

Autonomic Nervous System

Encyclopedia Article

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Autonomic Nervous System

The autonomic nervous system (ANS) is the specialized component of the nervous system that functions to regulate the activities of cardiac muscle, **smooth muscle**, **endocrine glands**, and exocrine glands. The ANS functions involuntarily and reflexively in an automatic manner without conscious control.

The ANS achieves its ability to either excite or inhibit activity via a dual innervation of target tissues and **organs**. The ANS achieves this control via two divisions of the ANS, the **sympathetic nervous system** and the **parasympathetic nervous system**.

The ANS is the mediator of visceral reflex arcs. In contrast to the somatic nervous system that always acts to excite muscles groups, the autonomic nervous systems can act to excite or inhibit innervated **tissue**. The autonomic nervous system also differs from the somatic nervous systems in the types of tissue innervated and controlled. The somatic nervous system regulates **skeletal muscle** tissue, while the ANS services smooth muscle, cardiac muscle, and glandular tissue.

The involuntary ANS is controlled in the **hypothalamus** while the somatic system is regulated by other regions of the **brain** (cortex). In contrast, the somatic nervous system may control motor functions by neural pathways that contain only a single axon that innervates an effector (e.g., a target) muscle. The ANS is comprised of pathways that must contain at least two axons separated by a ganglia (clusters of neural cells outside of the brain and **spinal cord** of the **central nervous system**) that lies in the path between the axons.

ANS reflex arcs are stimulated by input from sensory or visceral receptors. The signals are processed in the hypothalamus (or regions of the spinal cord) and target effector control is then regulated via myelinated preganglionic **neurons** (cranial and spinal nerves that also contain somatic nervous system neurons). Ultimately, the preganglionic neurons terminate in a neural ganglion. Direct effector control is then regulated via unmyelinated postganglionic neurons.

The principal **neurotransmitters** in ANS synapses are acetylcholine and norepinephrine.