
Seminar

■ **SPEAKER**

Prof. Hye Yoon Park (Seoul National University)

■ **TITLE**

Activity-Dependent Dynamics of mRNA in Live Neurons Studied at Single Molecule Resolution

■ **ABSTRACT**

The dynamics of mRNA - the synthesis, transport, and degradation - plays significant roles in a variety of neuronal processes. Abnormal mRNA processing and transport are implicated in neurological disorders such as autism and Alzheimer's disease. However, understanding the mechanistic roles of mRNA dynamics has been hampered by the lack of techniques to observe the endogenous molecules in the native tissue environment. Here I will describe a systems approach, combining single-particle tracking, genetic engineering, and intravital microscopy. Recently we developed a new mouse model to fluorescently label endogenous Arc mRNA. The immediate early gene Arc (also known as Arg3.1) is highly involved in the formation of long-term memory. Expression of Arc is tightly coupled to the activity of the neuron; Arc mRNA is rapidly produced in response to neural activity and transported to distal dendrites for local translation. We generated Arc-PBS mouse by knocking in 24 tandem arrays of PP7 binding site (PBS) in the 3' untranslated region (3' UTR) of the Arc gene. Using this mouse model, we simultaneously monitored calcium spikes and Arc transcription in live neurons and found that calcium activity was necessary but not sufficient for triggering Arc expression. We also found that blocking neuronal activity did not affect the dendritic transport of Arc mRNAs. Two-photon imaging of the live mouse brain revealed the immediate-early induction of Arc transcription in subpopulation of neurons in the CA1 region of the hippocampus after contextual fear conditioning and fear memory retrieval. The technology as demonstrated in our work, including the transgenic strategy and high-resolution microscopy of living tissue, will shed light on the dynamic regulation of gene expression during learning and memory processes in vivo.

■ **DATE AND VENUE**

November 08, 2018 (Thursday, 11:00 - 12:00)
Seminar Room A (116), KU R&D Center

■ **LANGUAGE**

Korean

■ **INVITED BY**

Professor Sang-Hee Shim