RESPONSES TO NON-ADRENERGIC NON-CHOLINERGIC INHIBITORY NERVE STIMULATION AND VIP IN THE CIRCULAR SMOOTH MUSCLES OF THE RAT GASTRIC FUNDUS

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The neurotransmitter in the non-adrenergic, non-cholinergic (NANC) inhibitory nerve in the stomach has not been identified, but vasoactive intestinal peptide (VIP) is considered to be the most important candidate. Therefore, in this experiment, mechanical and electrical activities and cyclic nucleotide (cAMP and cGMP) content in response to VIP were compared with those of NANC inhibitory nerve stimulation using circular smooth muscle preparations isolated from the rat gastric fundus.

1. In the presence of atropine (10^{-6}M) and guanethidine (10^{-6}M), the mechanical activity induced by transmural stimulation (TMS) was recorded isotonically and isometrically. The electrical activity was recorded with the microelectrode and sucrose-gap methods. The cyclic nucleotide contents of smooth muscle segments clamp-frozen by the hammer method were assayed using radioimmunoassay.
2. TMP and VIP induced frequency-dependent and does-dependent relaxations, respectively. Apamin did not affect these responses.
3. TMS evoked inhibitory junction potentials (i. j. p.) at low frequencies (0.25Hz-1Hz), and hyperpolarization at high frequencies (2Hz–5Hz). Apamin reduced the amplitude of i. j. p. and hyperpolarization.
4. VIP induced hyperpolarization of the smooth muscle membrane in a dose-dependent manner.
5. TMS caused a frequency-dependent increase in the cyclic nucleotide content of the smooth muscles. Although the relaxant response to TMS (5Hz) started to appear within 5 sec following stimulation, cyclic nucleotide content increased 40sec after stimulation.
6. VIP caused a dose-dependent increase in cyclic nucleotide content. Although VIP (10^{-8}M)-induced relaxation started to appear 1 min after the application, cyclic nucleotide content increased 2min after the application.
7. TMS and VIP increased cyclic nucleotide content in the presence of apamin. Apamin did not influence the rate of increase in cyclic nucleotide content.
8. The mechanical and electrical activities and the increase of cyclic nucleotide content in response to VIP were similar to those of TMS, suggesting that VIP is a neurotransmitter released by NANC inhibitory nerves.