**General Immunology + Practicals**

- Main functions of the immune system. Methods for determining the number of immune system cells.
- Differences between innate and acquired immunity. Principle of indirect immunofluorescence.
- Types of immune mechanisms. Principle of the ELISA test for antigen detection.
- Differences between cellular and humoral immune mechanisms. ELISA test in the indirect diagnosis of infectious diseases.
- Ability of the immune system to distinguish self from non-self (self, absence of self, non-self). Labeling of secondary antibodies in immunoanalytical methods.
- Immunological memory. Principle of Western blot.
- Antigen – definition, epitope, affinity, avidity. Principle of electrophoresis.
- Division of antigens – according to origin, relation to the organism, and solubility. Determination of lysozyme.
- Division of antigens in transplantation. Indications for complement examination.
- Division of antigens depending on the method of inducing an immune response. Principle of C3 determination.
- Immunogen – characteristics, example. Principle of isolation of mononuclear cells from peripheral blood.
- Haptens, tolerogens – characteristics. Determination of total complement cascade activity.
- Immunogenicity and factors influencing it. Lysozyme – function, principle of its determination.
- PAMP (pathogen-associated molecular patterns). Principle of cold agglutination.
- TLR (Toll-like receptors) – characteristics, function. Latex agglutination for detection of antibodies against microbial antigens.
- Endocytic receptors, scavenger receptors – classification, characteristics, function. Latex agglutination for detection of microbial antigens.
- KAR (killer activating receptors) – classification, characteristics, function. Zone of equivalence in precipitation reactions.
- KIR (killer inhibitory receptors) – classification, characteristics, function. Evaluation of complement fixation reaction results.

- CR (complement receptors) and FcR (receptors for Fc fragment of immunoglobulins) – characteristics, function. Specific phase of serological reactions.
- BCR (B-cell receptors) – characteristics, function. M-rosettes.
- TCR (T-cell receptors) – characteristics, function. E-rosettes.
- First line of defense of the immune system – main components and their role. Determination of lysozyme.
- Mechanical barriers of the immune system – skin, mucous membranes. Principle of gradient centrifugation of peripheral blood.
- Mechanical barriers of the immune system – respiratory and urinary tracts. Interpretation of the tuberculin test.
- Chemical barriers of the immune system. Possibilities of determining the number of T and B lymphocytes.
- Role of physiological microflora in the immune system. Possibilities of determining immunoglobulin levels.
- Physiological microflora – explain the terms eubiosis, dysbiosis. Possibilities of determining CRP.
- Second line of defense – main components and their role. Indirect immunofluorescence in the diagnosis of autoimmune diseases.
- Third line of defense – main components and their role. Tests for determination of specific humoral immunity.
- Hematopoiesis, criteria for classification of white blood cells. Functional testing of phagocytes.
- Characteristics of myeloid and lymphoid lineage cells. Testing the function of the complement cascade.
- Mononuclear and polymorphonuclear leukocytes – characteristics, types. Blood smear.
- Granular and agranular leukocytes – characteristics, types. Separation of mononuclear cells from peripheral blood.
- Neutrophils – origin, characteristics, function. Microscopy of blood smear.
- Eosinophils – origin, characteristics, function. Direct immunofluorescence.
- Mast cells – origin, characteristics, function. Blood smear.

- Monocytes, macrophages – origin, characteristics, function. Determination of FI.
- Dendritic cells – origin, characteristics, function. Determination of FA.
- T-lymphocytes – origin, characteristics, function. Principle of the Mantoux test.
- B-lymphocytes, plasma cells – origin, characteristics, function. Principle of ELISA test for detection of antibodies in serum.
- NK cells, NKT cells – origin, characteristics, function. Use of biochips in diagnosis of autoimmune diseases.
- CD markers of immune system cells. Principle of flow cytometry.
- Activation of innate immunity mechanisms. Diagnostic techniques used for determination of antibodies in patient serum.
- Activation of acquired immunity mechanisms. Widal reaction.
- Cooperation of innate and acquired immune mechanisms. Principle of flow cytometry.
- Complement – characteristics, function, regulation. Principle of CFR.
- Classical pathway of complement activation, principle of CH50 determination.
- Lectin pathway of complement activation, principle of C4 determination.
- Alternative pathway of complement activation, principle of C3 determination.
- Defensins, lysozyme – characteristics, function, principle of lysozyme determination.
- Interferons – characteristics, function. Principle of ELISPOT.
- Cytokines, chemokines – characteristics, function. Principle of determination of bactericidal activity of serum.
- Acute phase proteins of inflammation – characteristics, function, principle of CRP determination.
- Phagocytosis – role in immune response, possibilities of determining phagocyte count.
- Phagocytosis – chemotaxis, adhesion, FI testing – principle, indications.
- Phagocytosis – opsonization, FA testing – principle, indications.
- Phagocytosis – ingestion, principle of NBT test.
- Phagocytosis – destruction of phagocytosed material. Principle of phagocytosis testing using flow cytometry.

- Fever, pyrogens. Complement fixation reaction – principle.
- Inflammation. Possibilities of CRP determination.
- Inflammatory cells. Possibilities of determining phagocyte function.
- Humoral components of inflammatory response. Principle of determination of bactericidal activity of serum.
- Immunoglobulins – domains, fragments. Serological diagnostics – criteria for detection of acute infectious disease.
- IgM. Principle of ELISA test for detection of antigens.
- IgG. Phases of serological reactions.
- IgA. Use of serological reactions in direct diagnosis of infectious diseases.
- IgE, IgD. Use of serological reactions in indirect diagnosis of infectious diseases.
- Isotype, allotype, idiotop, idiotype, idiotype network. Explain the principle of antibody titer determination.
- MHC class I. Principle of agglutination reactions.
- MHC class II and MHC class III. Principle of Widal reaction.
- Processing and presentation of endogenous antigens by MHC molecules. Principle of reverse agglutination.
- Processing and presentation of exogenous antigens by MHC molecules. Principle of hemagglutination.
- Development of T-lymphocytes with αβ TCR. Principle of latex agglutination.
- Development of T-lymphocytes with γδ TCR. Precipitation – principle.
- Process of formation of mature B-lymphocytes. Principle of ring precipitation.
- Autoreactive B-lymphocytes and their elimination. Principle of simple radial immunodiffusion.
- Differentiation of B-lymphocytes into plasma cells. Principle of double radial immunodiffusion.
- Differentiation of B-lymphocytes – isotype switching. Elek test – principle, application.
- Interaction of B-lymphocytes with antigen. Interpretation of complement fixation reaction result.
- Antibody response induced by T-dependent antigens. Agglutination reactions.

- Antibody response induced by T-independent antigens. Precipitation reactions.
- Immunological synapse. Principle of FI determination.
- Proliferation and differentiation of CD4+ T-lymphocytes. Principle of FA determination.
- Th1 cells. Principle of tuberculin skin test.
- Th2 cells. Principle of IGRA.
- Mutual regulation of Th1 versus Th2 cells. Advantages and disadvantages of the tuberculin skin test.
- Proliferation and differentiation of CD8+ T-lymphocytes. Advantages of IGRA versus Mantoux test.
- Formation of memory T-lymphocytes. Principle of ELISPOT.
- Activation of T-lymphocytes by superantigens. Determination of toxigenicity of C. diphtheriae.
- Function of the thymus in the immune system. Proof of specific cellular immunity in vivo.
- Function of bone marrow in the immune system. Tests for determining nonspecific humoral immunity.
- Function of the spleen in the immune system. Determination of antibody titer.
- Function of lymph nodes and mucosal lymphoid tissue in the immune system. Use of serological reactions.
- Function of lymphatic circulation system in the immune system. Determination of lymphocyte count.
- Primary phase of antibody response. Use of complement fixation reaction.
- Secondary phase of antibody response. Determination of total complement function.
- Mechanisms of antibody action in the organism. Use of precipitation reactions.
- Central tolerance. Use of agglutination reactions.
- Peripheral tolerance. Determination of antinuclear antibodies.
- Regulatory cytokines – functions, examples. Tests for determining nonspecific cellular immunity.

**Special Immunology**

Autoimmunity and autoantibodies

Autoimmune diseases mediated by humoral immune response – mechanism + examples

Autoimmune diseases mediated by cellular immune response – mechanism + examples

Organ-specific autoimmune diseases – characteristics + examples

Non-organ-specific autoimmune diseases – characteristics + examples

Laboratory diagnosis of autoimmune diseases – indirect immunofluorescence

Other methods in laboratory diagnosis of autoimmune diseases (besides immunofluorescence)

Central and peripheral tolerance

Loss of tolerance to self – list causes

Loss of tolerance to self – cross-reactions and molecular mimicry

Loss of tolerance to self – epitope spreading and loss of suppression

Loss of tolerance to self – sequestered antigens and neoantigens

Anti-infective immunity – immunity in bacterial infection caused by extracellular bacteria

Anti-infective immunity – immunity in bacterial infection caused by intracellular bacteria

Anti-infective immunity – immunity in viral infection

Anti-infective immunity – immunity in parasitic infection

Anti-infective immunity – immunity in mycotic (fungal) infection

Passive immunization – methods of induction, advantages and disadvantages

Active immunization – methods of induction, advantages and disadvantages

Vaccine immunology – primary vaccination, booster vaccination, vaccine + types of vaccines

Live attenuated vaccines – characteristics + example

Whole-cell and whole-virion – characteristics + example

Subunit – characteristics + example

Toxoid vaccines – characteristics + example

Recombinant vaccines and recombinant vector vaccines – characteristics + examples

Acellular and split vaccines – characteristics + examples

Individual and herd immunity, vaccination gap, contraindications to vaccination

Hypersensitivity reactions type I

Hypersensitivity reactions type II

Hypersensitivity reactions type III

Hypersensitivity reactions type IV

Immunodeficiency states – definition, classification, clinical manifestation

Primary antibody immunodeficiencies – occurrence, symptoms, causative agents, complications, survival, example

Primary cellular and combined immunodeficiencies – occurrence, symptoms, causative agents, complications, survival, example

Primary phagocytic immunodeficiencies – occurrence, symptoms, causative agents, complications, survival, example

Primary complement immunodeficiencies – occurrence, symptoms, causative agents, complications, survival, example

Secondary immunodeficiencies – causes

Treatment of immunodeficiencies