OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

OIST SEMINAR

Date: Wednesday, September 17, 2014

Time: 14:00 – 15:00

Venue: OIST Campus Lab 1, Meeting Room C016 (Level C)

Speaker: Hongping Wei, Ph.D

Affiliation: Institute of Neuroscience, Shanghai Institute for Biological Sciences, Chinese Academy of Science, Shanghai, China

Title: "Long-term Synaptic Plasticity in Zebrafish Retina"

Abstract:

Neural activity-dependent long-term potentiation (LTP) of synaptic transmission is believed to be a synaptic basis of learning and memory, as well as experience-dependent refinement of neural circuits. Although LTP of excitatory synapses has been reported in nearly all brain regions, its existence in the retina remains to be demonstrated. We reported that both electrical and natural visual stimulation could induce LTP of excitatory synapses formed by bipolar cells (BCs) on retinal ganglion cells (RGCs) in the retina of zebrafish larvae. Using *in vivo* perforated-patch whole-cell recording, we found that brief theta burst stimulation (TBS) of the inner nuclear layer of the retina resulted in a persistent increase in the amplitude of extracellularly electrical stimulation-evoked excitatory postsynaptic currents (e-EPSCs) in RGCs for as long as stable recording could be made (up to 1 hour), an effect that required the activation of postsynaptic N-methyl-D-aspartate receptors. Presynaptic changes were involved in the expression of LTP at BC-RGC synapses because it was accompanied by an increase in the frequency but not the amplitude of miniature EPSCs (mEPSCs) and a reduction of both paired-pulse ratio and coefficient of variation of e-EPSCs in RGCs, in addition, electrical stimulation-evoked calcium responses of bipolar cell terminals show persistent increase after TBS. Arachidonic acid released by cPLA2 plays a role in presynaptical change during LTP at BC-RGC synapses. Furthermore, repetitive light stimulation (RLS) of the retina also caused a persistent increase in the amplitude of e-EPSCs and occluded TBS-induced LTP at BC-RGC synapses. Finally, this LTP is functionally important because it increased light-evoked EPSCs (l-EPSCs) in RGCs. Thus, LTP does exist in the developing retina and may provide a mechanism for visual experience-dependent refinement of retinal circuits.

Ref: Wei et al. (2012) **Neuron** 75:479-489

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