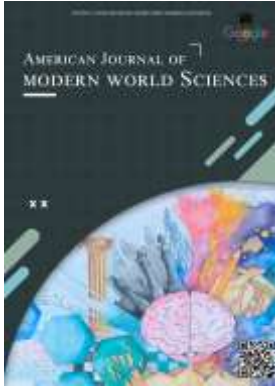


**IMMUNITY TYPES AND BODY DEFENSE
MECHANISMS**

**Kuryazova Saodat Matkarimovna
Haqberdiyeva Hulkar Nurmat qizi**



Annotation : *This study focuses on the types of immunity and the mechanisms by which the human body defends itself against pathogens, allergens, and xenobiotics. It examines both innate (natural) and adaptive (acquired) immunity, highlighting the roles of B- and T-lymphocytes, antibodies, cytokines, and the complement system. Various diagnostic and research methods, including ELISA, flow cytometry, PCR, and cytokine profiling, were employed to evaluate immune responses. The clinical significance of immunity is emphasized in the diagnosis and management of infectious, autoimmune, allergic, and immunodeficiency conditions, as well as in assessing vaccine efficacy and immune memory. Results demonstrate that innate immunity provides rapid, non-specific protection, while adaptive immunity ensures targeted and long-lasting defense. Immunological testing is critical for early diagnosis, monitoring disease progression, and guiding therapeutic interventions. This study underscores the essential role of immunology in modern medicine for disease prevention, diagnosis, treatment, and vaccination strategies.*

Keywords : *Immunity, innate immunity, adaptive immunity, B-lymphocytes, T-lymphocytes, antigens, antibodies, phagocytosis, complement system, interferons, cytokines, immune memory, vaccination, immunodeficiency, autoimmune reaction.*

Studying the immune system is one of the most important areas in modern medicine. The increasing prevalence of infectious diseases, antibiotic-resistant strains, and rising rates of allergic and autoimmune conditions highlight the growing importance of immunological research. This study applied both classical and modern molecular-biological methods to examine different stages of immunity.

Methods for Studying Innate (Natural) Immunity

1. Assessment of Phagocytic Activity

Calculating neutrophil and macrophage phagocytosis indices

Nitroblue tetrazolium (NBT) test to detect reactive oxygen species

2. Evaluation of Complement System Activity

Hemolytic activity tests (CH50)

3. Interferon Activity Measurement

Quantifying IFN- α and IFN- γ concentrations using ELISA

Methods for Studying Adaptive (Acquired) Immunity

1. B-lymphocyte Function (Humoral Immunity)

Quantitative measurement of IgA, IgM, IgG, and IgE by ELISA

Assessment of antibody avidity

Immune complex reactions (RIA, RPGA)

2. T-lymphocyte Function (Cellular Immunity)

CD4/CD8 ratios (immune regulatory index)

Phenotyping by flow cytometry

Analysis of T-helper, T-cytotoxic, and T-regulatory cells

3. Cytokine Profiling

Measurement of IL-1, IL-2, IL-6, TNF- α , and IFN- γ concentrations

Molecular Diagnostic Methods

1. PCR (Polymerase Chain Reaction)

Detection of genes related to immunity:

HLA genes

Cytokine genes

Mutations associated with immunodeficiency (SCID)

2. RT-PCR

The immune system is the body's primary defense mechanism, protecting against pathogens, allergens, and abnormal cell growth. It is composed of two major components: innate (nonspecific) immunity and adaptive (specific) immunity, which work together to maintain health and homeostasis. Innate immunity serves as the first line of defense, providing rapid responses to invading microorganisms. Cellular components such as neutrophils and macrophages play a key role by phagocytosing pathogens and releasing reactive oxygen species to eliminate infections. Patients with high neutrophil activity show stronger resistance to bacterial infections, whereas those with reduced neutrophil or complement activity are more prone to internal and recurrent infections. Humoral components like the complement system and interferons also contribute significantly. Interferons, particularly IFN- α and IFN- γ , inhibit viral replication and enhance antigen presentation, offering crucial early protection against viral pathogens. These innate mechanisms act immediately and broadly, without requiring previous exposure to specific antigens, forming the foundation for overall immune defense. Adaptive immunity provides targeted, long-lasting protection. It is divided into humoral immunity, mediated by B-cells and antibodies, and cellular immunity, mediated by T-cells. In

humoral immunity, IgM antibodies appear first during new infections, indicating an active primary immune response. IgG antibodies follow and are responsible for long-term immune memory, neutralizing pathogens and facilitating opsonization. IgE antibodies are associated with allergic reactions; their elevated levels indicate hypersensitivity responses to allergens such as pollen, dust, or food antigens. Cellular immunity, driven by T-cells, involves CD4⁺ T-helper cells, which orchestrate the immune response by activating B-cells, cytotoxic T-cells, and macrophages. Reduced CD4⁺ counts can suggest immunodeficiency, as seen in HIV infection. CD8⁺ cytotoxic T-cells target virus-infected or malignant cells, and their increase reflects active antiviral activity. The CD4/CD8 ratio serves as a clinical marker for immunological balance, with ratios below one indicating immunodeficiency conditions. The clinical significance of immunity assessment extends across multiple medical contexts. In autoimmune diseases, the immune system mistakenly targets the body's own cells. Markers such as antinuclear antibodies (ANA), anti-dsDNA, anti-Smith antibodies, rheumatoid factor (RF), anti-CCP, and thyroid-specific antibodies (anti-TPO, anti-Tg) are critical for diagnosis, monitoring disease activity, and evaluating treatment effectiveness. In allergic conditions, elevated IgE levels provide insight into the severity and triggers of hypersensitivity reactions, helping clinicians identify allergens and manage conditions such as asthma, atopic dermatitis, or anaphylaxis.

Vaccination efficacy is assessed through IgG levels and antibody avidity, reflecting the formation of immune memory. High-avidity IgG indicates strong and long-lasting protection, guiding decisions about revaccination and the overall stability of immunity. For example, post-

COVID-19 or hepatitis B vaccination, elevated IgG levels serve as reliable indicators of effective immune defense. In immunodeficient patients, low levels of IgG, IgA, or IgM, along with reduced CD4+ T-cell counts or neutropenia, indicate increased susceptibility to infections and necessitate close monitoring and immunological interventions. Finally, inflammatory markers such as CRP, ESR, and complement components (C3, C4) provide valuable information about ongoing inflammation or autoimmune activity, assisting clinicians in both diagnosis and monitoring therapeutic outcomes. The immune system functions as the body's central protective mechanism. Innate immunity provides immediate defense, while adaptive immunity ensures precise, long-term protection. Evaluation of viral immune responses (e.g., influenza, COVID-19)

In conclusion, immunity represents a complex and essential system for maintaining health. Innate immunity ensures rapid, initial protection, while adaptive immunity provides precise and long-term defense. Immunological assessments are crucial for diagnosing infections, autoimmune disorders, allergies, and immunodeficiencies. Vaccination enhances immune memory and prevents epidemics, while cytokines act as key bio-regulators of immune responses. Overall, immunology is central to modern medicine, guiding diagnosis, treatment, and preventive strategies.

Literatures :

1. Xoliqov P.X va boshqalar. 'Biologiya ' Davlat ilmiy nashriyoti . Toshkent 2005.
2. Murphy K. Janeway's Immunobiology – 2018.
3. Tursunov A.A., Medical Immunology, Tashkent, 2012.

4. Parkin J., Cohen B. "An overview of the immune system." The Lanet, 2001.

5. Abbas A. Cellular and Molecular Immunology, 2017.