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**"Modeling Sensitivity of Neuronal Firing Frequency to L-type Calcium Channel Activity"**

**Background:** The substantia nigra is a part of the brain associated with learning, movement, and addiction, and more. Within the substantia nigra, there are different subpopulations of dopaminergic neurons which project to different areas of another part of the brain called the striatum. These different subpopulations are believed to have different functions and effects on behavior. Among two subpopulations in particular, DMS (dorsomedial striatum) projecting neurons and DLS (dorsolateral striatum) projecting neurons, one observed difference is a contrast in the sensitivity of firing frequency in both baseline and depolarizing inputs to inhibitors of the L-type calcium channel $Ca_V1.3$. In this experiment, the goal was to investigate how this channel acts as a linear amplifier in the DLS projecting neurons through the simulation of the L-type channel-specific blocker isradipine (ISR).

**Methods:** A Hodgkin-Huxley conductance-based single-compartment model of a neuron was used to simulate neuronal pacemaking and bursting. The project addressed two methods of investigation. Two scenarios were set up: one where the variation in frequency was attributed to the L-type channel, and one where it was attributed to sodium leak (NaLCN). For each scenario, we inhibited the L-type channel and observed whether a linear decrease in frequency occurred.

**Conclusion:** We concluded that the variation in frequency when driven by the L-type channel was consistent with the linear effect of ISR, while the variation in frequency independent of the L-type channel was not.