



USE OF NON-INVASIVE SENSORY SYSTEMS TO TITRATE CRANIAL NERVE STIMULATION TO ENHANCE BRAIN CLEARANCE CLOSED-LOOP

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Overview

Waste removal from the central nervous system (CNS) is essential for maintaining brain homeostasis. Disruption of waste clearance can lead to protein accumulation. The aggregation of pathogenic proteins β -amyloid, α -synuclein, and C-tau in the brain may cause the deleterious effects of numerous diseases and disorders such as traumatic brain injury/chronic traumatic encephalopathy, epilepsy, Alzheimer's disease, and Parkinson's disease. Removal of these pathogenic proteins has been found to have substantial therapeutic benefit, for example, in treating traumatic brain injury/chronic traumatic encephalopathy, epilepsy, Alzheimer's disease, and Parkinson's disease. Disruption of glymphatic waste clearance is also implicated in several mental health disorders including depression, bipolar disorder (BPD), and anxiety.

The Invention

UW-Madison researchers have developed a method whereby administration of low frequency electrical stimulation of the cranial nerves delivered during sleep increases the presence and function of aquaporin-4 (AQP4) channels in the astrocytic endfeet surrounding descending arterioles in the brain. This underlying low frequency stimulation pattern is overlaid with temporally patterned 'bursts' of higher frequency stimulation to pulse the underlying artery to drive cerebrospinal fluid (CSF) penetration into the parenchyma. This also serves to create more movement in general within the parenchymal extracellular space to increase the probability of waste biomolecules to interact with sites for active transport out of the brain. During the period of sleep, this stimulation helps break down waste biomolecules and misfolded proteins for subsequent clearance. Administration of electrical stimulation can be selectively modified to adjust CSF clearance, for example, to quickly clear drug concentrations in the brain during an overdose.

Additional Information

For More Information About the Inventors

- [Kip Ludwig](#)
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Tech Fields

- [Medical Devices : Neurological devices](#)

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846