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VEGETATIVE NERVOUS SYSTEM. SYMPATHETIC AND PARASYMPATHETIC DIVISIONS

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Abstract: The vegetative nervous system (VNS) provides regulation of internal organs and maintains the body's homeostasis. It consists of the sympathetic and parasympathetic divisions, each performing specific functions. The sympathetic division activates the "fight or flight" response, increases heart rate, raises blood pressure, and mobilizes energy resources. The parasympathetic division ensures restoration and rest, decreases heart rate, and promotes digestion. This article examines the morphological structure of the VNS, neurotransmitters, regulation mechanisms, clinical significance, and recent research on the influence of the sympathetic and parasympathetic divisions on the functional systems of the body.
Keywords: vegetative nervous system, sympathetic system, parasympathetic system, neurotransmitters, homeostasis, organ regulation, autonomic nervous system, stress, cardiovascular system, digestion.

The vegetative nervous system (VNS) is one of the key parts of the peripheral nervous system and provides automatic regulation of internal organs, endocrine glands, and blood vessels. The main function of the VNS is to maintain homeostasis — a stable internal environment necessary for the normal functioning of all systems. The VNS ensures coordinated work of the cardiovascular, respiratory, digestive, urinary, and reproductive systems, as well as the endocrine system.

The VNS is divided into two functional parts: the sympathetic and parasympathetic systems. These systems act antagonistically, enabling the body to adapt to various environmental conditions. The sympathetic division is activated in stressful situations or during physical exertion, forming the "fight or flight" response. It increases heart rate, enhances blood supply to the muscles, accelerates breathing, and mobilizes the body's energy resources. The parasympathetic division, on the contrary, ensures recovery, slows heart rate, stimulates digestive processes, and promotes relaxation.

In recent decades, the study of the VNS has gained particular importance not only in physiology but also in clinical medicine. Dysfunction of the sympathetic or parasympathetic divisions can lead to arterial hypertension, tachycardia, bradycardia, functional digestive disorders, and other pathological conditions. Modern methods of diagnosing VNS function include heart rate variability analysis, physical stress tests, pupil reaction assessment, and neurotransmitter level evaluation.

Integrating VNS evaluation into clinical practice makes it possible to develop individualized approaches to treating patients with internal organ dysfunctions and to prevent functional disorders. Knowledge of the morphology, neurochemistry, and mechanisms of interaction between the sympathetic and parasympathetic systems is essential for understanding the body's adaptive capabilities and for developing innovative methods to correct dysfunctions.

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Thus, a detailed study of the structure, functions, and interaction between the sympathetic and parasympathetic divisions of the VNS is crucial for understanding physiological processes, stress adaptation, and the maintenance of homeostasis in both normal and pathological states.

The sympathetic system forms the "fight or flight" response. It controls acceleration of heart rate, elevation of blood pressure, dilation of the bronchi, and mobilization of energy reserves. Neurotransmitters: norepinephrine in postganglionic fibers and acetylcholine in preganglionic fibers.
Morphologically, sympathetic ganglia are located paravertebrally, forming the sympathetic trunk. The parasympathetic system ensures restoration and rest of the body. It decreases heart rate, enhances digestive processes, constricts pupils, and lowers blood pressure. The main neurotransmitter is acetylcholine. Ganglia are located close to target organs, providing localized influence.

The sympathetic and parasympathetic systems act antagonistically, providing adaptation to external and internal conditions. For example, during physical activity the sympathetic system accelerates heart rate, while the parasympathetic system restores it after the activity ends.
Acetylcholine — the mediator of the parasympathetic system acts through nicotinic and muscarinic receptors.
Norepinephrine — the mediator of the sympathetic system acts through α- and β-adrenergic receptors.
Adrenaline — secreted by the adrenal glands enhances the sympathetic response.
VNS disorders manifest as hypertension, bradycardia, tachycardia, digestive dysfunctions, and other functional abnormalities. Diagnosis includes heart rate variability measurement, physical stress tests, and pupil reaction assessment. Modern correction methods include pharmacological therapy, physiotherapy, and biofeedback.

The vegetative nervous system plays a key role in maintaining the body's homeostasis. The sympathetic division activates adaptive stress responses, while the parasympathetic division promotes recovery. Understanding the morphology, neurotransmitters, and regulatory mechanisms of the VNS is essential for clinical practice and for developing treatments for functional disorders of internal organs.

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