Special Seminar

Prof. Shelley Halpain

Division of Biological Sciences
UC San Diego

March 26, 2019
16:00-17:30PM
Seminar Room 103
1st Floor, Science Frontier Laboratory Building

The Actin Cytoskeleton Helps Neurons Survive Stroke: a Novel Protective Molecular Pathway in Cellular Edema

In the U.S., roughly 690,000 incidents of ischemic stroke occur each year, thus posing a significant hazard to the aging population. Neurons are particularly vulnerable to ischemia because they consume prodigious amounts of glucose and oxygen delivered by the blood stream. Sustained hypoxia in neurons leads to ATP depletion, aberrant opening of ion channels, loss of membrane potential, and osmotically driven cellular swelling—cellular edema—that ultimately leads to oncosis, a form of non-apoptotic cell death. Not surprisingly, most cells are equipped with various survival mechanisms, including the hypoxic response. However, the unique cellular architecture of neurons raises the possibility that they may have additional vulnerabilities, hence additional protective strategies. One vulnerability is the presence of numerous glutamate-gated channels in neurons, and these are hyperactivated very early after the onset of hypoxia. Professor Halpain has a long-standing interest in the neuronal cytoskeleton, and in signaling mechanisms that strengthen or weaken neural circuits during plasticity and disease. In this seminar she will present unpublished work describing a novel reorganization of the neuronal actin cytoskeleton in which actin filaments disassemble from dendritic spines and accumulate in the dendrite shaft within minutes of hyper-activation of glutamate receptors. This phenomenon occurs both after ATP depletion in culture, and after experimental stroke in mouse neocortex. Dr. Halpain will describe a specific biochemical pathway that activates formin-driven actin polymerization, and serves a pro-survival function to counteract cytotoxic cellular edema.

Keywords: Actin cytoskeleton, dendritic spine, neurons, glutamate receptor, stroke, hypoxia

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