Astrocyte chloride

- Targeting glial fibrillary acidic protein in glaucoma: a monoclonal antibody approach to modulate glial reactivity and neuroinflammation for neuroprotection
- Impaired Volume Regulation and Electrophysiology of Astrocytes In Situ in a Mouse Model for Megalencephalic Leukoencephalopathy With Subcortical Cysts
- Molecular basis of human GABA transporter 3 inhibition
- GABA and astrocytic cholesterol determine the lipid environment of GABA(A)R in cultured cortical neurons
- EIF4A3-Induced circ_0029941 Promotes Astrocyte Activation Through Enhancing Autophagy via miR-224-5p/NFAT5 Axis
- High-Salt Diet Increases Suprachiasmatic Neuronal Excitability Through Endothelin Receptor Type B Signaling
- Cryo-EM structures of mouse bestrophin 1 channel in closed and partially open conformations
- Isoliensinine ameliorates cognitive dysfunction in AlCl₃/D-gal-induced Alzheimer's disease-like mice by inhibiting the calcium signaling pathway

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Astrocytes are a type of glial cell in the central nervous system (CNS), and they play a crucial role in supporting the function and health of neurons. While chloride ions are important for various cellular processes, including maintaining membrane potential and regulating neuronal excitability.

Astrocytes are known to be involved in the regulation of extracellular ion concentrations, including chloride. They express various ion channels and transporters that contribute to the balance of ions in the extracellular space. One of the well-known transporters involved in chloride regulation is the sodium-potassium-chloride cotransporter (NKCC1), which is expressed in astrocytes.

The balance of chloride is critical for maintaining the proper function of neurons and other cells in the brain. Changes in chloride concentrations can influence the excitability of neurons and synaptic transmission. In certain neurological conditions or during injury, disruptions in chloride homeostasis may occur, and astrocytes may be involved in responding to and regulating these changes.

Research on astrocyte function and chloride regulation is ongoing, and the understanding of the specific mechanisms and their implications in various neurological disorders continues to evolve. If you have a specific context or question about astrocyte chloride, feel free to provide more details for a more targeted response.

The balance between excitatory and inhibitory neurotransmission is crucial for normal brain function, and disruptions in this balance have been implicated in various neurological disorders, including epilepsy. Astrocytes play a significant role in maintaining the excitatory-inhibitory balance by regulating the concentration of ions, including chloride, in the extracellular space.

In the context of epilepsy, there is evidence suggesting that alterations in astrocyte chloride homeostasis may contribute to the development and maintenance of epileptic activity. The excitatory and inhibitory neurotransmission in the brain involve the release of neurotransmitters such as glutamate (excitatory) and GABA (gamma-aminobutyric acid, inhibitory). Changes in the concentration of chloride ions can affect the efficacy of GABAergic neurotransmission, as the direction

and strength of the GABAergic response depend on the intracellular chloride concentration.

In some cases of epilepsy, it has been observed that the expression or function of the NKCC1 cotransporter in astrocytes and neurons may be altered. The NKCC1 cotransporter is responsible for importing chloride ions into cells, and increased activity of NKCC1 can result in elevated intracellular chloride levels. This, in turn, can lead to a shift in the GABAergic response from inhibitory to excitatory, a phenomenon known as “GABAergic depolarization.”

GABAergic depolarization can contribute to hyperexcitability in the brain, potentially facilitating the generation and propagation of epileptic seizures. Astrocytes may modulate the expression and function of NKCC1, influencing chloride homeostasis and, consequently, the balance between excitatory and inhibitory neurotransmission [1)]

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Untiet V, Nedergaard M, Verkhratsky A. Astrocyte chloride, excitatory-inhibitory balance and epilepsy. Neural Regen Res. 2024 Sep 1;19(9):1887. doi: 10.4103/1673-5374.390981. Epub 2023 Dec 15. PMID: 38227511.