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**SAMRC Clinician-Scientist Conference Abstract Submission**

**Background**

The brain integrates neural information via non-linear interactions between chemical and electrical signals varying along narrow spatiotemporal scales. Cable Theory and equivalent circuit models provide valuable predictions of how neural signals propagate; however, are limited in that they fail to account for impermeant anions. Impermeant anions are integral in the pathogenesis of cerebral oedema, neurodegenerative disorders, and epilepsy yet the implications of these charged compounds on the computational and electrical properties of neurons are not fully understood.

**Objectives**

I propose constructing a computational model that will incorporate impermeant anions. Using this model, I will (i.) determine whether impermeant anions can alter the isopotential status of neurons; (ii.) assess whether impermeant anions can alter the propagation of synaptic input, and possibly affect neuronal output; (iii.) probe how such alterations could play a role in disease processes.

**Methodology**

I have programmed an electrodiffusion based multicompartmental neural model using the Python 3 programming language, with user-interfacing developed in the Jupyter/Voila environments. This program will allow me to run computational simulations to elucidate the impact impermeant anions have on the biophysical and computational properties of neurons.

**Results**

Preliminary results from our group indicate impermeant anions play a crucial role in neuronal osmoregulation. We anticipate that the outcome of the simulations will further suggest that impermeant anions affect the neuronal isopotentiality and neuronal signal processing.

**Conclusion**

This work will provide better theoretical descriptions of normal and pathological neuronal functioning.

**Key words:** impermeant anions; electrodiffusion; computational model