NUS National University of Singapore | Department of Anatomy
Yong Loo Lin School of Medicine

NUHS National University Health System

RECRUITMENT VISIT : RESEARCH SEMINAR

Microglial Dynamics in Health and Neurodegeneration: Imaging by In Vivo Two-Photon Microscopy

Microglia comprise a unique subset (5-10% of total brain cells) of glial cells and are the principal immune cells in the CNS. Resting microglia have highly dynamic processes and survey the brain and spinal cord microenvironments. Under pathological conditions, these cells are activated and exhibit chemotactic, phagocytic, and secretory responses to various stimuli. Growing evidence indicates that microglia play multiple role in neurodegenerative disorders. Therefore, to understand microglial dynamics and its mechanism in health is critical to develop therapeutic strategies for neurodegenerative disease. Microglia dynamically survey the brain parenchyma. Microglial processes interact with neuronal elements; however, the role neuronal network activity plays in regulating microglial dynamics is not entirely clear. Most studies of microglial dynamics use either slice preparations or in vivo imaging in anesthetized mice. Here we demonstrate that microglia in awake mice have relatively reduced process area and surveillance territory, and that reduced neuronal activity under general anesthesia increases microglial process velocity, extension and territory surveillance. Similarly, reductions in local neuronal activity through sensory deprivation or optogenetic inhibition increase microglial process surveillance. Using pharmacological and chemogenetic approaches, we demonstrate that reduced norepinephrine signaling is necessary for these increases in microglial process surveillance. These findings indicate that under basal physiological conditions noradrenergic tone in awake mice suppresses microglial process surveillance. Our results demonstrate how neuronal activity influences microglial process dynamics..

ABOUT THE SPEAKER

Currently, I am a senior research fellow in Dr. Long-Jun Wu Lab in Department of Neurology at Mayo Clinic. I obtained my PhD in Physiology in June 2012 from Sun Yat-sen University. Then I joined Dr. Mark Mattson's laboratory at National Institute on Aging and took a five-year postdoctoral training (2012-2017) that studying how exercise and intermittent fasting benefit neurodegenerative diseases. In 2017, I joined Dr. Long-Jun Wu's lab at Mayo Clinic, studying microglial dynamics in health and neurodegeneration by using in vivo two-photon imaging system.

In sum, my research experiences are: 1) Microglial dynamics in awake mice and the molecular mechanism (Liu, et al., Nature Neurosci., 2019); 2) The molecular mechanism of intermittent fasting ameliorating Alzheimer's disease (Liu, et al., Nature Commun., 2019; 3) The differential role of microglia in spinal cord and hippocampus of chronic pain (Liu et al., J Neurosci. 2017). My expertise for neuroscience includes *in vivo* two-photon imaging of microglia and neuronal network activity and patch clamp electrophysiology in vitro and vivo.

Monday
2 December 2019
10.30 am to 11.30 am
Seminar Room, MD10
Level 2, Anatomy Museum

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Address enquiries Dr Hu Qidong at 66013730 or Ms Nuramalina Binte Abdul Ghani at 65163200. All are welcome.