Oral Sessions

Astrocytic density tunes presynaptically silent synapses

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Information processing in the brain is performed not only by neurons but also by glial cells. Specifically, a major glial cell type, the astrocyte, is in charge of forming and maturing synapses to establish sustainable synaptic transmission in the brain. Generally, higher animals have larger brains. There is a possibility that the number of astrocytes determines the intricate brain function in which a higher animal’s brain has a higher density of astrocytes. This study took advantage of a primary co-culture system using a single autaptic hippocampal neuron with dot-patterned cortical astrocytes. This preparation enables the proper and systematic counting of astrocytes surrounding a single neuron. As a result, a hippocampal neuron with a higher density of astrocytes showed more excellent excitatory synaptic transmission than that of neurons with a lower density of astrocytes. This result was accompanied by a significant increase in the pool of readily releasable synaptic vesicles. The number of morphologically identified glutamatergic synapses was comparable, but the percentage of functional ones was increased, indicating a lower ratio of presynaptically silent synapses. Taken together, the higher astrocytic density enhanced excitatory synaptic transmission by increasing the fraction of functional synapses through presynaptic un-silencing.