
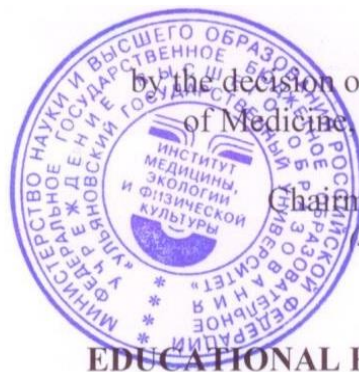


RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		



by the decision of the Academic Council of the Institute of Medicine, Ecology and Physical Culture of USU

**APPROVED**

June "19" 2019, № 10/210

V. I. Midlenko

Chairman (signature, signature clarification)

June "19", 2019.

**EDUCATIONAL PLAN**

Subject:	Immunology
Faculty	Medical
Department	Department of General and Clinical Pharmacology with Microbiology course
Year	2

Speciality 31.05.01 – General Medicine

Form of education full-time

Date of introduction at the education process at ULSU: « 01 » September 2019.

The program was updated at the department session: protocol № 8 on 17/03 2020.

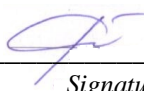

The program was updated at the department session: protocol № 12 on 19/06 2020.


The program was updated at the department session: protocol №    on    20   .

The program was updated at the department session: protocol №    on    20   .


Information about authors:


Initials	Department abbreviation	Position, Degree, title
Artamonova Marina Nikolaevna	Department of General and Clinical Pharmacology with Microbiology course	Associate professor, PhD in Biological Sciences
Potaturkina Nesterova Natalia Iosifovna	Department of General and Clinical Pharmacology with Microbiology course	Professor, Doctor of Medical Sciences, professor

AGREED	AGREED
Head of the Department of General and Clinical Pharmacology with Microbiology course that implements the discipline	Head of the Graduating Department of Hospital Therapy
 / <u>M. P. Markevich</u> / Signature Name « <u>21</u> » <u>05</u> 2019 г.	 / <u>M. A. Vise-Khripunova</u> / Signature Name « <u>  </u> » <u>  </u> 2019 г.

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**CHANGE SHEET**  
**to the educational plan "Microbiology, Virology"**  
**specialty 31.05.01 “General medicine”**

<b>№ п/п</b>	<b>Contents of the change or link to the at- tached text of the change</b>	<b>Name of Head of the Depart- ment</b>	<b>Signature</b>	<b>Date</b>
1	Introduction of changes in subparagraphes 4.2. types of academic workload in paragraph " Subject volume " with writing of application 1	Markevich M.P.		17.03.2020

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## Application 1

### 4.1. Subject volume in credits (total) 3



### 4.2. types of academic workload (in hours) 108


Type of academic workload	Number of hours (form of training - <u>full-time</u> )	
	Total in the plan	Throughout the semesters
		semester № 4
1	2	3
Student-Teacher activity	54	54
Classes:		
Lectures	18/12*	18/12*
Practical classes	36/28*	36/28*
Self-study work	54	54
Concurrent checking (number and type: a test, a colloquium, a report)	-	-
Term thesis		
Types of midterm assessment (an exam, a test)		offset
Total number of hours on the subject	108/40*	108/40*

\* The number of hours during which teacher works with students in a distance format using online education

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**CHANGE SHEET**  
**to the educational plan "Microbiology, Virology"**  
**specialty 31.05.01 “General medicine”**

<b>№ п/п</b>	<b>Contents of the change or link to the attached text of the change</b>	<b>Name of Head of the Department</b>	<b>Signature</b>	<b>Date</b>
1	Introduction of changes in subparagraphes a) list of recommended literature, b) professional databases in paragraph 11 « Educational-methodological and information support of the discipline» with writing of application 1	Markevich M.P.		19.06.2020
2	Introduction of changes in paragraph 13 «Special conditions for students with disabilities of health and disabilities» with writing of application 2	Markevich M.P.		19.06.2020

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## Application 1

### 11. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

#### a) the list of recommended literature

##### general

1) Khaitov R.M., Immunology [Электронный ресурс] / Khaitov R.M. - , 2008. - 256 с. - ISBN 978-5-9704-0704-2 - Режим доступа:

<http://www.studentlibrary.ru/book/ISBN9785970407042.html>

2) Medical microbiology, virology and immunology. Lecture notes = Медицинская микробиология, вирусология и иммунология : textbook : учебное пособие для вузов уровня специалитета по направлению подготовки 31.05.01 "Лечебное дело" / М. N. Artamonova [и др.]. - Moscow : GEOTAR-Media, 2020. - 352 p.

##### additional

1) Medical microbiology : a guide to microbial infections: pathogenesis, immunity, laboratory investigation and control / ed. by M. R.Barer, W. Irving, A. Swann, N. Perera. - 19th ed. - London : Elsevier, 2018. - 743 p.

##### teaching

1) Artamonova M. N. **Immunology** : guidelines for practical classes for foreign students / M. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The Institute of Medicine, Ecology and Physical Culture. - Ulyanovsk : ULSU, 2017. - На англ. яз.; <http://lib.ulsu.ru/MegaPro/Download/MObject/911>

#### Agreed:

Гл. библиотекарь ООП НБ УЛГУ / Стадольникова Д. Р. *Стаж* / \_\_\_\_\_


#### b) Professional databases, information and reference systems

##### 1. Электронно-библиотечные системы:

1.1. IPRbooks : электронно-библиотечная система : сайт / группа компаний Ай Пи Ар Медиа. - Саратов, [2020]. – URL: <http://www.iprbookshop.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.2. ЮРАЙТ : электронно-библиотечная система : сайт / ООО Электронное издательство ЮРАЙТ. – Москва, [2020]. - URL: <https://www.biblio-online.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.3. Консультант студента : электронно-библиотечная система : сайт / ООО Политехресурс. – Москва, [2020]. – URL: [http://www.studentlibrary.ru/catalogue/switch\\_kit/x2019-128.html](http://www.studentlibrary.ru/catalogue/switch_kit/x2019-128.html). – Режим доступа: для

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зарегистрир. пользователей. – Текст : электронный.

1.4. Лань : электронно-библиотечная система : сайт / ООО ЭБС Лань. – Санкт-Петербург, [2020]. – URL: <https://e.lanbook.com>. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.5. **Znanium.com** : электронно-библиотечная система : сайт / ООО Знаниум. - Москва, [2020]. - URL: <http://znanium.com>. – Режим доступа : для зарегистрир. пользователей. - Текст : электронный.

1.6. Clinical Collection : коллекция для медицинских университетов, клиник, медицинских библиотек // EBSCOhost : [портал]. – URL: <http://web.a.ebscohost.com/ehost/search/advanced?vid=1&sid=e3ddfb99-a1a7-46dd-a6eb-2185f3e0876a%40sessionmgr4008>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

**2. КонсультантПлюс** [Электронный ресурс]: справочная правовая система. /ООО «Консультант Плюс» - Электрон. дан. - Москва : КонсультантПлюс, [2020].

### **3. Базы данных периодических изданий:**

3.1. База данных периодических изданий : электронные журналы / ООО ИВИС. - Москва, [2020]. – URL: <https://dlib.eastview.com/browse/udb/12>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

3.2. eLIBRARY.RU: научная электронная библиотека : сайт / ООО Научная Электронная Библиотека. – Москва, [2020]. – URL: <http://elibrary.ru>. – Режим доступа : для авториз. пользователей. – Текст : электронный


3.3. «Grebennikon» : электронная библиотека / ИД Гребенников. – Москва, [2020]. – URL: <https://id2.action-media.ru/Personal/Products>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

**4. Национальная электронная библиотека** : электронная библиотека : федеральная государственная информационная система : сайт / Министерство культуры РФ ; РГБ. – Москва, [2020]. – URL: <https://нэб.рф>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

**5. SMART Imagebase** // EBSCOhost : [портал]. – URL: <https://ebsco.smartimagebase.com/?TOKEN=EBSCO-1a2ff8c55aa76d8229047223a7d6dc9c&custid=s6895741>. – Режим доступа : для авториз. пользователей. – Изображение : электронные.

### **6. Федеральные информационно-образовательные порталы:**

6.1. Единое окно доступа к образовательным ресурсам : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://window.edu.ru/>. – Текст : электронный.

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6.2. [Российское образование](#) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://www.edu.ru>. – Текст : электронный.


### 7. Образовательные ресурсы УлГУ:

7.1. Электронная библиотека УлГУ : модуль АБИС Мега-ПРО / ООО «Дата Экспресс». – URL: <http://lib.ulsu.ru/MegaPro/Web>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

7.2. Образовательный портал УлГУ. – URL: <http://edu.ulsu.ru>. – Режим доступа : для зарегистр. пользователей. – Текст : электронный.

### Agreed:

Зам. начальника УИТТ / Ключкова А. В. /   
*position* *name*

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## **1. GOALS AND OBJECTIVES OF DISCIPLINE**

**The goals of the discipline:** the formation of a scientific understanding in future doctor of the role of innate and acquired immunity in normal human activity and in diseases, mastering the most important methods of immunodiagnostics of diseases, which will prepare the student for further study of the complex of biomedical, preventive and clinical training disciplines in the specialty 31.05.31 “General Medicine”.

### **Tasks of the discipline:**

- learning of the structure of the system, the function of the human immune system and its role in preserving the structural and functional integrity of the organism, maintaining its homeostasis and biological individuality;
- acquisition by students of knowledge in the field of immunodeficiency conditions, allergic and autoimmune diseases with immune inflammation syndrome;
- teaching of students the basic methods of assessment of the immune status of a person, interpreting the results of studies of the immune system state, forming methodological bases for setting an immunological and allergic diagnosis;
- formation of the ability and readiness to carry out advisory, informational and educational activities, to explain immunologically the choice of medical immunobiological and immunotropic drugs for diagnosis, treatment and prevention of diseases;
- forming the skills of studying scientific literature.

## **2. PLACE OF THE SUBJECT IN THE STRUCTURE OF BASIC EDUCATIONAL PROGRAM:**

The discipline B1.B.57 "Immunology" refers to the basic part of the basic educational program of higher education of specialty 31.05.01 - "General Medicine".

The basic knowledge indispensable for learning the subject are formed:

- in the cycle pertaining to the humanities, social and economic disciplines, including learning of Philosophy, Medical ethics, History of medicine, Latin;
- in the pertaining to mathematics, natural science, including learning of Physics, Mathematics, Medical IT, Chemistry, Biology.

The discipline "Immunology" refers to the basic part of the medical-biological cycle. The total complexity is 3 SET (108 academic hours).

## **3. THE LIST OF EXPECTED LEARNING RESULTS ON THE SUBJECT (UNIT), MATCHED TO EXPECTED RESULTS OF MASTERING THE PROGRAM**



The study of the discipline "Immunology" is aimed at the formation of the following competences among students: general professional competence – GPC-8, professional competences: PC-5, PC-6, PC-8 according to the plan for the development of the educational program.

<b>Competence content (or its main parts)</b>	<b>The proposed results of the course students are</b>
<p><b>GPC-8</b> to be ready to use drugs and other substances and their combinations for solving professional problems</p>	<p><b>To know:</b> the physico- chemical the essence of the processes occurring in a living organism on the molecular, cellular, tissue and organ levels; mechanisms of the effect of environmental factors and endogenous factors on the state of the immune system</p> <p><b>To be able to:</b> explanation of the necessity to use immunomodulators, to use biological preparations.</p> <p><b>To be skilled in:</b> to have skills in the use of medicines in the treatment, rehabilitation and prevention of various diseases and immunopathological conditions.</p>
<p><b>PC-5</b> Readiness for collection and analysis of patient complaints, data of his anamnesis, examination results, laboratory, instrumental, pathological and anatomical and other studies to recognize the condition or state of health, the presence or absence of disease.</p>	<p><b>To know:</b> safety rules and work in immunological laboratories, with reagents, instruments, animals; methods for evaluating the immune status, the findings and principles of its evaluation, immunopathogenesis, methods for diagnosis of the main diseases of the human immune system, the types and indications for the use of immunotropic therapy.</p> <p><b>To be able to:</b> To explain the need for clinical and immunological examination of the patient; interpret the results of the immunological examination, make a diagnosis.</p> <p><b>To be skilled in:</b> interpretation of the results of laboratory, instrumental diagnostic methods in patients in different age; algorithm for making a preliminary diagnosis of patients and if necessary with subsequent directing them to an additional survey and to specialist doctors; technique of collection of biological material for laboratory research.</p>
<p><b>PC-6</b> The ability to determine the patient's primary pathological conditions, symptoms, syndromes of</p>	<p><b>To know:</b> structure and functions of the human immune system, its age features, cell-molecular mechanisms of development and functioning of the immune system, the main stages, type, genetic control of the immune response, methods of immunodiagnostics</p>


diseases, nosological forms in accordance with the International Statistical Classification of Diseases and the problems associated with health, X review, adopted by the 43rd World Health Assembly, Geneva, 1989.	<p><b>To be able to:</b> make a preliminary diagnosis to the patient; determine the amount of additional research to make the diagnosis; interpret the results of the main diagnostic allergological assays.</p> <p><b>To be skilled in:</b> algorithm for making a preliminary diagnosis of patients and if necessary with the subsequent directing them to an additional survey and to doctors; technique of collection of biological material for laboratory research.</p>
<b>PC-8</b> the ability to determine the tactics of managing patients with various nosological forms	<p><b>To know:</b> etiology and pathogenesis of various infectious diseases; main parameters of life activity; factors of immunity, its importance for man and society; the role of immune processes in the etiology and pathogenesis of infectious and non-infectious diseases (tumors, neuro- and psychopathology, autoimmune conflicts, allergic diseases).</p> <p><b>To be able to:</b> define the tactics of managing the patient with different nosological forms; to control the effectiveness of drug treatment; to prevent the spread of infections.</p> <p><b>To be skilled in:</b> interpretation of the results of laboratory and diagnostic methods of diagnostics in children of different age with different diagnoses.</p>

#### 4. SUBJECT VOLUME

##### 4.1. Subject volume in credits (total) 3

##### 4.2. on types of academic workload (in hours) 108

Type of academic workload	Number of hours (form of training -full-time)	
	Total in the plan	Throughout the semesters
		semester № 4
1	2	3
Student-Teacher activity	54	54
Classes:		
Lectures	18	18
Practical classes	36	36
Self-study work	54	54
Concurrent checking (number and type: a test, a colloquium, a report)	-	-
Term thesis		
Types of midterm as-		offset

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assessment (an exam, a test)		
Total number of hours on the subject	108	108

### 4.3. The content of a subject (unit.) Distribution of hours on themes and types of academic workload:


Form of training full-time

Name of sections and topics	Total	Types of classes					form of current knowledge control
		Classes		Interactive classes	Self-study work		
		lectures	practical classes and seminars				
1	2	3	4	6	7	8	
<b>Section 1. General Immunology</b>							
Immunology as a science	12	2	4	1	6	oral survey, test	
Innate immunity. Factors and mechanisms of the innate immunity	12	2	4	1	6	oral survey, test	
Antigens. Antibodies	13	2	4	1	6	oral survey, test	
<b>Section 2. Allergology</b>							
Hypersensitivity. Immunological memory. Immunological tolerance	12	2	4	1	6	oral survey, test	
<b>Section 3. Clinical Immunology</b>							
Pathology of the immune system	11	2	4	1	6	oral survey, test	
Evaluation of the immune status	12	2	4		6	oral survey, test	
Serological tests: agglutination, precipitation test, complement fixation test (CFT), tests using labeled antibodies and antigens (ELISA, IFT, RIA)	12	2	4	1	6	oral survey, test	
<b>Section 4. Immunotherapy.</b>							
Specific prevention and treatment of infectious diseases. Therapeutic,	12	2	4		6	oral survey, test	

prophylactic, and diagnostic immunological preparations						
<b>Section 5. Special Immunology</b>						
Antiviral and anti-bacterial immunity. Immunity in transplantation, cancer and immunity in mycoses. Immunity and age.	12	2	4		6	oral survey, test
<b>Total</b>	<b>108</b>	<b>18</b>	<b>36</b>	<b>6</b>	<b>54</b>	

Interactive forms of classes

№	Name of the subject section	Interactive form of classes	Hours
1	<b>Section 1. General Immunology.</b> Immunology as a science	Watching of the film and its discussion: “Our immune system”	1
2	Innate immunity. Factors and mechanisms of the innate immunity	Watching of the film “Phagocytosis” and its discussion, solving of clinical cases	1
3	Antigens. Antibodies	Watching of the following films and its discussion: “Antigen-antibody reactions”, “Immunoglobulin classes”.	1
4	<b>Section 2. Allergology.</b> Hypersensitivity. Immunological memory. Immunological tolerance	Watching of the film “Hypersensitivity” and its discussion, solving of clinical cases	1
5	<b>Section 3. Clinical Immunology.</b> Pathology of the immune system	Watching of the film “David Vetter –bubble boy, solving of clinical cases	1
6	Serological tests: agglutination, precipitation test, complement fixation test (CFT), tests using labeled antibodies and antigens (ELISA, IFT, RIA)	Watching of the films “Agglutination test”, “Precipitation test”, “Complement fixation test”, “Immunofluorescence test”, “Western Blot”	1
	<b>Total</b>		<b>6</b>

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## 5. COURSE CONTENT

### Section 1. General Immunology

#### Topic 1. Immunology as a science. Introduction in immunology.

Immunology, its definition, problems. The history of immunology, the main periods in the development of immunology. The concept of immunity. Classification of immunity. Sections of modern immunology. Structure of the immune system. The central organs of the immune system. The peripheral organs of the immune system. The role of blood cells in immunity. Immunocompetent cells: definition, classification. The main cell populations of the immune system. The forms of immune response. The mechanism of interaction of immune cells.

#### Topic 2. Innate immunity. Factors and mechanisms of the innate immunity.

The concept of a non-specific (innate) immunity. The main barriers of nonspecific immunity. The innate immune factors - the skin, mucous membranes, the normal microflora, lysozyme. Lysozyme - chemical composition, function. Complement - chemical composition and functions. The activation of the complement pathway. Phagocytosis, mononuclear phagocyte system. The functions of phagocytes. Opsonin. Phagocytosis mechanism stage. "Oxygen explosion." Complete and incomplete phagocytosis. Indicators of activity of phagocytes - phagocytic index, opsono-phagocytic index. Cytokines - classification, properties. The clinical significance of cytokines detection. Interferon - chemical composition, properties. Classification. Protective serum proteins - acute phase proteins, C-reactive protein (CRP),  $\beta$ - lysine, mannose proteins, properdin, fibronectin.


#### Topic 3. Antigens. Antibodies.

Antigens: definition, chemical composition. The structure of the antigen. Properties of antigens: heterogeneity, immunogenicity. Types of antigens according to the degree of foreignness. Specificity antigens, types antigenic specificity. Classification antigens on its origin, chemical structure, the degree of immunogenicity. Classification of antigens by the immune response. Haptens. Adjuvants. The antigens of the human body. The antigens of bacteria, viruses, tumor antigens. Autoantigens. Ways of penetration of antigens in the macro-organism. Antibodies: definition, structure. The structure of the immunoglobulin, immunoglobulin classes. Serum immunoglobulins. The properties of antibodies. Phases of antibody synthesis. The antibody functions in the formation of an immune complex.

### Section 2. Allergology

#### Topic 4. Hypersensitivity. Immunological memory. Immunological tolerance.

Hypersensitivity, its definition. The definition of allergy, stages of allergic reaction. Classification of allergies. I type reactions of immediate type hypersensitivity: anaphylaxis (mechanism of development, manifestations of anaphylaxis, principles of therapy). Anaphylactic shock. Atopy. II

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type of immediate hypersensitivity: cytotoxic: mechanisms of development, clinical manifestations. III type of immediate hypersensitivity reactions: immune complex: mechanisms of development, clinical manifestations. Delayed type of hypersensitivity: mechanism of development, manifestations of contact allergy. Classification of allergens. Infectious allergy. Drug allergies: the immune response to the drug-haptens, clinical manifestations of drug allergy. The principles of treatment and prevention of drug allergy. Laboratory diagnosis of allergies. Immunological memory: concept, mechanisms. Immunological tolerance: concept, causes, mechanisms. Classification of immunological tolerance. Using the phenomenon of immunological tolerance to solve medical problems. Artificial cancellation state of immunological tolerance.

### **Section 3. Clinical Immunology**

#### **Topic 5. Pathology of the immune system.**

The definition of immune deficiency, the classification of immune deficiencies. Causes of congenital immunodeficiency states. Primary immunodeficiencies: characteristics, classification. Combined immunodeficiencies. Secondary (acquired) immunodeficiency: characteristics, classification. The causes of acquired immune deficiencies. Clinical manifestations of immunodeficiency states. Factors affecting the immune status. Immunotherapy, immunomodulators: definition, classification.

#### **Topic 6. Evaluation of the immune status.**

Laboratory diagnosis of immunopathological diseases in children and adults: methods, assessment criteria, interpretation. Methods of assessing the immune status. The levels of assessment of immune status. General rules of immunograms evaluation.


#### **Topic 7. Serological tests: agglutination, precipitation test, complement fixation test (CFT), tests using labeled antibodies and antigens (ELISA, IFT, RIA).**

The main principles and aims of the serological tests in medical practice. Agglutination test and indirect (passive) haemagglutination test (PHAT): definition, mechanism, and practical use. Precipitation reaction: identification, mechanism, types, practical use. Agglutination and precipitation sera: preparation, titration, practical use. Complement fixation test (CFT): the aim of its carrying out, components, mechanisms. Immunofluorescent test (IFT): the variety, aim of its carrying out, components, mechanism. Enzyme linked immunosorbent assay (ELISA): the purpose of its carrying out, components, mechanism. Radioimmunoassay (RIA): the purpose of its carrying out, components, mechanism.

### **Section 4. Immunotherapy**

#### **Topic 8. Specific prevention and treatment of infectious diseases. Therapeutic, prophylactic and diagnostic immunological preparations.**

Immunoprophylaxis, immunotherapy: definitions. Immunobiological preparations - group, the route of administration. The history of immunization. Vaccines - classification, characteristics. Anatoxins - obtaining, application. Requirements to vaccines. Complications, contraindications.

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Scheme administration. Vaccines. The immunological antibody-based drugs. Classification. Characteristic. Rules of vaccines and serums. Immunomodulators : using, classification.

## **Section 5. Special Immunology**

### **Topic 9. Antiviral and antibacterial immunity. Immunity in transplantation, cancer and immunity in mycoses. Immunity and age.**

Features of local immunity - skin and mucous membranes. Antibacterial and antitoxic immunity. Factors of antibacterial immunity. Antiviral immunity. Features of antifungal immunity. Features of immunity in protozoa infestations. Features of parasitic immunity. Transplantation immunity. Immunity in tumors. Immunity of pregnancy. Rhesus-conflict. Age features of immunity. Neonatal immunity with aging.

## **6. TOPICS OF PRACTICAL CLASSES**

### **Section 1. General Immunology**

#### **Topic 1. Immunology as a science. Introduction in immunology.**


##### **Questions:**

1. Immunology, its definition, problems.
2. The history of immunology, the main periods in the development of immunology.
3. The concept of immunity. Classification of immunity.
4. Sections of modern immunology.
5. Structure of the immune system. The central organs of the immune system.
6. The peripheral organs of the immune system.
7. The role of blood cells in immunity.
8. Immunocompetent cells: definition, classification.
9. The main cell populations of the immune system.
10. The forms of immune response.
11. The mechanism of interaction of immune cells.

#### **Topic 2. Innate immunity. Factors and mechanisms of the innate immunity.**

##### **Questions:**

1. The concept of a non-specific (innate) immunity. The main barriers of nonspecific immunity.
2. The innate immune factors - the skin, mucous membranes, the normal microflora, lysozyme.
3. Lysozyme - chemical composition, function.
4. Complement - chemical composition and functions.
5. The activation of the complement pathway.
6. Phagocytosis, mononuclear phagocyte system.
7. The functions of phagocytes. Opsonin.
8. Phagocytosis mechanism stage. "Oxygen explosion." Complete and incomplete phagocytosis.
9. Indicators of activity of phagocytes - phagocytic index, opsono-phagocytic index.
10. Cytokines - classification, properties. The clinical significance of cytokines detection.

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11. Interferon - chemical composition, properties. Classification.
12. Protective serum proteins - acute phase proteins, C-reactive protein (CRP),  $\beta$ -lysozyme, mannose proteins, properdin, fibronectin.

### **Topic 3. Antigen. Antibodies.**

#### **Questions:**

1. Antigen: definition, chemical composition.
2. The structure of the antigen.
3. Properties of antigen: heterogeneity, immunogenicity. Types of antigen according to the degree of foreignness.
4. Specificity antigen, types antigenic specificity.
5. Classification antigen on its origin, chemical structure, the degree of immunogenicity.
6. Classification of antigen by the immune response. Haptens. Adjuvants.
7. The antigen of the human body.
8. The antigen of bacteria, viruses, tumor antigen. Autoantigen.
9. Ways of penetration of antigen in the macro-organism.
10. Antibodies: definition, structure.
11. The structure of the immunoglobulin, immunoglobulin classes. Serum immunoglobulins.
12. The properties of antibodies.
13. Phases of antibody synthesis.
14. The antibody functions in the formation of an immune complex.

### **Section 2. Allergology.**


#### **Topic 4. Hypersensitivity. Immunological memory. Immunological tolerance.**

#### **Questions:**

1. Hypersensitivity, its definition. The definition of allergy, stages of allergic reaction.
2. Classification of allergies.
3. I type reactions of immediate type hypersensitivity: anaphylaxis (mechanism of development, manifestations of anaphylaxis, principles of therapy). Anaphylactic shock. Atopy.
4. II type of immediate hypersensitivity: cytotoxic: mechanisms of development, clinical manifestations.
5. III type of immediate hypersensitivity reactions: immune complex: mechanisms of development, clinical manifestations.
6. Delayed type of hypersensitivity: mechanism of development, manifestations of contact allergy.
7. Classification of allergens. Infectious allergy.
8. Drug allergies: the immune response to the drug-haptens, clinical manifestations of drug allergy.
9. The principles of treatment and prevention of drug allergy. 10. Laboratory diagnosis of allergies.
11. Immunological memory: concept, mechanisms.
12. Immunological tolerance: concept, causes, mechanisms.
13. Classification of immunological tolerance. Using the phenomenon of immunological tolerance to solve medical problems. Artificial cancellation state of immunological tolerance.

### **Section 3. Clinical Immunology.**



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### **Topic 5. Pathology of the immune system.**

#### **Questions:**

1. The definition of immune deficiency, the classification of immune deficiencies. Causes of congenital immunodeficiency states.
2. Primary immunodeficiencies: characteristics, classification. Combined immunodeficiencies.
3. Secondary (acquired) immunodeficiency: characteristics, classification.
4. The causes of acquired immune deficiencies.
5. Clinical manifestations of immunodeficiency states. Factors affecting the immune status.
6. Immunotherapy, immunomodulators: definition, classification.

### **Topic 6. Evaluation of the immune status.**

#### **Questions:**

1. Laboratory diagnosis of immunopathological diseases in children and adults: methods, assessment criteria, interpretation.
2. Methods of assessing the immune status.
3. The levels of assessment of immune status.
4. General rules of immunograms evaluation.

### **Topic 7. Serological tests: agglutination, precipitation test, complement fixation test (CFT), tests using labeled antibodies and antigens (ELISA, IFT, RIA).**

#### **Questions:**


1. The main principles and aims of the serological tests in medical practice.
2. Agglutination test and indirect (passive) haemagglutination test (PHAT): definition, mechanism, and practical use.
3. Precipitation reaction: identification, mechanism, types, practical use.
4. Agglutination and precipitation sera: preparation, titration, practical use.
5. Complement fixation test (CFT): the aim of its carrying out, components, mechanisms.
6. Immunofluorescent test (IFT): the variety, aim of its carrying out, components, mechanism.
7. Enzyme linked immunosorbent assay (ELISA): the purpose of its carrying out, components, mechanism.
8. Radioimmunoassay (RIA): the purpose of its carrying out, components, mechanism.

### **Section 4. Immunotherapy**

### **Topic 8. Specific prevention and treatment of infectious diseases. Therapeutic, prophylactic and diagnostic immunological preparations.**

#### **Questions:**

1. Immunoprophylaxis, immunotherapy: definitions. Immunobiological preparations - group, the route of administration.
2. The history of immunization.
3. Vaccines - classification, characteristics.
4. Anatoxins - obtaining, application.

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5. Requirements to vaccines. Complications, contraindications. Scheme administration.
6. Vaccine.
7. The immunological antibody-based drugs. Classification. Characteristic.
8. Rules of vaccines and serums.
9. Immunomodulators : using, classification.

### **Section 5. Special Immunology.**

**Topic 9. Antiviral and antibacterial immunity. Immunity in transplantation, cancer and immunity in mycoses. Immunity and age.**

#### **Questions:**


1. Features of local immunity - skin and mucous membranes.
2. Antibacterial and antitoxic immunity. Factors of antibacterial immunity.
3. Antiviral immunity.
4. Features of antifungal immunity.
5. Features of immunity in protozoa infestations.
6. Features of parasitic immunity.
7. Transplantation immunity.
8. Immunity in tumors.
9. Immunity of pregnancy. Rhesus-conflict.
10. Age features of immunity. Neonatal immunity with aging.

**7. LABORATORY CLASSES: this type of work is not provided by the curriculum.**


**8. TOPICS OF COURSE, CONTROL WORKS, ABSTRACTS: this type of work is not provided by the curriculum.**

#### **9. LIST OF QUESTIONS FOR THE OFFSET:**

1. Immunology, its definition, problems. Sections of modern immunology.
2. The history of immunology, the main periods in the development of immunology.
3. The concept of immunity. Classification of immunity.
4. Structure of the immune system.
5. The central organs of the immune system. The peripheral organs of the immune system.
6. The role of blood cells in immunity.
7. Immunocompetent cells: definition, classification.
8. The main cell populations of the immune system.
9. The forms of immune response.
10. The mechanism of interaction of immune cells.
11. The concept of a non-specific (innate) immunity. The main barriers of nonspecific immunity.
12. The innate immune factors - the skin, mucous membranes, the normal microflora, lysozyme. Lysozyme - chemical composition, function.
13. Complement - chemical composition and functions.

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14. The activation of the complement pathway.
15. Phagocytosis, mononuclear phagocyte system. The functions of phagocytes. Opsonin.
16. Phagocytosis mechanism stage. "Oxygen explosion." Complete and incomplete phagocytosis.
17. Indicators of activity of phagocytes - phagocytic index, opsono-phagocytic index.
18. Cytokines - classification, properties. The clinical significance of cytokines detection.
19. Interferon - chemical composition, properties. Classification.
20. Protective serum proteins - acute phase proteins, C-reactive protein (CRP),  $\beta$ -lysinase, mannose proteins, properdin, fibronectin.
21. Antigens: definition, chemical composition.
22. The structure of the antigen.
23. Properties of antigens: heterogeneity, immunogenicity. Types of antigens according to the degree of foreignness.
24. Specificity antigens, types antigenic specificity.
25. Classification antigens on its origin, chemical structure, the degree of immunogenicity.
26. Classification of antigens by the immune response. Haptens. Adjuvants.
27. The antigens of the human body.
28. The antigens of bacteria, viruses, tumor antigens. Autoantigens.
29. Ways of penetration of antigens in the macro-organism.
30. Antibodies: definition, structure.
31. The structure of the immunoglobulin, immunoglobulin classes. Serum immunoglobulins.
32. The properties of antibodies.
33. Phases of antibody synthesis.
34. The antibody functions in the formation of an immune complexes.
35. Hypersensitivity, its definition. The definition of allergy, stages of allergic reaction.
36. Classification of allergies.
37. I type reactions of immediate type hypersensitivity: anaphylaxis (mechanism of development, manifestations of anaphylaxis, principles of therapy). Anaphylactic shock. Atopy.
38. II type of immediate hypersensitivity: cytotoxic: mechanisms of development, clinical manifestations.
39. III type of immediate hypersensitivity reactions: immune complex: mechanisms of development, clinical manifestations.
40. Delayed type of hypersensitivity: mechanism of development, manifestations of contact allergy.
41. Classification of allergens. Infectious allergy.
42. Drug allergies: the immune response to the drug-haptens, clinical manifestations of drug allergy. The principles of treatment and prevention of drug allergy.
43. Laboratory diagnosis of allergies.
44. Immunological memory: concept, mechanisms. Immunological tolerance: concept, causes, mechanisms.

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45. Classification of immunological tolerance. Using the phenomenon of immunological tolerance to solve medical problems. Artificial cancellation state of immunological tolerance.
46. The definition of immune deficiency, the classification of immune deficiencies.
47. Causes of congenital immunodeficiency states. Primary immunodeficiencies: characteristics, classification. Combined immunodeficiencies.
48. Secondary (acquired) immunodeficiency: characteristics, classification. The causes of acquired immune deficiencies.
49. Clinical manifestations of immunodeficiency states. Factors affecting the immune status.
50. Immunotherapy, immunomodulators: definition, classification.
51. Laboratory diagnosis of immunopathological diseases in children and adults: methods, assessment criteria, interpretation.
52. Methods of assessing the immune status.
53. The levels of assessment of immune status. General rules of immunograms evaluation.
54. The main principles and aims of the serological tests in medical practice.
55. Agglutination test and indirect (passive) haemagglutination test (PHAT): definition, mechanism, and practical use.
56. Precipitation reaction: identification, mechanism, types, practical use. Agglutination and precipitation sera: preparation, titration, practical use.
57. Complement fixation test (CFT): the aim of its carrying out, components, mechanisms.
58. Immunofluorescent test (IFT): the variety, aim of its carrying out, components, mechanism.
59. Enzyme linked immunosorbent assay (ELISA): the purpose of its carrying out, components, mechanism.
60. Radioimmunoassay (RIA): the purpose of its carrying out, components, mechanism.
61. Immunoprophylaxis, immunotherapy: definitions. Immunobiological preparations - group, the route of administration.
62. The history of immunization.
63. Vaccines - classification, characteristics. Anatoxins - obtaining, application.
64. Requirements to vaccines. Complications, contraindications. Scheme administration.
65. The immunological antibody-based drugs. Classification. Characteristic.
66. Rules of vaccines and serums.
67. Immunomodulators : using, classification.
68. Features of local immunity - skin and mucous membranes.
69. Antibacterial and antitoxic immunity. Factors of antibacterial immunity.
70. Antiviral immunity.
71. Features of antifungal immunity.
72. Features of immunity in protozoa infestations.
73. Features of parasitic immunity.
74. Transplantation immunity.
75. Immunity in tumors.
76. Immunity of pregnancy. Rhesus-conflict.

77. Age features of immunity. Neonatal immunity with aging.

### 10. SELF-STUDY WORK OF STUDENTS

Form of training full-time

The unit title	Type of self-study work	Amount of hours	Type of control
Immunology as a science. Introduction in immunology	Preparation for classes, performing of tasks for self-guided work in the copybooks	6	Discussion of home tasks, checkup of tasks in copybook
Innate immunity. Factors and mechanisms of the innate immunity	Preparation for classes, performing of tasks for self-guided work in the copybooks, preparation of multimedia presentations	6	Discussion of home tasks, checkup of tasks in copybook, checkup of presentation
Antigens. Antibodies	Preparation for classes, performing of tasks for self-guided work in the copybooks	6	Discussion of home tasks, checkup of tasks in copybook
Hypersensitivity. Immunological memory. Immunological tolerance	Preparation for classes, performing of tasks for self-guided work in the copybooks, work with literature and other information sources, writing of abstract, preparation of multimedia presentations	6	Discussion of home tasks, checkup of tasks in copybook
Pathology of the immune system	Preparation for classes, performing of tasks for self-guided work in the copybooks, preparation of multimedia presentations	6	Discussion of home tasks, checkup of tasks in copybook
Evaluation of the immune status	Preparation for classes, performing of tasks for self-guided work in the copybooks	6	Discussion of home tasks, checkup of tasks in copybook
Serological tests: agglutination, precipitation test, complement fixation test (CFT), tests using labeled antibodies and antigens (ELISA, IFT, RIA)	Preparation for classes, performing of tasks for self-guided work in the copybooks, work with literature and other information sources, writing of abstract	6	Discussion of home tasks, checkup of tasks in copybook
Specific prevention and treatment of infectious diseases. Therapeutic, prophy-	Preparation for classes, performing of tasks for self-guided work in the copybooks, work with literature and other information sources,	6	Discussion of home tasks, checkup of tasks in copybook

lactic, and diagnostic immunological preparations	writing of abstract, preparation of multimedia presentations		
Antiviral and antibacterial immunity. Immunity in transplantation, cancer and immunity in mycoses. Immunity and age	Preparation for classes, performing of tasks for self-guided work in the copybooks, work with literature and other information sources, writing of abstract, preparation of multimedia presentations	6	Discussion of home tasks, checkup of tasks in copybook

## 11. INSTRUCTIONAL AND INFORMATION SUPPORT OF THE SUBJECT

### a) the list of recommended literature

#### main

1) Khaitov R.M., Immunology [Электронный ресурс] / Khaitov R.M. - , 2008. - 256 с. - ISBN 978-5-9704-0704-2 - Режим доступа:

<http://www.studentlibrary.ru/book/ISBN9785970407042.html>

#### additional

1) Medical microbiology : a guide to microbial infections: pathogenesis, immunity, laboratory investigation and control / ed. by M. R.Barer, W. Irving, A. Swann, N. Perera. - 19th ed. - London : Elsevier, 2018. - 743 p.

#### teaching

1) Artamonova M. N. **Immunology** : guidelines for practical classes for foreign students / M. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The Institute of Medicine, Ecology and Physical Culture. - Ulyanovsk : ULSU, 2017. - На англ. яз.;

<http://lib.ulsu.ru/MegaPro/Download/MObject/911>

#### Agreed:


Гл. библиотекарь ООП НБ УЛГУ / Стадольникова Д. Р. / *Смаг* /  
Должность сотрудника научной библиотеки ФИО подпись

### b) Professional databases, information and reference systems

#### 1. Электронно-библиотечные системы:

1.1. IPRbooks : электронно-библиотечная система : сайт / группа компаний Ай Пи Ар Медиа. - Саратов, [2020]. – URL: <http://www.iprbookshop.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.2. ЮРАЙТ : электронно-библиотечная система : сайт / ООО Электронное

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издательство ЮРАЙТ. – Москва, [2020]. - URL: <https://www.biblio-online.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.3. Консультант студента : электронно-библиотечная система : сайт / ООО Политехресурс. – Москва, [2020]. – URL: [http://www.studentlibrary.ru/catalogue/switch\\_kit/x2019-128.html](http://www.studentlibrary.ru/catalogue/switch_kit/x2019-128.html). – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.4. Лань : электронно-библиотечная система : сайт / ООО ЭБС Лань. – Санкт-Петербург, [2020]. – URL: <https://e.lanbook.com>. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.5. **Znanium.com** : электронно-библиотечная система : сайт / ООО Знаниум. - Москва, [2020]. - URL: <http://znanium.com>. – Режим доступа : для зарегистрир. пользователей. - Текст : электронный.

1.6. Clinical Collection : коллекция для медицинских университетов, клиник, медицинских библиотек // EBSCOhost : [портал]. – URL: <http://web.a.ebscohost.com/ehost/search/advanced?vid=1&sid=e3ddfb99-a1a7-46dd-a6eb-2185f3e0876a%40sessionmgr4008>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

**2. КонсультантПлюс** [Электронный ресурс]: справочная правовая система. /ООО «Консультант Плюс» - Электрон. дан. - Москва : КонсультантПлюс, [2020].

### **3. Базы данных периодических изданий:**


3.1. База данных периодических изданий : электронные журналы / ООО ИВИС. - Москва, [2020]. – URL: <https://dlib.eastview.com/browse/udb/12>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

3.2. eLIBRARY.RU: научная электронная библиотека : сайт / ООО Научная Электронная Библиотека. – Москва, [2020]. – URL: <http://elibrary.ru>. – Режим доступа : для авториз. пользователей. – Текст : электронный

3.3. «Grebennikon» : электронная библиотека / ИД Гребенников. – Москва, [2020]. – URL: <https://id2.action-media.ru/Personal/Products>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

**4. Национальная электронная библиотека** : электронная библиотека : федеральная государственная информационная система : сайт / Министерство культуры РФ ; РГБ. – Москва, [2020]. – URL: <https://нэб.рф>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

**5. SMART Imagebase** // EBSCOhost : [портал]. – URL: <https://ebco.smartimagebase.com/?TOKEN=EBSCO->

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1a2ff8c55aa76d8229047223a7d6dc9c&custid=s6895741. – Режим доступа : для авториз. пользователей. – Изображение : электронные.

#### 6. Федеральные информационно-образовательные порталы:

6.1. [Единое окно доступа к образовательным ресурсам](http://window.edu.ru/) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://window.edu.ru/>. – Текст : электронный.

6.2. [Российское образование](http://www.edu.ru/) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: [http://www.edu.ru.](http://www.edu.ru/) – Текст : электронный.

#### 7. Образовательные ресурсы УлГУ:

7.1. Электронная библиотека УлГУ : модуль АБИС Мега-ПРО / ООО «Дата Экспресс». – URL: <http://lib.ulsu.ru/MegaPro/Web>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

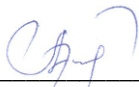
7.2. Образовательный портал УлГУ. – URL: <http://edu.ulsu.ru>. – Режим доступа : для зарегистр. пользователей. – Текст : электронный.


#### Agreed:

Зам. начальника УИТТ / Ключкова А. В. /   
*position* *name*

## 12. MATERIAL AND TECHNICAL SUPPORT OF THE SUBJECT

Specialized training laboratory microbiology must have individual jobs for students, equipped with microscopes, and facilities for making micropreparations, bacteriological research and productions of immunological reactions (dyes, alcohol lamp, racks, trays, bacterial loop, tubes, automatic dispensers, pipettes, sets disks with antibiotics thermostat, vaccines, sera, diagnostic preparations). It also requires basic equipment for the preparation and storage of culture media and disinfection / sterilization: autoclave ( "clean" and "dirty"), dry-heat sterilizer, distiller, fridge. Visual aids (tables, posters and are fixed preparations of bacteria) in the diagnosis of major infectious diseases, and others.

**Creators**  \_\_\_\_\_ associate professor \_\_\_\_\_ Artamonova M. N.  
*signature* *position* *full name*

 \_\_\_\_\_ professor \_\_\_\_\_ Potaturkina-Nesterova N. I.  
*signature* *position* *full name*