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NERVE TISSUE

Soatova Xolnisa Raxmat qizi
Student of the Termiz branch of the Tashkent Medical Academy
ttermez148@gmail.com

Najimatdinova Shinargul Baxadirovna
Student of the Termiz branch of the Tashkent Medical Academy
najimatdinovashinar@gmail.com

Bekmurodova Marjona Xurshidbek qizi
Student of the Termiz branch of the Tashkent Medical Academy
mbekmurodova709@gmail.com

Zulfaliyeva Kamola Qo'yliboy qizi
Student of the Termiz branch of the Tashkent Medical Academy
kamolazulfaliyeva@gmail.com

Almamatova Shahlo Xushboq qizi
Student of the Termiz branch of the Tashkent Medical Academy
shaxloannayeva@gmail.com

ANNOTATION

While reading this article, you will get acquainted with the nervous tissue in a brief context. You will approach them separately by getting acquainted with the structure and functions of the nervous tissue in the case of practical medical tasks.

Keywords: Axon, dendrite, neuron, neuroglia, macroglia (astrocyte, ependymoglia, oligodendrocyte), Hematoencephalic barrier (GEB)

INTRODUCTION

Currently, the study of the nervous system is deeply studied by all scientists. Substances are exchanged in the nervous system, as in the whole body. Energy is generated as a result of this biochemical process. Nerve fibers consume very little energy when they work, but in nerve cell bodies, energy is consumed relatively more and substances are exchanged faster. In addition, biocurrents (bioelectric potentials) play an important role in the functioning of the nervous system. They are a characteristic sign of the excitation process and are of great importance in the transmission of nerve impulses, and their study is used in the diagnosis of diseases of the nervous system.

MAIN PART

Nervous tissue is the newest tissue in phylogenetic development, it is composed only of cells, there is no intercellular substance. The nervous system consists of a network of numerous organs and structures distributed throughout the body, and is mainly composed of two types

of cells. The first type of cells are called neurons or neurocytes. These cells receive external and internal influences, convert them into nerve impulses and ensure that they spread throughout the body. The second type of cells - neuroglia perform a number of auxiliary functions. Neurons and neurocytes (neuronum, neurocytus) are the main specialized cells of nervous tissue. Neurons synthesize and secrete neurotransmitters and other substances that transmit information to other neurons and cells. A neuron is a morphologically and functionally independent unit, but it establishes synaptic connections with other neurons with the help of its outgrowths, forming reflector cells - chain links, which are the basis of the structure of the nervous system. Receptor (sensing, afferent), effector (motor, motoneuron) and associative (intermediate) neurons are distinguished according to their function in the reflector. Afferent neurons influence receives, converts them into nerve impulses and amplifies them. Efferent neurons transmit the impulse to the tissue of the working organs, prompting them to move. Associative neurons provide communication between neurons. Usually, the body (perikaryon) and outgrowths of neurons are distinguished: one axon and a different number of dendrites. According to the number of outgrowths, there are unipolar neurons with only one axon (not found in highly developed animals and humans), bipolar neurons with one axon and one dendrite, and multipolar neurons with one axon and several dendrites. Sometimes among bipolar cells there are pseudo-unipolar cells with a single tumor. One tumor emerges from their body, which then divides into an axon and a dendrite. In fact, two outgrowths come out of the cell body wrapped in a single glial membrane, after some distance this outgrowth divides into axon and dendrite in the shape of a —T‖. Pseudounipolar cells are found in the spinal cord, while bipolar neurons are found in the auditory and visual organs. Multipolar neurons are the most common nerve cells in humans and animals.

Dendrites. Dendrites are the true protrusions of the cell body. They contain many synapses and serve as the main part of neurons that receive and process incoming information. Most nerve cells have several dendrites, due to which the sensory surface of the cell increases. For example, motor neurons in the spinal cord have 5 to 15 large dendrites. Dendritic networks receive signals from a large number of axon terminals of other nerve cells to a single neuron allows to make and combine. Bipolar cells with a single dendrite are extremely rare and are found only in sensory organs. Unlike axons, which have the same diameter throughout their length, dendrites become thinner as they branch. Axon. Through the axon, the impulse is transmitted from the cell body to another neuron or to the working organ. It is non-branching and has the same thickness along its entire length, containing mitochondria, microtubules and neurofilaments, as well as elements of the smooth endoplasmic reticulum. There is only one axon in each neuron, and it is the longest outgrowth. For example, the length of the axon of motor neurons of the spinal cord innervating the muscles of the palm of the hand can reach 100 cm. At the point where the axon exits the neuron surrounded by myelin membrane, there is a special place - primary cementum - between the axon crest and the point where myelination begins. Unlike dendrites, axons have a constant diameter and branch very little. Sometimes axon as it exits the cell body, it gives a network and it returns to the body of the nerve cell. All branches of the axon are called collaterals. Two-way active transport of small and large molecules along the axon takes place. Axon transport (axoplasmic transport) is the transfer of substances from the neuron body to tumors and from tumors to the body. It is

carried out through microtubules (neurotubules), and kinesin and dynein proteins participate in the transport.

Neuroglia. Neurons are highly specialized cells that live and work in a strictly specific environment. Such an environment is created for them by neuroglia and performs a number of auxiliary functions, such as supporting, trophic, limiting, electrical insulating and protective functions. At the same time, neuroglial cells, including Schwann cells, participate in the structure of peripheral nerves and nerve endings, participate in the generation and transmission of nerve impulses, and in the degeneration and regeneration of nerve fibers. Neuroglia are composed of cells of different sizes and shapes, and there are many of them they contain numerous outgrowths, but unlike neurons, all their outgrowths are the same: axon and dendrite are not differentiated. Neuroglia are divided into glia of the central and peripheral nervous system. Neuroglia of the central nervous system consists of: a) macroglia and b) microglia; in neuroglia of the peripheral nervous system (they are often considered to be a type of oligodendrocytes) a) mantle gliocytes (satellite cells, satellite cells, ganglion gliocytes) and b) neurolemmocytes (Schwann cells) are differentiated.

Macroglia. Macroglia include ependymoglia, astrocytarglia, and oligodendroglia. Ependymoglia. Ependymoglia or ependymocytes (ependymocytes) cover the ventricles of the brain and the spinal canal and form a single layer similar to the epithelium. Beneath the ependyma is the white matter of the brain. Gap junctions and junctional bands are present between adjacent ependymal cells, and there are no tight junctions, so that the spinal fluid can pass between the cells into the nervous tissue. The ependyma of the vascular network of the ventricles of the brain forms the cerebrospinal fluid.

Astrocyter. They mainly perform supporting and limiting functions. According to the structure of their tumors, protoplasmic astrocytes located in the gray matter of the central nervous system (astrocyti protoplasmatici) and fibrous astrocytes located in the white matter (astrocyti fibrosi) are distinguished. Astrocyte outgrowths are directed toward capillary basement membranes, neuron bodies, and dendrites, surrounding synapses and separating them from each other. separates. It also goes towards the soft membrane of the brain and forms the pioglial membrane (basal membrane), which borders the subarachnoid space and separates the brain substance from the soft meninges. Near the blood capillaries, their growths end by forming the final expansions - astrocytic cells and completely cover the surface of the capillaries from all sides. participates in the formation of a specific barrier between the capillary cavity and the nervous tissue of the brain - the hematoencephalic barrier. Astrocytes hold the system of transport of certain substances to neurons, collect substances and transfer them from capillaries to neurons, ensure exchange of substances between blood and neurons. In addition, astrocytes are involved in insulating the receptor surface of neurons, controlling the chemical composition of tissue fluid, proliferation and replacement of dead neurons participates in the events. During brain development and regeneration of nerve tissue, astrocytes secrete a number of substances that promote axon growth: nerve growth factor (NGF), laminin and fibronectin, which accelerate the elongation of neuronal tumors.

Oligodendrocytes. Oligodendrocytes (oligodendrocytes) are small, small (oligos - few) number and short tumor-bearing cells. Oligodendrocytes are found in both gray matter and white matter. In the gray matter, they are located near the bodies of neurons. In the white matter,

their outgrowths form the myelin sheath of myelinated nerve fibers, while, unlike the neurolemmocytes of the peripheral nervous system, one oligodendroliocyte can participate in the formation of the myelin sheath of several axons.

Conclusion: it can be concluded that nerve cells work in a mutually dependent state and perform the task of transmitting nerve impulses. In addition, macroglia and microglia cells in nerve cells perform the function of connecting nerve fibers, protecting them and transmitting impressions. In addition, the cells forming the hematoencephalic barrier protect the nervous tissue from other foreign substances and protect it from external influences.

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