Ph.D. Dissertation Defense

Zoom Link: https://cwru.zoom.us/j/91808764190?pwd=cGF0aEk4WGRWT25tVVFwbUo5bkrQT09

Meeting ID: 918 0876 4190
Passcode: 084247

Friday, August 5, 2022
10:00AM

“Genes and Proteins at Play: How Genomic and Proteomic Expression at the Tissue-Intercortical Microelectrode Interface Influences Tissue Response”

by

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Abstract:

Intracortical microelectrodes can record single unit neuronal action potentials. The associated high-resolution of recorded signals is crucial for clinical applications of brain-machine interface systems. Unfortunately, the clinical utility of these devices is limited by the decline in recorded signal quality over time. The neuroinflammatory response to the microelectrode at the tissue-microelectrode interface has been identified as a major contributing factor to performance degradation. In a previous study, gene expression profiles of the acute neuroinflammatory response of mice that were implanted with non-functional intracortical probes were characterized. Numerous upregulated genes were found, but two genes showed significant potential as therapeutic targets: Cd14 and C3. Cd14 and C3 encode key proteins that activate or amplify cellular responses. My thesis investigated neuroinflammatory responses at the tissue-microelectrode interface in Cd14 -/- and C3 -/- mice implanted with non-functional probes, compared to both implanted wildtype control animals and nonsurgical control mice. Together, my work helped to develop a gene- and protein-wide understanding of key inflammatory molecules in both temporally- and spatially-controlled tissue responses to intracortical microelectrodes with an emphasis on the effects of Cd14 and C3 inhibition and the goal of informing additional potential therapeutic targets.