MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION

PENZA STATE UNIVERSITY

MEDICAL INSTITUTE

AGREED:

Director of the Medical Institute

_____ A.N. Mitroshin

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STUDY PROGRAMME

C1.2.7 Immunology

Course 31.05.01. - General Medicine

Graduate's Degree - Medical doctor

Type of study – full-time

Penza, 2016

1. Aims and goals

The purpose of learning in Immunology is getting the students the fundamental knowledge on the structure and functions of the immune system in the adult, its age characteristics, mechanisms of development and functioning, the main methods of immunodiagnostics, methods for assessing the immune status and indications for the use of immunotropic therapy. As a result, the student becomes able to learn the formation of basic and applied knowledge that he will need to at studying of clinical disciplines.

The **objectives** of the study the immunology students include:

- getting ideas about the structure and functions of the immune system in adult humans;
- formation of ideas about serological diagnostics of infectious diseases;
- using the basic reactions of the immune system to identify selected microbial culture;
- the development of methods for immunodiagnostics, immunization and evaluation of immune status.

2. Links to other disciplines of the general curriculum

Academic discipline "Immunology" refers to the variative part of the unit C1. Subject (module). Immunology builds on the knowledge acquired during the study courses of biology, chemistry, biochemistry. The competence acquired during the study of immunology prepare the student to development of professional competencies.

The main provisions of the discipline should be used in the further study of clinical disciplines (epidemiology, infectious diseases, dermatology, Phthisiology, etc.)

3. Student competences developed as a result of subject "Immunology"

According to the state curriculum for the course, learning is oriented at developing the following competences and their elements:

Competence code	**Title of competence**	Structural elements of competence **(having mastered the subject students should have knowledge, skills, working abilities)**
1	2	3
GEK -1	abstract thinking, logical analysis and synthesis skills	Knowledge: structure and functions of the human immune system, its age characteristics, mechanisms of development and functioning, the basic methods of immunodiagnostics, methods of assessing immune status and indications for use immunotropic therapy.
		Skills: to analyse scientific problems arising in professional activities
		Working abilities: skills in practice methods in biomedical Sciences
SPC -1	be able to perform the scope of measures aimed at protecting and promoting the health and safety of the public, including fostering healthy lifestyle, prevention of the diseases and their treatment, early diagnostic of medical conditions, their causes and conditions of their	Knowledge: structure and functions of the human immune system, its age characteristics, mechanisms of development and functioning, the basic methods of immunodiagnostics.
		Skills: justify the need for clinical-immunological examination of the patient, to interpret the results of immunological studies, serology diagnosis of infectious diseases.

	development, elimination of harmful environmental factors	Working abilities: skills preliminary diagnosis based on the results of laboratory examination of the population to use the basic reactions of the immune system for detection of antibodies in serum of patients with the diagnosis of infectious diseases.
SPC -2	be ready to perform prophylactic medical check-ups, public health examination and health surveys	Knowledge: structure and functions of the human immune system, its age characteristics, mechanisms of development and functioning, the basic methods of immunodiagnostics.
		Skills: justify the need for clinical-immunological examination of the patient, to interpret the results of immunological studies, serology diagnosis of infectious diseases.
		Working abilities: skills preliminary diagnosis based on the results of laboratory examination of the population to use the basic reactions of the immune system for detection of antibodies in serum of patients with the diagnosis of infectious diseases.
SPC -5	be able to analyse patients complaints and medical history, results of medical examinations, laboratory tests, special equipment diagnostics and others so as to determine the presence or absence of pathologies, medical disorders and diseases	Knowledge: safety rules and work in immunological laboratories; the application of basic immunological products.
		Skills: conduct sanitary treatment of therapeutic and diagnostic areas of health care institutions, tools and equipment.
		Working abilities: skills of sterilization, disinfection and antiseptic treatment of instruments and equipment in order to avoid infection the doctor and the patient

4. The structure and content of the discipline Immunology

4.1. The structure of the discipline

The total complexity of discipline is 3 credit units, 108 hours.

№ п/п	Name of sections and topics of the discipline (module)	Semestr	Weeks of the semester	The types of academic work, including independent work of students and the complexity (hours)									Forms of current control of progress (by week of semester)							
				Classroom work				Самостоятельная работа												
				totally	Lecture	Practical classes	Laboratory classes	totally	Preparing for the classroom training	essay, etc.	Course work (project)	Exam preparation	Interview	Colloquium	Verification tests	The validation control works	The review of the abstract	Check essays and other creative works	Course work (project)	To check the practical skills
1.	Section 1. Infection and immunity	4	1-9	46	10	36		6	6				1-8	9	2-8					2-8
1.1.	Topic 1.1. Immunological laboratory. Basic models in immunology. Features of immunocompetent cells.	4	1	6	2	4		0,5	0,5				1							
1.2.	Topic 1.2. The doctrine of infection. Infection and infectious process.	4	2	6	2	4		0,5	0,5				2		2					2
1.3	The theme of 1.3. Immunity: types of immunity, the nonspecific factors of protection.	4	3	4	-	4		0,5	0,5				3		3					3
1.4.	Topic 1.4. Immunity: antigens and antibody production, immune response	4	4	6	2	4		0,5	0,5				4		4					4
1.5.	Topic 1.5. Immunity: immunological memory and tolerance. Immune response.	4	5	6	2	4		0,5	0,5				5		5					5
1.6.	Topic 1.6. Immunity: the interaction	4	6	4	-	4		0,5	0,5				6		6					6

	between the factors of immunity and nonspecific resistance in infections of various etiologies. Anti-tumor immunity. Complementability reactions.																			
1.7.	Topic 1.7. IHS and DHS. Antitoxic immunity		7	6	2	4		0,5	0,5				7		7					7
1.8	Topic 1.8. Immunity: the immune response using fluorescently labeled antibodies or antigens. Immunobiological preparations		8	4	-	4		0,5	0,5				8		8					8
1.9	Colloquium No. 1. Infection and immunity		9	4	-	4		2	2					9						
2.	Section 2.Clinical immunology.	4	10-19	49	9	40		7	7				10-18	19	10-18					10-18
2.1.	Topic 2.1. Clinical immunology: the immune status of the macroorganism Impact of various factors on immune status. Experimental models of immunodeficiency States. Cell culture in vivo and in vitro.	4	10	6	2	4		0,5	0,5				10		10					10
2.2.	Topic 2.2. Clinical immunology. Primary immunodeficiencies.	4	11	4	-	4		0,5	0,5				11		11					11
2.3.	Topic 2.3. Clinical immunology. Secondary immunodeficiencies	4	12	6	2	4		0,5	0,5				12		12					12
2.4.	Topic 2.4. Clinical immunology. Autoimmune diseases. Principles of assessing immune status. Evaluation of nonspecific resistance of the macroorganism.	4	13	6	2	4		0,5	0,5				13		13					13
2.5	Topic 2.5. Clinical immunology. Evaluation of the immune status.	4	14	4	-	4		0,5	0,5				14		14					14
2.6	Topic 2.6. Clinical immunology. Allergic diseases. Hypersensitivity and its diagnosis	4	15	7	3	4		0,5	0,5				15		15					15
2.7	Topic 2.7. Clinical immunology the Immunoassays. Immunoassay methods in immunology. Production and evaluation.	4	16	4	-	4		0,5	0,5				16		16					16

	Immunoelectrophoresis, modification, application. Immunobloting.Radioimmunoassay method																			
2.8	Topic 2.8. Clinical immunology. Genetic methods of research in immunology	4	17	4	-	4		0,5	0,5				17		17					17
2.9	Topic 2.9. Immunocorrigirutee therapy. Immunomodulatory drugs	4	18	4	-	4		1	1				18		18					18
2.10	Colloquium No. 2. Clinical immunology	4	19	4	-	4		2	2					19						
	Course work (project)	-																		
	Exam preparation	-																		
	Total labor input in hours			95	19	76		13	13				Interim certification							
													Form		Semester					
													Credit		*4*					
													Exam							

4.2. Content of the discipline

THE DOCTRINE OF INFECTION

The definition of "infection", "infectious process", "infectious disease". The conditions of occurrence of the infectious process. The characteristic features of the infectious process.

1. The role of microorganisms in the infectious process

Forms of interaction of micro - and macroorganism: mutualism, commensalism, parasitism. Infection as a form of parasitism. Evolution of microbial parasitism. The concept of sapronosis.

Pathogenicity of microorganisms, determination. The obligate pathogenic, conditionally pathogenic, non-pathogenic microorganisms. Virulence, definition, units of measurement (DLm, LD_{50} etc.).

Virulence factors of microorganisms: adhesin, enzymes of pathogenicity; the factors causing immunosuppression; microbial toxins. Characterization of virulence factors. Toxicity and toxigenicity of the bacteria. Protein toxins (exotoxins), classification, main properties and mechanism of action. The units of force toxins (DLm, LD50). Endotoxins, chemical composition, properties, mechanism of action. The main differences from protein toxins. Allergens and germs tolerogenic.

Pathogenic properties Rickettsia, chlamydia, mycoplasmas, fungi, protozoa. Obligate intracellular parasitism of viruses.

Genetic control of virulence factors in microorganisms. The heterogeneity of microbial populations on the basis of virulence and virulence factors. The role of plasmids in the expression of virulence factors in microorganisms.

2. The role of macroorganism in the infectious process

The role of host immunity in the infectious process. The significance of hereditary factors. The heterogeneity of the human population on the basis of susceptibility to infection. The significance of gender, age, condition of the nervous and endocrine systems, as well as the influence of lifestyle, environmental and social conditions of human life on the emergence, development and outcome of the infectious process.

3. The concept of the pathogenesis of infectious diseases

The phase of development of the infection process: adhesion, colonization, invasion, damage to the microbial cell and tissue.

The critical dose of microorganisms that cause infectious disease. The sources of infection. The concept of anthroponotic, zoonoses, sopranosax. The penetration of pathogenic microbes into the body. Entrance gate of infection. Mechanisms of transmission: fecal-oral, respiratory, blood, contact. Transmission.

The way of the spread of germs and toxins in the body. Dynamics of development of infectious diseases, the periods.

Forms of infection: exogenous and endogenous; focal and generalized; mono - and combined; secondary infection, reinfection, superinfection, relapse; acute, chronic, persistent infections; microbial carrier.

Biological method of research and its application for study of pathogenesis of infectious processes.

Pathogenetic features of viral infections. The infectivity of viral nucleic acids. Acute and persistent viral infection.

MEDICAL IMMUNOLOGY

1. Tasks and history of immunology

Immunology as a science about the ways and mechanisms of protection against genetically foreign substances in order to maintain homeostasis.

The emergence and establishment of immunology as a science, the stages of immunology. The role of domestic and foreign scientists in the development of immunology and Nobel laureates in the field of immunology. The main directions of modern immunology: cellular, molecular, clinical, transplant, ecological immunology; immunogenetics, immunopathology, Allergology, immunomorphology, immunokine, immunohematology, immunology of reproduction, etc. the Role of immunology in medicine and biology, its relationship with other Sciences.

The modern definition of the concept of "immunity". Types of immunity (innate, acquired, natural, artificial, active, passive, sterile, non-sterile, local, etc.).

2. Nonspecific factors of protection of the human body

The concept of the mechanical, physical, chemical and biological barriers.

Mechanical protective reaction of the skin, mucous membranes. Physico-chemical protection of the body: the pH, the enzymatic activity of pepsin and other Biological factors of protection.

Phagocytosis. The role of I. I. Mechnikov to the development of the doctrine of phagocytosis. Classification of phagocytic cells, particularly the morphology of the neutrophils and macrophages. The main stages of phagocytosis and their characteristics. Completed and uncompleted phagocytosis. Methods for determination of phagocytic activity, phagocytic index and index of phagocytosis. The importance of phagocytosis in protecting the body from germs and foreign substance.

Natural killer cells, their role in protecting the body.

Nonspecific humoral factors of protection.

Complement system, β- lysine, interferons, lakini, antiviral serum inhibitors, lysozyme, Platini, properdin, fibronectin, etc. Their physico-chemical and biological properties.

Nomenclature of main components of the complement system. The classical and alternative pathway activation of complement. The role of complement in chemotaxis, the development of allergic and immunopathologic processes.

Interferons. Classification of interferons, inducers, mechanism of formation and action of interferon. Immunobiological importance of interferons (antiviral, immunomodulating), their production and practical use.

3. Antigens

Antigens. Definition. The concept of antigenicity, immunogenicity and specificity. The terms of antigenicity. Antigenic determinants, their structure. The terms of immunogenicity. Classification of antigens. The biological role of antigens. Complete antigens, haptens, synthetic antigens and their properties. Immunochemical specificity of antigen and its manifestations are: species, group, model, organ, heterospecifics. The antigens of microbes, localization, chemical composition, and their role in infectious process and development of the immune response. Antigens of blood groups, autoantigens, embryo specific, tumor, and transplantation antigens of man. Major histocompatibility complex, histocompatibility antigens class I and II. Processing of antigen in the microorganism.

4. The immune system of the human body and its main functions

4.1. Structure and function of the immune system.

The Central organs of the immune system: bone marrow, thymus. Peripheral immune organs: spleen, lymph nodes and follicles. Age features of immune system.

4.2. Cells of the immune system.

Hematopoietic stem cells. The main cells of the immune system: T and b-lymphocytes, macrophages (A cells), their ontogeny.

T-lymphocytes. Subpopulations of T cells: T-helpers, cytotoxic T-cells (T-effectors); surface markers and receptors of these cells (CD-antigens). Products and function T-lymphocytes.

B-lymphocytes. Subpopulations of b-cells. Surface markers and receptors of b cells: immunoglobulins, Fc-receptors. Receptors for complement, mitogens, etc. Products and functions of b-lymphocytes.

The recirculation of lymphocytes.

Zero cells (zero cells) cells and normal (natural) killer.

Interaction (cooperation) between T-, B-, And-cells during the immune response. Principles and mechanisms of immunocompetent cells. Recognition of antigen and induction of an immune response. The role of immunocytokines.

5. Specific forms of immune response

The concept of specific forms of immune response: antibody production, immune phagocytosis, killer function, hypersensitivity reactions, immunological memory and tolerance.

5.1. Antibodies and antibody production.

Antibodies. Definition. Physico-chemical, biological properties and functions. The immunoglobulins. The main classes, their structural and functional features. Constant and variable sites, domains. The structure of the active centers of antibodies and their main function. The mechanism of interaction of antibody with antigen. The immune complex. Avidity and affinity of antibodies. The concept of valency antibodies. Antigenic structure of immunoglobulins: isotype, allotypes, idiotypes determinants. Antiidiotypic antibodies, abnormal immunoglobulins. Complete and incomplete antibodies. Genetics of immunoglobulins. Autoantibodies. The concept of monoclonal antibodies. Hybridoma.

The biosynthesis of antibodies. Regulation of antibody productions. The concept of the HLA – restriction of immune response. Dynamics of formation of antibodies, primary and secondary immune response.

Theory of fusion and diversity of antibodies.

The biological role of different classes of immunoglobulins in protecting the body. Development of the ability of the body to immune response.

5.2. Immune phagocytosis and NK cell function.

The types of immune responses cell type: reaction on intracellular parasites, cytotoxic effects of lymphocytes, the destruction of tumor cells by activated T-lymphocytes, delayed type hypersensitivity, cell responses in autoimmune processes.

The concept of immunological surveillance, role in this process, cytotoxic lymphocytes, K cells, NK cells and macrophages.

5.3. Hypersensitivity of delayed type.

5.4. Hypersensitivity of immediate type.

5.5. Immunological tolerance.

Definition. The role of P. Medawar and M. Hasek in the study of tolerance. Methods induction of tolerance (dose, properties, and route of administration of antigen – tolerogen; age factor, duration of stay in the body). The value of lymphocytes in the mechanisms of tolerance. Specificity of immunological tolerance. Cancel natural immunological tolerance. The manifestation of tolerance and its practical use in medicine. Tolerogenic.

5.6. Immunological memory.

Definition. Forms of manifestation. The mechanism of immunological memory. Methods induction of immunological memory. T - and b-memory cells. Features of development of immunological memory at the cellular and humoral immune response. The role of immunological memory to protect the body from infection, the use of the phenomenon of immunological memory in the diagnosis and prevention of infectious diseases.

6. Allergic reactions

The concept of allergies. Classification of allergic reactions according to Gelu and Coombs: type I – caused by IgE anaphylactic (atopic) reactions; type II, cytotoxic reactions; type III – immune complex reactions; type IV – cell mediated T-lymphocyte reaction.

Allergens, used in diagnostics.

6.1. Allergic reactions humoral (immediate) type (types I-III), V.

The history of discovery. The concept of sensitization. Characterization of allergens. The mechanism of development of allergic reactions humoral type. The signs of the differences between humoral and cellular allergic reactions. Manifestations (anaphylactic shock, serum sickness, local anaphylaxis, etc.). Diagnostic tests for detection of humoral Allergy type. Immunological basis of prevention and treatment. Desensitization.

6.2. Allergic reactions of the cell (slow) type (type IV).

The concept of cell-mediated immunity. Mechanisms of development reactions, the role of mediators. Manifestations: infectious, contact, transplant. Antitumor, autoimmune allergies. Methods of detection. Skin-allergic tests, their diagnostic value.

7. Features antibacterial, antiviral, antifungal, Antiprotozoal, antihelminthic, antitumor, transplantation immunity. Immunological aspects of embryogenesis

8. Human immune status

The immune status of the person.

The principles of formation. Age dynamics. Factors affecting immune status: climatic and geographical, social, medical.

9. Methods of assessing immune status

9.1. Humoral immunity.

Detection of antibodies. Methods for determining immune complexes. Methods for quantitative and qualitative detection of immunoglobulins.

9.2. Cellular immunity.

Determination of subpopulations of T and b cells: cluster analysis, E - and EAC-rosethorne; evaluation of mitotic and killer activity of lymphocytes, determination of the activity of NK cells. Methods of detection: the reaction of blast transformation of lymphocytes, production of lymphokines, reaction of braking of migration of leucocytes.

Skin tests as a method of display of cell-mediated immunity.

9.3. Immunogram.

10. Immunopathology

Primary and secondary immunodeficiencies. Failure of the humoral, cell-mediated immunity combined immunity disorders. The role of infections in the development of immunodeficiency of the person. The role of environmental factors in the induction of primary and secondary immunodeficiencies. Allergic diseases. Autoimmune disease. Immunoproliferative disease.

11. Immunoprophylaxis, immunotherapy and immunotherapy

The development of the theory of immunoprophylaxis and immunotherapy. E. Jenner, L. Pasteur, E. Bering, Ramon etc.

The principles of immunoprophylaxis, immunotherapy, and immunomodulation. Marine immunogenetically immunosuppressive therapy. Immunotherapeutic agents; interferons, interleukins, levamisole, thymus preparations, antimetabolites, corticosteroids, cyclophosphamide, antilimfocitarnyi serum, monoclonal antibodies, etc.

12. Immunobiological preparations

The concept of immunobiological preparations, their main groups: vaccines and other products of microbial origin, immunoglobulins and immune sera, immunomodulators, diagnostic drugs, adaptogens.

Modern classification of vaccines: living, nonliving, whole cell (consist of whole), subcellular (subvirion), molecular, attenuated, divergent, recombinant, synthetic. Associates and combination vaccines. Adjuvants. Autovaccine, is easy to administer. The principle and mechanism of action of vaccines.

Methods of preparation of vaccines, evaluation of their efficiency and quality control.

Drugs to seroprofilaktiku and serotherapy. Homologous and heterologous serum. Antitoxic, antibacterial, antiviral immune sera. Immunoglobulins (normal and directional). Principles of production, purification, titration and control of sera and immunoglobulins. Side effects of serotherapy and their prevention. A. Besredka.

13. Immunological reactions in diagnostics of infectious and non-infectious diseases

The concept of serological reactions. Characteristic reactions of antigen – antibody: specificity, two-phase, reversible, optimum ratio of ingredients, qualitative and quantitative, sensitivity etc. of the reaction Mechanism. The practical use of serological reactions: identification of an antigen, the diagnostic identification of antibodies. The main components of serological reactions. Diagnostic immune serums, diagnosticums. Monoclonal antibodies and their application. The phenomena of manifestation and the ways of registration of serological reactions.

Reactions based on agglutination phenomenon: the deployed agglutination reaction is indicative of agglutination, indirect hemagglutination reaction, hemagglutination inhibition, coagglutination, latex agglutination, Coombs test.

Reaction, based on phenomenon of precipitation: calcarenite, flocculation, precipitation in gel (double counter immunodiffusion, radial immunodiffusion, immunoelectrophoresis).

Reactions with participation of complement: immune lysis (bacteriosis, hemolysis); complement fixation; the reaction of immobilization of microorganisms; opsona-phagocytic reaction; neutralization reaction (toxins, viruses, Rickettsia).

Reactions with the use of labeled antigens and antibodies: immunofluorescence; enzyme immunoassay method (direct, indirect, solid, competitive); radioimmunoassay analysis (competitive, direct, indirect), Western blot sections.

Immunoelectron microscopy (using antibodies labeled the San, colloidal gold, isotopes).

5. Educational technology

1) Multimedia lectures.
2) Laboratory studies using microscopic techniques.
3) Conducting supervision sessions in the form of colloquia.
4) Computer testing.
5) The decision of situational tasks.
6) Individual consultations of a teacher in performing tasks in the laboratory classes and group counseling before testing for each section of the discipline.
7) Independent work of students with literature and visual materials.
8) Student participation in research projects (the work of the club, participation in conferences, competitions, etc.).

In order to implement an individual approach to the training of students engaged in the learning process on their own trajectory within the individual work plan, the study of this discipline is based on the following features: the provision of extracurricular activities with students including e-learning environment using the appropriate equipment and software, distance learning, opportunities, online resources, individual consultations etc.

5.1. Active learning methods

The method of analysis of concrete situations (case-method)

Immunity: antigens and antibody production, immune response.

The decision of situational tasks

Clinical immunology. Primary immunodeficiencies.
Clinical immunology. Secondary immunodeficiencies.
Clinical immunology. Autoimmune diseases.
Clinical immunology. Allergic diseases.
Immunocorrigirutee therapy. Immunomodulatory drugs.

6. Educational and methodological support of students` out-of-class work. Appraisal tools for current control of progress, intermediate assessment on the results of learning.

6.1. Plan of independent work of students

№ week.	Topic	The type of independent work	task	Recommended reading	The number of hours
1	Immunological laboratory. Basic models in immunology. Features of immunocompetent cells	Preparation for the classroom lesson №1	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson №1	William E. Paul. Immunity. Baltimore: Johns Hopkins University Press, 2015. 280 p.	0,5
2	Infection and infectious process	Preparation for the classroom lesson №2	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 2 to answer the test tasks for the classroom lesson №2	The same	0,5
3	Immunity: types of immunity, the nonspecific factors of protection.	Preparation for the classroom lesson №3	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 3, answer test tasks for the classroom lesson No. 3	The same	0,5
4	Immunity: antigens and antibody production, immune response	Preparation for the classroom lesson №4	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 4, answer the test tasks for the classroom lesson 4	The same	0,5
5	Immunity: immunological memory and tolerance. Immune response	Preparation for the classroom lesson №5	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 5, answer test tasks for the classroom lesson №5	The same	0,5

6	Immunity: the interaction between the factors of immunity and nonspecific resistance in infections of various etiologies. Anti-tumor immunity. Complementability reactions.	Preparation for the classroom lesson №6	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 6, answer the test tasks for the classroom lesson №6	The same	0,5
7	HIT and HDT. Antitoxic immunity	Preparation for the classroom lesson №7	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 7, answer the test tasks for the classroom lesson No. 7	The same	0,5
8	Immunity: the immune response using fluorescently labeled antibodies or antigens. Immunobiological preparations	Preparation for the classroom lesson №8	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 8 answer the test tasks for the classroom lesson №8	The same	0,5
9	Colloquium No. 1. Infection and immunity	Preparing for the Colloquium No. 1	To study theoretical material on the topic. Answer questions for self-preparation to Colloquium No. 1. To answer the test assignment Colloquium No. 1. To perform practical skills Colloquium No. 1.	The same	2
10	Clinical immunology: the immune status of the macroorganism Impact of various factors on immune status. Experimental models of immunodeficiency States. Cell culture in vivo and in vitro	Preparation for the classroom lesson №10	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 10, answer test tasks	The same	0,5

			for the classroom lesson No. 10		
11	Primary immunodeficiencies	Preparation for the classroom lesson №11	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 11, answer test tasks for the classroom lesson No. 11	The same	0,5
12	Clinical immunology. Secondary immunodeficiencies	Preparation for the classroom lesson №12	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 12, answer to test items for the classroom lesson №12	The same	0,5
13	Clinical immunology. Autoimmune diseases. Principles of assessing immune status. Evaluation of nonspecific resistance of the macroorganism.	Preparation for the classroom lesson №13	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 13 to respond to the test tasks for the classroom lesson No. 13	The same	0,5
14	Clinical immunology. Evaluation of the immune status.	Preparation for the classroom lesson №14	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 14 to answer the test tasks for the classroom lesson No. 14	The same	0,5
15	Clinical immunology. Allergic diseases. Hypersensitivity and its diagnosis	Preparation for the classroom lesson №15	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 15 to answer the test tasks for the	The same	0,5

			classroom lesson No. 15		
16	Clinical immunology the Immunoassays. Immunoassay methods in immunology. Production and evaluation. Immunoelectrophoresis, modification, application. Immunobloting.Radioimmunoassay method	Preparation for the classroom lesson №16	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson 16, answer test tasks for the classroom lesson No. 16	The same	0,5
17	Clinical immunology. Genetic methods of research in immunology	Preparation for the classroom lesson №17	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson No. 17 to answer the test tasks for the classroom lesson No. 17	The same	0,5
18	Immunocorrigirutee therapy. Immunomodulatory drugs	Preparation for the classroom lesson №18	To study theoretical material on the topic. Answer questions for self-preparation for the classroom lesson no. 18 to answer the test tasks for the classroom lesson No. 18	The same	1
19	Colloquium No. 2. Clinical immunology	Подготовка к коллоквиуму №2	To study theoretical material on the topic. Answer questions for self-preparation to Colloquium No. 2. To answer the test assignment Colloquium No. 2. Solve situational tasks Colloquium No. 2.	The same	2

6.2. Methodical instructions on organization of independent work of students

Independent work of students is conducted in accordance with the guidelines of the Department of immunology:

Mitrofanova N. N., Melnikov V. L. Melnikov L.V., Immunology (textbook for students).

6.3. The materials for the current and intermediate control of students ' knowledge

Control of mastering of competences

№	type of control	Controlled topics (sections)	Competence, the components of which are controlled
1	Interview	Sections 1, 2	GEK -1, SPC -1, SPC -2, SPC -5
2	Verification tests	Sections 1, 2	GEK -1, SPC -1, SPC -2, SPC -5
3	To check the practical skills	Sections 1, 2	GEK -1, SPC -1, SPC -2, SPC -5
4	Colloquium	Sections 1, 2	GEK -1, SPC -1, SPC -2, SPC -5

The approximate version of the test

1. For antigens of the main complex histocompatibility system characterized by the following signs:

a) the MNS antigens are unique to each organism and determine its biological individuality;
b) the chemical structure and functional purpose of MNS are divided into two classes;
c) MNS is the same in all warm-blooded organisms;
d) antigens of class I MNS are located on the surface of all nucleated cells;
e) the chemical structure and functional purpose of MNS is divided into four classes;
f) antigens class II MHC are located on the membrane of immune cells.

2. For immunoglobulin class E equitable the following provisions:

a) is a monomer that has 2 antigen-binding centre.
b) content in the serum of approximately 0.00025 g/l;
c) it is pentamer, which has 10 antigen-binding sites;
d) has a pronounced cytophylactic – an affinity for fat cells, and basophils;
d) participates in the development of immediate hypersensitivity reaction type I;
e) detection requires highly sensitive methods of diagnostics.

3. During primary immune response:

a) produced only Ig M;
b) produced only Ig G;
c) produced the first Ig M and Ig G. then

4. Humoral regulation of the immune response is carried out:

a) humoral factors of the thymus gland;
b) the factors that enhance and inhibit functional activity of the cells;
c) humoral factors of macrophages;
d) humoral factors of the bone marrow.

5. Phenomena specific interaction of serum antibodies with antigens are:

a) agglutination;
b) precipitation;
c) lysis;
d) cytotoxicity

6. The main properties of antigens include:

a) the ability to induce development of the immune response;
b) the ability to penetrate into the interstitial fluid;
c) the ability to interact with products of an immune response induced to the same antigen.

7. From the point of view of the immunologist microbial cell is:
a) an antibody;
b) a set of antigens;
c) a microorganism.

8. The antibodies are called:
a) whey proteins, produced in response to introduction (hit) antigen;
b) all whey proteins;
c) proteins of the complement system.

9. The immunoglobulin molecule consists of:
a) light chains;
b) polysaccharides;
c) heavy chains.

10. The active site of the antibody is represented by:
a) constant sections of H and L chains of immunoglobulin molecules;
b) variable sites H and L chains of the molecule immuno-globulin;
c) Fab-fragments.

11. Full antibodies are:
a) antibodies having at least two active centres;
b) antibodies having one active site;
c) antibodies produced by one clone of plasma cells.

12. The agglutination is called:
a) reaction with the use of erythrocytic diagnosticums;
b) specific adhesion and deposition of particulate antigens by the action of antibodies in the presence of the electrolyte;
c) dissolution of cellular antigen by the action of antibodies in the presence of complement.

13. Specify the analytical technique most widely used to detect microbial antigens in the examined material:
a) immunoelectrophoresis;
b) reaction of indirect hemagglutination;
c) enzyme-linked immunosorbent assay;
d) immunofluorescence;
e) polymerase chain reaction (PCR);
f) reaction of binding complement;
g) Western blot sections.

14. Specify the immunological parameters used in Immunoradiometric infectious diseases:
a) titer determination of antibodies;
b) identifying the quality of seroconversion;
c) the quantitative detection of seroconversion;
d) detection of microbial antigens;
e) the determination of Allergy to microbial antigens.

15. Phases of formation of immunoglobulins are:
a) productive;
b) recessive;
c) inductive.

16. For immunoglobulin class A is characterized by the following signs:

a) this pentamer, which has 10 antigen-binding sites;

b) exists in serum and secretory forms;

c) does not pass through the placental barrier.;

d) is in the form of monomer, with 2 antigennegative centers and in polymeric form as a di - or trimer;

e) prevents adhesion of microbes to the epithelial cells and the generalization of an infection within the mucous membranes;

f) phylogenetically most ancient immunoglobulin.

17. During the primary immune response first appear:

a) Ig A;

b) Ig M;

c) Ig E;

d) Ig G;

e) Ig D.

18. Indicate which of the following characteristics best define the properties of haptens:

a) immunogenic and reactive with the At;

b) immunogenic and do not react with the AT;

c) react with al, but neimenovan;

d) don't react with AT and neimenovan;

e) chemically complex macromolecular structures.

19. The primary immune response after administration of the antigen develops:

a) 1-2 days;

b) after 3-4 days;

c) 5-6 days;

d) after 7-10 days;

e) after 10-12 days.

20. Antigens are:

a) the substance or body, bearing the signs of alien genetic information;

b) all the substances of the body;

c) high molecular weight compounds.

21. On the chemical nature of the antigen can be:

a) proteins;

b) inorganic substances;

c) polysaccharides;

d) nucleic acids.

22. The role of immunoglobulins is:

a) the implementation of the cellular type immune response;

b) implementation of the humoral type immune response;

c) implementation of non-specific factors of resistance.

23. List the signs, which are different immunoglobulins of the same class, but different specificity:

a) structure of the heavy chains;

b) the structure of the active site;

c) constant sections of H and L chains of immunoglobulin molecules.

24. The origin of the immunoglobulins are divided into:
a) cross-reactive;
b) normal;
c) post-infection;
d) post-vaccination;
e) infectious.

Criteria for the assessment test

"Excellent" ("5") – 91% or more correct answers to test items**.**
"Good" ("4") – 81-90% of correct answers to test items**.**
"Satisfactory" ("3") – 71-80% of correct answers to test items.
"Unsatisfactory" ("2") – 70% or less correct answers to test items.

The approximate questions for the control lessons

Infection and immunity

1. The concept of infection. The conditions of occurrence of the infectious process. Infectious disease. Stage of development. Types of infectious diseases and their distinctive features.
2. The role of the environment in the processes of infection and immunity. The role of the state of microorganism in causing infection and development of immunity.
3. Pathogenicity and virulence of the bacteria, measurement units. Pathogenic, conditionally pathogenic and non-pathogenic microorganisms.
4. Morphological and biochemical aspects of virulence. Toxins of bacteria, their nature and properties. The toxoids. Receiving, titration, application.
5. Principles of specific prophylaxis and treatment of infectious diseases. Vaccine definition, classification, application. Vaccination and vaccine therapy.

Clinical immunology

1. The immune status of the macroorganism. The influence of various factors on immune status.
2. Primary immunodeficiencies. Description of the basic characteristics, reasons, classification.
3. HIV infection. Etiology, pathogenesis, clinical manifestations, General principles of treatment and prevention.
4. Evaluation of the immune status. Clinical stage assessment of the immune status.
5. Autoimmune diseases and disease syndromes of immune inflammation. Description of the basic signs, causes, classification.

Criteria for assessing the interview at the control classes

"**Excellent**" – the story complete, competent, logical; fluent terminology; answers to additional questions, a clear brief.

"**Good**" – the lack of a coherent story with a single error in the particulars; a single error in terminology; answers to additional questions correct, is not clear.

"**Satisfactory**" – the story is competent enough, incomplete, with errors in detail; errors in terminology; answers to the additional questions is not clear, with errors in the particulars.

"**Unsatisfactory**" – the story of an illiterate, incomplete, with gross errors; lack of knowledge of terminology; answers to supplementary questions wrong.

The approximate questions of practical skills

1. Estimated agglutination
2. The expanded agglutination reaction with the purpose of serotyping E. coli
3. Titroline agglutinins serum
4. Agglutination by Vidal with the purpose of serological diagnosis of typhoid

Criteria for the assessment the practical skills

"**Excellent**" ("5") – accurately performs a demonstration of practical skills correctly identifies concepts and categories, is freely guided in the practical material.

"**Good**" ("4") – with the description and execution skills made some mistakes.

"**Satisfactory**" ("3") – not a full description and demonstration of practical skills, errors, and some gaps in knowledge.

"**Unsatisfactory**" ("2") – the lack of necessary practical knowledge in the discipline, practical skills are not met.

The approximate credit questions

Infection and immunity

1. Antigens. Definition. The concept of complete and incomplete antigens. Requirements for antigens. The concept of antigenic properties of microorganisms. Antigenic structure of bacteria.
2. Serotyping. Receiving, titration and application of the agglutinating serum. Obtaining and deploying minoritarnyh sera.
3. Phylogenesis and ontogenesis of the immune system. The features of immunological reactivity in children.
4. The concept of immunity. General biological significance of the immune system. Types of immunity.
5. Immunoglobulins, structure and function. The mechanism of interaction of antibody and antigen.

Clinical immunology

1. Allergic diseases. Description of the basic characteristics, reasons, classification.
2. Immunostimulatory therapy. Vaccination.
3. ELISA test in immunology. Production and evaluation.
4. Genetic methods of research in immunology.
5. Experimental models of immunodeficiency States.

Criteria for assessing the interview at the exam

"Excellent" **–** the story complete, competent, logical; fluent terminology; answers to additional questions, a clear brief**.**

"Good" **–** the lack of a coherent story with a single error in the particulars; a single error in terminology; answers to additional questions correct, is not clear**.**

"Satisfactory" **–** the story is competent enough, incomplete, with errors in detail; errors in terminology; answers to the additional questions is not clear, with errors in the particulars**.**

"Unsatisfactory" **–** the story of an illiterate, incomplete, with gross errors; lack of knowledge of terminology; answers to supplementary questions wrong.

The approximate case studies

Task 1

A child of 5 years. Complaints of frequent infections (more than 10 times per year). Over the past year he has had pneumococcal pneumonia, otitis media, candidiasis of the oral cavity. Frequent diarrhoea. Infections are persistent in character. There is a lag in development. In the physical examination inspection observed the lack of lymph nodes.

What are the presumptive diagnosis.

What laboratory studies should be conducted?

Task 2

When setting the reaction of neutralization of toxin by antitoxin on white mice, the mouse has not received the antitoxic serum was killed, and received – alive.

Give a description of the reactions and make a conclusion.

Criteria for assessing the decision of case studies

"**Excellent**" – the answer is complete, competent, logical; fluent terminology.

"**Good**" – the answer is logical enough with a single error in the particulars; a single error in terminology.

"**Satisfactory**" – the answer is not enough competent, incomplete, with errors in details; the error in terminology.

"**Unsatisfactory**" – the answer illiterate, incomplete, with gross errors; lack of knowledge of terminology.

Criteria of credit in the discipline of "Immunology"

"**Pass**" – If the answer to the theoretical questions the story complete, competent, logical; a working knowledge of terminology; answers to the additional questions are correct, can be allowed some minor errors; correct implementation of practical skill, more than 70% correct answers on test tasks.

"**Fail**" – If the answer to the theoretical questions the story of an illiterate, incomplete, with gross errors; lack of knowledge of terminology; answers to additional questions incorrect; improper execution of practical skills, less than 70% correct answers on test tasks.

7. Educational methodolodical and informational means provided for subject «Immunology»

A) Main literature:

William E. Paul. Immunity. Baltimore: Johns Hopkins University Press, 2015. 280 p.

B) additional literature

1. Allergic diseases : textbook. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
2. Autoimmune diseases : textbook. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
3. Antitumor immunity : studies. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
4. Methods of diagnosis of infectious diseases : textbook. aid / N. N. Mitrofanov, V. L. Melnikov. Melnikov L.V
5. HIV infection : proc. manual / V. L. Melnikov, N. N. Mitrofanov, A. S. Esaulov. Melnikov L.V

C) software and Internet resources

1. Microsoft Windows (DreamSpark/Microsoft Imagine Standart); reg. number 00037FFEBACF8FD7, contract №СД-130712001 of 12.07.2013
2. Kaspersky Anti-Virus 2016-2017, reg number KL4863RAUFQ, contract №ХП-567116 of 29.08.2016
3. Open source software: Libre Office; Google Chrome; Adobe Reader; 7zip.

1. Knowledge base in human biology http://humbio.ru/humbio/immunology
2. Russian medical information resource http://www.rosmedic.ru/immunologiya http://www.nedug.ru/library/аллергология_и_иммунология
3. Medical portal http://medvuz.info/load/ http://www.inim.ru
4. Single window access to educational resources - http://elibrary.ru/
5. ELS "Consultant of a student - http://www.studmedlib.ru

8. Educational, methodological and informationalmeans provided for subject " Immunology "

№ п\п	The name of the special rooms and areas for independent work	Equipment of special rooms and areas for independent work
1.	Classroom18-1, 18 educational building PSU, 36 m^2	Desk training – 10. Chair – 30 PCs. Pedestal – 3 PCs Board training – 1 PC. Immunobiological preparations. Visual AIDS (posters). Microscope – 4 PCs. Tools for serological studies. Reagents. The nutrient medium. Notebook – 1 PC.
2.	Classroom18-2, 18 educational building PSU, 36 m^2	Table training – 15 PCs. Chair – 34 PCs. Computer – 2. Board training – 1 PC. Immunobiological preparations. Visual AIDS (posters). Microscope – 4 PCs. Tools for serological studies. Reagents. The nutrient medium.
3.	Classroom18-3, 18 educational building PSU, 36 m^2	Table training – 15 PCs. Chair – 27 PCs Cabinet – 2 PCs. Board training – 1 PC. Cabinet laboratory – 2 PCs. Immunobiological preparations. Visual AIDS (posters). Microscope – 4 PCs. Tools for serological studies. Reagents. The nutrient medium. Notebook – 1 PC.

№ п\п	The name of the special rooms and areas for independent work	Equipment of special rooms and areas for independent work
4.	Classroom18-4, 18 educational building PSU, 36 m^2	Table training – 5 PCs. Chair – 23 PCs. Stand – 5 PCs. Board training – 1 PC. Lab wardrobe – 3 PCs Immunobiological preparations. Visual AIDS (posters). Microscope – 4 PCs. Tools for serological studies. Reagents. The nutrient medium.

The study programme for the discipline "Immunology" is drawn in accordance with the requirements FSES HE and curriculum for the course **31.05.01 - General Medicine**

The programme developers:

1. Head of the department, M.D. prof. V.L. Melnikov

2. Senior Lecturer A. S. Esaulov

3. Senior Lecturer L.V. Melnikov

The programme was discussed and agreed at the department meeting

Records № 13 on « 05 » 03 2016

Head of department, M.D. V.L. Melnikov

The programme is agreed with the dean of the general medicine faculty of PSU

Dean of GM faculty I.Ya. Moiseeva

The programme was approved by methodology council of the Medical Institute

Records № 9 on « 5 » 03 2016

Chair of the methodology commission of the Medical Institute, M.D. prof. O.V. Kalmin

Сведения о переутверждении программы на очередной учебный год и регистрации изменений

Учебный год	Решение кафедры (№ протокола, дата, подпись зав. кафедрой)	Внесенные изменения	Номера листов (страниц)		
			заменен-ных	новых	аннулиро-ванных
2016/2017	Протокол №1 от 02.09.2016	Программа переутверждена без изменений			
2016/2017	Протокол №18 от 24.05.2017	Внесено изменение в титульный лист РП с «Врач общей практики» на «Врач-лечебник»	1		
2017/2018	Протокол №1 от 30.08.2017	Программа переутверждена без изменений			
2017/2018	Протокол №2 от 04.09.2017	Добавлено в п.5 описание применения образовательных технологий к обучающимся с ограниченными возможностями здоровья и инвалидам			
2018/2019	Протокол №1 от 31.08.2018	Программа переутверждена без изменений			
2019/2020	Протокол №1 от 26.08.2019	Программа переутверждена без изменений			

Сопроводительное письмо

Довожу до Вашего сведения, что данные учебные пособия готовятся к печати в 2017-2018 году. На момент создания УМК они переведены и используются студентами в электронном виде при изучении дисциплины «Иммунология»

1. Mitrofanova N. N., Melnikov V. L. Melnikov L.V., Immunology (textbook for students)
2. Allergic diseases : textbook. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
3. Autoimmune diseases : textbook. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
4. Antitumor immunity : studies. manual / V. L. Melnikov, N. N. Mitrofanov, L. V. Melnikov.
5. Methods of diagnosis of infectious diseases : textbook. aid / N. N. Mitrofanov, V. L. Melnikov. Melnikov L.V
6. HIV infection : proc. manual / V. L. Melnikov, N. N. Mitrofanov, A. S. Esaulov. Melnikov L.V