Forum

Development of therapeutic strategies to repair neuronal network for the central nervous system diseases

Initial behavioral deficits resulting from brain injury are frequently followed by spontaneous recovery of function, although this recovery is quite limited. It has been noted that synaptic plasticity in pre-existing pathways and the formation of new circuits through collateral sprouting of lesioned and unlesioned fibers are important aspects of the spontaneous recovery process. Although reorganization of the neural network is considered to contribute to this recovery, behavioral plasticity is not fully understood. Furthermore, the molecular mechanism of this phenomenon is poorly understood. We aim to elucidate the mechanisms underlying this plasticity, knowledge of which will contribute to enhancement of functional recovery after injury to the central nervous system. We have explored the mechanism of this behavioral plasticity, and more importantly, we have obtained evidence to show that immune modulation, inflammation-induced neovessels, and some types of microglia enhance plasticity and survival of neurons by secreting trophic factors. Disorders of the central nervous system, such as cerebrovascular diseases, cerebrospinal trauma, and encephalomyelitis, often cause spatiotemporal changes in the nervous system and in various biological systems, such as the immune system and vascular system. We analyzed the mechanism by which the spatiotemporal dynamics in those biological systems control a series of processes. Additionally, we aimed to elucidate the principle involved in the operation of living organisms with neural network disorders within the central nervous system by observing such disorders and their functional recovery process with respect to the dynamics of the entire biological system and by conducting a comprehensive analysis of the association between each system. These immune cells, neovessels, and microglia may prove to be drug targets for the treatment of CNS injuries, CNS inflammation, and neurodegenerative diseases. I will talk about our recent findings that uncover the molecular mechanism of formation and restoration of neuronal network in the CNS.

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Date: Fridy, October 11, 14:30-15:30
Venue: D116, Laboratory of Advanced Research D (総合研究D棟)
Host: Master's and Doctoral Programs in Neuroscience
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