

**FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION  
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DEPARTMENT REPRODUCTIVE HUMAN HEALTH  
WITH COURSE OF IMMUNOLOGY

APPROVED by  
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**Methodical recommendations For professors  
to the practice session on the topic:  
«Features of immunity in various localizations and conditions. Immune status and its  
assessment.»**

Discipline: Clinical Immunology  
Specialty: 31.05.01. «General education»  
Course 4  
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Methodological instructions for students for practical lessons in the discipline "Clinical 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 31.05.01 General education (M., 2020).

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## **1. The theme and its relevance: "Features of immunity in various localizations and conditions. Immune status and its assessment.»**

The reaction of macroorganism to antigens is quite similar, as it is limited by a set of factors of immune defense and physiological capabilities of the macroorganism itself. However, depending on the nature of the antigen, the immune system does not have to include the entire available arsenal to eliminate it - only the most effective mechanisms and defenses are sufficient for a particular antigen. Therefore, when exposed to different nature and properties of antigens, the immune response of macroorganism has its own peculiarities.

The immune response of macroorganism in response to bacterial infection is largely determined by the pathogenicity factors of the microbe and, above all, its ability to form toxins. There are antibacterial (against structural-functional components of bacterial cells) and antitoxic (against protein toxins) immunity. The main factors of antibacterial protection in the vast majority of cases are antibodies and phagocytes. Antibodies effectively inactivate biologically active bacterial cell molecules (toxins, aggression enzymes, etc.), mark them, trigger the mechanism of antibody-dependent bacteriosis and participate in immune phagocytosis. Phagocytes carry out phagocytosis, including immune, extracellular killing pathogen using ion-radicals and antibody-dependent bacteriosis. In addition to these, the introduced bacteria are affected by the entire arsenal of factors of non-specific resistance. Among them is an important role in the fight against gram-positive microbes priinadl ...

The immune protection of macroorganism in viral infections has features caused by two forms of the virus's existence: extracellular and intracellular. The main factors providing antiviral immunity are specific antibodies, T-killers, natural killers, interferon and serum inhibitors of viral particles. Specific antiviral antibodies are able to interact only with extracellular virus, intracellular structures are not available for them in life. Antibodies neutralize the viral particle by preventing it from being absorbed in the target cell, infection and generalization of the process, and bind viral proteins and nucleic acids, which enter the intercellular environment and secrets after the destruction of virus-infected cells. The formed immune complexes are eliminated by immune phagocytosis. Specific binding of antibodies to viral proteins expressed on MTC infected cells induces cytotoxic activity of natural cells ...

Features of antifungal immunity. Antigens of fungi have a relatively low immunogenicity: they practically do not induce antibody formation (titles of specific antibodies remain low), but stimulate the cellular link of immunity. Meanwhile, the main active factors of antifungal immunity are activated macrophages, which carry out antibody-dependent cell-mediated cytotoxicity of fungi. In mycosis there is an allergy of macroorganism. Skin and deep mycosis are usually accompanied by HRT. Fungal lesions of the mucous respiratory and urinary tract swells cause allergy by type of GNT (type I reaction).

Features of immunity in protozoal infestations. It is known that parasitic infestation is accompanied by the formation of humoral and cellular immunity in the macroorganism. The blood is defined by specific antibodies of classes M and G, which most often do not have a protective effect. However, they activate antibody-dependent cell-mediated cytotoxicity involving macrophages, and in the case of intracellular parasitization - natural killers and gadet-lymphocytes. Parasitic infestations are accompanied by macroorganism allergy - there is an increase in HRT on protozoan antigens. The leading role in the implementation of the immune defense of macroorganism against worm infestation is played by eosinophils, which carry out antibody-dependent cell-mediated cytotoxicity. These cells "recognize" parasites "marked" by specific IgE or IgA. Activated eosinophil, degranulating, secretes a number of toxic substances (enzymes, protein toxins), harmful lyons. Antigens ge ...

Transplantation immunity is called the immune response of macroorganism, directed against transplanted into it foreign tissue (graft). The immune response to foreign cells and tissues is due to the fact that they contain genetically alien to the body antigens. These antigens, called transplantation or antigen histocompatibility, are most fully represented at the MTC cells. The rejection reaction does not occur in the case of the complete compatibility of the donor and the recipient on antigenes histocompatibility - this is only possible for identical twins. The severity of the rejection response largely depends on the degree of alienity, the volume of the transplanted material and the state of immunoreactivity of the recipient. In contact with foreign transplantantium antigens, the body reacts with factors of cellular and humoral links of immunity. The main factor of cell transplantation immunity are T-killers. These cells after sensitization by antigens donor ...

Immunity against tumors. Anticancer immunity has its own features associated with low immunogenicity of cancer cells. These cells are practically indistinguishable from the normal, insyactic morphological elements of their own body. The specific antigenic "repertoire" of tumor cells is also scarce. Tumor-associated antigens include a group of cancer-embryonic antigens, oncogenes, some viral antigens and hyperexpressable normal proteins. Weak immunological recognition of tumor cells contributes to the absence of an inflammatory response in the place of oncogenesis, as well as their immunosuppressive activity - biosynthesis of a number of "negative" cytokines (be-TFR, etc.), as well as screening of cancer cells by anticancer antibodies.

1. Immune status is the structural and functional state of the individual's immune system, determined by a set of clinical and laboratory immunological indicators. Immune status characterizes the anatom-functional state of the immune system, i.e. its ability to respond immune to a certain antigen at a given time. The assessment of immune status is carried out in the clinic for organ and tissue transplantation, autoimmune diseases, allergies, to detect immunological insufficiency in various infectious and somatic diseases, to monitor the effectiveness of treatment of diseases associated with disorders of the immune system. Depending on the laboratory's capabilities, the assessment of immune status is most often based on the definition of a set of indicators:

1. General Clinical Examination;
2. The state of natural resistance factors;
3. Humoral immunity;
4. Cellular immunity;
5. additional tests.

## **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:

- anatomical and physiological features of the functioning of organs and systems involved in the formation of the immune response in various conditions and localization of the pathological process;
- features of the immune response in various conditions and localization of the pathological process;
- indications for assessing the immune status;
- determination of a set of indicators characterizing the immune status of the patient.

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

- collect anamnesis, determine the patient's examination plan for organs and systems in various conditions and localization of the pathological process;
- determine the plan of additional examination of the patient;
- determine the scope of the assessment of the patient's immune status, taking into account the alleged pathological condition;
- 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:

1. Immunity in bacterial infections; the concept of "antibacterial" and "antitoxic" immunity;
2. Features of antiviral immunity;
3. Features of antifungal immunity;
4. Features of anti-parasitic immunity;
5. Features of transplantal immunity;
6. Features of antitumor immunity; The concept of "immune status";
7. Methods for assessing immune status interpretation of the results of the immune status assessment.

#### 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				

**Self-control tasks:** students' decision on individual test sets on the topic:

**Task 1. Immunoglobulin of which class is predominantly formed in mucus shells?** A) IgD

B) Secret IgA

C) IgG

D) IgE Job

**Task 2. Note what kind of humoral factor non-specific immunity is in the cells of the body's mucus membranes:**

A) Lizochima

B) Properdine

C) Normal antibodies

D) Interleukin

**Task 3. Which class do antibodies dominate saliva?**

A) IgA

B) IgG

C) IgM

D) IgD

**Task 4. What antiviral substance is produced in macrophages?**

A) Interferon

B) Lizocim

**Task 5. The concept of immunogram**

1. The diagnosis of infectious disease is confirmed:

A) By reducing the credits of specific antibodies in the dynamics of the disease. B) Increased credits of specific antibodies in the dynamics of the disease.

**Task 6. Antibody title is:**

A) The greatest breeding of the serum under study, which provides a specific immunological response (agglutination, precipitation, lysis).

B) The smallest breeding serum that provides a specific immunological response.

**Task 7. To quantify the content of serum immunoglobulins of different classes are most often used:**

- A) Reaction of radial immunodiffusion.
- B) Agglutination reaction.
- C) Immunoelectrophoresis method.

**Task 8. To assess the condition of neutrophils is determined:**

- A) The number in the leukogram.
- B) The effectiveness of the restoration of nitrocin ethrazolium (NST test).

**Task 9. The monoclonal antibodies cd-3 allow to determine:**

- A) All thymus independent lymphocytes.
- B) All thymus-dependent lymphocytes.
- C) Macrophages and neutrophils.

**Task 10. CD-4 monoclonal antibodies can be identified:**

- A) T-suppressors (cytotoxic cells).
- B) T-helper (inductors).
- C) All B-lymphocytes.

**Task 11. The monoclonal antibodies cd-3 allow to determine:**

- A) All thymus independent lymphocytes.
- B) All thymus-dependent lymphocytes.
- C) Macrophages and neutrophils.

**Task 12. CD-4 monoclonal antibodies can be identified:**

- A) T-suppressors (cytotoxic cells).
- B) T-helper (inductors).
- C) All B-lymphocytes.

**Task 13. CD-8 monoclonal antibodies can be identified:**

- A) T-helper (inductors).
- B) T-suppressors (cytotoxic cells).
- C) B-lymphocytes secreting.

**Task 14. The main marker of pre-B cells is the presence in their cytoplasm: A) Ig A.**

- B) Ig D.
- C) Ig E.
- D) Ig G.
- E) Ig M.

**Task 15. How does stress affect immune responses?**

- A) Suppresses the reactions of the T-link of the immune system.
- B) Stimulates the reactions of the T-link of the immune system.
- C) Suppresses the immune system's B-link reactions.
- D) Stimulates the immune system's B-link reactions.

**Task 16. How does stress affect immune responses?**

- A) Suppresses the reactions of the T-link of the immune system.
- B) Stimulates the reactions of the T-link of the immune system.
- C) Suppresses the immune system's B-link reactions.
- D) Stimulates the immune system's B-link reactions.

**Task 17. Does the human immunodeficiency virus affect the formation of cytotoxic T-lymphocytes, mainly by acting on T-helpers?**

- A) Yes
- B) No
- C) In rare cases

**Task 18. Immune response in patients with viral infection is characterized by:**

- A) Increased production of interferon
- B) Activation of cytotoxic T-lymphocytes
- C) Accelerated production of immunoglobulins A, M, G
- D) Memory Cell Formation
- E) None of these

**Task 19. How does stress affect immune responses?**

- A) Suppresses the reactions of the T-link of the immune system.
- B) Stimulates the reactions of the T-link of the immune system.
- C) Suppresses the immune system's B-link reactions.
- D) Stimulates the immune system's B-link reactions.

**Task 20. Immune response in patients with viral infection is characterized by:**

- A) Increased production of interferon
- B) Activation of cytotoxic T-lymphocytes
- C) Accelerated production of immunoglobulins A, M, G
- D) Memory Cell Formation
- E) None of these

**Task 21. How does stress affect immune responses?**

- A) Suppresses the reactions of the T-link of the immune system.
- B) Stimulates the reactions of the T-link of the immune system.
- C) Suppresses the immune system's B-link reactions.
- D) Stimulates the immune system's B-link reactions.

**Task 22. Clinical markers of secondary T-cell immunodeficiency are:**

- A) recurrent pyogenic infection
- B) recurrent viral infections
- C) hypoplasia thymus
- D) pathology of parathyroid glands.

**Task 23. Frequent infections with defects in phagocytosis in patients with secondary immunodeficiency:**

- A) bacterial
- B) viral
- C) parasitic
- D) fungal.

**Task 24. Causes of secondary immunodeficiency conditions:**

- A) chromosomal disorders
- B) immunosuppressive therapy
- C) cancer
- D) chronic infections.

**Task 25. Circulating immune complexes are:**

- A) complex antigen-antibody
- B) myelome proteins
- C) complex antigen-antibody complement
- D) allergen-IgE
- E) aggregated IGG.

**Task 26. Immunodeficiency is characterized by the patient's increased sensitivity to viral and fungal infections. The main defect of the immune system is determined by the dysfunction:**

- A) macrophages
- B) T-lymphocytes
- C) B-lymphocytes
- D) system complement



E) neutrophils.

**Typical situations.**

**Task 1.** The engineer, who worked for three years under contract in Africa, the last two years felt satisfactory, was hospitalized in the pulmonology department with complaints of general weakness, night sweating, dry unproductive cough. A blood test found lymphopenia. What is the most appropriate diagnostic tactic?

- A. A test to restore nitrofurantoin.
- B. Determining the activity of the complement.
- C. Definition of the phagocytic index.
- D. Search for ANTIBODIES to HIV in the ELISA test and immunoblotting.
- E. Search for white blood cell activity

**Task 2.** In connection with the liver transplant, the patient was prescribed prednisone. What was the purpose of this therapy and how will it affect the immune system?

**Task 3.** The patient with the sah. diabetes has a tendency to boil, etc. infectious-inflammatory processes. What's this all about?

**Task 4.** Two patients have immunodeficiency. The first has mycosis and viral disease, the other has a pharyngeal coccidiosis. What immunity systems do everyone have?

**Task 5.** The patient L., 56 years old, went to the clinic with complaints of dry cough, general malaise, rapid fatigue during physical exertion. Often noticed in a meager sputum veins of blood, lost weight. Weight loss is associated with frequent exacerbations of bronchitis. A month ago he was treated for candida of oral mucosa. In the last 6 months. disturbed by frequent dyspeptic disorders. X-rays in the root area of the left lung revealed a shadow of the wrong shape. In bronchoscopy, the left lower-lobe bronchus are narrowed and a tumor is visible in its lumen, bleeding when touched. A lung tomography confirmed the presence of a tumor in the lung root area. No metastases were found in the lymph nodes of the mediastinum. In the blood of red blood cells  $3.3 \times 10^{12}/l$ , white blood cells  $2.7 \times 10^9/l$ , platelets  $90 \times 10^9/L$ , reduced content of IgG, IgM.

- 1. Describe the immunological status of the patient.
- 2. What syndromes can confirm this status in this patient?
- 3. What is the reason for the violation of immunological ...

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] : [учебноеиздание]	<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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