

**FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION  
OF HIGHER EDUCATION  
«BASHKIR STATE MEDICAL UNIVERSITY»  
OF THE MINISTRY OF HEALTHCARE OF RUSSIAN FEDERATION**

DEPARTMENT REPRODUCTIVE HUMAN HEALTH  
WITH COURSE OF IMMUNOLOGY

APPROVED by  
Head of the department

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**Methodical recommendations For professors  
to the practice session on the topic:  
«Immunity, species. Factors of non-specific resistance. Acquired immunity. Forms of immune  
response. Antigens.»**

Discipline: Immunology  
Specialty: 31.05.03. «Dentistry»  
Course 2  
Semester 3  
Hours: 4

Methodological instructions for students for practical lessons in the discipline "Immunology " were developed by the faculty of the department in accordance with the work program of the academic discipline (Ufa, 2021), the curriculum (2021) and taking into account the requirements of the Federal State Educational Standard of Higher Education 3 ++ according to specialty 31.05.03 Dentistry (M., 2020).

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**1. The theme and its relevance: "Immunity, species. Factors of non-specific resistance. Acquired immunity. Forms of immune response. Antigens.»**

Immunity is the immunity of the body to infectious diseases, as well as agents and substances that have foreign to the body, antigenic properties.

Immunity is provided by the organs and cells of the immune system.

Immune system functions:

1. Protection of the body from the introduction of foreign cells and from modified cells of the body (cells infected with viruses, malignant cells, etc.).
2. Destruction of old, defective and damaged own cells, as well as cellular elements that are not characteristic of this organism.
3. Neutralization and subsequent elimination of all genetically foreign high-molecular substances of biological origin (proteins, polysaccharides, lipopolysaccharides, etc.).

The optimal functioning of the immune system is ensured by the interaction of specific cellular elements (lymphocytes) and cell products (antibodies and cytokines) with each other, as well as with non-lymphoid elements. The main ones are antigen-presenting cells (APC).

Types of immunity:

1. There are the following types of immunity: innate and acquired.
2. Innate, specific, hereditary, or natural immunity is the immunity of one animal or human species to diseases of another species. For example, humans are immune to canine and bovine stingray plague; many animals fail to cause measles disease, etc. There are varying degrees of strain on species immunity. Sometimes adverse factors (such as exposure to low temperatures) can reduce the natural immunity to a particular type of microbe.

Acquired immunity can be natural or artificial. In turn, there is a distinction between actively and passively acquired natural and artificial immunity.

Actively acquired natural immunity occurs after an infectious disease. This is the most durable, long-lasting immunity, which is sometimes maintained for life.

Actively acquired artificial immunity occurs as a result of vaccination with live weakened or killed vaccines (microbial preparations). Such immunity occurs 1-2 weeks after vaccination and is maintained for a relatively long time - for years and tens of years.

Passively acquired natural immunity is the immunity of a fetus or newborn who receives antibodies from the mother through the placenta or with breast milk. In this regard, newborns for a certain time remain immune to certain infections, for example, to measles.

Passively acquired artificial immunity is created by introducing into the body immunoglobulins obtained from actively immunized people or animals. Such immunity is established quickly - a few hours after the introduction of immune serum or immunoglobulin and persists for a short time for 3-4 weeks, because the body seeks to get rid of foreign serum.

All types of immunity associated with the formation of antibodies are called specific, because antibodies act only against a certain type of microorganisms or toxins.

The immune response always begins with non-specific reactions.

Non-specific factors of immune defense are genetically fixed and inherited factors of a certain type of organism developed in the process of phylogeny to various antigens, depending on the biological characteristics of each organism. Non-specific and specific protection factors function as a single integral system of protection against antigens (for example, pathogens of infectious diseases). Depending on the nature of the antigenic effect, either one or several forms of response can be leading. The understanding of the protective factors of the body's reactivity is of great importance in preventive and clinical medicine, which justifies the importance of the knowledge of this section, which students should master.

Non-specific protective mechanisms include the skin and mucous membranes, which are practically impervious to microbes, lysozyme (a bactericidal substance of the skin and

mucous membranes), the inflammatory reaction, the bactericidal properties of blood tissue fluid, phagocytosis reactions.

## **2. Learning purpose: mastering knowledge about the concept of Immunity, types. Factors of non-specific resistance, knowledge of pathogenesis of each type of reaction and clinical manifestations.**

To form professional competencies, the student must know:

- Anatomy-physiological features of non-specific resistance;
- the role of each factor of non-specific resistance in anti-infective protection;
- clinical manifestations of insufficiency of various factors of nonspecific resistance.

To form professional competencies, the student must be able to:

- determine the intensity of innate immunity;
- detect the presence of agglutination and establish the titer of normal antibodies;
- collect anamnesis, determine the plan of examination of the patient by organs and systems, which will allow to assess the functioning of factors of nonspecific resistance of the immune system;
- determine the plan for additional examination of the patient;
- evaluate the results of clinical and laboratory-instrumental data;
- master the following competencies: GC 1, GC 6, GPC 5, PC 1, PC 5.

## **3. Materials for self-preparation to master this topic:**

### **Self-training questions:**

- The modern definition of the concept of "immunity". Types of MI (congenital, acquired), their main differences.
- Non-specific immune factors: mechanical, physico-chemical, cellular and humoral.
- Phagocytosis; phagocytic cells; the main stages of phagocytosis; completed and incomplete phagocytosis.
- The system of complement activation pathway. The role of complement in chemotaxis, microbial opsonization, and the development of allergic and immunopathological processes.
- The properdin system.
- Interferons; classification; immuno-biological significance.
- Heat shock proteins.
- Organs of the immune system
- Acquired immunity, forms (active, passive, natural, artificial, antibacterial, antitoxic, antiviral, sterile, nonsterile, local, etc)
- Basic differences in the innate and acquired immunity.
- Forms of immune response.
- Antigens, property (heterology, antigenicity, immunogenicity, specificity and other)
- Antigenic determinants, their structure. Manifestation of the antigenic specificity: specific, group, organ, heterospetsific.
- Haptens, the property: autoantigens.
- Antigens of the man: ksenoantigeny, autoantigens, isoantigens, alloantigens, the antigenic markers of the cells of man (SD3-, CD -4, CD8- antigens and others )
- Main complex of histocompatibility, the antigens of histocompatibility I ,II and III classes.

4. Type of lesson: practical lesson
5. Duration: 4 hours
6. Equipment: computer, projector
7. The content of the lesson.

**Technological map of the lesson:**

№	Stages of classes and their content	Time in min.	Used visual aids, methodological manuals, etc.	Location of classes	Purpose and nature of the activity	
					of the student's activity	The purpose and nature of the teacher's activity
1	2	3	4	5	6	7
1	Organizational stage	5				
2	Control of students' initial knowledge using test tasks	40	Textbook for classroom and extracurricular work of students Tests.	Study room	Assimilation of theoretical material. Solving typical tasks using tests	Control of the initial level of knowledge.
3	Familiarization of students with the content of the lesson	15	Training tables, slides.			
4	Independent work of students under the guidance of a teacher:	105	Training tests, training situational tasks.		Consolidation of knowledge on the topic, self-examination of the level of assimilation of the material	Control over the work of students.
5	Control of the final level of knowledge and skills on the topic	15	Situational tasks that control test tasks.	Study room		Summing up the lesson. Checking the test results, the level of assimilation of the lesson topic
6	Homework assignment	5				

7.1. Control of the initial level of knowledge and skills. Self-control assignments: students' decision on individual sets of test assignments on the topic «Immunity, types. Factors of non-specific resistance» ":

Task 1. The main function of the immune system:

1. Control of proliferation processes
2. Maintaining the molecular constancy of the body
3. Maintaining the genetic homeostasis of the body
4. Ensuring optimal conditions of tissue exchange

Task 2. An alternative way to activate the complement is started:

1. The AG - AT complex
2. Complex AG-Ig M
3. Complex AG-Ig M
4. Lipopolysaccharides of microbes
5. Through the properdin system

Task 3. The classic complement activation path is started:

1. The AG – AT complex
2. Complex AG-Ig M
3. The AG – Ig G complex
4. Lipopolysaccharides of microbes
5. Through the properdin system

Task 4. Activated complement components:

1. Destroy the cells
2. I increase phagocytosis
3. Participate in anaphylactic reactions
4. Cause chemotaxis
5. Stimulate antibody formation

Task 5. Components of the complement system that have opsonizing properties:

1. From 5
2. From 7
3. From 9
4. C3v C4v

Task 6. Components of the complement system that provide a lytic effect:

1. C2
2. C3B
3. C8, C9
4. C3A, C3B
5. C1

Task 7. Incomplete phagocytosis is caused by:

1. Capsule-forming bacteria
2. The suppression of the fusion of lysosomes with phagosomes
3. The release of microbes from phagosomes
4. The formation of pseudopodia
5. Spore formation

Task 8. The monocyte-macrophage system includes all but:

1. Monocytes
2. Dendritic cells

3. Astrocytes
4. The Kupffer Cells
5. Langerhans cells
6. Natural killers

Task 9. Macrophages have receptors for:

1. Fc-Ig G
2. Fc – Ig A
3. Complement
4. Cytokines
5. Red blood cells

Task 10. The main functions of the macrophage:

1. Phagocytosis
2. Presentation of the antigen to T cells
3. The secretion of cytokines
4. Damage to target cells
5. The synthesis of antibodies

Task 11. Interferons:

1. A variety of cytokines
2. Formed only in viral infections
3. Species-specific
4. Factors of innate immunity
5. Factors of acquired immunity

Task 12. To set up an agglutination reaction for the purpose of serodiagnostics, the following parameters are required:

1. Diagnosticum
2. Test serum
3. Saline solution
4. Diagnostic serum
5. Complement

Task 13. Which of the following non-specific humoral factors of immunity is determined by its enzyme activity?

1. Lysozyme
2. Interferon

Task 14. What part of the antibody molecule is responsible for activating the complement along the classical pathway after interaction with the antigen?

1. " L " - chains
2. FC fragments
3. FAB fragments

Task 15. The cascade system of blood serum that can cause cell lysis is:

1. complement system
2. cytokine network
3. interferons
4. kallikrein-kinin system
5. immunoglobulins

### **Typical tasks.**

#### **Task #1.**

Specify the properties that characterize exotoxins and endotoxins of bacteria.

1. Proteins.
2. Thermally stable.
3. They are characterized by organotropy.
4. Do not turn into toxoids.
5. Form antitoxic immunity.
6. Formed mainly by gram-negative bacteria.
7. Exhibit enzymatic activity.
8. The mechanism of action is similar in different pathogens.

#### **Task #2.**

Indicate possible errors in the following statements and give the correct answer, in your opinion.

1. According to the nature of the relationship with the plant and animal world, microbes are divided into two groups: commensals and parasites.
2. For the emergence and development of the infectious process, three links are necessary: the presence of a microbe; its penetration into an unresponsive macroorganism; certain conditions of the internal environment in which the interaction between the microorganism and the macroorganism occurs.
3. Pathogenicity is the ability of a virulent microbe to adhere, invade, aggress, and colonize.
4. Virulence is the potential ability of a microorganism to cause an infectious process.
5. In the development of the infectious process, the following periods are distinguished: prodromal, the period of the main manifestations of the disease, the incubation period, the recovery period.

#### **Task №3.**

Give a description of immunity.

1. A child, 7 years old, was vaccinated with ADS (adsorbed diphtheria tetanus toxoid).
2. Convalescence of typhoid fever (the causative agent of typhoid fever does not form exotoxin).
3. A 2-year-old child who was not vaccinated against measles and had contact with a measles patient was injected with anti-measles immunoglobulin.
4. The child is 21 days old. The mother of the child was vaccinated during her life and had infectious diseases.
5. Man, as a species, is immune to the plague of dogs.

7.2. Analysis with the teacher of the key questions necessary for the development of the topic of the lesson.

7.3. Presentation by the teacher of the methodology for assessing the state of factors of non-specific protection of the body in the laboratory.

7.4. Independent work of students under the supervision of a teacher (draw in a notebook the stages of phagocytosis, the main schemes of complement activation).

7.5. Control of the final level of assimilation of the topic:

The teacher checks the students' oral answers to the questions of self-preparation.

Checking the presence of drawings of phagocytosis stages and the main schemes of complement activation in the notebooks.

Materials for monitoring the level of development of the topic:



- a set of test tasks,
- situational tasks.

Place of self-training: study room for independent work of students.

**Educational and research work of students on this topic (conducted during school hours): working with the main and additional literature.**

**The main literature**

Serial№	Title	Author(s)	Year, place of publication	Number of copies	
				In library	At the department
1	2	3	4	7	8
	<b>Basic Immunology: Functions and Disorders of the Immune System</b> [Текст] : [учебноиздание]	<b>A. K. Abbas, A. H. Lichtman, S. Pillai.</b>	Elsevier, 2016 – 335 p.	80	0

**Additional literature**

Serial №	Title	Author(s)	Year, place of publication	Number of copies	
				In library	At the department
1	2	3	4	7	8
•	Lectures in immunology: курс лекций	Maianskii, A. N.	N. Novgorod: Publishing house NSMA, 2004 – 256 p.	40	0
•	<b>IMMUNOLOGY</b>	<b>Khaitov R.M.</b>	<b>2008 – 256 c.on-line.</b>	<b>access mode:</b> ЭБС «Консультант студента»  <a href="http://www.studmedlib.ru/book/ISBN9785970407042.html">http://www.studmedlib.ru/book/ISBN9785970407042.html</a>	unlimited access
•	<b>Fundamental Immunology.</b>	<b>Lippincott Williams &amp; Wilkins</b>	<b>2008 –on-line</b>	<b>access mode:</b> Database«LWW	unlimited access

				Medical Book Collection 2011»  <a href="http://ovidsp.ovid.com">http:// ovidsp .ovid.com</a>	
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