大学院特別講義/シグナル伝達医学講演会
先端医学トピックス

Activity dependent Btbd3 protein dynamics for selective dendrite morphogenesis in developing neuron

場所/臨床研究棟4階　A講義室
日時/令和元年9月5日(木)　17:00～19:00

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Morphological changes of select dendrites in developing neurons is largely controlled by neuronal activity, allowing for proper neural circuit formation during the critical period. The BTB/POZ domain containing 3 protein (BTBD3) is critical for this process in the mouse sensory cortex. Moreover, BTBD3 is expressed strongly in the primary visual cortex of neonatal common marmoset (Callithrix jacchus), a brain region that mediates high acuity vision via ocular dominance columns (https://gene-atlas.brainminds.riken.jp/). This observation suggested a conserved function for BTBD3 in dendritic remodeling in the visual cortex of animals with high resolution vision mediated by ocular dominance columns. However, how Btbd3 function is differentially controlled by neuronal activity in individual dendrites remains unclear. Here, we show that Btbd3 interacts with PlxnA4 and increases the activity of the small GTPase Rho under low neuronal activity conditions. High neuronal activity causes Btbd3 to dissociate from PlxnA4 and suppresses the small GTPase Rho activity. Long-lasting high neuronal activity leads to dissociation of Btbd3 from protein complexes and stimulate translocation to cytoskeletal fibers, leading to a termination of dendrite morphology dynamics. Taken together, we have revealed a molecular mechanism for how neuronal activity level in individual dendrite controls precise morphological remodeling in developing neuron.

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