

*Summary of the working program of the academic discipline*

**«IMMUNOLOGY-CLINICAL IMMUNOLOGY»**

General Educational Program of higher education **31.05.03 DENTISTRY**

Department: **EPIDEMIOLOGY, MICROBIOLOGY AND EVIDENCE-BASED MEDICINE**

**1. The purpose of mastering the discipline:** participation in forming *the relevant competencies* UC–1, UC-8, GPC-5, GPC-9, PC-6.

**2. Position of the academic discipline in the structure of the General Educational Program (GEP).**

**2.1.** The discipline "Immunology – clinical immunology" refers to the core part of Block 1 of GEP HE (B1.O.19).

The discipline is taught in 3 and 4 semester II year of study.

**3. Deliverables of mastering the academic discipline and metrics of competence acquisition**

Mastering the discipline aims at acquiring the following universal (UC) or/and general professional (GPC) or/and professional (PC) competencies

№	Competence code	The content of the competence (or its part)	Code and name of the competence acquisition metric	As a result of mastering the discipline, the students should:		
				Know	Be able to	Possess
1.	UC-1	Able to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy	1.1 Knows: methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis 1.2 Able to: gain new knowledge based on analysis, synthesis, etc.; collect data on complex scientific problems related to the professional field; search for information and solutions based on action, experiment and experience 1.3 Has practical experience: re-searching the problem of professional activity using analysis, synthesis and other methods of intellectual activity; devel-	-methods of critical analysis -safety regulations and work in physical, chemical, biological laboratories, with reagents, devices, animals; -dissemination of information in medical and biological systems, use of information computer systems in medicine and healthcare; -biosphere and ecology, the phenomenon of parasitism and bioecological diseases; -classification, morphology and physiology of microorganisms and viruses, their impact on the health of children and adolescents; the spread of microbes, their impact on human health. Ecology of microorganisms, their role in the circulation of substances. - methods of microbiological diagnostics -the use of basic antibacterial, antiviral and biological drugs	- be able to apply critical analysis methods -be able to apply safety regulations -to carry out sampling, labeling and arrange for the direction of biological material from the patient and habitat objects for microbiological examination; -interpret the results of the most common methods of laboratory and functional diagnostics; -to justify from microbiological positions the choice of material for research during the diagnosis of infectious diseases; use physical, chemical and biological equipment; work with magnifying equipment (microscopes, optical and simple magnifiers);	- critical analysis skills -work skills in compliance with safety regulations --basic information conversion technologies: text, tabular editors, Internet search skills of making a preliminary diagnosis based on the results of laboratory and instrumental examination of children and adolescents; -information on the principles of sterilization, disinfection and antiseptic treatment of instruments and equipment in order to avoid infection of the doctor and patient; -skills of making preliminary diagnosis based on the results of laboratory and instrument

			oping an action strategy to solve professional problems		-use educational, scientific, popular science literature, the Internet for professional activities;	examination.
2.	UC-8	Able to: create and maintain safe living conditions in everyday and professional life for the preservation of the natural environment, ensuring sustainable development of society, including in the case of a threat and occurrence of emergency situations and military conflicts	8.1 Knows: factors of harmful influence on vital activity; algorithms of actions in case of emergencies and military conflicts 8.2 Able to: identify dangerous and harmful factors within the framework of its activities, create and maintain safe living conditions in everyday and professional life 8.3 Has practical experience in: participation in planned exercises to work out the rules of conduct in case of emergencies, first aid; complies with safety regulations at the workplace	- factors of harmful influence on vital activity - safety regulations and work in physical, chemical, biological laboratories, with reagents, devices, animals; - dissemination of information in medical and biological systems, use of information computer systems in medicine and healthcare; - biosphere and ecology, the phenomenon of parasitism and bioecological diseases; - classification, morphology and physiology of microorganisms and viruses, their impact on the health of children and adolescents; - the spread of microbes, their impact on human health. Ecology of microorganisms, their role in the circulation of substances. - methods of microbiological diagnostics - the use of basic antibacterial, antiviral and biological drugs	- identify harmful factors of vital activity - to carry out sampling, labeling and arrange for the direction of biological material from the patient and habitat objects for microbiological examination; - interpret the results of the most common methods of laboratory and functional diagnostics; - to justify from microbiological positions the choice of material for research during the diagnosis of infectious diseases; - use physical, chemical and biological equipment; - work with magnifying equipment (microscopes, optical and simple magnifiers); - use educational, scientific, popular science literature, the Internet for professional activities;	- skills of professional activity in compliance with safety regulations at the workplace - skills of making a preliminary diagnosis based on the results of laboratory and instrumental examination of children and adolescents; - information on the principles of sterilization, disinfection and antiseptic treatment of instruments and equipment in order to avoid infection of the doctor and patient;
3.	GPC-5	Able to conduct an examination of the patient in order to establish a diagnosis in solving professional problems	5.1 Knows the methodology for collecting anamnesis of life and diseases, complaints from children and adults (their legal representatives); 5.2 Is able to: collect complaints, anamnesis of life and disease in children and adults (their legal representatives), identify risk factors and causes of diseases; 5.3 Has practical	methods of examination and physical examination; clinical picture, methods of diagnosis of the most common diseases; methods of laboratory and instrumental studies to assess the state of health, medical indications for research, rules for interpreting their results; international statistical classification of diseases and health-related problems (ICD); conditions requiring urgent medical care - risk factors for the occurrence of infectious diseases; a plan for laboratory, instrumental and addition-	apply methods of examination and physical examination of children and adults; interpret the results of examination and physical examination of children and adults; diagnose the most common pathology in children and adults; send children and adults to laboratory, instrumental and additional studies in accordance with the current procedures for providing dental medical care,	skills of examination and physical examination of children and adults; diagnosis of the most common diseases in children and adults; identification of risk factors for major oncological diseases; formulation of a preliminary diagnosis, drawing up a plan for instrumental, laboratory, additional studies, consultations of specialist doctors; re-

			<p>cal experience in: collecting complaints, anamnesis of life and diseases in children and adults (their legal representatives), identifying risk factors and causes of diseases;</p>	<p>al studies in children and adults in accordance with the procedures for providing medical care, clinical recommendations, taking into account the standards of medical care;</p> <p>-fundamentals of differential diagnosis of diseases; recognition of conditions arising from sudden acute diseases, exacerbation of chronic diseases without obvious signs of a threat to the patient's life and requiring urgent medical care</p> <p>- clinical signs of sudden acute diseases, conditions, exacerbations of chronic diseases without obvious signs of life-threatening, requiring urgent medical care</p>	<p>clinical recommendations, taking into account the standards of medical care; send children and adults for consultations with specialist doctors in accordance with the procedures for providing medical care, clinical recommendations, taking into account the standards of medical care; interpret and analyze the results of consultations by specialist doctors for children and adults; interpret and analyze the results of basic (clinical) and additional (laboratory, instrumental) examination methods; carry out differential diagnosis of diseases in children and adults;</p>	<p>ferral of patients to instrumental, laboratory, additional studies, consultations of specialist doctors in accordance with the current procedures for providing medical care, clinical recommendations, taking into account the standards of medical care; interpretation of data from additional (laboratory and instrumental) examinations of patients; making a preliminary diagnosis in accordance with the international statistical classification of diseases and health-related problems (ICD);</p>
4.	GPC-9	GPC-5. Able to assess morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems	<p>5.1 Knows: anatomy, histology, embryology, topographic anatomy, physiology, pathological anatomy and physiology of human organs and systems</p> <p>5.2 Able to: evaluate the basic morphological and functional data, physiological conditions and pathological processes in the human body</p> <p>5.3 Has practical experience in: assessment of basic morphological and functional data, physiological conditions and pathological processes in the human body when solving professional problems</p>	<p>-safety regulations and work in physical, chemical, biological laboratories, with reagents, devices, animals;</p> <p>-pathological anatomy and physiology of human organs and systems, possible pathological processes associated with the vital activity of microorganisms, the effect of enzymes and toxins of bacteria on homeostasis-the main disciplines for assessing pathological processes in the human body</p> <p>-biosphere and ecology, the phenomenon of parasitism and bioecological diseases; classification, morphology and physiology of microorganisms and viruses, their impact on the health of children and adolescents;</p> <p>-the spread of microbes, their impact on human health. Ecology of microorganisms, their role in the circulation of substances.</p> <p>methods of microbiologi-</p>	<p>to evaluate the main morphofunctional data, physiological conditions and pathological processes in the human body associated with contamination by pathogenic microorganisms, including viruses and fungi to use laboratory equipment;</p> <p>work with magnifying equipment;</p> <p>interpret the results of the most common methods of laboratory and functional diagnostics, thermometry to identify pathological processes in the organs and systems of patients;</p> <p>evaluate the main pathological processes in the human body</p> <p>-to carry out sampling, labeling and arrange for the direc-</p>	<p>assessment of the main morphofunctional data, physiological conditions and pathological processes in the human body when solving professional tasks, diagnosis of infectious lesions of the human skin and mucous membranes during the examination of the patient</p> <p>-skills to assess the main pathological processes in the human body</p> <p>-information on the principles of sterilization, disinfection and antiseptic treatment of instruments and equipment in order to avoid infection of the doctor and patient;</p> <p>-skills of making preliminary diagn-</p>

				<p>cal diagnostics</p> <ul style="list-style-type: none"> <li>-the use of basic antibacterial, antiviral and biological drugs</li> <li>- the nature of the pathological process and its clinical manifestations, the principles of pathogenetic therapy of the most common diseases, in particular dental;</li> </ul>	<p>tion of biological material from the patient and habitat objects for microbiological examination;</p> <ul style="list-style-type: none"> <li>-interpret the results of the most common methods of laboratory and functional diagnostics;</li> </ul>	<p>sis based on the results of laboratory and instrumental examination.</p>
5.	PC-6	<p>readiness to collect, analyze complaints and other information from the patient (relatives/legal representatives), data from his anamnesis, interpretation of examination results, laboratory, instrumental, pathological-anatomical and other studies in order to recognize the state or establish the fact of the presence or absence of a dental disease, symptoms, syndromes of dental diseases, the establishment of nosological forms in accordance with the International statistical classification of diseases and health-related problems and other regulatory documents of the Ministry of Health of the</p>	<p>6.1 Knows: The methodology for collecting complaints and anamnesis from patients (their legal representatives). The procedure for providing medical care to children with dental diseases</p> <p>6.2. Able to: interpret the results of the examination, laboratory, instrumental, pathoanatomical and other studies in order to recognize the condition or establish the presence or absence of a dental disease, symptoms, syndromes of dental diseases, the establishment of nosological forms in accordance with the International Statistical Classification of Diseases</p> <p>6.3 Has practical experience: interpretation of the results of examination, laboratory, instrumental, pathoanatomical and other studies in order to recognize the condition or establish the presence or absence of a dental disease.</p>	<ul style="list-style-type: none"> <li>- methods of physical examination of patients (examination, palpation, percussion, auscultation).</li> <li>- the procedure for providing medical care to adults with dental diseases</li> <li>rules of work and safety in physical, chemical, biological and clinical laboratories, with reagents, devices, animals;</li> <li>the chemical-biological essence of the processes occurring in a living organism at the molecular and cellular levels;</li> <li>biosphere and ecology the phenomenon of parasitism and bioecological diseases;</li> <li>- classification, morphology and physiology of microorganisms and viruses, their impact on human health;</li> <li>- microbiology of the oral cavity;</li> <li>methods of microbiological diagnostics; the use of basic antibacterial, antiviral and biological drugs;</li> <li>scientific principles of sterilization, disinfection and antiseptic treatment to avoid infection when working in dental practice;</li> <li>clinical recommendations on the provision of medical care to patients with dental diseases</li> <li>Standards of medical care (The procedure for providing medical care, the Standard of medical care, Clinical recommendations on the provision of medical care, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- use laboratory equipment;</li> <li>work with magnifying equipment;</li> <li>interpret the results of the most common methods of laboratory and functional diagnostics, thermometry to identify pathological processes in the organs and systems of patients;</li> <li>to substantiate the nature of the pathological process and its clinical manifestations, the principles of pathogenetic therapy of the most common diseases, in particular dental; To develop a treatment plan for children and adults with dental diseases in accordance with the procedures for providing medical care, clinical recommendations, taking into account the standards of medical care.</li> </ul>	<ul style="list-style-type: none"> <li>- medico-functional conceptual apparatus;</li> <li>methods of sterilization, disinfection and antiseptic treatment;</li> <li>information on the principles of sterilization, disinfection and antiseptic treatment of instruments and equipment in order to avoid infection of the doctor and patient;</li> <li>skills of making a preliminary diagnosis based on the results of laboratory and instrumental examination of patients; development of a treatment plan for children and adults with dental diseases, taking into account the diagnosis, age and clinical picture in accordance with current medical care procedures, clinical recommendations, taking into account the standards of medical care</li> <li>determination of symptoms, syndromes of dental diseases, establishment of nosological forms in accordance with the International Statistical Classification of Diseases</li> </ul>

		Russian Federation				and Health-related Problems and other regulatory documents of the Ministry of Health of the Russian Federation
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#### 4. Volume of the academic discipline and types of academic work

Total labor intensity of the discipline is 3 CU (108 AH)

Type of educational work	Labor intensity		Labor intensity (AH) in semesters	
	volume in credit units (CU)	volume in academic hours (AH)	3	4
<b>Classroom work, including</b>	<b>1,8</b>	<b>66</b>	<b>34</b>	<b>32</b>
Lectures (L)		14	8	6
Practicals (P)		52	26	26
Seminars (S)				
Laboratory practicum (LP)				
Student's individual work (SIW)	<b>1,2</b>	<b>42</b>	<b>20</b>	<b>22</b>
Mid-term assessment				
credit/exam ( <i>specify the type</i> )				<b>test</b>
<b>TOTAL LABOR INTENSITY</b>	<b>3</b>	<b>108</b>	<b>54</b>	<b>54</b>

#### 5. Sections of the discipline and competencies that are formed

№	Competence code	Section name of the discipline	The content of the section in teaching units
1.	UC-1, UC-8, GPC-5, GPC-9, PC-6	General immunology. Immunity of the oral cavity.	<p>The concept of immunity. Types and forms of immunity. Antigens as carriers of structural foreignness and inducers of immunological conflict. Basic differences between antigen-dependent and antigen-independent (innate) immunity. Schematic diagram of the immune response (from induction to implementation). The concept of humoral, cellular immunity and their effectors. Immunological memory. Immunological tolerance.</p> <p>Cells of the immune system. CD antigens. The main functional variants of T-lymphocytes.</p> <p>Central (primary) organs of the immune system. The results of antigen-independent differentiation of lymphocytes in the central organs of immunity (cloning, auto-tolerance, functional maturation of lymphocytes).</p> <p>Peripheral (secondary) organs/tissues of the immune system. Results of antigen-dependent activation of lymphocytes in peripheral lymphoid tissue (immunogenesis). Lymphocyte recirculation as the basis of the functional unity of the immune system.</p> <p>Antigens. Structure of antigenic specificity. Complete and incomplete antigens. Submolecular organization of the antigen. The nature and sources of antigens. Structural and functional features of B- and T-epitopes. The concept of conformational and sequential (linear) epitopes. The relationship of antigens with antigen-presenting cells (processing of T-dependent antigens). T-dependent and T-independent antigens.</p> <p>Antibodies. The biochemical nature of antibodies. Source of antibodies. Submolecular organization of a typical immunoglobulin molecule (variable and constant domains). Hypervariable and skeletal sites of V-domains of immunoglobulins. Structural bases of specificity (antigen-binding function) of antibodies (paratopes). "Secondary" functions of antibodies and their structural basis.</p> <p>Isotypes (classes), allotypes and idiotypes of immunoglobulins. Isotypes (classes/subclasses) immunoglobulins: structural features,</p>

functions. Serum concentration of various classes of immunoglobulins. The dynamics of antibodies during the primary and secondary immune response: qualitative and quantitative seroconversion. Immunological memory.

The concept of the secretory immune system (mucosal immunity, or mucosal immunity). Production, structure and functions of secretory IgA (sIgA).

Cloning of B-lymphocytes. Selection of antigen-sensitive clones as the basis of the immune response. Polyclonal nature of the immune (antibody) response and its causes. Monoclonal antibodies (principles of hybridomic technology).

Formation and differentiation of T- and B-lymphocytes. Features of presentation of antigens to B- and T-lymphocytes. The concept of B- and T-epitopes in the structure of antigens.

Antigen-recognizing B-lymphocyte receptors. Basic receptors and their rearrangement during the immune response.

CD-antigens and functional classification of T-lymphocytes.

The main category of antigen-recognizing T-lymphocyte receptors. Structure, similarities and differences with B-lymphocyte receptors. The principle of double recognition of antigens by T-lymphocytes. Functional cooperation in the system of antigenic receptors of B- and T-lymphocytes (the concept of receptor complexes).

Molecular and submolecular bases of B- and T-lymphocyte cloning

The main human histocompatibility complex (HLA): genes and their products. The genetic basis of HLA polymorphism. HLA polymorphism as a basis for rejection of allogeneic tissues. HLA-1. The principle of structure, subclasses, structural (allelic) polymorphism, tissue localization, immunological function. HLA-2. The principle of structure, subclasses, structural (allelic) polymorphism, distribution in the body, immunological function. The concept of HLA restriction of the immune response (double recognition of antigens). Molecular basis of selective interaction of CD4<sup>+</sup> and CD8<sup>+</sup> T-lymphocytes with antigens represented by HLA-1 and HLA-2. "Professional" and "non-professional" antigen-presenting cells. The principal mechanism of presentation of antigens to T-lymphocytes (processing of antigens by antigen-presenting cells). The concept of antigenic peptides presented to T-lymphocytes by HLA molecules (HLA peptides). HLA-dependent regulation of the immune response.

The concept of induction, its components (recognition and activation) and the main stages. Mediators (costimulators) of intercellular cooperation: their classification and functional characteristics. Costimulating (auxiliary) signals in antigen-dependent activation of lymphocytes. The molecular basis of contact and mediator (humoral) interactions.

The central regulatory link of T-dependent immunity: CD4<sup>+</sup> lymphocytes and the mechanisms of its relationship with B-lymphocytes and CD8<sup>+</sup> lymphocytes.

Cytokines: biochemical nature, sources, polyfunctionality, mechanisms of action, classification, similarities and differences with hormones. Cytokines and their role in the regulation of the immune response.

Activation of CD4<sup>+</sup> T-lymphocytes. Functional variants of T-helper cells (Th1, Th2) and their participation in the immune response. Activation of B-lymphocytes. Results of antigen-induced differentiation. Development of immune responses to T-dependent antigens. T-independent antigens: nature, features of reactions. Activation of CD8<sup>+</sup> T-lymphocytes, results of antigen-induced differentiation.

Realization of the immune response (cellular and humoral link) and the concept of immunological memory. Features of the interaction of immune effectors in the primary and secondary immune response.

The complement system. The nature of the components, activation pathways (classical and alternative pathways). Biologically active factors of the complement system and their properties.

			<p>Phagocytes. Histological profile of phagocytes: neutrophil granulocytes, macrophages - mobile and immobile, tissue macrophages, alveolar and peritoneal macrophages. Oxygen-dependent and oxygen-independent biocidity of phagocytes. Stages of the phagocytic process. The concept of incomplete phagocytosis. Opsonins. The role of opsonins in phagocytic reactions.</p> <p>Effectors of specific (antigen-dependent) immunity. Antibodies. The formation of immune complexes as the basis of the antigen-eliminating function of antibodies. Functional cooperation of specific and non-specific factors in the implementation of the humoral immune response. Molecular and cellular bases of the opsonic effect of antibodies.</p> <p>Specific effectors of T-cell immunity and their targets. Molecular bases and mechanisms of realization of the effector potential of CD8<sup>+</sup> (T-killers, or cytotoxic T-lymphocytes) and CD4<sup>+</sup> T-lymphocytes.</p> <p>Natural killers. Effect functions. The phenomenon of antibody-dependent cellular cytotoxicity.</p> <p>Antiviral immunity. Effectors of humoral and cellular immunity in the implementation of antiviral activity. Forms of implementation: complement-dependent and T-cell cytolysis, antibody-dependent cellular cytotoxicity (macrophages, NK lymphocytes, neutrophils), the phenomenon of apoptosis. Non-specific mechanisms - interferon. Classification and biological properties.</p> <p>Protection levels (skin, mucous membranes, loose connective tissue, regional lymph nodes, blood. organs). Protection effectors and their manifestations. Secretory system of immunity and its effector functions. Features of immunity in diseases caused by microorganisms – intracellular parasites.</p> <p>Factors of nonspecific resistance of the oral cavity. Barrier function of the mucous membrane and enamel of teeth, colonization resistance. Oral fluid, its enzymes, lysozyme, complement, lysines. Features of phagocytosis in the oral cavity. Mechanisms of specific immunity of the oral cavity. Saliva immunoglobulins. Features of antiviral immunity of the oral cavity.</p>
2.	UC-1, UC-8, GPC-5, GPC-9, PC-6	Clinical immunology.	<p>Analysis and interpretation of immunological parameters. Methods of studying the immune status and principles of its assessment. Assessment of oral immunity. The content of immunoglobulins sIgA, A, G, M in saliva, gingival fluid, gingival pocket fluid.</p> <p>Allergy. Definition of the concept and general characteristics of allergy. Classification of allergic diseases of types I, II, III, IV, V (according to Gell. Coombs). Allergy of anaphylactic type (anaphylactic shock, local anaphylaxis). Etiology, pathogenesis, clinic. Methods of specific desensitization. Allergy of the atopic type. Cytotoxic allergy. Immunocomplex allergy. Serum sickness. The phenomenon of Artyus. Cell-mediated allergy. Cooperation of effectors of cellular immunity in delayed-type hypersensitivity. Transplant allergy. Drug, food and insect allergies. Skin tests and other methods of allergodiagnosics. Non-allergic forms of intolerance to materials and preparations used in dentistry. Emergency care in allergology.</p> <p>Sensitization of the body of medical personnel of dental institutions.</p> <p>Manifestations of immunopathology in the oral cavity. Intolerance of dental materials from acrylates: etiology, pathogenesis, diagnosis. Intolerance of latex and gypsum products. Intolerance to metal dentures: etiology, pathogenesis, diagnosis, prevention and principles of treatment. Amalgams, their characteristics, effect on oral tissues and the body.</p> <p>Autoimmune pathology, mechanisms of development, classification, immunopathogenesis of the main forms, immunodiagnosics.</p> <p>Primary and secondary immunodeficiency, classification. The main clinical forms, immunodiagnosics. Immunotherapy. Immunomodulators.</p>

