

" Novel Roles of Neurexins in synaptogenesis"

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Date: Wednesday, December 7th, 2005

Time: 14:30-17:00

Place: 2nd-Floor Seminar Room, ANNEX,

Graduate School of Frontier Biosciences, Suita Campus

Host: Fujio Murakami

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All are welcome to attend!

*This seminar will be conducted in English.

Abstract

Synapses are specialized sites to relay the information between neurons, whose morphological and functional changes have been believed to be fundamental for the mechanisms of learning and memory. Therefore, it is very important to elucidate basic mechanisms of the formation of synapses in the view of not only developmental biology but also understanding brain functions.

Theoretically, synapse formation could be explained roughly by two mechanisms, positive and negative control. The fact that synapses are dynamically formed and eliminated during development and maintain the ability to change their morphology in response to electrical activity even in adulthood supports this view. Recently several transmembrane proteins including cell adhesion molecules such as Neuroligins (NLGs) and Neurexins (Nrxs) that we have extensively studied have been reported to positively control synapse formation. However little is known about molecules that negatively control synapse formation.

In this study we aimed to identify and characterize molecules that suppress synapse formation. We took advantage of the capability for NLGs to potently induce the assembly of presynaptic structures on dendrites when overexpressed in hippocampal neurons. Candidate molecules were coexpressed with NLGs in hippocampal neurons and tested for the activity to cancel the effect of NLGs overexpression. We found that beta-Nrxs, receptors for NLGs, suppressed the activity of NLGs to recruit presynaptic structures. Immunocytochemical and immunoelectron microscopic analysis using a pan-Nrx antibody showed that Nrxs are localized not only in presynaptic but also postsynaptic structures. Nrx1beta colocalized with NLGs in a cis manner could inhibit the trans interaction between NLG and Nrx1beta, thereby suppressing the synaptogenic activity of NLGs. Furthermore, we found that overexpression of Nrxs in hippocampal neurons leads to upregulation of NLGs. We would like to discuss the inhibitory role of postsynaptic Nrxs in the formation of synapses based on our findings.