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Hydrogen sulfide as an endogenous modulator of transmitter release in the frog neuromuscular synapse

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Abstract

We studied effects of gaseous hydrogen sulfide (H₂S) and its donor, sodium hydrosulfide (NaHS), on the functioning of the neuromuscular synapse in nerve-muscle preparations of frog pectoral muscle with the use of extracellular and intracellular microelectrode techniques. The exogenous H₂S was shown to increase the frequency of spontaneous postsynaptic signals and the amplitude of evoked postsynaptic signals without changes in the electrogenesis of motor nerve ending and distribution of synaptic delays. An increase in the postsynaptic signals was associated with an increase in the quantum content. Rhythmic stimulation of a motor nerve (10 and 50 imp/s) in the presence of NaHS induced a smaller facilitation of transmitter release as compared to the control. This was determined by an increase in the initial level of secretion. The dynamics of outward potassium currents in the nerve ending were not changed. A substrate for H₂S synthesis, L-cysteine, caused an increase in the evoked transmitter release, whereas the inhibitors of H₂S synthesis, aminooxyacetic acid and β-cyanoalanine, decreased it. We concluded that hydrogen sulfide may be synthesized in the region of the nerve-muscular synapse, modulating acetylcholine release, and affecting molecular mechanisms of exocytosis of synaptic vesicles. © MAIK Nauka 2008.

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Keywords

β-cyanoalanine, Aminooxyacetic acid, Cysteine, Hydrogen sulfide, Neuromuscular synapse, Transmitter release