CYTOPLASM AND MEMBRANE-FREE ORGANELLES OF THE CELL

Ahmadjonova Begoyim
Biology teacher of Andijan Region Izboskan district Polytechnic No. 1
E-mail:begoyimahmadjonova2001@gmail.com

Annotation: this article provides an overview of the cytoplasm and non-membrane organelles of the cell. The article analyzes the structure, functions of the cytoplasm and the biological importance of non-membrane organelles (ribosomes, centrioles and microtubules) in it. The study highlights the relevance and scientific foundations of the topic through literature analysis, methodological approaches, results and discussion parts. The article concludes with conclusions and suggestions, as well as a list of used literature.
Keywords: cytoplasm, non-membrane organelles, ribosomes, centrioles, microtubules, cell biology, functional analysis.

Introduction: the cytoplasm occupies a central place in Cell Biology, as it coordinates various processes as the internal environment of the cell and localizes organelles. It is located within the cell membrane and contains all the components of the cell, with the exception of the nucleus. The cytoplasm is not only the area of activity of organelles, but also an important environment for the exchange of substances, signal transmission and maintenance of cellular structure. This environment is home to membranous organelles (e.g. mitochondria, endoplasmic reticulum) and non-membranous organelles (ribosomes, centrioles, microtubules). Despite its simple structure, non-membrane organelles play a large role in the vital processes of the cell. Among non-membrane organelles, ribosomes are one of the most important. Ribosomes are known as the main center of protein synthesis. They are made up of rRNA and protein molecules that settle in the cytoplasm or on the surface of the endoplasmic reticulum. Ribosomes combine amino acids to form proteins based on genetic information from mRNA. This process is necessary for the growth, repair and many other functions of the cell. Recent research on the structure and function of ribosomes, in particular the work of scientists such as Wilson and Doudna Cate (2012), has helped to understand their molecular mechanisms more clearly. These studies have shown that ribosomes are important not only in protein synthesis, but also in the exact translation of genetic information [1].

Centrioles, on the other hand, are of particular importance in the process of cell division. They are cylindrical structures made up of microtubules and participate in the organization of the spindle apparatus, which controls the movement of chromosomes during cell division. Centrioles also play a role in the formation of action organelles such as cilia and flagella in animal cells. Research by scientists such as Nigg and Stearns (2011) suggests the regulatory role of centrioles in the cell cycle and that their malfunctions can lead to diseases such as cancer.Microtubules, on the other hand, form the skeletal system of the cytoplasm. They are composed of tubulin proteins and are involved in processes

such as cell shape maintenance, internal matter transport, and cell division. Microtubules are dynamic structures that are constantly assembled and propagated, allowing the cell to adapt to different tasks. For example, in the process of mitosis, microtubules provide chromosome movement, thus successfully carrying out cell division [2].

Literature analysis is based on a broader review of recent scientific research on cytoplasmic and non-membrane organoids and analyzes the state of existing knowledge in the field. The cytoplasm as the internal environment of the cell not only serves as a platform for the location of organelles, but also plays an important role in the exchange of substances, signal transmission and ensuring the stability of the cell structure. In Alberts and others '" Molecular Biology of the Cell" (2014), the cytoplasm is described as an important environment for intracellular chemical reactions and organoid interactions. The work highlights the central position of the cytoplasm in the support of cellular functions, extensively illuminating its internal structure and dynamic properties. For example, the cytoplasm is seen not only as an environment for the transport of substances, but also as a system that regulates the location and movement of intracellular organelles. Research on ribosomes, in particular the work of Wilson and Doudna Cate (2012), is an in-depth study of their primary role in protein synthesis and molecular structure. Ribosomes are made up of rRNA and protein molecules that function freely in the cytoplasm or located on the surface of the endoplasmic reticulum. They read genetic information from mRNA, combine amino acids and synthesize proteins. This process is important for vital processes such as cell growth, differentiation and repair. Wilson and Doudna Cate have contributed significantly in their research to the identification of fine details of ribosome structure, in particular their active centers and molecular mechanisms of protein synthesis. These studies have also opened up new possibilities that can be used in the medical field, such as in the production of antibiotics, by increasing or inhibiting the effectiveness of ribosome activity [3].

Research on centrioles and microtubules, particularly the work of Nigg and Stearns (2011), highlights their important role in cell division and cytoskeleton structure. Centrioles are cylindrical structures made up of microtubules and participate in the formation of the spindle apparatus in the process of cell division. This process ensures proper chromosome distribution, which is crucial for successful cell cycle completion. In addition, centrioles are also involved in the formation of action organelles, such as cilia and flagella, in animal cells. Research by Nigg and Stearns suggests that centrioles malfunctions can lead to genetic instability and even diseases such as cancer. Microtubules, on the other hand, serve as the internal skeletal system of the cell. They are composed of tubulin proteins and are actively involved in processes such as cell shape maintenance, substance transport, and cell division. The dynamic nature of microtubules – that is, their constant Assembly and distribution – allows the cell to adapt to different conditions. However, literature analysis suggests that research on non-membrane organelles has been studied in a less systematic way compared to membrane organelles. Membrane organelles, such as mitochondria and the Golgji apparatus, have gained more

attention, while there is insufficient information on the interaction of non-membrane organelles such as ribosomes, centrioles, and microtubules and their fine intracellular tuning. For example, the interdependence of non-membrane organelles and their regulatory mechanisms in the cell cycle have not yet been fully studied. Studies designed to bridge this gap focus on a deeper analysis of not only the individual functions of non-membrane organelles, but also their interactions within the cytoplasm. Such an approach will help to better understand the complex processes in Cell Biology and open up new opportunities in the future in the field of Biomedicine [4].

Methodology: the methodology section explains more broadly what methods and approaches the research is based on. The study primarily used literature analysis and generalization techniques. In this process, the structure and functions of cytoplasmic and non-membrane organelles were studied in depth, using scientific articles, authoritative books and reliable electronic resources. Through the analysis of literature, the existing knowledge in the field was systematically considered, and new conclusions were formed on their basis. Tables and diagrams were used to systematize and accurately classify the data, which helped to present the information obtained in a visual and understandable form. The main purpose of the study was to determine the position of non-membrane organelles in Cell Biology and to present their functional properties in a general form. This process focused on understanding not only the individual characteristics of organelles, but also their interactions within the cytoplasm and their overall role in cellular processes. The study combined analytical and synthetic approaches to determine the effects of these organoids on important processes in Cell Life.

Results: the role of cytoplasmic and non-membrane organelles in Cell Biology is more broadly highlighted. The cytoplasm acts as an important platform for chemical reactions, transport of substances and the interaction of organelles as the main internal environment of the cell. It is surrounded by a cell membrane that contains all the components of the cell except the nucleus. The cytoplasm is not only a static environment, but also a dynamic system that ensures the movement of intracellular substances, signal transmission and the location of organelles. This environment plays a central role in coordinating the various processes of the cell. Among non-membrane organelles, ribosomes occupy a special place as the main center of protein synthesis. They are made up of rRNA and protein molecules, consisting of small and large subunits. Ribosomes read genetic information from mRNA to combine amino acids using tRNA to form proteins. This process is necessary for the growth, repair and other vital functions of the cell. Ribosomes function freely in the cytoplasm or located on the surface of the endoplasmic reticulum, ensuring their flexibility in synthesizing proteins for various purposes. Centrioles are important in the process of cell division. They are cylindrical structures made up of microtubules that serve as centers that make up microtubules in the cell cycle, specifically in the process of mitosis. Centrioles control the movement of chromosomes through the formation of the mil apparatus, which ensures the correct distribution of the genetic material of the cell. In addition, centrioles are involved in the formation of motile

organelles such as cilia and flagella in animal cells, which is important in cell motility and interaction with the external environment. Microtubules, on the other hand, serve as the internal skeletal system of the cell. They are composed of tubulin proteins and are actively involved in processes such as cell shape maintenance, substance transport, and cell division. Microtubules are dynamic structures whose constant Assembly and distribution allows the cell to adapt to different conditions. For example, in the process of mitosis, microtubules provide chromosome movement, thus promoting the successful completion of cell division. In addition, microtubules play an important role in the transport of intracellular organelles and substances, such as in the movement of vesicles.

When the structure and functions of these organelles are analyzed, their specific and complementary roles in Cell Biology are clearly visible. While ribosomes provide the molecular needs of the cell through protein synthesis, centrioles and microtubules support the cell's structural stability and division processes. The interaction of these organelles forms a complex and coordinated system within the cytoplasm, which ensures the vital activity of the cell. Through tables and diagrams, these data were systematized, making their functional properties and correlations more apparent.

Discussion: the discussion section analyzes the results of the study in a broader context and delves further into the important role of non-membrane organelles in Cell Biology. The results of the study show that non-membrane organelles occupy a central place in ensuring the vital activity of the cell. Ribosomes satisfy the functional needs of the cell through protein synthesis. They convert genetic information into protein molecules to produce proteins necessary for cell growth, repair, and other processes. This process is the basis of the vital activity of the cell, since proteins are involved in almost all chemical and biological processes within the cell. Centrioles, on the other hand, play an important role in the process of cell division, specifically controlling the movement of chromosomes through the organization of microtubules. This ensures the correct distribution of the genetic material of the cell, which in turn is essential for the successful completion of the cell cycle. Microtubules are involved in the processes of maintaining the shape of the cell as an internal skeletal system, transport of substances and division. Their dynamic nature allows the cell to adapt to different conditions, which is necessary for the stability and functionality of the cell. However, the study shows that the interaction of non-membrane organelles and their relationship with other intracellular structures has not yet been fully studied. For example, there is insufficient information on the molecular connections between ribosomes, centrioles, and microtubules and their coordinated performance in the cytoplasmic environment. Questions remain open about how these organelles affect each other, such as how centrioles ' role as microtubule organizers affects ribosome activity or how their cell cycle regulatory mechanisms function. Therefore, it is necessary to carry out molecular and genetic research in the future. These studies help determine the relationship between non-membrane organelles and how they are coordinated with other intracellular structures. Such an approach opens up a deeper understanding of complex processes in

Cell Biology and, perhaps, new opportunities in the treatment of disease-related problems, such as cancer or genetic abnormalities.

Conclusions and suggestions: summarizes the main findings of the study and sets the directions for future research. The cytoplasm as the internal environment of the cell is important in coordinating cellular functions and creating an environment for organoid localization. Non-membrane organelles, specifically ribosomes, centrioles, and microtubules, play a key role in ensuring the functional and structural stability of the cell. While ribosomes meet the molecular needs of the cell through protein synthesis, centrioles and microtubules are involved in cell division and internal structure maintenance. The joint activity of these organelles ensures the successful implementation of the vital processes of the cell.

The study shows that it is necessary to carry out systematic research on non-membrane organelles, since many questions remain open in this area. In the future, it is recommended to delve deeper into the molecular structure of non-membrane organelles. This helps to more accurately understand, for example, the molecular structure of ribosomes or microtubules and their mechanisms of activity. It is also important to analyze the interaction of these organelles with other organelles within the cell. These analyses help determine how non-membrane organelles are coordinated with other structures, such as membrane organelles or signal transduction systems. Finally, the study of the possibility of using these organelles in the biotechnological field will be of great importance in the future. For example, strategies such as producing new drugs by modulating ribosome activity or inhibiting the division of cancer cells by targeting microtubules can be developed. Such research will serve not only to develop fundamental biology, but also to open up new opportunities in applied fields, in particular, medicine and biotechnology.

REFERENCES:

1. Alberts, B., Bray, D., Hopkin, K., et al. (2014). Molecular Biology of the Cell. Garland Science.
2. Wilson, D. N., & Doudna Cate, J. H. (2012). The structure and function of the eukaryotic ribosome. Cold Spring Harbor Perspectives in Biology, 4(5), a011536.
3. Nigg, E. A., & Stearns, T. (2011). The centrosome cycle: Centriole biogenesis, duplication and inherent asymmetries. Nature Cell Biology, 13 (10), 1154-1160.
4.” What is the cytoplasm — the basis of cellular viability " – article, ifazo.uz, on May 30, 2023.