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THE IMPORTANCE OF PROTEINS IN MEDICINE

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Abstract. Proteins are one of the most important biomolecules in living organisms. They perform many essential biological functions and play a critical role in medical science. Proteins are involved in the structure of cells, regulation of metabolic processes, immune defense, and transportation of substances in the body. In modern medicine, proteins are used for diagnosis, treatment, and prevention of many diseases. This article discusses the structure and classification of proteins, their biological functions, and their significance in medicine.

Keywords: proteins, amino acids, enzymes, antibodies, hormones, medical biochemistry, therapeutic proteins.

Annotatsiya. Oqsillar tirik organizmlardagi eng muhim biomolekulalardan biridir. Ular ko‘plab hayotiy zarur biologik funksiyalarni bajaradi va tibbiyot fanida muhim o‘rin tutadi. Oqsillar hujayra tuzilmasida, modda almashinuvi jarayonlarini tartibga solishda, immun himoyada hamda organizmda moddalarni tashishda ishtirok etadi. Zamonaviy tibbiyotda oqsillar turli kasalliklarni aniqlash, davolash va oldini olishda keng qo‘llaniladi. Ushbu maqolada oqsillarning tuzilishi va tasnifi, ularning biologik funksiyalari hamda tibbiyotdagi ahamiyati yoritiladi.

Kalit so‘zlar: oqsillar, aminokislotalar, fermentlar, antitanachalar, gormonlar, tibbiy biokimyo, terapevtik oqsillar.

Аннотация. Белки являются одними из наиболее важных биомолекул в живых организмах. Они выполняют множество жизненно необходимых биологических функций и играют ключевую роль в медицинской науке. Белки участвуют в формировании клеточных структур, регуляции метаболических процессов, иммунной защите и транспорте веществ в организме. В современной медицине белки широко используются для диагностики, лечения и профилактики различных заболеваний. В данной статье рассматриваются структура и классификация белков, их биологические функции, а также их значение в медицине.

Ключевые слова: белки, аминокислоты, ферменты, антитела, гормоны, медицинская биохимия, терапевтические белки.

1. INTRODUCTION.

Proteins are complex organic macromolecules composed of amino acids linked by peptide bonds. They are essential components of all living cells and tissues. The word “protein” originates from the Greek word *proteios*, meaning

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"primary" or "most important." In the human body, proteins are responsible for many biological processes including enzyme catalysis, cell signaling, immune protection, and structural support [1]. Due to these functions, proteins have significant importance in medicine, biotechnology, and pharmacology. Proteins are formed from **20 standard amino acids**, and their specific sequence determines their biological activity [2]. In medicine, the study of proteins helps scientists understand disease mechanisms and develop new therapeutic drugs.

2. STRUCTURE OF PROTEINS.

Proteins have four levels of structural organization. Each level contributes to the final biological activity of the protein molecule [3].

Table 1.

Levels of Protein Structure

Structure Level	Description	Example
Primary structure	Linear sequence of amino acids connected by peptide bonds	Insulin
Secondary structure	Local folding such as α-helix or β-sheet	Keratin
Tertiary structure	Three-dimensional folding of the entire polypeptide chain	Myoglobin
Quaternary structure	Combination of multiple protein subunits	Hemoglobin

The correct folding of proteins is very important. Misfolded proteins can cause serious diseases such as **Alzheimer's disease, Parkinson's disease, and prion diseases**.

3. BIOLOGICAL FUNCTIONS OF PROTEINS.

Proteins perform a wide variety of biological functions necessary for life.

Table 2.

Major Functions of Proteins in the Human Body

Function	Example Protein	Medical Importance
Enzymatic function	Amylase, pepsin	Catalyze biochemical reactions
Structural function	Collagen, keratin	Maintain tissue structure
Transport function	Hemoglobin	Transport oxygen in blood
Hormonal function	Insulin	Regulate metabolism
Immune protection	Antibodies	Protect against infections
Storage	Ferritin	Store essential elements

These functions demonstrate why proteins are fundamental for normal physiological processes [4].

4. PROTEINS IN MEDICAL DIAGNOSIS.

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Proteins are widely used as **biomarkers** in medical diagnostics. Changes in protein concentration in blood or tissues can indicate the presence of disease.

Table 3.

Diagnostic Protein Biomarkers

Protein Biomarker	Disease Indication
Troponin	Heart attack
C-reactive protein (CRP)	Inflammation
Hemoglobin A1c	Diabetes monitoring
Prostate-specific antigen (PSA)	Prostate cancer
Albumin	Liver or kidney disease

Modern diagnostic methods such as **ELISA, immunoassays, and electrophoresis** rely heavily on protein detection.

5. THERAPEUTIC PROTEINS IN MEDICINE.

Therapeutic proteins are widely used to treat many diseases. Biotechnology allows the production of recombinant proteins that act as medicines [5].

Table 4.

Examples of Therapeutic Proteins

Protein Drug	Disease Treated
Insulin	Diabetes mellitus
Interferons	Viral infections, cancer
Monoclonal antibodies	Cancer, autoimmune diseases
Erythropoietin	Anemia
Growth hormone	Growth disorders

These protein-based drugs are safer and more targeted compared with many traditional chemical drugs.

6. PROTEINS AND THE IMMUNE SYSTEM.

Proteins play a central role in immune defense. Antibodies (immunoglobulins) are specialized proteins produced by B-lymphocytes that recognize and neutralize pathogens. Vaccines also work by stimulating the body to produce protective antibodies [6]. Many modern vaccines use **protein antigens** or **recombinant proteins**.

7. NUTRITIONAL AND CLINICAL IMPORTANCE OF PROTEINS.

Adequate protein intake is essential for human health. Protein deficiency can lead to severe health problems such as:

- **Kwashiorkor**
- **Muscle wasting**
- **Immune system weakness**
- **Delayed growth in children**

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Table 5.

Protein Requirements for Different Age Groups

Age Group	Recommended Daily Protein Intake
Children	1.0–1.2 g/kg body weight
Adults	0.8 g/kg body weight
Pregnant women	1.1 g/kg body weight
Elderly	1.0–1.2 g/kg body weight

Proper nutrition ensures the body has enough amino acids to synthesize necessary proteins.

8. Modern Research on Proteins Advances in **proteomics**, **biotechnology**, and **genetic engineering** have significantly expanded the role of proteins in medicine. Scientists now study protein structures and interactions to develop:

- new drugs
- personalized medicine
- targeted cancer therapies
- diagnostic biosensors

Protein engineering also allows scientists to design proteins with improved therapeutic properties.

9. CONCLUSION. Proteins are fundamental molecules that perform numerous essential functions in the human body. Their importance in medicine is evident in diagnostics, therapeutic drug development, immune protection, and nutritional health. Modern biomedical research continues to explore the potential of proteins for improving disease treatment and prevention. Understanding protein structure and function remains one of the most important areas of medical and biochemical research.

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