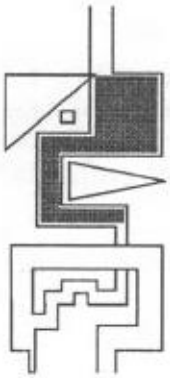

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Diverse effects of tetramethylammonium on smooth muscle layers from the body of human stomach

Različita dejstva tetrametilamonijuma na glatke mišićne slojeve tela humanog želuca

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Effects of ganglion stimulant tetramethylammonium were studied on circular and longitudinal smooth muscle isolated preparations from the body of human stomach. Tetramethylammonium (from 0.61 x 10^{-6}M to 5.10 x 10^{-3}M) produced concentration-dependent tonic contractions of all isolated preparations ($p<0.05$). Tonic contractions of human longitudinal muscle isolated preparations were not inhibited by lidocain and mecamylamine, but were significantly blocked by atropine and pancuronium. These results suggest direct muscarinic effects of tetramethylammonium on longitudinal smooth muscle from human stomach. On the other side, tonic contractions of human circular muscle isolated preparations were inhibited by lidocain and mecamylamine, as well as by atropine and pancuronium. Considering these results we could suppose that tetramethylammonium in these preparations stimulated both nicotinic ganglion receptors and smooth muscle muscarinic receptors.

KEY WORDS: stomach - body, smooth muscle, man, tetramethylammonium

Dejstva ganglijskog stimulatora tetrametilamonijuma su ispitivana na izolovanim preparatima cirkularnog i longitudinalnog mišićnog sloja tela humanog želuca. Tetrametilamonijum (od 0.61 x 10^{-6}M do 5.10 x 10^{-3}M) je izazivao od koncentracija - zavisne toničke kontrakcije svih izolovanih preparata ($p<0.05$). Toničke kontrakcije izolovanih preparata longitudinalnog mišića su inhibirali atropin i pankuronijum, dok lidokain i mekamilamin nisu imali efekta. Ovakvi rezultati sugeriraju direktno muskarinsko dejstvo tetrametilamonijuma na longitudinalni mišić tela humanog želuca. S druge strane, toničke kontrakcije izolovanih preparata cirkularnog mišića su inhibirali kako atropin i pankuronijum, tako i lidokain i mekamilamin. Prema ovakvim rezultatima možemo pretpostaviti da je tetrametilamonijum u ovim preparatima stimulisao i nikotinske ganglijske receptore i muskarinske receptore na glatkim mišićnim ćelijama.

KLJUČNE REČI: želudac - telo, glatki mišić, čovek, tetrametilamonijum

The ganglion simulant action of tetramethylammonium was confirmed long ago (1, 2), as well as its muscarinic agonist properties (3, 5). Which of these two actions will be observed in particular experiment depends primarily on the complexity of isolated preparation used. Gut isolated preparations are extremely complex structures containing abundant neuronal networks besides effectors (smooth muscles and glands). There are two common final pathways in gut neuronal circuits that control smooth muscle activity: cholinergic excitatory neurones in myenteric plexus whose axons excite myocytes, and inhibitory neurones whose axons relax myocytes in external muscle layers.

Tetramethylammonium produces contraction of many isolated smooth muscle preparation from the gut. Targets for its actions are nicotinic receptors on excitatory enteric neurones and muscarinic receptor both on enteric neurones and on smooth muscle cells. We have recently demonstrated its contractile properties on smooth muscles from the body of human and feline stomach (6). In the present study, we made an attempt to determine which action of tetramethylammonium was responsible for the contraction in human stomach: nicotinic or muscarinic.

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MATERIALS AND METHODS

Human stomach isolated preparations

In eight patients (4 men and 4 women) between 33 and 62 years old, suffering from duodenal ulcer, 2/3 resection of the stomach with Billroth II reconstruction was performed. In the operating theatre, immediately after stomach resection, a piece