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Presentation Abstract

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Presentation Title: Active K+ conductance and passive membrane properties of NG2 cells

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Abstract: NG2 cells, also known as polydendrocytes or oligodendrocyte precursor cells, are multipotent cells and may differentiate into oligodendrocytes, astrocytes or neurons. Unlike other types of glial cells, NG2 cells receive synaptic inputs from neurons. A recent study has shown that synaptic long-term plasticity exists at neuron-NG2 cell synapses. Such findings indicate that synaptic integration is crucial for NG2 cells in information processing. We thus study voltage-gated K^+ conductances, which can curtail synaptic potentials, in NG2 cells. Using electrophysiological and pharmacological approaches, we characterized functional and pharmacological properties of outward K^+ currents in nucleated patches isolated from NG2 cells in the hippocampal CA1 area. Our results indicate that K_v4 subunit is a major component of K^+ channels in NG2 cells. We further correlated electrophysiological studies with single-cell RT-PCR analysis to reveal subunit composition of K^+ channels in NG2 cells. Interestingly, K^+ currents are downregulated as the morphological features are more complex during the development of oligodencrocyte lineage cells. Further studies on passive membrane properties of NG2 cells show that these cells have a “leaky” membrane property with a fast membrane time constant. Similar to K_v channels, passive membrane properties are also altered during development. To address the significance of K^+ channels and passive membrane properties in signal processing in NG2 cells, we will develop anatomically detailed NG2 cell cable models.

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Potassium channels

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