Study Guide
in discipline «Immunology»
for students of 2023 year of admission
under the educational programme
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Topic 1. **Introduction to immunology. The concept of immunity. The subject and tasks of immunology. History of immunology. Types of immunity. The structure of the immune system. Principles of functioning of the immune system.**

Key questions:

1. The concept of immunity and immunology. The subject, tasks and basic concepts of immunology.
2. History of immunology. The development of immunology in the ancient and medieval period. Contribution by B. Jesti and E. Jenner. L. Pasteur is the founder of immunology as a science.
3. The role of I. Mechnikov and P. Ehrlich in the development of immunology. The development of immunology and the main achievements of the XX century.
4. Classifications of immunity.
5. Functional organization of the immune system (organs, cells). Cells of the immune system: structure, functions, maturation, differentiation.
6. General concepts on the functioning of the immune system (specific defense formation).
7. The concept of humoral and cellular immunity.
8. Organization and safety rules when working in the immunological laboratory and the office of an allergist-immunologist.

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Topic 2. **Antigens. Nature, structure, classification, properties. Presentation of exo- and endogenous antigens. Phagocytosis. Methods of studying the phagocytic activity of leukocytes.**

Key questions:

1. Antigens: concept, chemical nature, structure, classification. The concept of antigenic determinants. Haptens and carriers.
2. Properties of antigens: antigenicity, immunogenicity, specificity, macro molecularity.
3. Mechanisms of antigen persistence in the body (penetration pathways, localization, elimination pathways). Ways of entrance of antigens into the organism.
4. Non-specific resistance factors. Physical defenses, chemical defenses, and cellular defenses: phagocytes, NK-cells, mast cells, basophils. Complement system, acute phase proteins. Antigen recognition in non-specific immune response.
5. The concept of antigen-presenting cells. Major histocompatibility complex. Mechanisms of antigen recognition. Antigen elimination.
6. Macrophages, dendritic cells: functions. Phagocytosis. Presentation of exogenous antigens to T-lymphocytes.
7. Presentation of endogenous antigens to immune cells.
8. Methods of studying the phagocytic activity of leukocytes.

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Topic 3. **Humoral immune response. Cellular base. Immunoglobulins: nature, structure, types, functions, production dynamics in primary and secondary immune responses. The complement system and its functions. Methods of studying the complement system. Serological research methods.**

Key questions:

1. History of the study of humoral immunity.
2. B-lymphocytes as producers of immunoglobulins. Classification, receptor apparatus. Structure and functioning of the B-cell receptor. Genetic control of the synthesis of immunoglobulins of various classes.
3. Antibodies (immunoglobulins): definition, chemical nature, structure, domain organization. The role of antibodies in the elimination of antigens.
4. Structure and functions of various classes of immunoglobulins.
5. Dynamics of the production of various types of immunoglobulins in primary and secondary immune response.
6. General characteristics of "antigen-antibody" reactions. Serological methods based on the physical properties of the reaction participants (precipitation, agglutination).
7. Serological methods based on the biological properties of the reaction participants (biological neutralization, immobilization, cytotoxicity);
8. Serological methods using (immunofluorescence analysis, enzyme immunoassay, radioimmunoprecipitation); ways to increase the sensitivity of serological methods. The method of paired serums in the diagnosis of infectious diseases.
9. General ideas about the complement system. The history of discovery. Composition and main functions. The effector role of complement. Formation of a membrane-attacking complex and its role in cell lysis.
10. Classical pathway. Immunoglobulins that classical pathway triggered with. Formation of C3 and C5-convertase. Lectin pathway and its similarity to classical pathway. Nonspecific activation of complement with proteolytic enzymes.
11. Alternative pathway of complement activation. Formation of C3 and C5-convertase.
12. Complement binding reaction. The reaction principle. Evaluation of the results. Clinical application.

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Topic 4. **Cellular immunity. Differentiation of T-lymphocytes. Regulatory functions of T-lymphocytes. The main subpopulations of T-lymphocytes. Recognition of the antigen. Specific and nonspecific cellular cytotoxicity, mechanism, biological significance. Methods of studying cellular immunity and cytotoxicity.**

Key questions:

1. The main stages of differentiation of lymphocytes in the thymus. Types of T-lymphocytes. Positive and negative selection. Migration and settlement of T-lymphocytes in the body.
2. Structure and functioning of the T-cell receptor (TCR). Co-receptor molecules, signal transduction and activation of T-lymphocytes.
3. Superantigens, toxic shock syndrome.
4. Regulatory function of T-lymphocytes. The concept of Th1, Th2, Th17, Treg cells. Differentiation of Th cells into Th1 or Th2.
5. Th1 cells. The main inducers, physiological and pathological role of Th1-dependent immune response.
6. Th2 cells. The main inducers, physiological and pathological role of Th2-dependent immune response.
7. Antigen recognition, selection of CD4 or CD8 pathways of T-cell response.
8. Mechanism of specific cytotoxicity. Physiological and pathological significance of T-cell cytotoxicity.
9. Antibody-dependent cell-mediated cytoxicity.
10. Methods to study lymphocyte activation *in vitro* (blastogenic transformation of lymphocytes, lymphocyte migration assays, assays for cytotoxicity assesment).

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Topic 5. **Cytokines as factors regulating the immune response. Methods of studying cytokines. Immunological tolerance.**

Key questions:

1. Cytokines: definition, classification, types of action.
2. Types of cytokine interactions.
3. Interferons: definition, classification, properties. Antiviral, antitumor and immunomodulatory activity.
4. Methods of studying cytokines.
5. Immunological tolerance: definition, history of discovery, differences from immunodeficiency.
6. Types of immunological tolerance.
7. Features of the formation of immunological tolerance depending on the state of the immune system.
8. Clinical significance and induction of artificial immunological tolerance.
9. Immune aspects of organ and tissue transplantation.

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Topic 6. **Concluding №1**

Questions list:

1. The concept of immunity and immunology. The subject, tasks and basic concepts of immunology.
2. The development of immunology in the ancient and medieval period. Contribution by B. Jesti and E. Jenner.
3. L.Pasteur is the founder of immunology as a science.
   The role of I.Mechnikov and P. Ehrlich in the development of immunology. The concept of humoral and cellular immunity.
4. The development of immunology and the main achievements of the XX century. Types of immunity.
5. Functional organization of the immune system.
6. Antigens: concept, chemical nature, structure, classification. The concept of antigenic determinants.
7. Properties of antigens: antigenicity, foreignness, immunogenicity, macromolecularity.
8. Properties of antigens: specificity.
9. Mechanisms of antigen persistence in the body (penetration pathways, localization, elimination pathways).
10. The concept of antigen-presenting cells. Presentation of endogenous antigens to immune cells.
11. Presentation of exogenous antigens to T-lymphocytes.
12. Phagocytosis – as a stage of the immune response. Cells that carry out phagocytosis.
13. Methods of studying the phagocytic activity of leukocytes.
14. Antibodies (immunoglobulins): definition, chemical nature, structure, domain organization. The role of antibodies in the elimination of antigens.
15. Structure and functions of various classes of immunoglobulins.

16. Dynamics of production of various types of immunoglobulins in primary and secondary immune response.
17. The method of paired serums in the diagnosis of infectious diseases.
18. B-lymphocytes as producers of immunoglobulins. Classification, receptor apparatus.
19. Structure and functioning of the B-cell receptor. Genetic control of the synthesis of immunoglobulins of various classes.
20. General characteristics of "antigen-antibody" reactions.
21. Serological methods based on the physical properties of the reaction participants (precipitation, agglutination).
22. Serological methods based on the biological properties of the reaction participants (biological neutralization, immobilization, cytotoxicity);
23. Serological methods using (immunofluorescence analysis, enzyme immunoassay, radioimmunoprecipitation); ways to increase the sensitivity of serological methods.
24. Complement binding reaction. The reaction principle. Evaluation of the results. Clinical application. Assessment of the total activity of the complement system by 50% hemolysis. Determination of the activity of complement components.
25. The main stages of differentiation of lymphocytes in the thymus. The receptor apparatus. Types of T-lymphocytes. Positive and negative selection. Migration and settlement of T-lymphocytes in the body.
26. Regulatory function of T-lymphocytes. The concept of Th1, Th2, Th17, Treg cells.
27. The main inducers, physiological and pathological role of Th1-dependent immune response.
28. The main inducers, physiological and pathological role of Th2-dependent immune response.
29. Structure and functioning of the T-cell receptor (TCR). Coreceptor molecules, signal transduction and activation of T-lymphocytes.
30. Antigen recognition, selection of CD4 or CD8 pathways of T-cell response.
31. Mechanism of specific cytotoxicity. Physiological and pathological significance of T-cell cytotoxicity.
32. Cytokines: definition, classification, types of action. Types of cytokine interactions.
33. Interferons: definition, classification, properties. Antiviral, antitumor and immunomodulatory activity. Methods of studying cytokines.
34. Immunological tolerance: definition, history of discovery, differences from immunodeficiency.
35. Types of immunological tolerance. Features of the formation of immunological tolerance depending on the state of the immune system.
36. The importance of immunological tolerance in maintaining homeostasis.
37. Clinical significance and induction of artificial immunological tolerance. Immune aspects of organ and tissue transplantation.

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Topic 7. **Infection and immunity. The immune response in bacterial, viral, fungal infections, helminthic infestations; ways of "escape" of infectious pathogens from immune surveillance.**

Key questions:

1. General factors of host defense: physical and chemical barriers, interferons, phagocytosis, complement system, acute phase proteins, NK-cells, T lymphocytes, antibodies.
2. Antibacterial Immunity (immune response to bacteria). Immune response to intra- and extracellular bacteria.
3. Evasion of immune response by bacteria.
4. Factors, mechanisms of antiviral immunity. Viruses: mechanisms of infection, persistence, pathogenesis.
5. Viral mechanisms of immune evasion.
6. Factors, mechanisms of anthelmintic, antifungal immunity.
7. Mechanisms of escape of fungi and helminths from immune protection.
8. The main factors of immune protection against intracellular infections not accompanied by genetic parasitism (mycoplasma, chlamydia). Pathways of pathogen elimination. Mechanisms of escaping from immune protection.

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Topic 8. **Immunology of the tumor process. Basic immunological mechanisms of antitumor protection. Mechanisms of tumor "escape" from immunological surveillance. Immunological diagnosis of tumors. Approaches to tumor immunotherapy.**

Key questions:

1. Tumor cells as antigens. Evidence of the immune system's involvement in tumor growth.
2. Mechanisms of antitumor immunity.
3. Mechanisms of "escaping" tumors from immunobiological surveillance.
4. Tumor-associated antigens. Origin, types, clinical significance. Immunodiagnostics of neoplastic diseases.
5. Oncomarkers, types, requirements for an ideal oncomarker, clinical significance.
6. Principles of immunotherapy and immunoprophylaxis of tumors.

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Topic 9. **Immunological monitoring of infectious and non-infectious diseases. Immunoprophylaxis of infectious and non-infectious diseases. Immunobiotechnology.**

Key questions:

1. Immunological monitoring of infectious diseases. Methods to find infection agents: ELISA, immunofluorescence. Serological diagnostics and monitoring for infectious diseases (HCV, HBV, TORCH)
2. Immunoprophylaxis. Goals, tasks.
3. Vaccination. Types of vaccines. Modern approaches.
4. The concept of the National Vaccination Calendar.
5. Immunobiotechnology in the creation of vaccines and immunoprophylaxis of infectious and non-communicable diseases.
6. Postvaccinal reactions and complications. Kinds. Ways of prevention.
7. The concept of immunobiotechnology. The main methods of obtaining immunobiotechnological drugs.
8. Immunobiotechnology in vaccine development and immunoprophylaxis of infectious and non-communicable diseases.

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Topic 10. **Immunology of reproduction. Immunological factors in the development of infertility. Age-related features of immunity.**

Key questions:

1. Immunological relationships in the "mother-father" system.
2. Immunological relationships in the mother-fetus system. Immunosuppression factors in normal pregnancy.
3. Immunological causes of infertility.
4. Immunological mechanisms of intrauterine development disorders due to incompatibility of spouses according to the Rh-antigen system.
5. The prenatal period of the immune system development. Features of the structure and functioning of the immune system at birth.
6. The immune system of a newborn baby. Features of the structure and functioning. Dynamics of development in the first year of life.
7. The immune system in early childhood. Features of the structure and functioning. Development of the immune system in the period from 2 to 6 years.
8. The immune system in adolescents. Features of the structure and functioning. The development of the immune system in the period from 12-15 years.
9. Involutive changes in the immune system.

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Topic 11. **The basic concepts of autoimmunity. Autoimmune diseases. Classification. Hypotheses of origin. Approaches to diagnosis and treatment. Transplantation immunology.**

Key questions:

1. Autoimmune diseases. The concept of autoantigens and autoantibodies.
2. Hypotheses of the development of autoimmune diseases. The role of infectious agents in the development of autoimmune diseases.
3. The concept of transplantation. Types of transplants. Selection of the "donor-recipient" pair.
4. The mechanism of allograft rejection.
5. Immunological monitoring of the recipient after transplantation.
6. Immunosuppressive therapy during allotransplantation.
7. Complications in allograft recipients.
8. Ways to prevent and overcome transplant rejection.

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Topic 12. **Concluding №2**

Questions list:

1. Immunological mechanisms of antibacterial resistance. Mechanisms of bacterial escape from immune elimination.
2. Factors of antiviral immunity. Mechanisms of virus evasion from immune elimination.
3. Factors of anthelmintic and antifungal immunity. Mechanisms of escape of fungi and helminths from immune protection.
4. The main factors of immune protection against intracellular infections that are not accompanied by genetic parasitism (mycoplasma, chlamydia). Pathways of pathogen elimination. Mechanisms of evading immune protection
5. Immunological monitoring of infectious diseases.
6. Tumor cells as antigens. Evidence of the immune system's involvement in tumor growth.
7. Mechanisms of antitumor immunity.
8. Mechanisms of tumor "escape" from immunobiological surveillance.
9. Tumor-associated antigens. Origin, types, clinical significance. Immunodiagnostics of neoplastic diseases.
10. Cancer markers, types, requirements for an ideal cancer marker, clinical significance.
11. Principles of immunotherapy and immunoprophylaxis of tumors.
12. Immunological monitoring of infectious and non-communicable diseases. Goals and objectives.
13. Immunoprophylaxis. Goals and objectives.
14. Vaccination. Types of vaccines. Modern approaches.
15. The concept of the National Vaccination Calendar.
16. Post-vaccination reactions and complications. Kinds. Ways of prevention.
17. The concept of immunobiotechnology. The main methods of obtaining

immunobiotechnological preparations.

18. Immunobiotechnology in vaccine development and immunoprophylaxis of infectious and non-communicable diseases.
19. Immunological relationships in the "mother-father" system.
20. Immunological relationships in the mother-fetus system. Immunosuppression factors in normal pregnancy.
21. Immunological causes of infertility.
22. Immunological mechanisms of intrauterine development disorders due to incompatibility of spouses according to the Rh-antigen system.
23. The intrauterine period of development of the immune system. Features of the structure and functioning of the immune system at birth.
24. The immune system of a newborn baby. Features of the structure and functioning. Dynamics of development in the first year of life.
25. The immune system in early childhood. Features of the structure and functioning. Development of the immune system in the period from 2 to 6 years.
26. The immune system in adolescents. Features of the structure and functioning. The development of the immune system in the period from 12-15 years.
27. Involutive changes in the immune system.
28. Autoimmune diseases. The concept of autoantigens and autoantibodies.
29. Hypotheses of the development of autoimmune diseases. The role of infectious agents in the development of autoimmune diseases.
30. The concept of transplantation. Types of transplants. Selection of a donor-recipient pair.
31. The mechanism of allograft rejection.
32. Immunological monitoring of the recipient after transplantation.
33. Immunosuppressive therapy during allotransplantation.
34. Complications in allograft recipients.
35. Ways to prevent and overcome transplant rejection.

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Topic 13. **Introduction to clinical immunology. Immunodeficiency states. Principles of immune status assessment. The main types of immunopathology. The concept, classification, marker syndromes of immunodeficiency states. Primary immunodeficiency states, classification, warning signs, principles of diagnosis and treatment.**

Key questions:

1. The subject and objectives of clinical immunology. The main types of immunopathology.
2. Clinical assessment of immune status.
3. Methods of laboratory assessment of immune status. Tests of the first and second levels.
4. Immunodeficiency states (IDS). Definition and classification.
5. Mechanisms of formation of clinical manifestations of IDS (syndromes-markers of IDS).
6. Principles of diagnosis of primary immunodeficiency states (PIDS). Warning signs regarding PIDS.
7. Principles of treatment of PIDS.
8. Diseases with agammaglobulinemia syndrome. Age-related features. Principles of diagnosis and treatment.
9. Primary deficiencies of the complement system. Etiology. Pathogenesis. Clinical manifestations. Diagnostics. Natural development. Principles of treatment.
10. Hereditary angioedema. Etiology. Pathogenesis. Diagnostics. Natural development. Principles of treatment.

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Topic 14. **Secondary immunodeficiency states. Immunotropic drugs.**

Key questions:

1. General concepts of secondary immunodeficiency states (SIDS). Classification of SIDS.
2. The dynamics of the formation of SIDS under the influence of the environmental factor.
3. SIDS caused by infection: nonspecific immunosuppressive effect of the infectious process; immunosuppressive effect of bacteria, viruses, chlamydia and mycoplasmas. Indications for immunocorrection.
4. SIDS caused by the action of xenobiotics. Causes and mechanism of SIDS development. Clinical features of environmental SIDS. Indications for immunocorrection.
5. Post-traumatic stress disorder. Mechanism of development, biological expediency. Indications for immunocorrection.
6. The concept of immunomodulation. Classification of immunotropic drugs.
7. Thymic peptides and their synthetic analogues. Classification. Biological effects. Indications and contraindications.
8. Immunotropic drugs of bacterial origin. Classification. Biological effects. Indications and contraindications.
9. Chemically pure IM. Biological effects. Indications and contraindications.
10. Allergen-specific immunotherapy. The principle of the method, mechanisms of effectiveness, indications and contraindications.
11. Immunoglobulin preparations and their use in clinical practice. Monoclonal antibodies.
12. Cytokine and anti-cytokine therapy. Indications. Medication. Principles.

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Topic 15. **Infections of the immune system. The effect of microorganisms on cells and organs of the immune system (HIV, Epstein-Barr virus, cytomegalovirus, HHV-6, HHV-7, etc.). Laboratory diagnostic methods and principles of therapy of infections of the immune system.**

Key questions:

1. Infectious agents affecting cells of the immune system.
2. Infection caused by Human immunodeficiency virus. Clinical manifestations, diagnosis, principles of treatment.
3. Infection caused by Epstein-Barr virus. Clinical manifestations, diagnosis, principles of treatment.
4. Infection caused by Cytomegalovirus. Clinical manifestations, diagnosis, principles of treatment.
5. Infections caused by Herpesvirus types 6 and 7. Clinical manifestations, diagnosis, principles of treatment.

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Topic 16. **The concept of allergy. Classification and mechanisms of allergic reactions. Pseudoallergic reactions. Principles of diagnosis and treatment.**

Key questions:

1. Allergens and their classification. Characteristics of allergens. Hereditary aspects of allergic diseases. Cross reactivity. Inhaled allergens. Food allergens.
2. Classification of allergic reactions (Gell & Coombs). The concept of allergy as a form of perverted immune response.
3. Type I hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
4. Type II hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
5. Type III hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
6. Type IV hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
7. General principles of diagnosis of allergic diseases.
8. General principles of treatment of allergic diseases.
9. Pseudoallergic reactions (PAR). Definition, prevalence, classification.
10. Differential diagnosis of allergic and pseudoallergic reactions.
11. PAR due to altered histamine metabolism. Common causes, clinics, treatment.
12. PAR due to arachidonic acid metabolism alterations. Common causes, clinics, treatment.
13. PAR due to acetylcholine and bradykinin metabolism alterations. Common causes, clinics, treatment.
14. PAR due to complement system disorders. Common causes, clinics, treatment.

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Topic 17. **Concluding №3**

Questions list:

1. The subject and objectives of clinical immunology. The main types of immunopathology.
2. Clinical assessment of immune status.
3. Methods of laboratory assessment of immune status. Tests of the first and second levels.
4. Immunodeficiency states (IDS). Definition and classification.
5. Mechanisms of formation of clinical manifestations of IDS (syndromes-markers of IDS).
6. Principles of diagnosis of primary immunodeficiency states (PIDS). Warning signs regarding PIDS.
7. Principles of treatment of PIDS.
8. Diseases with agammaglobulinemia syndrome. Age-related features. Principles of diagnosis and treatment.
9. Hereditary angioedema. Etiology. Pathogenesis. Diagnostics. Natural development. Principles of treatment.
10. General concepts of secondary immunodeficiency states (SIDS). Classification of SIDS.
11. The dynamics of the formation of SIDS under the influence of the environmental factor.
12. SIDS caused by infection: nonspecific immunosuppressive effect of the infectious process; immunosuppressive effect of bacteria, viruses, chlamydia and mycoplasmas. Indications for immunocorrection.
13. SIDS caused by the action of xenobiotics. Causes and mechanism of SIDS development. Clinical features of environmental SIDS. Indications for immunocorrection.

14. Post-traumatic stress disorder. Mechanism of development, biological expediency. Indications for immunocorrection.
15. The concept of immunomodulation. Classification of immunotropic drugs.
16. Thymic peptides and their synthetic analogues. Classification. Biological effects. Indications and contraindications.
17. Immunotropic drugs of bacterial origin. Classification. Biological effects. Indications and contraindications.
18. Chemically pure IM. Biological effects. Indications and contraindications.
19. Allergen-specific immunotherapy. The principle of the method, mechanisms of effectiveness, indications and contraindications.
20. Immunoglobulin preparations and their use in clinical practice. Monoclonal antibodies.
21. Cytokine and anti-cytokine therapy. Indications. Medication. Principles.
22. Infection caused by Human immunodeficiency virus. Clinical manifestations, diagnosis, principles of treatment.
23. Infection caused by Epstein-Barr virus. Clinical manifestations, diagnosis, principles of treatment.
24. Infection caused by Cytomegalovirus. Clinical manifestations, diagnosis, principles of treatment.
25. Infections caused by Herpesvirus types 6 and 7. Clinical manifestations, diagnosis, principles of treatment
26. Allergens and their classification. Characteristics of allergens. Hereditary aspects of allergic diseases. Cross reactivity. Inhaled allergens. Food allergens.
27. Type I hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
28. Type II hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
29. Type III hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
30. Type IV hypersensitivity reaction: etiology, pathogenesis, underlying diseases.
31. General principles of diagnosis of allergic diseases.
32. General principles of treatment of allergic diseases.
33. Pseudoallergic reactions (PAR). Definition, prevalence, classification.
34. Differential diagnosis of allergic and pseudoallergic reactions.
35. PAR due to altered histamine metabolism. Common causes, clinics, treatment.
36. PAR due to arachidonic acid metabolism alterations. Common causes, clinics, treatment.
37. PAR due to acetylcholine and bradykinin metabolism alterations. Common causes, clinics, treatment.
38. PAR due to complement system disorders. Common causes, clinics, treatment.

Final CONCLUDING

1. The concept of immunity and immunology. The subject, tasks and basic concepts of immunology.
2. The development of immunology in the ancient and medieval period. The contribution of B. Jesty and E. Jenner. L. Pasteur is the founder of immunology as a science.
3. The role of I. Mechnikov and P. Ehrlich in the development of immunology. The concept of humoral and cellular immunity.
4. The development of immunology and the main achievements of the 20th century.
5. Types of immunity.
6. Functional organization of the immune system.
7. Organization and safety rules when working in the immunological laboratory and the office of an allergologist-immunologist.
8. Antigens: concept, chemical nature, structure, classification. The concept of antigenic determinants.
9. Properties of antigens: antigenicity, foreignness, immunogenicity, macromolecularity, specificity.
10. Mechanisms of antigen persistence in the body (pathways of penetration, localization, pathways of elimination).
11. The concept of antigen-presenting cells. Presentation of endogenous antigens to immune cells.
12. The concept of antigen-presenting cells. Presentation of exogenous antigens to T-lymphocytes.
13. Phagocytosis is a stage of the immune response. Cells that carry out phagocytosis.
14. Methods of studying the phagocytic activity of leukocytes.
15. History of the study of the humoral link of immunity. Antibodies (immunoglobulins): definition, chemical nature, structure, domain organization. The role of antibodies in the elimination of antigens.
16. Structure and functions of various classes of immunoglobulins.
17. Dynamics of the production of various types of immunoglobulins in the primary and secondary immune response. The method of paired sera in the diagnosis of infectious diseases.
18. B-lymphocytes as producers of immunoglobulins. Classification, receptor apparatus. The structure and functioning of the B-cell receptor. Genetic control of the synthesis of immunoglobulins of various classes.
19. General ideas about the complement system. The history of discovery. Composition and main functions.
20. The classical way of complement activation. The effector role of complement.

Formation of the membrane-attacking complex and its role in cell lysis.

21. Alternative and lectin ways of complement activation. The effector role of complement. Formation of the membrane-attacking complex and its role in cell lysis.
22. General characteristics of antigen-antibody reactions. Serological methods based on the physical properties of the reaction participants (precipitation, agglutination).
23. Serological methods based on the biological properties of the participants in the reaction (biological neutralization, immobilization, cytotoxicity).
24. Serological methods using (immunofluorescence analysis, enzyme immunoassay, radioimmunoprecipitation); ways to increase the sensitivity of serological methods.
25. Complement binding reaction. The principle of reaction. Evaluation of the results. Clinical application. Assessment of the total activity of the complement system by 50% hemolysis. Determination of the activity of complement components.
26. The main stages of lymphocyte differentiation in the thymus. The receptor system. Types of T-lymphocytes. Positive and negative breeding. Migration and settlement of T-lymphocytes in the body.
27. Regulatory function of T-lymphocytes. The concept of Th1, Th2, Th17, Treg cells.
28. The main inducers, the physiological and pathological role of the Th1-dependent immune response.
29. The main inducers, the physiological and pathological role of the Th2-dependent immune response.
30. Structure and functioning of the T-cell receptor (TCR). Coreceptor molecules, signal transduction, and activation of T-lymphocytes.
31. Antigen recognition, selection of CD4 or CD8 pathways of T-cell response.
32. Mechanism of specific cytotoxicity. The physiological and pathological significance of T-cell cytotoxicity.
33. Cytokines: definition, classification, types of action. Types of cytokine interactions.
34. Interferons: definition, classification, properties. Antiviral, antitumor and immunomodulatory activity.
35. Methods of studying cytokines.
36. Immunological tolerance: definition, history of discovery, differences from immunodeficiency.
37. Types of immunological tolerance. Features of the formation of immunological tolerance depending on the state of the immune system.
38. The importance of immunological tolerance in maintaining homeostasis.
39. Clinical significance and induction of artificial immunological tolerance.
40. Immunological mechanisms of antibacterial resistance. Mechanisms of bacterial escape from immune elimination.

41. Factors of antiviral immunity. Mechanisms of virus evasion from immune elimination.
42. Factors of anthelmintic and antifungal immunity. Mechanisms of escape of fungi and helminths from immune protection.
43. The main factors of immune protection against intracellular infections not accompanied by genetic parasitism (mycoplasma, chlamydia). Pathways of pathogen elimination. Mechanisms of evading immune protection
44. Tumor cells as antigens. Evidence of the immune system's involvement in tumor growth.
45. Mechanisms of antitumor immunity.
46. Mechanisms of tumor "escape" from immunobiological surveillance.
47. Tumor-associated antigens. Origin, types, clinical significance. Immunodiagnostics of neoplastic diseases.
48. Cancer markers, types, requirements for an ideal cancer marker, clinical significance.
49. Principles of immunotherapy and immunoprophylaxis of tumors.
50. Immunological monitoring of infectious and non-communicable diseases. Goals and objectives.
51. Immunoprophylaxis. Goals and objectives.
52. Vaccination. Types of vaccines. Modern approaches.
53. The concept of the National Vaccination Calendar.
54. Post-vaccination reactions and complications. Kinds. Ways of prevention.
55. The concept of immunobiotechnology. The main methods of obtaining immunobiotechnological preparations.
56. Immunobiotechnology in vaccine development and immunoprophylaxis of infectious and non-communicable diseases.
57. Immunological relationships in the "mother-father" system.
58. Immunological relationships in the mother-fetus system. Immunosuppression factors in normal pregnancy.
59. Immunological causes of infertility.
60. Immunological mechanisms of intrauterine development disorders due to incompatibility of spouses according to the Rh-antigen system.
61. The intrauterine period of development of the immune system. Features of the structure and functioning of the immune system at birth.
62. The immune system of a newborn baby. Features of the structure and functioning. Dynamics of development in the first year of life.
63. The immune system in early childhood. Features of the structure and functioning. Development of the immune system in the period from 2 to 6 years.
64. The immune system in adolescents. Features of the structure and functioning. The

development of the immune system in the period from 12-15 years.

65. Involutive changes in the immune system.
66. Autoimmune diseases. The concept of autoantigens and autoantibodies.
67. Hypotheses of the development of autoimmune diseases. The role of infectious agents in the development of autoimmune diseases.
68. The concept of transplantation. Types of transplants.
69. Selection of the donor-recipient pair.
70. The mechanism of allograft rejection.
71. Immunological monitoring of the recipient after transplantation.
72. Immunosuppressive therapy during allotransplantation.
73. Complications in allograft recipients.
74. Ways to prevent and overcome transplant rejection.
75. The subject and objectives of clinical immunology. The main types of immunopathology
76. Clinical assessment of immune status. Methods of laboratory assessment of immune status. Tests of the first and second levels.
77. Immunodeficiency states (IDS). Definition and classification.
78. Mechanisms of formation of clinical manifestations of IDS (IDS marker syndromes).
79. Principles of diagnosis of primary immunodeficiency states (PIDS). Warning signs regarding PIDS.
80. Principles of treatment of primary immunodeficiency conditions.
81. General concepts of secondary immunodeficiency states (SIDS). Classification of SIDS.
82. The dynamics of the formation of SIDS under the influence of the environmental factor.
83. SIDS caused by infection: nonspecific immunosuppressive effect of the infectious process; immunosuppressive effect of bacteria, viruses, chlamydia and mycoplasmas. Indications for immunocorrection.
84. SIDS caused by the action of xenobiotics. Causes and mechanism of SIDS development. Indications for immunocorrection.
85. Post-traumatic stress disorder. Mechanism of development, biological expediency. Indications for immunocorrection.
86. The concept of immunomodulation. Classification of immunotropic drugs.
87. Thymic peptides and their synthetic analogues as they are. Classification. Biological effects. Indications and contraindications.
88. Immunotropic medicinal products of bacterial origin. Classification. Biological effects. Indications and contraindications.
89. Chemically pure IM. Medication. Biological effects. Indications and

contraindications.

90. Allergen-specific immunotherapy. The principle of the method, mechanisms of effectiveness, indications and contraindications.
91. Immunoglobulin preparations and it`s use in clinical practice. Monoclonal antibodies.
92. Infection caused by Human immunodeficiency virus. Clinical manifestations, diagnosis, principles of treatment.
93. Infection caused by Epstein-Barr virus. Clinical manifestations, diagnosis, principles of treatment.
94. Infection caused by Cytomegalovirus. Clinical manifestations, diagnosis, principles of treatment.
95. Infections caused by Herpesvirus types 6 and 7. Clinical manifestations, diagnosis, principles of treatment.
96. Allergens and their classification. Characteristics of allergens. Hereditary aspects of allergic diseases. Cross reactivity. Inhaled allergens. Food allergens.
97. Types of allergic reactions. The immediate type hypersensitivity: anaphylactic type, cytotoxic and immune complex types. Hypersensitivity of the delayed type. Stages of development of allergic reactions.
98. General principles of diagnosis of allergic diseases.
99. General principles of treatment of allergic diseases.
100. Pseudoallergic reactions (PAR). Definition, prevalence, classification. Common causes, clinics, treatment.
101. Differential diagnosis of allergic and pseudoallergic reactions.

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Head of the Department  E.B. Belan