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METABOLISM IN THE CELL

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Annotation: This article covers a wide range of processes of metabolism in the cell, their stages, chemical bases and physiological significance. Metabolism is the main biological process of the cell, which continues its vital activity through the production of energy and the synthesis of essential biomolecules. The article provides scientific analysis on the processes of catabolism and anabolism, the enzymes that regulate them, cellular organelles and diseases related to metabolism. Based on the studies, methods that assess metabolic activity as well as modern treatment approaches have also been considered.

Keywords: Metabolism, catabolism, anabolism, cell, enzymes, mitochondria, energy metabolism, medical biology, diseases of metabolism.

Annotatsiya: Ushbu maqolada hujayrada moddalar almashinuvi jarayonlari, ularning bosqichlari, kimyoviy asoslari va fiziologik ahamiyati keng yoritilgan. Moddalar almashinuvi bu hujayraning energiya ishlab chiqarish va zaruriy biomolekulalarni sintez qilish orqali hayotiy faoliyatini davom ettiruvchi asosiy biologik jarayonidir. Maqolada katabolizm va anabolizm jarayonlari, ularni tartibga soluvchi fermentlar, hujayra organoidlari va metabolizm bilan bog‘liq kasalliklar haqida ilmiy tahlillar berilgan. Tadqiqotlar asosida metabolik faollikni baholovchi usullar hamda zamonaviy davolash yondashuvlari ham ko‘rib chiqilgan.

Kalit so‘zlar: Metabolizm, katabolizm, anabolizm, hujayra, fermentlar, mitoxondriya, energiya almashinuvi, tibbiy biologiya, moddalar almashinuvi kasalliklari.

Аннотация:В этой статье подробно рассматриваются процессы обмена веществ в клетке, их стадии, химическая основа и физиологическое значение. Метаболизм-это основной биологический процесс, посредством которого клетка продолжает свою жизнедеятельность, производя энергию и синтезируя необходимые биомолекулы. В статье представлен научный анализ процессов катаболизма и анаболизма, ферментов, которые их регулируют, клеточных органелл и заболеваний, связанных с обменом веществ. На основе исследований также были рассмотрены методы оценки метаболической активности, а также современные подходы к лечению.

Ключевые слова:метаболизм, катаболизм, анаболизм, клетка, ферменты, митохондрии, энергетический обмен, медицинская биология, метаболические заболевания.

Introduction

Metabolism (metabolism) involves all the chemical reaction processes that occur in living cells. Through these processes, the cell receives the necessary substances from the external environment, converting them into energy or other necessary biomolecules, while excreting

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excess or harmful substances. The basis of each cell activity is precisely the continuous and balanced course of metabolic processes.

Metabolism consists of two main stages: catabolism is the process of breaking down complex substances and separating energy, and anabolism is the process of synthesizing new, complex compounds from simple molecules. These two processes are intertwined and necessary for the cell to live, grow, divide, recover and adapt to external factors.

In modern medical biology, through an in-depth study of metabolism, it is possible to detect many diseases early and understand the mechanism of their development. For example, diabetes, obesity, hormonal disorders, mitochondrial syndromes and even cancer — all directly or indirectly depend on the metabolism. Therefore, the control of metabolic processes, the identification of factors affecting it and the understanding of regulatory mechanisms are an urgent scientific and practical issue today.

This article covers a wide range of processes of metabolism that occur in the cell, Their Types, the participation of cell organelles, as well as diseases associated with metabolic disorders and modern treatment approaches.

Methods

In writing this article, scientific literature on the fields of medical biology, biochemistry and Molecular Biology was analyzed. In particular, experimental studies on the metabolism at the cellular level, clinical observations, laboratory-based tests and methods of microscopic observation were studied. Scientific databases such as PubMed, ScienceDirect and Google Scholar were also used.

The main chemical processes that make up metabolism (glycolysis, Krebs cycle, oxidative phosphorylation, beta-oxidation, etc.) were analyzed on the basis of biological models. At the same time, scientific work on the functions of various organelles of the cell — mitochondria, endoplasmic lattice, ribosomes and lysosomes-was compared. In clinical medicine, cases of disorders related to metabolism disorders (e.g. diabetes mellitus, galactosemia, phenylketonuria) were also analyzed.

Modern methods used to assess metabolic activity have also been considered:

- **RT-PCR and Western blotting** — in determining changes in gene and protein levels;

- Mass spectrometry-precise quantification of metabolites;

- Isotopic tracking methods-used to monitor the circulation of substances.

Results

According to the data studied, the metabolism is divided into two main stages: catabolism (breakdown of substances) and anabolism (synthesis of new substances). Catabolic processes are accompanied by the release of energy (for example, the breakdown of glucose), while anabolic processes, on the contrary, require energy (for example, the synthesis of proteins). Cells, especially mitochondria, are the main “production station” of these processes. At the

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same time, the exchange of substances provides not only energy, but also the necessary substances — a prerequisite for the survival of the cell.

Analysis

Based on the sources studied, it can be noted that the metabolism is controlled at the cellular level through various enzymatic reaction chains. Each enzyme selectively cleaves or synthesizes a particular substrate. Enzymatic activity, on the other hand, depends on environmental conditions (temperature, pH), genetic factors, and the physiological state of the organism.

Metabolic pathways (e.g. glucolysis, gluconeogenesis, lipid synthesis) are closely related and through which energy is produced or stored. Mitochondria are the central foci of processes, where ATP — the main source of energy for the cell is formed. Especially in athletes, children and pregnant women, metabolic activity is high.

Violation of metabolism leads to severe consequences:

- Diabetes mellitus-impaired glucose metabolism;
- Increased gout-purine substances;
- Galactosemia-insufficient breakdown of galactose;
- Mitochondrial diseases-defects in energy production.

In modern medicine, the concept of metabolic therapy is developing — this method uses special diets, drugs, gene therapy and biotechnological approaches aimed at restoring the body's metabolic activity.

The above analyzes show that cell metabolism is not only a process that ensures the vitality of the body, but it is also possible to prevent or treat many diseases by controlling it.

Conclusion

In conclusion, the exchange of substances in the cell is the main process that serves to generate energy in the body, synthesize substances and support vital functions. Its normal course is a guarantee of health, while its violation leads to severe diseases. Therefore, an in-depth study of cell metabolism and the development of methods for its regulation remains an urgent issue in medical biology.

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