NERVOUS SYSTEM

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Abstract: *The nervous system is a complex and highly specialized network responsible for regulating, coordinating and transmitting information throughout the body. It receives stimuli from both the external and internal environment, processes them and generates appropriate responses. The central nervous system (brain and spinal cord) analyzes information and controls reflex and psychic activities, while the peripheral nervous system conducts impulses from the center to tissues and organs and black. The autonomic nervous system regulates involuntary processes such as heartbeat, respiration and digestion. Neurons and glial cells form the structural basis of the nervous system. Information transfer between neurons occurs through electrical impulses and neurotransmitters. This synaptic communication enables higher functions such as perception, memory, speech, emotion and voluntary movement. Additionally the nervous system plays a crucial role in maintaining homeostasis and ensuring the organism's adaptive responses. This article discusses the structure, anatomical divisions and physiological mechanisms of the nervous system and highlights its essential importance for life processes. Furthermore, some pathological conditions associated with nervous system dysfunction and modern approaches to their study are briefly described.*

Keywords: *Brain, Neurons, Spinal cord, Sensory nerve, Motor nerve, Mixed nerve, Synapses, Glial cells.*

Introduction.

The nervous system is one of the most complex and essential control systems of the body. It coordinates all vital processes, receives signals from the external and internal environment, processes them and generates appropriate responses. Thanks to the nervous system, the body can move, perceive, learn and adapt to the environment. The main function of this system is to transmit information quickly and accurately, ensure communication between central and peripheral organs and maintain the organism in a constant state of homeostasis. The nervous system is divided into two main parts: the central nervous system and the peripheral nervous system. The central nervous system consists of the brain and spinal cord, which analyze information and control reflexes and psychic processes. The higher nervous activity of the human body is also connected with the function of the brain.

The weight of the brain in adults is about 1020-1970 grams. In newborn babies, it is about 450 grams. In old age, the weight of the brain slightly decreases. The increase in brain weight occurs due to the myelination of nerves, the nerve cells. The human brain consists of more than 100 billion neurons. The spinal cord in an adult is 40-45 grams. Its diameter is nearly 1 cm and it has the shape of a whitish cord. It is located inside the vertebral canal and consists of gray and white matter. The peripheral nervous system transmits impulses from the center throughout the body and brings information from organs back to the center. The autonomic nervous system regulates involuntary processes such as heartbeat, respiration and digestion.

Neurons are the primary functional cells of the nervous system, transmitting information through electrical and chemical signals. A neuron consists of three main parts: the soma (cell body), dendrites (branches that receive information), and axon (branch that transmits information to other cells). Communication between neurons occurs at synapses. In a single neuron cell body, there are 1200-1800 synapses. A synapse consists of two layers of membranes and the gap between them. Under the influence of a nerve impulse, a small amount of mediator (neurotransmitter) is released into the synaptic cleft. This mediator causes excitation in the second neuron’s cell body. In this way, nerve impulses are transmitted from one neuron to another. At a synapse, neurotransmitters transmit signals to other neurons or muscle tissues. This process enables reflexes, movements, perception and higher psychic activities. Glial cells support neurons, nourish them and provide protection. They also enhance the speed of information transmission and remove toxic substances. Thanks to glial cells, the central and peripheral nervous systems function efficiently. The central nervous system, composed of the brain and spinal cord, is responsible for processing information, thinking, memory and emotions. The spinal cord acts as a reflex center and transmits impulses to different parts of the body. Various brain regions have specific functions: the cerebellum ensures the coordination of movements, while the cerebral hemispheres control thinking, memory and emotional processes. The peripheral nervous system connects the central nervous system to all parts of the body and is divided into two main types: somatic and autonomic. The somatic nervous system controls voluntary movements and receives information from sensory organs, while the autonomic system regulates involuntary processes such as heartbeat, respiration and digestion. The autonomic nervous system is further divided into sympathetic and parasympathetic divisions. The sympathetic division activates the body during stress or emergency situations, while the parasympathetic division supports rest and recovery processes.

The central nervous system is connected to all organs through nerves. Nerves consist of long projections of neurons covered with a common sheath. There are sensory, motor and

mixed nerves. Sensory nerves are made up of the dendrites of sensory neurons. Through them, nerve impulses are transmitted from the sense organs to the central nervous system. Motor nerves consists of the axons of motor neurons. Through them, nerve impulses are carried from the central nervous system to muscles and internal organs. Mixed nerves are composed of both axons and dendrites of neurons. Through them, nerve impulses travel in two opposite direction, from the central nervous system to the organs and from the organs to the central nervous system.

The main functions of the nervous system include receiving and transmitting information controlling reflexes and movements, maintaining homeostasis, managing psychic processes and forming memory and perception. The interaction between neurons and glial cells enables sensation, speech, emotions and movement. The nervous system helps the body adapt to the environment and maintain homeostasis. Dysfunction of the nervous system negatively affects the normal functioning of the body; for example, stroke, Parkinson’s disease, brain injury and neuropathies impair reflexes, movement and sensory processes.

Conclusion

Thus, the nervous system is a complex and interconnected system that controls the body’s vital activities. It is divided into central and peripheral parts, transmitting and coordinating impulses to ensure normal functioning. Neurons and glial cells form the structural basis, enabling information exchange and higher psychic processes. The peripheral and autonomic divisions assist in environmental adaptation, maintain homeostasis and control vital functions. Studying the nervous system and its pathological conditions is of great importance in modern media.

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