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"Nicotinic" receptors are 5-hydroxytryptamine receptors: Evidence from relaxation effect of d-tubocurarine and hexamethonium on chick rectum smooth muscles

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Abstract

Relaxation responses of d-tubocurarine and hexamethonium at serotonin receptors of chick rectum provided evidence that N_N and N_M-"nicotinic" receptors are serotonin receptors. The responses of the smooth muscles of chick rectum of 1 day, 1week and 1month old chicks to intrinsic and trasmural electrical field stimulation and to a variety of drugs were investigated. The drugs employed in the study included: acetylcholine, atropine,adrenaline, noradrenaline, propanolol, phentolamine, indomethacin; mepacrine, chloroquine; papaverine; brethylium; dipyridamole; guanethidine; d-tubocurarine; hexamethonium; adenosine triphosphate; burimamide and Reserpine. The results of the study showed that the smooth muscles of the rectum of 1 day old-1 month old chicks responded to both intrinsic stimulation and electrical field stimulation with a graded and age-dependent biphasic response which consisted of an excitatory response followed by a relaxation response. Comparism of the responses of chick rectum to both intrinsic stimulation and electrical field stimulation before and after pre-treatment of the tissue with reserpine established that 5-hydroxytryptamine was the endogenous mediator of 95% of the biphasic responses of chick rectum smooth muscles to intrinsic and intramural electrical stimulation. The relaxation responses d-tubocurarine and hexamethonium abolished the contractile phase of the biphasic response of chick rectum to intrinsic and transmural electrical field stimulation at the same sites where the contractile responses to acetylcholine and adenosine triphosphate were elicited. These results show that the receptors on which d-tubocurarine and hexamethonium produce their antagonism of contraction or muscle relaxation at acetylcholine "nicotinic" sites (at the neuromuscular junctions, ganglia, in the central nervous system, et cetera are 5-hydroxtryptamine receptors. All nicotinic acetylcholine (nAchRs) receptors (most of which are pentameric structures that function as ligand gated ion channels) are therefore 5-hydroxytryptamine receptors. Tubocurarine (and curare-like drugs) and hexamethonium (and ganglion-blocking drugs) acts at these serotonin receptor sites by producing a relaxation at the β- subunits of the 5-HT receptor just as they produced at chick rectum smooth muscle 5-HT receptors.

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