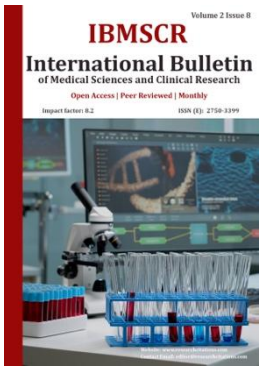

CELL STRUCTURE AND ITS FUNCTIONS

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Abstract: The cell is the smallest structural and functional unit of all living organisms. This topic covers the structure of the main parts of the cell - namely the plasma membrane, cytoplasm, and nucleus - and their respective functions. Additionally, the functions of intracellular organelles such as mitochondria, ribosomes, the endoplasmic reticulum, and the Golgi apparatus are explained. The cell plays a vital role in sustaining the life of an organism, as it is where processes like metabolism, energy production, protein synthesis, and the storage of hereditary information take place.

Keywords: Cell, plasma membrane, cytoplasm, nucleus, organelles, mitochondria, ribosome, endoplasmic reticulum, Golgi apparatus, lysosome, vacuole, DNA, RNA, protein synthesis, metabolism, energy, biological system.

Introduction:

All living organisms are composed of cells, which carry out essential functions necessary for survival. Cells can exist as single-celled organisms or as part of complex multicellular systems. Despite their diversity, all cells share common structural features that enable them to perform life-sustaining processes.

The cell is the smallest structural and functional unit of all living organisms. It is at the center of all vital processes, such as growth, development, reproduction, and metabolism. In modern medicine, understanding the structure and function of the cell makes it possible to scientifically explain the origin of diseases, as well as their diagnosis and treatment. In particular, regeneration processes, hereditary diseases, and oncological conditions are studied at the cellular level.

All living organisms are composed of cells. The cell (from the Latin cellula, meaning small chamber, or Greek cytos, meaning hollow vessel) is the smallest structural unit of living organisms. The planet Earth is a home for numerous creatures. Some living organisms are very small, while others are very large.

Almost all cells are several times smaller than particles that can be seen with the naked eye, without the use of magnifying instruments. A microscope can be used to view cells. A microscope works like a magnifying glass and serves to magnify images of small living organisms and cells by hundreds or even thousands of times. Let us recall that the phenomena of life include growth and development, excretion, nutrition, respiration, responding to environmental stimuli, and reproduction. What organisms do you think are composed of a single cell? For example, the amoeba is one such organism. Additionally, organisms like the green euglena and the paramecium are also among the unicellulars. A cell's ability to remain viable and reproduce is maintained by each of its main constituent parts performing its specific function.

Cytoplasm and its Composition

Cells contain a semi-fluid substance called cytoplasm. This substance consists of a large amount of water. Some of the cell's life processes, such as digestion, nutrient synthesis, and energy production, take place in the cytoplasm.

It is the egg-white-like fluid that fills the space between the cell membrane and the nucleus, and in which the organelles are located. The cytoplasm contains organelles such as mitochondria, ribosomes, centrosomes, lysosomes, the Golgi body (Golgi apparatus), the endoplasmic reticulum, plastids, and vacuoles. By performing their specific functions, these organelles ensure the continuity of the cell's life. Mitochondria are found in both plant and animal cells. They are the organelles responsible for breaking down nutrients and producing energy in the cell. Cells that require a lot of energy, such as muscle, nerve, and liver cells, have a much higher number of mitochondria compared to other cells.

A ribosome is an organelle responsible for producing protein. The cells of living organisms such as bacteria contain no other organelles besides this one. The centrosome is found only in animal cells. This organelle, which functions in cell division, is composed of two centrioles. The lysosome has the property of breaking down large-molecule nutrients within the cell's internal environment. This process is also called digestion. Lysosomes are found only in animal cells and are not present in developed plant cells. Golgi body: Present in both plant and animal cells. It is the organelle responsible for the production, packaging, and secretion of substances within the cell. Endoplasmic reticulum: This type of organelle is also found in both plant and animal cells and is responsible for substance transport. Vacuoles are few in number and large in size in plant cells, whereas they are numerous and small in size in animal cells. It is a sac-like structure where waste products and certain fluids within the cell are stored for a period of time.

Plastids: Found only in plant cells, and there are three types: and in small volumes. Intracellular waste products and some is a sac-like structure where liquids accumulate for a certain period. Plastids: Found only in plant cells, and have three types:

Chloroplasts use water and carbon dioxide in the presence of light to produce oxygen and nutrients. This process is called photosynthesis, and it also gives plants their green color.

Chromoplasts are a type of plastid that give plant cells their red, yellow, and orange colors. Leucoplasts are a type of plastid responsible for nutrient storage, and they are colorless.

The Function of the Nucleus:

Cells usually have a nucleus. The nucleus is larger than other structures within the cell and is often located in the center of the cell. When it is stained, it can be easily distinguished under a microscope.

The cell nucleus consists of the following parts:

1) the membrane surrounding the nucleus;
2) nuclear sap;
3) the nucleolus;
4) chromosomes.

The nucleus is enclosed by an envelope with pores that allow for the passage of substances. The nucleus contains the hereditary material that carries information about the life processes occurring within the cell.

1) nuclear sap;
2) nucleolus;

Signals are sent from the nucleus to other parts of the cell, which then ensures these life processes are carried out. In short, the nucleus is the control center of the cell. Following these processes, cells begin to grow, produce energy, and start to divide when they reach a certain size. This process is also controlled by the nucleus. Cellular information is passed on to other new, young cells through this hereditary material.

Not all cells have a nucleus. In such cases, the hereditary material carrying the cell's regulatory information is located in the cytoplasm. Bacteria are an example of cells without a nucleus. The segments of DNA that determine our hereditary, or heritable, characteristics are called genes. The structure consisting of DNA and the specific proteins surrounding it is called a chromosome.

The Study of Cell Structure with the Development of Technology:

In 1674, Anton van Leeuwenhoek was the first to observe the cell of a living organism. He also observed sperm cells and blood cells.

In 1828, Robert Brown learned that there was a spherical structure inside cells, and gave it the name "nucleus," which means "core". In 1838, Matthias Schleiden proposed that the nucleus plays an important role in the development of the cell. In 1839, Theodor Schwann expanded on Schleiden's view, stating that both plants and animals are composed of cells and that the nucleus is located within their structure. In 1858, based on his scientific research related to cell growth and reproduction, Rudolf Virchow stated that existing cells are formed through the division of pre-existing cells. In short, he established the cell theory.

In 1900, equipment was developed that allowed for taking very thin sections from materials to study cell structure, and chemical substances were produced that enabled easier observation by staining cells. Thus, intracellular structures such as the Golgi apparatus, mitochondria, and others were described. In 1900, a device called a centrifuge was invented, which facilitated the separation and study of intracellular structures. In 1900, detailed information about the internal structure of the cell began to be obtained using the electron microscope.

1996 - Gene Transfer:

Methods were invented that enabled the transfer of a gene from one living organism to another. The first was a sheep named Dolly, which was cloned in 1996. Later, mammals such as cats and mice were also cloned. In the year 2000, scientific research related to the cell and the knowledge gained continue to increase rapidly. Rapid developments in technology are greatly helping scientists. Equipment that ensures obtaining, ensuring more easy observation by staining cells Chemical substances were produced. Thus, the intracellular Golgi bodies, mitochondria and other structures were described.

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Meiosis

Reproductive germ cells are located in the reproductive organs of both females and males. Reproductive germ cells form spermatozoa and eggs. The female reproductive cell, the egg cell, is produced in the ovaries, and the male reproductive cell, the spermatozoon, is produced in the testes.

The fusion of the nuclei of the egg and sperm cells is called fertilization. The living cell formed as a result of fertilization is called a zygote. If during fertilization, the reproductive germ cells were to fuse, a living organism with 92 chromosomes would be created. If this process were to continue in this manner, the chromosome number would increase with each new generation, and the resulting individuals would have a completely different number of chromosomes.

Meiosis plays an important role in keeping the chromosome number constant after fertilization. It ensures the formation of reproductive cells from reproductive germ cells. Meiosis occurs in two stages: in the first stage, the chromosome number is reduced by half, resulting in the formation of two daughter cells. In the second stage, the two resulting cells divide again to form four new cells.

The Stages of Meiosis

The cell receives a signal from the DNA to divide. The DNA replicates itself and doubles. The non-sister chromatids of homologous chromosomes cross over each other, and an exchange of segments occurs. The nucleolus and the nuclear envelope dissolve and disappear. The centrioles form the spindle fibers. The chromosomes that have undergone crossing over align at the center of the cell. The homologous chromosomes are pulled to opposite poles by the spindle fibers. In this way, the chromosome number is reduced by half. Then, cytokinesis (division of the cytoplasm) occurs, and Meiosis I is complete. The events that occur in Meiosis II are similar to those in mitosis. If meiosis did not occur during the formation of reproductive cells, the chromosome number would not be reduced by half, and the chromosome number specific to a species would not be maintained.

Conclusion

Cells are the building blocks of life, and their structure is closely related to their function. Each organelle has a specific role that contributes to the overall functioning of the cell. Studying cell structure helps us understand how living organisms grow, develop, and maintain life.

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