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SUBSTANCE P-EVOKED RELEASE OF ACETYLCHOLINE FROM ISOLATED SPINAL CORD OF THE NEWBORN RAT*

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Isolated spinal cords of newborn rats were perfused with artificial cerebrospinal fluid and the release of endogenous acetylcholine was measured using high-performance liquid chromatography with an electrochemical detection system, Application of high-K^+ (90 mM) medium evoked about an eight-fold increase in the acetylcholine release, and the K^+-evoked release was Ca^{2+} dependent. Veratridine (20 μM) also evoked about a four-fold increase in the acetylcholine release, and this increase was suppressed by 0.2 μM tetrodotoxin. Application of substance P at 0.3-3 μM evoked a concentration-dependent release of acetylcholine. The substance P-evoked acetylcholine release was Ca^{2+} dependent and abolished by tetrodotoxin. Neurokinin A, neurokinin B, acetyl-Arg^6-septide and senktide (3 μM each) also evoked a release of acetylcholine. Electrophysiological experiments using isolated spinal cords of newborn rats showed that bath application of substance P induced a depolarization of motoneurons, which was enhanced by edrophonium. This enhancement of substance P-induced depolarization by edrophonium disappeared in a low-Ca^{2+} medium or in the presence of atropine and dihydro-β-erythroidine. In the presence of edrophonium and dihydro-β-erythroidine, substance P induced an inhibition of monosynaptic reflex, and this inhibition was abolished by atropine.

These results suggest that substance P and other tachykinins induce a release of acetylcholine from the newborn rat spinal cord by exciting cholinergic neurons.

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