

Differences between spontaneous and evoked monoquantum signals in the frog neuromuscular junction

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Abstract

In experiments on the frog cutaneous-pectoris muscle, the amplitude-temporal parameters of monoquantum end-plate currents (EPC) and miniature EPC (mEPC) were investigated using extracellular recording. A significant dependence of the risetime of the signals on their amplitude was found after analyzing mEPC; at the same time, such dependence was absent for EPC. Approaches leading to disorganization of the active zones (AZ) of the nerve ending (NE), prolonged action of a Ca-free solution, and denervation resulted in an increased dependence of the risetime of the monoquantum signals on their amplitude; moreover, these dependences were similar for both mEPC and monoquantum EPC. Mathematical simulation showed that the obtained data could be explained by the spatial heterogeneity of the sites of spontaneous and evoked transmitter release within the regions of the AZ. A new hypothesis interpreting spontaneous and evoked transmitter release is proposed.

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Keywords

Disorganization of active zones, EPC, MEPC, Risetime