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NEUROGLIA AND ITS TYPES

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ABSTRACT

This article reviews the anatomy, functions, and role of neuroglia in the nervous system. Neuroglia are the main cells in the nervous system, other than neurons, and play an important role in the structure of the brain and spinal cord. These cells perform a variety of functions, including supporting, protecting, nourishing neurons, and accelerating nerve impulses. Different types of cells, such as astrocytes, microglia, oligoendrocytes, and ependymal cells, are important in maintaining the normal functioning of the nervous system. Dysfunction of neuroglia can be associated with a number of neurological diseases, including Alzheimer's and Parkinson's diseases. The article reviews the structural and functional aspects of neuroglia, as well as its study in neurological diseases.

Keywords: Neuroglia, astrocyte, marginal neuroglia, peripheral neuroglia, ependymal neuroglia, microglia,

INTRODUCTION

Neuroglia, glia (ancient Greek: νεῦρον - nerve and γλοιός - glue) - cellular elements of nervous tissue; fill the space between the nerve cell (neuron), growths and brain capillaries. Macroglia and microglia cells are differentiated in neuroglia. Macroglia develop from the ectoderm. Microglia cells are also small cells, developing from the mesenchyme; phagocytosis also plays a protective role in the nervous system.

1. Astrocytes (macroglia) - mainly perform the function of transporting necessary substances from the striatum and capillaries to the neuron, and they are widely distributed on the superficial and inner surfaces of the MNS.

2. Marginal neuroglia - are found in the inner and superficial layers of the neural tube, are located between nerve fibers, and form myelin sheaths. Oligodendrocytes of the marginal glia surround the bodies of neurons of the central and peripheral nervous system and form the nerve sheath.

3. Peripheral neuroglia — Schwann cells consist of stellate (mantle), lemmocytes and other cells of the autonomic nervous system. Schwann cells are found only in the peripheral nervous system. They are the only cells that surround axons with a multilayer myelin "sheath". As a result, a large part of the axon is covered with a sheath, the open part remains only in the narrow space between the sheaths, that is, at the junction of Ranvier. The junction of Ranvier in such fibers is of particular functional importance. Stellite cells surround the sensory neurons in the ganglia, as well as the bodies of multipolar neurons in the autonomic ganglia like ivy. Lemmocytes are Schwann cells that surround the autonomic nerve fibers in the periphery without a myelin sheath. Schwann cells, like marginal and perivascular glia in the CNS, perform an insulating function. They provide myelin functions and structural integrity,

and, like stellate cells of the CNS, Schwann cells, in addition to participating in metabolism, also have the ability to phagocytosis.

4. Ependymal neuroglia - consist of neuroepithelial cells, lining the walls of the central canal of the spinal cord and the ventricles of the brain. They resemble cylindrical epithelium and are therefore called ependyma. The apical (upper) part is covered with short, whisker-like hairs of the cell membrane (microvilli). Between the microvilli there are typical cilia, which move (6 times per second) and move the cerebrospinal fluid (CSF). Some ependymal cells extend to the perivascular, i.e., basement membrane of the vessel. Other types have secretory activity and produce cerebrospinal fluid.

5. Microglia are part of the reticuloendothelial system of the CNS and play a role only in pathological conditions. They are concentrated in the part of the soft tissue of the brain that adheres to the substance. Microglia have the ability to move and phagocytosis and, if necessary, quickly spread throughout the CNS tissue. They "guard" the CNS, eliminating small damaged cells until phagocytes arrive. Glial cells do not have impulse activity, like neurons, and their membrane contains a charge that creates an inert membrane potential. Glia and neurons are in very close contact, and therefore excitation in the neuron affects the electrical phenomena of glial elements. The membrane potential of glia depends on the amount of potassium ions, and during excitation in the neuron and repolarization of its membrane, a large amount of potassium ions are released, which causes depolarization in the glial cell.

Neuroglia are essential for nerve function, as evidenced by the proliferation of glial cells around working neurons. Glia also play a role in the formation of conditioned reflexes. In addition to their insulating function and participation in ionic homeostasis, glial elements also have other properties, for example, they participate in the exchange of mediators.

Microglia are a type of neuroglia (glial cell) located throughout the brain and spinal cord. Microglia make up 10-15% of all cells in the brain. As resident macrophage cells, they function as the first and main form of active immune defense in the central nervous system (CNS). Microglia (and other neuroglia, including astrocytes) are distributed throughout large areas of the central nervous system. Microglia are key cells in the general maintenance of the brain, constantly cleaning the central nervous system from plaques, damaged or unnecessary neurons and synapses, and infectious agents. Because these processes must be effective in preventing potentially fatal damage, microglia are highly sensitive to even minor pathological changes in the central nervous system. This sensitivity is achieved in part by the presence of unique potassium channels that respond to even small changes in extracellular potassium. Recent evidence suggests that microglia are also key players in maintaining normal brain function under healthy conditions. Microglia also continuously monitor neuronal function through direct somatic connections and exert neuroprotective effects when necessary. Microglial cells are highly plastic and undergo a variety of structural changes depending on their location and the needs of the system. This plasticity is required for the many diverse functions that microglia perform. The ability to transform distinguishes microglia from macrophages, which must be regularly replaced, and gives them the ability to protect the central nervous system for very short periods of time without immunological disruption. Microglia adopt a specific shape or phenotype in response to local conditions and the chemical signals they detect.

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