Division of Medical Sciences

# Seminar Series 2023 – 2024


## Mechanisms of circuit plasticity in the healthy and injured somatosensory cortex

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Circuits in the central nervous system have the capacity for plasticity and reorganization. It is well established that such circuit remapping occurs during development, learning, and in response to sensory experience. This capacity for plasticity might also offer an avenue for recovery after an injury to the brain. For example, based largely on human macroscopic brain mapping studies (e.g., fMRI, PET), it has been widely hypothesized that plasticity and remapping of circuits underlies recovery after stroke. However, these approaches lack the temporal and spatial resolution to precisely define circuit changes at the level of individual neurons, or the causality of these changes in relation to recovery. Thus, how specific changes in neuronal circuits mediate improvement in function and recovery after stroke remains a major gap in our understanding. Using a mouse model of focal cortical stroke, we performed longitudinal two-photon imaging of individual neurons in the peri-infarct somatosensory cortex after stroke. We found that sensory-evoked activity was reduced for a prolonged period after stroke and, in most cases, remapping was largely absent. We also found that whisker trimming-induced circuit remapping, a well-established paradigm for experience-dependent plasticity in the healthy somatosensory cortex, was impaired in the peri-infarct cortex. These results suggest that at least some plasticity in the peri-infarct cortex may be maladaptive and limit recovery. We are now exploring potential mechanisms of this maladaptive plasticity by studying the role of Parvalbumin inhibitory interneurons in the healthy and injured cortex. Understanding the details of how cortical circuits change after injury will be essential for designing pharmacologic and neuromodulatory approaches to promote functional remapping and improve recovery in the future.

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**Date: Friday, October 27, 2023**
**Time: 12:30 pm**
**Location: MSB 150 & Zoom***

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