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Cytoskeletal Protein Septins Participate in the Modulation of the Kinetics of Acetylcholine Quanta Release at Neuromuscular Junction

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Abstract

© 2016, Springer Science+Business Media New York.In the presynaptic nerve terminal, some families of cytoskeletal proteins can participate in the neurosecretion modulation. Septins, GTP-binding cytoskeletal proteins, form hetero-oligomeric complexes both among themselves and with other synaptic proteins. Previously, it was reported that in the cell cultures, septins can interact with SNARE complex, NSF and SNAP-25, suggesting septin involvement in the exocytosis of neuromediator. Here, we describe effects of septin blockade on the time course of acetylcholine quantal release at mice neuromuscular junction under different frequency stimulation of motor nerve. Forchlorfenuron (FCF), a synthetic cytokinin, is the inhibitor of septin polymerization which specifically impairs assembly and disassembly of septin hetero-oligomers without affecting the actin or tubulin polymerization. FCF in the concentrations from 20 to 100 μM decreased the intensity of the spontaneous and evoked release of acetylcholine quanta. Block of septin dynamics resulted in changes in the kinetics of quantal release: the synchronization of quanta secretion was observed at low and high frequencies of nerve stimulation. Thus, septins are important regulators of spontaneous and evoked neurotransmitter secretion, since disruption of their interaction with SNARE protein complex leads to changes in kinetics of neurotransmitter quanta secretion.

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Keywords

Cytoskeletal proteins, Kinetics of acetylcholine quanta release, Mouse, Neuromuscular junction, Septin