

**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 students
to the practice session on the topic:
"Organs of the immune system. Immune-competent cells. Antibodies.
Immuno-diagnostic reactions.»**

Discipline: Clinical Immunology
Specialty: 31.05.03. «Dentistry»
Course 2
Semester 3
Hours: 5 Hours

Ufa - 2021

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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(Kurcer M. A.)

1. The theme: "Organs of the immune system. Immune-competent cells. Antibodies. Immuno-diagnostic reactions.»

The central organs of immunogenesis, where immature lymphocytes develop and undergo primary clonal selection, are the bone marrow and thymus; the peripheral organs, where mature lymphocytes live and carry out immune responses, include the spleen, lymph nodes, the Waldeyer-Pirogov pharyngeal lymphoepithelial ring, and non-encapsulated scattered lymphocytic clusters of the gastrointestinal tract, bronchi and genitourinary system.

The bone marrow performs the functions of both the central and peripheral organs. Blood is also part of the immune system, as elements of the immune system, both specific and non-specific, have the ability to circulate. This applies to T and B cells, immunoglobulins (Ig), complement, and other immune response effectors. For this reason, local sensitisation may develop into systemic sensitivity.

Cellular components of the immune system, both specific and non-specific, can multiply. The reproduction of lymphocytes occurs not only in the central organs of immunogenesis (bone marrow, thymus) - there is also a secondary reproduction of stimulated T-and B-lymphocytes on the periphery. Due to the plasmatisation of B-lymphocytes, antibody titers can multiply. This trait allows for significantly enhanced immune responses, but also requires inhibitory mechanisms to prevent accidental or excessive responses. All the considered immunological reactions are under control and represent a mutually balanced network of stimulatory and suppressive influences.

The trigger factor of the immune response is an antigen-microbe. The basis is the activation of lymphocytes (T - and B -). In the presentation of antigens by T-lymphocytes, the antigen-presenting cells (A cells) play a crucial role. At this stage of the immune response induction, the interaction of the antigen with IS (immune system) cells leads to the formation of immunological memory and effectors of humoral and cellular immunity. The implementation phase involves the destruction of the antigen by antibodies (humoral immunity) or sensitized T-lymphocytes (cellular immunity). To detect humoral immunity and identify the microbe-antigen, antigen-antibody reactions (immunological reactions) are used. Knowledge of the mechanisms of immune responses allows students to understand the current understanding of mechanisms of diseases and to navigate in immunological diagnostic methods.

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:

- anatomical and physiological features of the structure and functioning of the organs of the immune system;
- •types and functions of immunocompetent cells;
- know what an antibody is, its structural unit, types, structure, classification, functions, methods for determining the content
- **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. Antibodies, classes of immunoglobulins, structural and functional features. Active centers of immunoglobulins, their function.
2. Antigenic structure of immunoglobulins: iso -, allo -, idiotypic determinants.
3. Incomplete antibodies, autoantibodies.
4. Name the classes and subclasses of immunoglobulins. What are their properties?
5. Name the antibodies that penetrate the placenta.
6. Name the antibodies that are synthesized in the early stages of the immune response.
7. What is an isotype, allotype, and idiotype?
8. List the reactions of the antigen-antibody interaction, briefly describe them.
9. Describe the principles of the main methods for identifying antibodies and antigens
10. Forms of the immune response (antibody formation, immune phagocytosis, killer function of lymphocytes, immunological memory and tolerance).
11. Immunological tolerance, types.
12. What is immunological memory? In what cases are formed memory cells?
13. Describe the concept of primary and secondary immune response.

4. Type of lesson: practical lesson

5. Duration: 4 hours

6. Equipment: computer, projector

7. The content of the lesson.

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

1. The main cells of cellular immunity are

- a) B-cells
- b) Macrophages
- c) T cells
- d) none of the above

2. Which cells do not belong to the antigen-presenting cells

- a) neutrophils
- b) dendritic cells
- c) monocytes
- d) eosinophils
- d) macrophages

3. The macrophage performs all the following functions:

- a) phagocytizes the antigen
- b) synthesizes interleukin-2,
- c) expresses the molecules of the 2nd class of the main histocompatibility complex
- d) presents the peptide fragments of antigens to other cells of the immune system

4. The following subpopulations of lymphocytes are distinguished:

- a) T-helper cells
- b) B-cells
- c) CD-15 T-ligand
- d) CD-4 lymphocytes
- e) cytotoxic T cells

5. Which cells of the immune system recognize an antigen only in combination with a molecule of the main histocompatibility complex?

- a) T cells

b) B-cells

6. Which cells directly produce

Class A immunoglobulins?

a) cytotoxic lymphocytes

b) CD-4 lymphocytes

c) plasma cells

d) macrophages

d) dendritic cells

7. What are Class G immunoglobulins

a) antibodies?

b) serum proteins

c) gamma fractions of serum proteins

d) none of the above

8. The property of immunoglobulins is the ability to bind directly to the antigen:

a) yes

b) no

9. The central organs of the human immune system include:

a) the spleen

b) thymus gland

c) lymph nodes

d) bone marrow

e) tonsils

e) none of the above

Typical tasks.

Task 1.

Specify which statements are correct and which are incorrect. Explain the error of each statement that you think is incorrect.

1. T cells develop from hematopoietic stem cells.

2. Plasma cells, T-killers, and T-suppressors are examples of effector cells.

3. B cells mature in the thymus.

4. Antigens entering the blood are captured by macrophages in the spleen.

5. Hapten can stimulate the synthesis of antibodies, but cannot interact with them.

6. Both cellular and humoral immune responses play a role in protecting the host body from viral infections.

7. T cells secrete antibody molecules.

Task 2.

Specify which statements are correct and which are incorrect. Explain the error of each statement that you think is incorrect.

1. The active center of the immunoglobulin is formed by a light chain.

2. A certain antigen causes the synthesis of one type of antibody.

3. IgM is the main class of antibodies synthesized in the secondary immune response.

4. Antibodies are not formed in response to the molecules of your own body, because the genes encoding information for the synthesis of autoantibodies are not inherited.

5. Antigenic stimulation of macrophages in the thymus causes their differentiation into T cells.

6. Activation of the third component of complement C3 occurs only if the antigen interacts with a specific antibody of the class that can bind the complement.

7. The lesions that occur in HPPT are cellular infiltrates containing lymphocytes and macrophages.

8. In the presence of an antigen, purified populations of T and B cells can cooperate in vitro, causing an immune response of B cells.
9. Killer cells can originate, either from a series of T cells or from a series of macrophages.

Task 3.

Insert the missing word or words in the following statements.

1. IgG is the main class of antibodies in the.... immune response.
- 2..... is a process in which antigen-dependent differentiation of lymphocytes occurs.
3. The response of B cells usually requires cooperation.....,..... and.....
4. On the surface of mast cells are receptors for Ig.....
5. Through the placenta, Ig penetrates into the fetus... .
- 6..... or T cells.... they are effector cells that directly destroy foreign cells.
- 7..... is a mechanism that protects the body from developing an immune response to its own macromolecules.
8. Many immunologists assume that.... It is the center of B-cell maturation in birds.
9. In the spleen, both B-and T-cell regions are located in.....

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
	Basic Immunology: Functions and Disorders of the Immune System [Текст] : [учебноеиздание]	A. K. Abbas, A. H. Lichtman, S. Pillai.	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
•	IMMUNOLOGY	Khaitov R.M.	2008 – 256 c.on-line.	access mode: ЭБС «Консультант студента» http://www.studmedlib.ru/book/ISBN9785970407042.html	unlimited access
•	Fundamental Immunology.	Lippincott Williams & Wilkins	2008 –on-line	access mode: Database«LWW Medical Book Collection 2011» http://ovidsp.ovid.com	unlimited access