

WHY IS “BRAINWASHING” NECESSARY? HISTOPHYSIOLOGY INVESTIGATION

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Background. The glymphatic system represents the indispensable mechanism for maintaining cerebral homeostasis, facilitating the drainage of cerebrospinal fluid (CSF) and the direct evacuation of neurotoxic metabolites. Thus, understanding the fundamental mechanisms of this system is essential for advancing neurobiology and implementing innovative, potentially revolutionary treatments for the prevention of neurodegenerative diseases.

Objective of the study. To analyze and investigate, from a histological and physiological point of view, the structure and functions of the glymphatic system, emphasizing the relevance of "brainwashing" for supporting neuronal integrity and preventing progressive neurological diseases.

Material and methods. There have been reviewed the specialized literature published between 2012 and 2024 was reviewed, integrating information obtained in the PubMed, Springer Link, ScienceDirect databases, regarding the structure, physiology and functions of the glymphatic system and the correlation of its dysfunctions with the development of neurodegenerative dysfunctions.

Results. It has been demonstrated that CSF drainage through the glymphatic system is an active process, dependent on arterial pulsations and the activity of astrocytes and AQP4 channels. It is found that the fluid flow increases significantly during deep sleep, with a share of over 60%, which allows for an efficient elimination of metabolic waste, and in the long term would represent a protective factor in neurodegenerative diseases. Also, recent studies on neurotransmitters have highlighted the importance of norepinephrine in modulating the activity of the glymphatic system, through its periodic release during sleep, respectively determining the pulsations of the vessels and facilitating the circulation of CSF and the clearance of the brain, these discoveries emphasize the close link between the quality of sleep and the efficiency of neuronal detoxification processes.

Conclusion. The glymphatic system proves to be a key element in protecting neurological health, ensuring the continuous elimination of metabolic residues and maintaining an optimal environment for neuronal functioning. This research offers new opportunities for the development of innovative therapeutic strategies for the prevention and treatment of neurodegenerative diseases, thus transforming the concept of "brainwashing" into a fundamental physiological process for the maintenance of long-term cognitive functions.

Keywords: glymphatic system, AQP4, neuroinflammation, astrocytes, CSF, perivascular space.