Department of Psychology
The University of Hong Kong
香港大學心理學系

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Departmental Seminar

Developmental Mechanisms of Slow Wave Activity



Prof. Wenjie Bian
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Laboratory of Sleep and Neural Development
Westlake Laboratory of Life Sciences and Biomedicine
Westlake University, School of Life Sciences

3:00p.m. – 4:00p.m.
Room 1103-1104, 11/F
The Jockey Club Tower
Centennial Campus
The University of Hong Kong

Abstract

Cortical slow wave activity (SWA) is the dominant electroencephalographic feature during the non-rapid-eye-movement sleep, a faithful indicator of sleep depth, and believed to actively participate many sleep functions. SWA undergoes substantial development changes and is frequently impaired in neurodevelopmental disorders such as autism, but the underlying mechanisms remain poorly understood. Here we identify a thalamus-centric mechanism essential for SWA enhancement during postnatal development and a mesocortical pathway for shaping its homeostasis. Taking advantage of a Shank3 loss-of-function mouse model of autism, we show that selective restoration of Shank3 in the centromedial/mediodorsal nuclei of thalamus starting from postnatal day (P) 15, but not their cortical counterparts, rescues SWA defects. Consistent with the SWA's role in memory, this thalamic restoration also led to improved social memory in Shank3 mutant mice. Furthermore, we found progressive growth of dopaminergic axons from the ventral tegmental area to the medial prefrontal cortex during P25 – 47 underlie the developmental increase of sleep pressure endurance, leading to mature homeostasis pattern of SWA. These results provide important mechanistic insights to both baseline generation and homeostatic regulation of SWA from the developmental perspective, impairment of which may underlie the comorbid sleep and cognitive defects in autism.

About the Speaker

Dr. Wen-Jie Bian earned his Ph.D. in Neurobiology from the Institute of Neuroscience, Chinese Academy of Sciences in 2016. From 2016 to 2022, he did postdoctoral training with Prof. Luis de Lecea in the Department of Psychiatry and Behavioral Sciences at Stanford University School of Medicine, and was promoted to an instructor in 2022. In 2023, Dr. Bian joined Westlake University as a Principal Investigator and started the Laboratory of Sleep and Neural Development. His research has been focusing on the developmental organization of neural circuits that give rise to the regulation and functions of sleep and related behaviors. Dr. Bian's early work identified a competition-based molecular mechanism underlying the dendritic spine pruning in the cortex during development. His recent work uncovered a novel function of developmental sleep that sleep during adolescence shapes the social novelty preference in adulthood by regulating the development of midbrain dopaminergic circuits. His research was published in journals including Cell, Nature Neuroscience, Neuron, and Sleep.

Zoom Meeting (For participants who couldn't attend the Seminar in person)

https://hku.zoom.us/j/97792403798?pwd=PDd2aPptwzoWdsiI6d7W1a9qaqMRMX.1
Meeting ID: 977 9240 3798 Password: 834863

~ All are Welcome ~

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