Understanding Postnatal Neurodevelopmental Disorders from Multiple Perspectives

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Abstract
Postnatal neurodevelopmental disorders, such as autism spectrum disorders (ASDs), are caused by multiple factors involving genes and environment. The biggest challenge for researchers studying autism today is identifying common and essential pathways which lead to these disorders. While genetic studies in ASDs found mutations in hundreds of genes, network analyses revealed that the genes involved in autism may be classified into a few groups: two of the largest groups being chromatin related genes and genes regulating synapses. Therefore, understanding the basic principles of postnatal brain development through the perspectives of chromatin and synapse regulation could give us an insight into unraveling the mechanisms which may explain the pathogenesis of autism.

Based on this background, this lecture will consist of two parts: one on neuronal chromatin and another on synapse. The chromatin part will focus on the roles of methyl-CpG binding protein 2 (MeCP2), a nuclear protein abundantly expressed in neurons, and whose loss of function causes Rett syndrome, a postnatal neurodevelopmental disorder with many neurological symptoms. In the synapse part, the lecture will introduce essential functions of Cblns in synapse development. Cbln family proteins are expressed in neurons throughout the brain, and mediate synaptogenesis by interacting with Nerexins, which have been repeatedly shown to be involved in ASDs.

By walking through the recent research findings, the lecture will aim to provide basic knowledge on the field and to address what are the remaining questions. Challenges in integrating these two different topics, chromatin and synapse, will also be discussed.
BIOGRAPHICAL SKETCH

Aya Ito-Ishida is a neuroscientist at Keio University School of Medicine. She studied medicine and received M.D. at the University of Tokyo in 2003. During residency in general pediatrics at Jichi Medical School, she learned that mechanisms leading to many childhood neurological disorders are not well understood, and was motivated to conduct basic research on postnatal brain development. She obtained Ph.D. in neurophysiology under the mentorship of Dr. Michisuke Yuzaki at Keio University in 2009. Her thesis work was on the physiological function of a secretory synapse organizer, Cbln1. After extending her graduate work with Dr. Shigeo Okabe at the University of Tokyo, Dr. Ito-Ishida joined Dr. Huda Zoghbi’s laboratory at Baylor College of Medicine, where she studied mouse models of Rett syndrome. Dr. Ito-Ishida moved back to Keio University in 2017 and has been a faculty member at Department of Physiology. Her current research focuses on synapse- and circuitry-wise mechanisms that underlie neurodevelopmental disorders.

Selected Publications

