



Different effects of nicotine, dimethylphenylpiperazinium and tetramethylammonium on smooth muscle preparations from the body of human and feline stomach

Različiti efekti nikotina, dimetilfenilpiperazina i tetrametilamonijuma na preparate glatkih mišića tela želuca čoveka i mačke

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ABSTRACT. Effects of the ganglionic stimulants, nicotine, dimethylphenylpiperazinium and tetramethylammonium on the isolated strips of longitudinal and circular muscles from the body of human and feline stomach were investigated. Tetramethylammonium produced concentration-dependent contractions of isolated preparations of either longitudinal or circular muscles of both species. Nicotine induced concentration-dependent relaxation only of the feline circular muscle strips. On the other hand, dimethylphenylpiperazinium had no significant effects on isolated strips of the longitudinal and circular muscles from the body of human and feline stomach. The differences in the effects of the ganglionic stimulants most probably reflect distinct anatomical sites of actions as well as nicotinic and muscarinic receptors in nervous structures and possibly smooth muscles of the human and feline gastric body. In addition, the ability of nicotine, but not of dimethylphenylpiperazinium and tetramethylammonium, to relax only the circular strips of the feline gastric body might indicate the existence of an unusual subtype of nicotinic receptors through which nicotine stimulates the inhibitory enteric ganglia.

KEY WORDS: human stomach, feline stomach, ganglionic stimulants, nicotinic receptors, inhibitory enteric ganglia.

SAŽETAK. U ovom radu su izučavana dejstva ganglijskih stimulatora: nikotina, dimetilfenilpiperazina i tetrametilamonijuma na izolovanim preparatima longitudinalnog i cirkularnog mišićnog sloja tela želuca čoveka i mačke. Tetrametilamonijum je izazvao koncentracijski zavisne toničke kontrakcije obe vrste izolovanih preparata (longitudinalnog i cirkularnog mišićnog sloja) kod oba speciosa. Nikotin je izazvao koncentracijski zavisnu relaksaciju samo izolovanih preparata cirkularnog mišićnog sloja tela želuca mačke. S druge strane, dimetilfenilpiperazin nije imao značajna dejstva na izolovanim preparatima longitudinalnog i cirkularnog mišićnog sloja tela želuca čoveka i mačke. Razlike u efektima ganglijskih stimulatora najverovatnije odražavaju anatomske različite mesta dejstva; različite nikotinske i muskarinske receptore u nervnim strukturama i verovatno glatkim mišićima tela želuca čoveka i mačke. Pored toga, sposobnost nikotina, ali ne i dimetilfenilpiperazina i tetrametilamonijuma, da relaksira samo preparate cirkularnog sloja tela želuca mačke mogla bi da ukaže na postojanje posebnog podtipa nikotinskih receptora preko kojih nikotin stimuliše inhibitorne crevne ganglije.

KLJUČNE REČI: humani želudac, želudac mačke, ganglijski stimulatori, nikotinski receptori, inhibitorne crevne ganglije.

The stimulation of sympathetic ganglia and adrenal medulla are the common pharmacological effects of the ganglionic stimulants, nicotine, dimethylphenylpiperazinium and tetramethylammonium (1, 2). On the other hand, it has long been known that the ganglionic stimulants produce excitatory and inhibitory motor effects in the gastrointestinal tract. For instance, nicotine, dimethylphenylpiperazinium and tetramethylammonium contract the isolated ilea of many species (3-5). Nicotine and dimethylphenylpiperazinium, apart from their stimulant actions, can relax the rabbit isolated intestine (6), isolated stomach strips of kittens (6), canine isolated lower oesophageal sphincter (7) and gui-

nea-pig strips of gastric antrum (8). The differences in the effects of the ganglionic stimulants in complex structure of the gastrointestinal tract cannot be solely ascribed to distinct anatomical sites of actions. In such structures of equal importance are the pharmacological characteristics of the ganglionic stimulants. Nicotine and dimethylphenylpiperazinium, in such complex structures have predominantly nicotinic, whereas tetramethylammonium predominantly muscarinic actions (1, 2, 5). Of course, these agents in large amounts could have direct actions on smooth muscles. In addition, species differences cannot be neglected as well. Therefore, in the present study, an attempt was made to compare the effects of the ganglionic stimulant agents, nicotine, dimethylphenylpiperazinium and tetramethylammonium on isolated longitudinal and circular muscle strips of the body of the human and feline stomach.

