THE ROLE OF GLIAL CELLS IN THE CONDUCTION OF IMPULSES IN THE BRAIN

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Glial cells (neuroglia) make up about 50-60% of the cellular mass of the brain and perform a wide range of functions, providing both support and regulation of neurons. Unlike neurons, glia do not generate an action potential, but are actively involved in the modulation of neuronal activity and homeostasis of the nervous tissue.

The main types of glial cells and their functions

Astrocytes

Form metabolic and trophic support for neurons.

Regulate the concentration of ions (K^+, Na^+, Ca^{2+}) and the level of neurotransmitters in the synaptic cleft.

Participate in the formation of the blood-brain barrier (BBB).

In case of brain damage, they provide scarring (gliosis).

Oligodendrocytes (in the CNS) and Schwann cells (in the PNS)

Form the myelin sheath around axons, which accelerates the conduction of nerve impulses via the saltatory conduction mechanism.

Support axonal metabolism.

Microglia

Are the "immune cells" of the brain.

Phagocytosis of cellular debris, damaged neurons, and pathological proteins.

Activated in neurodegenerative diseases (Alzheimer's disease, multiple sclerosis).

Ependymal cells

Line the ventricles of the brain and the central canal of the spinal cord.

Participate in the formation and circulation of cerebrospinal fluid.

Functional significance of glia

Maintains the structural integrity of nervous tissue.

Provides nutrition and protection for neurons.

Participates in synaptic plasticity and learning processes.

Regulates the energy metabolism of the brain.

Forms protective reactions in case of damage and inflammation.

Clinical significance

Demyelinating diseases (multiple sclerosis, neuropathies) are associated with dysfunction of oligodendrocytes and Schwann cells.

Brain tumors most often originate from glial cells (gliomas, astrocytomas, oligodendrogliomas).

Excessive activation of microglia contributes to chronic inflammation in the brain.