Cell shape formation controlled by cytoskeleton

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Neurons are highly polarized cells whose shape is controlled by cytoskeleton networks. The formation of neuronal protrusions such as dendrites and axons is mediated by the dynamic nature of microtubules, and it is the basis of neuronal development. Particularly at axon branches, signaling processes trigger actin reformation leading to the recruitment of microtubules to reinforce the branching site; however, little is known about this remodeling mechanism.

Combining the interdisciplinary methods of cryo-EM, biophysics, and cell biology, we focus on elucidating the mechanism of neuronal cell shape formation and accompanying cytoskeleton remodeling. We will present our recent discovery of a novel factor promoting axon branch formation. To understand the underlying mechanism of branch promotion, we have characterized the interaction of the protein with tubulin and reconstituted its microtubule nucleation process in vitro. Moreover, cryo-EM revealed the molecular mechanism of how microtubule remodeling leads to the formation of branches. Mutagenesis experiments in primary neurons correlate the molecular remodeling activity with the formation of axon branches.

Selected Publications


