The responses of, and release of acetylcholine by guinea pig small intestine in response to coaxial electrical stimulation / Paton, W.D.M.

PATON, W. D. M. (London, England). **The responses of, and release of acetylcholine by guinea-pig small intestine in response to coaxial electrical stimulation.**

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A strip of guinea-pig ileum is suspended in oxygenated Krebs' solution, so that its contractions or change in volume can be recorded in response to excitation by means of two platinum electrodes, one threaded through the lumen of the intestine, the other in the surrounding bath.

In the undistended intestine, single shocks of 0.5 msec and 5-25 volts elicit a vigorous twitch, lasting about 1 second. With repeated excitation, tetanus and "post-tetanic potentiation" is demonstrable. Since the response

1) has a chronaxie of about 200 μsec;

2) resists hexamethonium, nicotine, mepyramine, and desensitisation to 5-hydroxytryptamine;

3) is abolished by 0.01 μgm/ml atropine, and greatly increased and prolonged by 0.01 μgm/ml eserine;

it is concluded that the twitch is mediated by postganglionic cholinergic nerves.

If the intestine is distended by pressures of 1-2 cm water, an emptying reaction is obtained, resembling the peristaltic reflex elicited by higher pressures. This can be abolished by hexamethonium, and represents a response to preganglionic excitation.

If both these reactions are abolished, intestinal contraction can still be obtained with long shocks (chronaxie about 100 μsec), presumably by direct excitation of smooth muscle.

In the absence of an anticholinesterase, no significant amount of any gut-stimulating material appear in the bath-fluid after continued coaxial stimulation. But after eserinization, acetylcholine appears, both in the resting state, and at an increased rate on stimulation (about 0.5 ngm per shock). The output per shock diminishes with rapid or sustained excitation.

The preparation has been used for the analysis of the action of morphine. Morphine 0.1 — 1.0 μgm/ml will reduce or abolish the twitch without depressing the response to acetylcholine. Morphine also depresses the acetylcholine output. Since the depressant activity of morphine-like drugs on the twitch corresponds to their narcotic potency, the depression of acetylcholine release may represent a principal mode of action of such substances.

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