Altered Neuronal Firing Following a Spreading Depolarization: an *in vivo* Study

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Spreading Depolarizations (SD) are slowly propagating waves of tissue depolarization that result in the suppression of neuronal firing for multiple minutes. SDs are known to occur in rodents suffering from moderate or severe traumatic brain injuries and are also associated with visual auras that often-proceeded migraines. Our previous work established that SDs initiate in a closed skull concussion model in mice. The presence of SDs in our injury model is tightly associated with acute behavioral deficits that last hours. The behavioral deficits are attributed to neurological impairment, but a mechanistic understanding of that impairment remains unclear. We hypothesize that there is a period of altered neuronal firing that is associated with the period of acute behavioral symptoms of a concussion. Using two-photon microscopy we will investigate individual neuronal function with genetically encoded calcium indicators (GCaMP). The purpose is to measure the firing rate of an individual neuron prior to, during, and immediately after the acute recovery to assess baseline firing and recovery of individual neurons following an SD. In our preliminary data we have confirmed the complete suppression of neuronal firing immediately following the SD. We aim to determine the amount of time until neuronal firing returns to baseline rates following an SD.