Chloride potassium symporter 5

Potassium-chloride transporter member 5 (aka: KCC2 and SLC12A5) is a neuron-specific chloride potassium symporter responsible for establishing the chloride ion gradient in neurons through the maintenance of low intracellular chloride concentrations.

It is a critical mediator of synaptic inhibition, cellular protection against excitotoxicity and may also act as a modulator of neuroplasticity.

Potassium-chloride transporter member 5 is also known by the names: KCC2 (potassium chloride cotransporter 2) for its ionic substrates, and SLC12A5 for its genetic origin from the SLC12A5 gene in humans.

The potassium-chloride cotransporter 2 (KCC2) plays a role in epileptiform synchronization, but it remains unclear how it does influence such process. Here, we employed tetrode recordings in the in vitro rat entorhinal cortex (EC), to analyze the effects of the KCC2 antagonist VU0463271 on 4-amino-pyridine (4AP)-induced ictal and interictal activity. During 4AP application, ictal events were associated with significant increases in interneurons and principal cells activities. VU0463271 application transformed ictal discharges to shorter ictal-like events that were not accompanied by significant increases in interneuron or principal cell firing. Interictal events persisted during VU0463271 application at an accelerated frequency of occurrence with significant increases in interneuron and principal cell activity. Further analysis revealed that interneuron and principal cell firing rate during 4AP-induced interictal events were increased after VU0463271 application without changes in synchronicity. Overall, our results demonstrate that in the EC, KCC2 antagonism enhances both interneuron and principal cell excitability while paradoxically decreasing the ability of neuronal networks to generate structured ictal events [1)].

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Chen LY, Lévesque M, Avoli M. KCC2 ANTAGONISM INCREASES NEURONAL NETWORK EXCITABILITY BUT DISRUPTS ICTOGENESIS IN VITRO. J Neurophysiol. 2019 Jul 24. doi: 10.1152/jn.00266.2019. [Epub ahead of print] PubMed PMID: 31339790.