Colloquium

The Institute Colloquium: Interplay between glutamatergic synapse nanoscale organizat

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Host:

The spatio-temporal organization of neurotransmitter receptors in the postsynaptic membrane is a fundamental determinant of synaptic transmission and thus information processing by the brain. Ionotropic AMPA glutamate receptors (AMPAR) mediate fast excitatory synaptic transmission in the central nervous system. Using a combination of high resolution single molecule imaging techniques and video-microscopy, we had previously established that AMPARs are not stable in the synapse as thought initially, but undergo continuous entry and exit to and from the post-synaptic density through lateral diffusion.
Using three independent super-resolution imaging methods, on both genetically tagged and endogenous receptors, we have demonstrated that, in live hippocampal neurons, AMPAR are highly concentrated inside synapses into a few clusters of around seventy nanometers. AMPAR are stabilized reversibly in these domains and diffuse freely outside them. Nanodomains are themselves dynamic in their shape and position within synapses as they can form and disappear within minutes, although they are for the most part stable for at least up to an hour. These results open the new possibility that glutamatergic synaptic transmission is controlled by the regulation at the nanometer scale of the position and composition of these highly concentrated nanodomains. In support of this hypothesis, we recently demonstrated that AMPAR conformation strongly impacts their mobility, indicating that desensitized AMPAR can escape synapses. This finding provides a functional support to our hypothesis that fast AMPAR surface diffusion can tune short term plasticity by allowing fast replacement of desensitized AMPAR by naïve ones during high frequency stimulation.

Monday, December 14, 2015 12:45pm - 02:00pm
Raiffeisen Lecture Hall, Central Building

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