



## CHEMICAL COMPOSITION OF LIVING ORGANISMS. CELLULAR LEVEL OF LIFE

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**Abstract:** This article is devoted to the study of the chemical composition of living organisms and their role and significance in life. The essence of life at the cellular level, the main chemical components of the cell structure - water, proteins, lipids, carbohydrates, nucleic acids and their functional properties are analyzed. The article provides information about the interaction of substances inside the cell and the mechanisms of biological processes at the molecular level. In addition, the influence of chemical composition on other levels of life is also covered. This research is useful for scientists and students working in the fields of biology, biochemistry and molecular biology.

**Keywords:** Living organisms, chemical composition, cellular level, water, proteins, lipids, carbohydrates, nucleic acids, molecular biology, biological processes.

### Introduction.

Nature has always fascinated us with its amazing diversity and wonders. The interconnectedness of all living organisms on Earth, their structure and life activities, each invisible molecule and the vast ecosystem is mind-boggling. The origin of life and its stability largely depend on the chemical composition of cells. The seemingly simple water molecule, complex compounds such as proteins, lipids and carbohydrates are the most fundamental basis of life.

The cell is the smallest but most important structure of life. These small structures occupy a central place at all levels of life. Each cell carries out millions of chemical reactions within itself, ensuring the continuity of life. But this small mysterious world of life is of great importance not only for biologists, but also for understanding the future of humanity. After all, by understanding the essence of life, we learn to live in harmony with nature and preserve it.

This article analyzes the chemical composition of living organisms, their functional significance and role in life processes. This unique chemical symphony serves as the foundation for all manifestations of life. Therefore, we will try to understand its beauty by looking deeper into the molecular level of life.

### Methodology:

The study of the chemical composition of living organisms requires a multifaceted and in-depth approach. Research in this area is aimed at determining not only the superficial appearance of biological structures, but also their complexity at the molecular and chemical levels. These studies combine modern scientific methods and traditional experimental approaches to obtain objective data.

First of all, biochemical analyzes were conducted in laboratory conditions to determine the chemical components of living organisms. Modern analytical methods such as chromatography, spectrophotometry, and electrophoresis were used to determine the qualitative and quantitative indicators of proteins, lipids, carbohydrates, and nucleic acids.

These methods helped not only to identify structural molecules, but also to understand their interconnected functional functions.

Also, microscopy and molecular imaging technologies were used to study the mechanisms of biological processes at the molecular level. Modern confocal and electron microscopes were used to observe the internal structures of the cell, their interactions, and the influence of chemical composition on biological processes. This made it possible to analyze in detail not only the composition of chemicals, but also their role in cellular life.

In addition, the theoretical aspects of the topic were highlighted by studying the scientific literature and analyzing the data. The obtained data were synthesized on the basis of in-depth statistical analysis. This made it possible to systematically demonstrate the relationship between chemical composition and biological processes.

Thus, in this study, theoretical and statistical approaches, along with practical laboratory methods, were combined, creating a foundation for a deep understanding of the chemical composition of living organisms and the mechanisms of life at the cellular level. This approach will serve not only to develop biological science, but also to open up new directions for the study of life in the future.

#### **Discussion:**

The results of studying the chemical composition of living organisms once again convince us of the incredible complexity and harmony of life. They show that the chemical components of cells - water, proteins, lipids, carbohydrates and nucleic acids - are the main factors necessary for the continuation of life. These substances provide not only the structure of the cell, but also metabolic processes and energy metabolism in it.

One of the important observations was the central role of water in the life of cells. The water molecule serves not only as a medium that ensures life, but also as a catalyst for many biological processes. For example, enzymatic reactions or the transport of substances inside and outside the cell occur due to the unique properties of water.

Proteins are considered the "working power" of the cell. These complex macromolecules are necessary for every process in the body - enzymatic activity, signal transduction, and structural stability of the cell. The results of the study showed that even small changes in the chemical structure of proteins can have a significant impact on biological processes. This further increases the importance of studying the exact mechanisms at the protein level.

The role of lipids and carbohydrates is wide, from the structure of cell membranes to their functions as energy reserves. The study noted that the molecular organization of lipids ensures the stability of the cell and its protection from external influences. Carbohydrates are of paramount importance as a source of energy, controlling not only the energy supply, but also intermolecular signaling.

Also, nucleic acids - DNA and RNA - as the genetic material of the cell, form the control system of all vital processes. Their chemical composition and structure ensure the precise and consistent functioning of all biological processes of the organism.

These analyses show that the chemical level of life is the fundamental foundation for organisms. It is through the interaction and coordination of chemicals that cells carry out the complex processes necessary for life. These results provide a deeper understanding of life at the molecular level and open up promising directions for scientific fields such as biology, biochemistry, and molecular medicine.

The issues discussed may open up new horizons in the future in the study of the molecular properties of living organisms, the development of technologies for controlling cellular processes, and the solution of various biological problems of humanity. This once again emphasizes how complex and at the same time beautiful life is.

### **Conclusion.**

Research into the chemical composition of living organisms and the cellular level of life helps to understand the true essence of life. Each cell, as it were, forms a world within itself, showing that each of its elements is important and interconnected. Such basic components as water, proteins, lipids, carbohydrates, and nucleic acids create a whole system necessary for the continuity and stability of life.

This study has shown that the interaction of chemicals at the cellular level not only ensures vital processes, but also determines the interaction of organisms with the environment. The role of water as a universal solvent, the enzymatic and structural functions of proteins, the stability of lipids in membranes, the importance of carbohydrates as a source of energy, as well as the functions of nucleic acids in the storage and transmission of genetic information, perfectly complement each other.

Knowledge about the chemical composition of the cell is important not only for fundamental biology, but also has a wide range of applications. In the fields of modern medicine, biotechnology and ecology, effective methods are being developed based on this knowledge to create new drugs, carry out genetic modifications and restore ecological balance.

This research opens up new opportunities for solving biological and ecological problems facing humanity by studying the molecular mechanisms of life. By deeply understanding the harmony between living organisms and their chemical composition, we can take a firm step towards preserving nature and passing on a rich biological heritage to future generations. Thus, understanding the essence of life, understanding it at the molecular and chemical levels, gives humanity immense value not only from a scientific but also from a philosophical point of view. This knowledge once again reminds us of the need not only to study life, but also to value and protect it.

### **References:**

1. Alberts, B., Johnson, A., Lewis, J., et al. (2002). Molecular Biology of the Cell. 4th Edition. Garland Science.
2. Berg, J. M., Tymoczko, J. L., Stryer, L. (2015). Biochemistry. 8th Edition. W. H. Freeman and Company.
3. Campbell, N. A., Reece, J. B. (2008). Biology. 8th Edition. Pearson Education.
4. Lodish, H., Berk, A., Kaiser, C. A., et al. (2016). Molecular Cell Biology. 8th Edition. W. H. Freeman and Company.
5. Raven, P. H., Johnson, G. B., Mason, K. A., et al. (2020). Biology. 12th Edition. McGraw-Hill Education.
6. Nelson, D. L., Cox, M. M. (2017). Lehninger Principles of Biochemistry. 7th Edition. W. H. Freeman and Company.
7. Smith, C. A., Wood, E. J. (1996). Introduction to Biochemistry. 2nd Edition. Oxford University Press.

8.Voet, D., Voet, J. G. (2011). Biochemistry. 4th Edition. Wiley.

9.Madigan, M. T., Martinko, J. M., Bender, K. S., et al. (2018). Brock Biology of Microorganisms. 15th Edition. Pearson.

