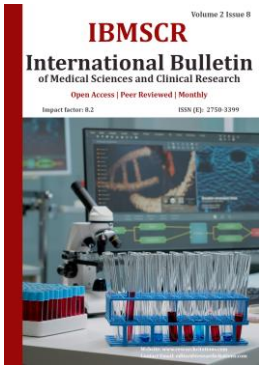


# CONTROL OF CARDIAC ACTIVITY BY THE NERVOUS SYSTEM

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Abstract: The main functions of the heart are regulated by the sympathetic and parasympathetic divisions of the autonomic nervous system. In general, the sympathetic nerves of the heart are facilitatory, while the parasympathetic (vagus) nerves are inhibitory. The kinetics of the two autonomous cleavages are significantly different. Vagal effects develop very quickly, often within a heartbeat, and they also decay quickly. Thus, the vagus nerve has the ability to control the activity of the heart. On the contrary, the onset and decay of sympathetic influences is much more gradual; only small changes are made during one cardiac cycle. When two autonomous systems act simultaneously, the effects are not algebraically additive, but complex interactions prevail.

Key words: heart, nervous system, sympathetic, parasympathetic, vegetative, autonomic nervous system, atriventicular, sinoatrial, depolarization, nerve, Purkenye, hiss bundles.

Purpose of research. The purpose of our research is to study the role of the nervous system in the control of heart activity and its control by the nervous system.

Material and inspection methods. Efferent preganglionic parasympathetic neurons of the heart arise from the posterior motor nucleus of the medulla oblongata and the nucleus accumbens. They travel bidirectionally within the two vagal nerves and synapse on postganglionic nerve fibers in the vagal nerve ganglion located at the base of the heart, in the cardiac plexus. The cardiac plexus consists of a complex network of different nerves, including sympathetic, parasympathetic, and cardiac nerves, as well as some small parasympathetic ganglia to control cardiac activity. The cardiac plexus is divided into two parts: the superficial part located in the cavity of the aortic arch and the deep part located between the trachea and the aortic arch. Both parts are connected to provide autonomic innervation of the heart. The heart has an internal conduction system made up of special cells. It can spontaneously depolarize, start the heartbeat from the rhythmic pacing charge and coordinate the electrical activity of the heart. The sinoatrial node is the first pacemaker that initiates the electrical impulses that cause the depolarization and contraction of the atrium. This electrical impulse travels throughout the heart through the internodal pathway, the atrioventricular node, the bundle, the branches of the bundle of gis, and the Purkinje fibers. Without external (hormonal and nervous) influences, the sinoatrial node generates approximately 100 beats per minute; however, cardiac output (and therefore heart rate) must change to meet the body's oxygen needs under changing conditions. The autonomic nervous system of the heart plays a role here. The heart has an internal conduction system made up of special cells. The heart receives extensive innervation from the sympathetic and parasympathetic systems of the autonomic nervous system. The autonomic nervous system affects most functions of the heart by influencing the sinoatrial node, atrioventricular node, myocardium, and the walls of small and

large vessels. The sympathetic system has a stimulating effect on the activity of the heart. Conversely, the parasympathetic system has an inhibitory effect on the heart. Abnormalities of the autonomic nervous system in terms of anatomy and physiology can lead to various cardiac abnormalities. Abnormalities of the autonomic nervous system associated with electrical abnormalities can lead to various cardiac manifestations. In addition to electrical abnormalities, the autonomic nervous system is also associated with ischemic heart disease. After electrical and ischemic instability, the autonomic nervous system also directly affects the recovery of action potential duration. By understanding the mechanism of action of the autonomic nervous system on cardiac anatomy and physiology and its impact on various cardiac abnormalities, we can determine appropriate therapeutic approaches. The autonomic nervous system affects most cardiac functions by influencing the sinoatrial node, the atrioventricular node, the myocardium, and the walls of small and large vessels. The autonomic nervous system regulates heart rate (chronotropic effect), myocardial cell contraction (inotropic effect), signal transduction (dromotropic effect), excitability (bathmotropic effect), as well as coronary vessels. regulates tone and myocardial blood flow. Because the sympathetic and parasympathetic systems have opposing effects on cardiac function, the ultimate effect on the heart is a net balance between the two systems. However, their effects differ in their distribution in the heart.

The sympathetic system has a stimulating effect on the heart and is activated in emergency situations, stressful situations or other situations that require an increase in cardiac output; therefore, it is also known as the "fight or flight response". It controls heart activity mainly through three effects: 1. Accelerates sinus node depolarization, increases heart rate (positive chronotrope), 2. Increases atrioventricular conduction, conduction velocity in atria and ventricles, 3. Myocardium in both atria and ventricles increases contractility. Most of these effects are mainly carried out by β1-adrenergic receptors, because they are predominant in the healthy human heart, while β2 receptors are concentrated in the atria and ventricles, so their functions are related to inotropic effects. Both β1 and β2 receptors are distributed in all regions of the heart, although . In addition, sympathetic activation also promotes coronary artery constriction, which leads to α1 and α2 receptor-mediated cardiac output and β2 receptor-mediated dilation of coronary arteries.

Conversely, the parasympathetic (vagal) system has an inhibitory effect on cardiac functions. It is activated under calm conditions and is therefore called the resting and digesting reaction. It slows the activity of the sinus node, resulting in a decrease in heart rate, slows down the electrical conduction through the atrioventricular node and the conduction system, causes delayed conduction and atrioventricular blockade, reduces the contraction of the atria and promotes the expansion of the coronary arteries, which causes a decrease in heart activity. Since parasympathetic fibers are mainly distributed in the atria and ventricles, parasympathetic activation does not have a significant effect on intraventricular conduction and ventricular contraction.

Summary. The heart receives extensive innervation from the sympathetic and parasympathetic systems of the autonomic nervous system. The sympathetic system has an excitatory effect on the heart, while the parasympathetic system has an inhibitory effect on the heart. Abnormalities of the autonomic nervous system associated with electrical abnormalities can lead to various cardiac manifestations. By understanding the mechanism of

action of the autonomic nervous system on cardiac anatomy and physiology and its impact on various cardiac abnormalities, we can determine appropriate therapeutic approaches.

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