

6th CiNet Monthly Seminar

Functional engineering of astrocytes and mind

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Abstract:

As the membrane potential of astrocytes fluctuates only slightly, it has been considered that astrocytes cannot serve as a medium of much information. However, using recently developed fluorescent probes, dynamic changes in the astrocytic ionic environment have been demonstrated. To reveal the role of astrocytes in brain function, the existence of astrocyte-to-neuron signaling pathway triggered by such astrocytic ionic changes needs to be shown. This study requires an on-demand control of astrocyte activity and, thus, we have created transgenic mice with astrocyte specific expression of light-sensitive membrane protein, channelrhodopsin-2 (ChR2) or archaerhodopsin (ArchT). We noticed that activation of these tools results in acidification and alkalization of the cytosol, respectively, as the main cation that they convey across the plasma membrane is proton. By artificially lowering the intracellular pH buffering capacity, we show that astrocytic ChR2 photoactivation results in more intracellular acidification of astrocytes and enhanced release of glutamate. Using this tool for perturbation of astrocytic function, we show that neuronal signals are also affected by changes in the astrocytic state. Plastic change in the state of the brain activity could be due, in part, to the plastic changes of the astrocyte function.

April 14 (Fri.) 16:00-17:00

CiNet 1F Conference Room

Host: Tamami Nakano

Center for Information and Neural Networks (CiNet), NICT