



CDB SEMINAR

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16:00~17:00 A7F Seminar Room

Inter-axonal communication defines presynaptic tiling in *C. elegans*

Summary

Cellular interactions between neighboring axons are essential for the stereotyped positioning of individual axons and topographic map formation. So far however, it is not known how axons communicate with each other at the level of synapse formation. To answer this question, we focused on two closely related cholinergic motor neurons, DA9 and DA8 in *C. elegans*. Both DA8 and DA9 neurons extend their axons through a commissure into the dorsal nerve cord, where they proceed anteriorly to form a series of *en passant* synapses. Although those axons largely overlap in the dorsal cord, they form synapses only at the specific area. While DA9 forms synapses onto the dorsal muscles in its axon in the posterior-most domain (DA9 synaptic domain) of dorsal muscle, DA8 axon has no synapses in DA9 synaptic domain, and starts to form synapses just anterior to DA9 synaptic domain. Therefore, DA8 and DA9 form 'tiled' synaptic domains leaving there is no apparent gap or overlap between DA8 and DA9 synaptic domains. Therefore, these two motor neurons have 'tiled' synaptic domain along dorsal nerve cord.

From a forward, visual-based genetic screening, we identified that two transmembrane Semaphorins (*smp-1*, *smp-2*) and their receptor Plexin (*plx-1*) are essential for the synaptic tiling between DA8 and DA9. Interestingly, cell specific rescue and mosaic experiments suggested that they both ligands and receptor function in cis in DA9. We also found that PLX-1::GFP is localized at the anterior edge of the synaptic domain of DA9 in a Semaphorin and axon-axon interaction dependent manner. We propose that contact-dependent PLX-1 subcellular localization sets up the synaptic boundary between DA8 and DA9 by restricting the synaptic domain via inactivation of Ras.

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