

Research Journal of Pharmaceutical, Biological and Chemical Sciences, 2015, vol.6, N4, pages 134-140

Interrelation between sympathetic and parasympathetic cardiac nerves within ontogenesis

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Abstract

We have studied the formation of interrelation between sympathetic and parasympathetic influences on the heart in dogs and rats in ontogenesis during electrical stimulation of nerves. To achieve the tasks set we have carried out acute experiments on adult dogs and puppies of the first, second and third age groups using artificial respiration, as well as on intact and sympathectomized growing and adult rats with natural respiration. The basic principle of interrelation in adult animals is an intercompensatory principle against the activity of both parts of nervous system. Intercompensatory principle develops gradually as the influence of sympathetic and parasympathetic outflows on the heart grows. With increasing activity of the sympathetic nervous system, the compensatory growing of influence of the parasympathetic outflow protects the heart from overloading. After sympathectomy, we revealed age-related features in the reaction of the heart to electrical stimulation of the vagus nerve. Sympathectomized rats had lesser stroke volume than intact rats, except for age of 14 days, which is compensated by higher heart rates. The obtained data on changes in heart rate and stroke volume in the right- and left-sided vagus nerve stimulation confirm that the intercompensation develops gradually in ontogenesis as one of the basic principles of interrelation between the influences of sympathetic and parasympathetic outflows on the heart in the active state.

Keywords

Heart, Intercompensation, Ontogenesis, Sympathectomy, Sympathetic nerve, Vagus nerve