Evidence for the Presence of Non-adrenergic Inhibitory Nerves in the Human Taenia Coli

AKIRA RIKIMARU, YASUE FUKUSHI and TAIKO SUZUKI
Department of Applied Physiology, Tohoku University
School of Medicine, Sendai

RIKIMARU, A., FUKUSHI, Y. and SUZUKI, T. Evidence for the Presence of Non-adrenergic Inhibitory Nerves in the Human Taenia Coli. Tohoku J. exp. Med., 1971, 104 (2), 199-200 —— Transmural stimulation applied to the atropinized human taenia coli caused relaxation which was resistant to adrenergic neuron blocking agents. This relaxation was, however, entirely abolished by tetrodotoxin. These results may suggest the presence of non-adrenergic inhibitory nerves in the human taenia coli.

It has been reported that nicotine and DMPP cause relaxation of the isolated human gut preparation which is antagonized by adrenergic blocking agents (Bucknell and Whitney 1964, Fishlock and Parks 1966). These results may be taken as evidence for the presence of sympathetic adrenergic ganglion cells in the intrinsic nerve plexuses. However, the histochemical fluorescence technique for localizing catecholamines failed to reveal any fluorescent neuron somata in Auerbach’s plexuses of the human gastrointestinal tract, though the fluorescent nerve fibers were observed abundantly around the non-fluorescent ganglion cells (Baumgarten 1967). These histochemical findings are rather similar to those of other animals, whose intrinsic inhibitory innervations are thought to be non-adrenergic in nature (Rikimaru 1971 b). Then we tried to re-investigate the inhibitory innervation of the human gut by the method of transmural stimulation to excite the intramural nervous elements selectively.

The human taenia coli, obtained at the operation of colon for carcinoma, was cut into longitudinal strips about 3 mm wide and 20 mm long. The taenia strip was mounted in an organ bath containing modified Krebs solution and was stimulated transmurally with square-wave pulses of 1 msec duration at different frequencies, and the response was recorded isometrically. Transmural stimulation first elicited contraction of the taenia, which was easily converted into relaxation after atropine (10^-7 g/ml). The relaxant response was maximally produced by the train of pulses at frequency between 5 and 10 pulses/sec as in other intestinal preparations (Rikimaru 1971 a). The relaxation was resistant to the adrenergic neuron blocking agents, bretylium (10^-5-5×10^-5 g/ml) and guanethidine (10^-6-10^-5 g/ml) as shown in Fig. 1. However, tetrodotoxin, a well-known neurotoxin, entirely abolished the relaxation elicited by transmural stimulation.

Received for publication, February 16, 1971.

199
Fig. 1. Contraction and relaxation of the isolated human taenia coli preparation elicited by transmural stimulation and the effect of drugs. A: before atropine. B: in the presence of atropine (10⁻⁷ g/ml). C: in the presence of atropine (10⁻⁷ g/ml) and bretylium (5x10⁻⁸ g/ml). D: in the presence of atropine (10⁻⁷ g/ml) and tetrodotoxin (10⁻⁸ g/ml). E: after washing tetrodotoxin out of the bath. Lower traces indicate the periods of electrical stimulation (10 pulses/sec, for 5 sec).

It is assumed from these data that non-adrenergic inhibitory nerves may exist in the human taenia coli.

Acknowledgment

We wish to express our thanks to Prof. T. Maki and Dr. T. Shiratori, Department of Surgery, for providing the material and for their kind advice.

References