individual work

In accordance with the current provisions on the organization of the educational process, independent work of the student is one of the forms of the organization of training, the basic form of mastering educational material in free from mandatory training time on schedule. Independent work of university students regulated by the "Regulations on independent work of students of LNMU DanyloHalytskyi "dated 24.10.20, protocol №4.

Self-education work of students (CCFs) and its control

№	Topic	Quantity of hours	Control
1	Types of microscopes, modern methods of microscopic examination of microorganisms.	3	Current control
2	Age-related changes in the microflora of the oral cavity.	3	Current control
3	The main habitats of the oral cavity.	3	Current control
4	Morphology and structure of gram-positive and gram-negative cocci and enterobacteria.	3	Current control
5	Morphology and structure of spirochetes, actinomycetes, fungi, protozoa.	3	Current control
6	The immune system of the human body. Cellular and humoral factors. Immunoglobulins of the oral cavity.	3	Current control
7	Immunopathological processes in the oral cavity.	3	Current control
8	Factors of specific and nonspecific protection of the oral cavity.	3	Current control
9	Immunoglobulins as a product of humoral immune response.	3	Current control
10	Allergies. Methods of allergy diagnosis. Immunopathological processes in the oral cavity. Assessment of the immune status of the oral cavity	3	Current control
11	Purulent - inflammatory diseases in dental practice (abscesses, phlegmons, thrombophlebitis, osteomyelitis). Septic conditions, microbiological diagnosis and prevention.	3	Current control
12	Features of the microflora of the oral cavity in periodontitis with concomitant pathologies.	3	Current control
13	Nosocomial infections in dental institutions. Coronaviruses. COVID-19. Virological diagnosis.	3	Current control
14	Retroviruses. Human immunodeficiency virus, properties, pathogenesis of HIV infection and AIDS, virological diagnosis. Prevention and treatment.	3	Current control
15	Hepatitis viruses. Virological diagnosis of hepatitis. Prevention of hepatitis during dental manipulations.	3	Current control
16	Herpes viruses. Herpetic lesions of the mouth. Virological diagnosis of herpes. Antiherpetic drugs.	3	Current control
17	Methods and means of sterilization of dental material.	3	Current control
18	Asepsis and antiseptics in the treatment of periodontitis.	3	Current control
19	Mechanisms of development of resistance of microorganisms to antibiotics	3	Current control
20	Immunoprophylaxis and immunotherapy of infectious diseases.	3	Current control
	TotalSEW	60	

Individual educational and research task is one of the forms of organization university education, which aims to deepen, generalize and consolidate the knowledge gained by students in the learning process, as well as the application of this knowledge in practice. Individual tasks are performed by students

independently under the guidance of teachers. The purpose of the individual educational and research task is independent study of a part of the program material, systematization, deepening, generalization and practical application of the student's knowledge from the educational course, development of skills of independent work. The designed individual task has a title page, the content of the individual task, theoretical and practical component, conclusion, list of references. Disclosure of an individual task should have a practical focus, a connection with a specific object of activity in the field of medicine or dentistry. Registration of work is carried out according to requirements of regulatory (methodical) documents.

The section should reveal the forms of organization of individual tasks in the discipline and their topics. An individual educational and research task is performed if it is planned in the working curriculum for the academic year.

"Teaching methods": relevance of the subject, connection with related disciplines, practical skills, current control of students' preparation for classes using test tasks of the license exam "Step-1", the use of interactive methods: "Brainstorming", "Method of competitive groups" ", " Case method "and other educational technologies used to transfer and assimilate knowledge, skills and abilities.

The section **"Methods of control"** should contain a description of the content and technology of assessing student knowledge, namely - a list of all types of work that the student must perform during the current, final control, independent work, individual tasks and evaluation criteria.

Distribution of the points that students get

In the section should be indicated:

- **Types of the control** (current and final)
- **Form of the final control according to the curriculum** (test, credit)
- **Evaluation criteria**

Control measures include current and final semester control and certification of the graduates.

Current control is carried out during training sessions and aims at checking mastering educational material by students. Form of conducting current control during training sessions is determined by working curriculum on the subject.

Evaluation of current educational activity. In evaluating the mastering of each topic for current educational activity the student gets marks by 4-point (traditional) scale taking into account approved evaluation criteria for appropriate discipline. Herewith all types of work, provided by the curriculum, are taken into account. The student must get the mark for each theme. Assessment forms of current educational activity should be standardized and include control of theoretical and practical training. Put by the traditional assessment scale marks are converted into points.

For subjects which form of the final control is the test:

The maximum number of points that a student can get for current educational activity at studying a subject is 200 points.

The minimum number of points that a student should get for current educational activity for admission the subject is 120 points.

Calculating the number of points is based on received by the student marks by the traditional scale while studying a subject during the semester, by calculating the average arithmetic (AA), rounded to two decimal places. The resulting mark is converted into points for multipoint scale as follows:

$$x = AA \times 200/5$$

Table 1

Conversion of the average mark for current activity in multipoint scale for the disciplines that ends with the test (differentiated test)

4- бальна шкала	200- бальна шкала
5	120
4.95	119
4.91	118
4.87	117
4.83	116
4.79	115
4.75	114
4.7	113
4.66	112
4.62	111
4.58	110
4.54	109
4.5	108

4- бальна шкала	200- бальна шкала
4.45	107
4.41	106
4.37	105
4.33	104
4.29	103
4.25	102
4.2	101
4.16	100
4.12	99
4.08	98
4.04	97
3.99	96
3.95	95

4- бальна шкала	200- бальна шкала
3.91	94
3.87	93
3.83	92
3.79	91
3.74	90
3.7	89
3.66	88
3.62	87
3.58	86
3.54	85
3.49	84
3.45	83
3.41	82

4- бальна шкала	200- бальна шкала
3.37	81
3.33	80
3.29	79
3.25	78
3.2	77
3.16	76
3.12	75
3.08	74
3.04	73
3	72
Менше 3	Недос- татньо

Independent work of students is evaluated during the current control of theme in the appropriate class. Mastering of themes which are submitted only to the independent work is controlled at the final control.

Final control is carried out to assess the results of study on a particular educational qualification level and on some of its completed stages by the national scale and scale ECTS. Final control includes semester control and students certification.

Semester control is carried out in the forms of semester exam or test (differentiated test) from a specific discipline in the volume of educational material, determined by the working program on the discipline and in terms determined by the working curriculum, individual curriculum of the student.

Semester (differentiated) test is a form of final control, which is to evaluate mastering the academic material on certain discipline by the student solely on the basis of performance of all kinds of educational works provided by the working curriculum. Semester (differentiated) test is evaluated by the results of current control.

Semester exam is a form of final control of mastering by the student theoretical and practical material on a single discipline per semester, carried out as a control measure. Student is considered to be admitted to the semester exam on the discipline, if he has visited all provided by the curriculum on the discipline lecture classes, fulfilled all kinds of works, provided by the working curriculum on this discipline and in its study during the semester got not less than the minimum number of points (72 points).

Semester exam is conducted in writing during the examination session, as scheduled. The form of the exam must be standardized and include control of theoretical and practical training.

The maximum number of points that a student can get in the exam is 80.

The minimum number of points in the exam is at least 50.

Determination of the number of points that a student got from the discipline

Mark of the discipline, culminating in the exam is defined as the sum of points for current educational activity (at least 72) and points for the exam (at least 50).

Mark of the disciplines, which form of the final control is differentiated test is based on the results for current educational activity and is calculated in points, according to the table 1.

Mark of the disciplines, which form of the final control is test (differentiated test), is based on the results of current educational activity and is expressed by two-point scale "Passed" or "Not passed". To enroll a student must get for current educational activity at least 60% of the maximum amount of points in the discipline (120 points).

Points of the discipline irrespectively are converted regardless both in scale ECTS, and in a 4-point scale. Points of the ECTS scale into 4-point scale are not converted and vice versa.

Points of the students, who study in one specialty, including the number of points gained in the discipline, are ranked on a scale ECTS as follows:

Table 2

Points ECTS	Statistical index
A	The best 10 % of students
B	Next 25 % of students
C	Next 30 % of students
D	Next 25 % of students
E	The last 10 % of students

Points of the discipline for students who successfully completed the program are converted into traditional 4-point scale by absolute criteria that are presented in the table below:

Table 3

Points of the discipline	Mark by 4-point scale
From 170 till 200 points	5
From 140 till 169 points	4
From 139 points till minimum quantity of points, that a student should get	3
Lower than minimal quantity of points, that a student should get	2

Points ECTS are not converted in traditional scale as the scale ECTS and four-point scale are independent.

Objectivity of students' educational activities evaluation is tested by statistical methods (correlation coefficient between the points ECTS and national scale mark).

List of practical skills for the credit.

1. Conduct microscopy of the drug using an immersion object, to draw conclusions about the morphological properties of the studied microorganisms.
2. Prepare a bacterial preparation from dental plaque, paint according to the Gram method, perform microscopy using an immersion lens, make a conclusion about the purity of the studied culture of microorganisms, its morphotinctorial properties.
3. Sow a curtain of bacteria on the IPA plate in order to isolate a pure culture of microorganisms. Justify the next course of research.
4. Describe the cultural properties of colonies of microorganisms that have grown on the surface of IPA. Assess the purity of the selected culture.
5. Explain the essence of the use of differential diagnostic media to study the glycolytic and proteolytic properties of microorganisms. To take into account the biochemical properties of the selected culture of bacteria, to identify it.
6. Conduct a microscopic examination of dental plaque. To draw a conclusion about the state of the microflora of the oral cavity.
7. Prepare the preparation from plaque. Describe the microscopic picture. Conclude.
8. Explain the essence of serological identification of microorganisms. Choose drugs that are used for this purpose. Principles of their receipt.
9. Explain the essence of serological diagnosis of infectious diseases. Choose drugs that are used for this purpose, their receipt.
10. Carry out bacterioscopic diagnosis of periodontitis.
11. Choose the method of cultivation, based on the properties of a particular virus.
12. Carry out primary treatment of clinical material for virus isolation
13. Choose a method and infect a chicken embryo
14. Select a cell culture to isolate a specific virus to conduct infection of cell culture.
15. Detect the virus in the chicken embryo, put the hemagglutination reaction
16. To carry out the account, to establish a hemagglutination titer of a virus
17. Detect the virus in cell culture, determine the nature of the cytopathogenic action of the virus.
18. To put the reaction of hemagglutination delay, to take it into account, to make a conclusion about the type and type of virus.
19. To take into account the reaction of neutralization of JRS on color breakdown to draw a conclusion about the type of virus.
20. To account for the reaction of enzyme-linked immunosorbent assay for the detection of virus antigens. Make a conclusion based on the results of the study
21. To take into account the reaction of enzyme-linked immunosorbent assay for the detection of antiviral antibodies of certain classes. Make a conclusion based on the results of the study.
22. Read the results of the analysis of studies of markers of viral hepatitis and draw conclusions about the type of virus, form and stage of the disease.

List of questions to be submitted to the final (current). Control

1. The main differences between prokaryotic and eukaryotic microorganisms. Forms of bacteria with a defect in cell wall synthesis (protoplasts, spheroplasts, L-forms of bacteria).

2. Morphology of bacteria. The role of individual structures for bacterial activity and in the pathogenesis of infectious diseases.
3. Classification and morphology of protozoa.
4. Classification and morphology of fungi.
5. Methods of microscopy.
6. Manufacture of bacteriological drugs. Dyes and auxiliary reagents. Simple and complex methods of painting.
7. Bacterioscopic method of research. Stages.
8. Types and mechanisms of nutrition of microorganisms. Mechanisms of penetration of nutrients into the bacterial cell. Chemical composition of microorganisms, values of constituent components.
9. Nutrient media, requirements for them. Classification of nutrient media used in microbiology.
10. Respiration of microorganisms. Aerobic and anaerobic types of respiration. Enzymes involved in the process of respiration; cell structures where respiratory enzymes are localized. Methods of culturing anaerobic bacteria.
11. Enzymes of microorganisms, their role in metabolism. Use for identification and differentiation of bacteria. Pathogenicity enzymes.
12. Growth and reproduction of bacteria. Mechanism of cell division, phases of reproduction of bacterial culture in stationary conditions.
13. Bacteriological method of research. Principles, methods and stages of isolation of pure cultures of bacteria and their identification.
14. The influence of physical, chemical and biological factors on microorganisms /
15. Sterilization, methods and means of sterilization. Sterilization efficiency control. Asepsis. Antisepsis.
16. Methods of sterilization of dental instruments.
17. Chemotherapy and chemotherapeutic drugs. Chemotherapeutic index. The mechanism of antibacterial action of sulfonamides.
18. Chemotherapeutic antimicrobial drugs used in dental practice.
19. The phenomenon of microbial antagonism. The role of domestic microbiologists in the development of the doctrine of microbial antagonism.
20. Antibiotics, characteristics, principles of production, units of measurement. Classification by mechanism of action on microorganisms.
21. Drug resistance of microbes, the mechanism of formation of stable forms. Methods for determining the sensitivity of microbes to antibiotics. Minimum inhibitory (MPC) and minimum bactericidal (MBC) concentrations. Practical meaning. Principles of combating drug resistance of microorganisms.
22. Infection. Factors that cause the infectious process. The role of microorganisms in the infectious process.
23. Pathogenicity, virulence, units of measurement, methods of determination. Factors of pathogenicity of microorganisms, their characteristics.
24. The role of macroorganisms in the infectious process. The influence of the environment and social conditions on the emergence and development of the infectious process in humans. Persistence of bacteria and viruses.
25. The doctrine of immunity. Stages of development of immunology. Types and forms of this manifestation.
26. Normal microflora of the human body, its role in physiological processes and the emergence of human pathology. Age features of the normal microflora of the nose, skin, mouth, genitals, intestines. Gnotobiology. Dysbacteriosis and its causes.
27. Normal microflora of the oral cavity. Its role in the human body. Changes in the microflora depending on age, health, tooth loss, etc.
28. Drugs for biocorrection of dysbiotic changes in the oral cavity.
29. Nonspecific factors of protection of an organism against pathogenic microbes. Complement, its properties, ways of activation. Phagocytosis, types of phagocytic cells. Stages of phagocytosis. Complete and incomplete phagocytosis.
30. Nonspecific factors of protection of an oral cavity.
31. The body's immune system, its organs. The role of the thymus gland in the immune response. Cells of the immune system, their varieties (T-, B-lymphocytes and macrophages). their role in cellular and humoral immunity.
32. Forms of the body's immune response. Immunological tolerance, causes of its occurrence. Immunological memory, its mechanism.
33. Classes of immunoglobulins, their characteristics. Immunoglobulins of the oral cavity.
34. Serological reactions, their phenomena. Practical use.

35. Agglutination reaction, its mechanism, varieties.
36. Reaction of precipitation, its mechanism. Use in medical practice. Gel precipitation reaction.
37. Lysis reactions. Complement binding reaction, its practical use.
38. Reactions with labeled antibodies or antigens. Principles and use of immunofluorescence reactions (RIF), enzyme-linked immunosorbent assay and radioimmunoassay.
39. Hypersensitivity reactions. their types, mechanism of development. The concept of sensitization and desensitization. Allergic manifestations in the oral cavity.
40. Immunodeficiency condition. Primary and secondary immunodeficiencies. Autoimmune diseases.
41. Comprehensive assessment of the immune status of the organism. Diagnosis of immunopathological conditions
42. Vaccines. History of receipt. Classification of vaccines. Corpuscular, chemical, synthetic, genetically engineered and idiotypic vaccines.
43. Immune sera. Purpose, composition, principle of receipt, use.
44. The evolution of cocci, their general characteristics. Staphylococci, biological properties, classification, practical significance.
45. The role of staphylococci in the development of human pathology, the pathogenesis of the processes caused by them. Characteristics of toxins and pathogenic enzymes. Role in the occurrence of nosocomial infection.
46. Methods of microbiological diagnosis of staphylococcal processes and their evaluation. Immunity in staphylococcal diseases. Drugs for specific prevention and therapy, evaluation.
47. Streptococci, biological properties, classification. Toxins, enzymes of pathogenicity.
48. Streptococci. Role in the development of human pathology. Pathogenesis of streptococcal diseases. Toxins and enzymes of pathogenicity of streptococci. Immunity. Methods of microbiological diagnosis of streptococcal diseases
49. Oral streptococci. Cariogenic streptococci. Biological properties, mechanism of caries development
50. Streptococcus pneumoniae, biological properties. Pathogenicity to humans and animals. Microbiological diagnosis of pneumococcal diseases.
51. Meningococci, biological properties, classification. Pathogenesis and microbiological diagnosis of meningococcal diseases and bacteriocarriers. Differentiation of meningococci from gram-negative diplococci of the nasopharynx.
52. Gonococci. Biological properties, pathogenesis and microbiological diagnosis of diseases. Prevention and specific therapy of gonorrhea and blenorrhea.
53. Neisseria of the oral cavity. Role in the development of pathological processes.
54. Enterobacteria, their evolution. Significance in the development of human pathology. Microbiological diagnosis of choleenteritis. Escherichia, their properties. Pathogenic serovars of Escherichia coli, their differentiation. Microbiological diagnosis of coli-enteritis.
55. General comparative characteristics of anaerobic bacteria, their importance in the development of pathological processes. Features of microbiological diagnosis of diseases caused by anaerobes. Anaerobic non-clostridial bacteria of the oral cavity.
56. Mycoplasmas, classification. Biological properties, cultivation methods. Role in the development of human pathology. Microbiological diagnosis of mycoplasmosis.
57. Chlamydia, classification, biological properties. Cultivation methods. Role in the development of human pathology. Microbiological diagnosis of chlamydia.
58. Modern methods of laboratory diagnosis of infectious diseases.
59. Pathogenic fungi and actinomycetes (pathogens of candidiasis, dermatomycosis, actinomycosis, their characteristics). Principles of microbiological diagnosis of mycosis.
60. Actinomycosis of the oral cavity. Diagnosis, treatment.
61. Conditionally pathogenic microorganisms, biological properties, etiological role in the development of opportunistic infections. Characteristics of diseases caused by opportunistic pathogens.
62. Nosocomial infection, conditions of its occurrence. Properties of hospital ecovars of microorganisms. Microbiological diagnosis of purulent-inflammatory, burn infections and wound infections caused by hospital strains.
63. Normal microflora of the human body, its role in physiological processes and the emergence of human pathology. Age features of the normal microflora of the nose, skin, mouth, genitals, intestines. Gnotobiology. Dysbacteriosis and its causes.
64. The role of microorganisms in the etiology and pathogenesis of diseases of the teeth (pulpitis, periodontitis), periodontium, oral mucosa, hard and soft tissues of the dental apparatus (abscesses, phlegmons, cysts, etc.).
65. Nonspecific factors of protection of the oral cavity and immunoglobulins.

66. Microflora of dental plaque, its role in the development of dental caries.
67. Lesions of the oral mucosa in various bacterial and viral infections. Fungal stomatitis.
68. Methods of microbiological diagnosis of infectious pathology of the oral cavity.
69. Nosocomial infection, conditions of its occurrence. Properties of hospital ecovars of microorganisms. Microbiological diagnosis of purulent-inflammatory, burn infections and wound infections caused by hospital strains.
70. Methods of culturing viruses.
71. Features of the pathogenesis of viral infections.
72. Features of immunity at viral infections. The value of cellular immunity. Andkipernyh reactions. Interferons as antiviral factors. Therapeutic drugs of interferons, methods of production.
73. Serological reactions in virology. Hemagglutination delay reaction, biological neutralization reaction JRS neutralization reaction.
74. The value of methods of immunoluminescent, radioimmune and enzyme-linked immunosorbent assay methods of virology.
75. Methods of virological diagnosis. Isolation and identification of viruses
76. Serological diagnosis of viral infections. Research of paired sera, methods of detection of classes of specific antibodies and their value.
77. Methods of genodiagnostics of viral infections. Polymerase chain reaction in the diagnosis of viral infections.
78. Prevention of viral infections. The main types of antiviral vaccines.
79. Chemotherapy of viral infections. The main groups of drugs.
80. Coronaviruses. COVID-19. Epidemiology, pathogenesis, virological diagnosis, prevention and treatment.
81. Retroviruses. Human immunodeficiency virus. The structure of the virion. Genome structure, mechanism of reproduction. Epidemiology and pathogenesis. The mechanism of immunodeficiency development. Opportunistic infections in HIV-AIDS. Methods of diagnosis of HIV-AIDS. Drugs for treatment
82. Hepatitis viruses. Hepatitis A, E. Paraenteric hepatitis B, C, D, G, PP. Epidemiology, pathogenesis, virological diagnosis, prevention.
83. Herpes viruses, classification, features of pathogenesis, persistence. Epidemiology, pathogenesis, virological diagnosis, antiviral treatment.
84. Herpetic lesions of the oral cavity. Diagnosis, treatment.

Recommended literature

Literature

Basic literature:

1. Medical microbiology, virology and immunology = Медична мікробіологія, вірусологія та імунологія : a textbook for English-speaking students of higher medical schools: translation from ukr. Published / [T.V. Andrianova, V.V. Bobyr, V.V. Danylichenko, ect.] ed. by V. P. Shyrobokov. Vinnytsia: Nova Knyha, 2019. - 744 p. : ill.
2. Medical microbiology and immunology = Медична мікробіологія та імунологія : підручник / Тимків М. З., Корнійчук О. П., Павлій С. Й. [та ін.]. – Вінниця : Нова Книга, 2019. – 416 с.
3. Richard J. Lamont and Howard F. Wiley Oral Microbiology at a Glance, 1st ed.. – Blackwell Jenkinson, 2010.
4. Fritz H. Kayser, Kurt A. Bienz, Johanenes Eckert, Rolf M. Zinkernagel Medical Microbiology. – Thieme, 2010. – P. 4 – 6, 146 - 148.
5. Ananthanarayan and Paniker's Textbook of Microbiology.- 7th ed.-N.Y., 2005.- P. 7 – 24.

Additional literature

6. Lakshman P., Samaranyake Essential Microbiology for Dentistry. – 3ed ed. – Elsevier Limitid, 2006. – P. 7 – 15.
7. Philip D. Marsh, Michael V. Martin Oral Microbiology Text and Evolve eBooks Package, 5th ed. – FRCPath FFGPDCS (UK), 2009.
8. Jawetz Melnick & Adelbera's Medical Microbiology.- 25th ed.- Mc Graw Hill Medical, 2010. – P. 8 - 13, 39.
9. Michael J. Pelczar, JR, E.C.S. Chan, Noel R. Krieg Microbiology. – 5th ed. – Tata McGraw-Hill Publishing Company Limited, 2002.- P.50 – 99.
10. Kathleen Park Talaro, Arthur Talaro Foundations in Microbiology.- 4th ed.- Mc Graw Hill, 2002.- P. 8 – 9, 18 – 21, 70 – 79, 87 – 107.

Information resources

World health organization <http://www.who.int/en/>

Microbiology and immunology on-line <http://www.microbiologybook.org/>

On-line microbiology note <http://www.microbiologyinfo.com/>

Centers for diseases control and prevention www.cdc.gov

The Microbiology Society <https://www.microbiologyresearch.org/>