

The innervation of human muscularis mucosae: an ultrastructural study

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The muscularis mucosae, a thin band of smooth muscle located at the base of the gastrointestinal mucosa, has been the topic of very few studies. The muscularis mucosae might regulate the absorptive and secretory functions of the gut through movements of the mucosal surface (1). The autonomic innervation of this tissue is almost completely unknown. Therefore we have carried out an ultrastructural study on nerve fibers of muscularis mucosae by using archived mucosal rectal biopsies of children of different age, examined in the past for the diagnosis of neurometabolic disease and resulted negative. Nerve fibers of muscularis mucosae were unmyelinated. They contain several axons with the characteristics of intervaricose tract completely or almost surrounded by Schwann cells. Other axons in the nerve fibers appear as varicosities partly covered with Schwann cell cytoplasm or naked, and filled with vesicles and mitochondria. The vesicles in the same varicosity appear pleomorphic: small clear-core vesicles, dense-core of small diameter or less often dense-core of larger type. The membrane of muscle cells often protruded toward the varicosity. No synaptic specialization was observed. With very low frequency we found varicosities in intimate contact with the plasmalemma. Pleomorphic vesicles inside the same varicosity suggest a complex neurotransmission based on the release of classical transmitter and cotransmitters. The physiological relevance of these nerves remains unclear. Strips of longitudinal muscularis mucosae isolated from the human, guinea pig and rat colon responded with concentration-dependent contractions to the application of several spasmogens (1). In the human muscularis mucosae, neurokinin A was most potent, followed by carbachol, prostaglandin F₂ and acetylcholine. These findings suggest the possibility that the muscularis mucosae is innervated by excitatory cholinergic nerves (1). On the other hand in oesophagus exogenously applied adrenaline inhibited spontaneous activities of the muscularis mucosae motor activity. Adrenergic nerves might inhibit spontaneous motility via the inhibition of cholinergic neurotransmission. VIP-, NPY-, CGRP- and galanin-immunoreactive nerve fibers were observed in the human esophageal muscularis mucosae but their function remains unknown (2).

References

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Keywords

Muscularis mucosae; human; electron microscopy; nerve fibers.