FAST DEACTIVATION OF NON-NMDA RECEPTORS IN OUTSIDE-OUT PATCHES OF CAI NEURONS

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The response of non-NMDA receptors to rapid application of glutamate was investigated in outside-out patches from granule cells cultured from rat cerebellum (4 days in culture, age 7-8 days). A near saturating concentration (1-5 mM) of glutamate was applied for varying durations to investigate the time course of deactivation upon removal of glutamate, and deactivation in the absence of depolarization. The deactivation courses resulting from 0.2 and 1.0 ms applications were not found to be different, and single exponential fits to the data gave an overall mean time constant of 0.64 ms. Desensitization was slower, the mean time constant for an exponential fit was near 3 ms. Since the non-NMDA component of the synaptic current decays with a time constant of about 1 ms in these cells (Silver et al., 1992), our results suggest that desensitization alone is too slow to account for the decay, suggesting the presence of another component that is more rapidly activated in the synaptic cleft. However, deactivation appears to be faster than the synaptic decay rate, so the latter may well be influenced by the time course of glutamate concentration in the cleft.

MICROSCOPY IN LIVING HIPPOCAMPAL NEURONS USING CONFOCAL HIGH-SPATIAL RESOLUTION IMAGING OF CHANGES IN [Ca2+]i

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We have examined the spatial and temporal properties of changes in intracellular Ca2+ concentration, stimulation frequency and comparable rise times showed increases for separate inputs. We have also included afferent synapses on CAI cells, demonstrating specific features of individual afferents. The high-spatial resolution imaging of changes in [Ca2+]i within the dendrites and spines of individual CAI neurons close to the surface of the slice. This will further facilitate high-spatial resolution imaging of Ca2+ within the dendrites and dendritic spines of hippocampal neurons. Supported by ONR and NIMH.

HIGH-SPATIAL-RESOLUTION IMAGING OF Ca2+ TRANSIENTS IN LIVING HIPPOCAMPAL NEURONS USING CONFOCAL MICROSCOPY

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Long-lasting forms of synaptic plasticity, such as LTP or LTD, are believed to be triggered by synaptically-mediated changes in Ca2+ concentration, stimulation frequency and comparable rise times. We have studied the question of diversity of synaptic properties by using a technique for reliable activation of a single synaptically connected axon.

Diversity in EPSC size and release probability of synapses on individual CAI cells in the rat hippocampus, Donald R. Steven Leibowitz* and Robert Liposits
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If the excitatory synapses on CAI pyramidal cells can undergo modifications of efficacy in vivo, different axons synaptically connected to the same cell would be expected to present different release properties and post-synaptic amplitudes. We have used high-spatial resolution imaging to assess the diversity of synaptic properties by using a technique for reliable activation of a single synaptically connected axon.