

Autonomic nervous system

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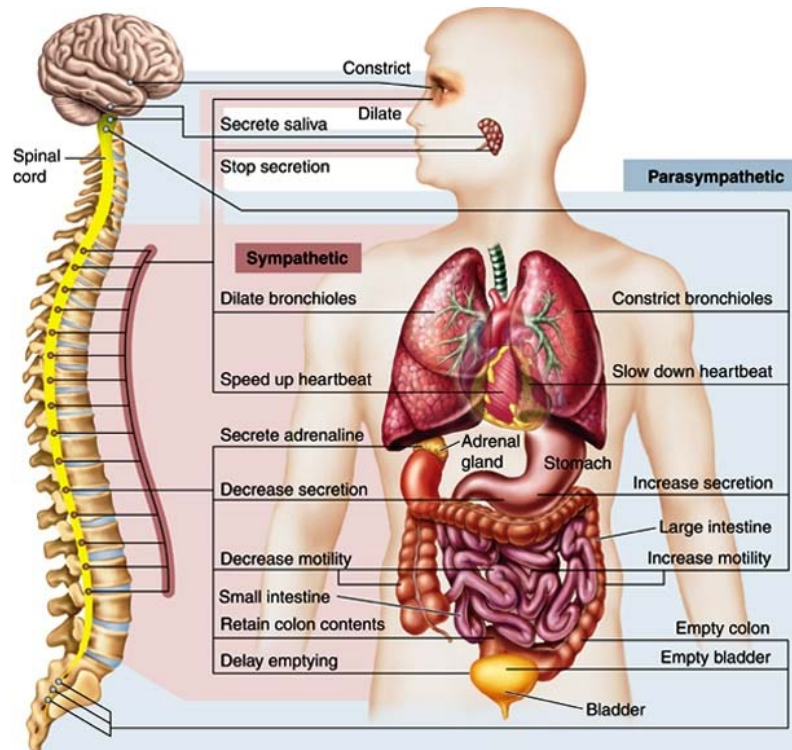
Publication year: 2019

Key Concepts

- The autonomic nervous system controls visceral functions of the body, including those associated with cardiovascular activity, digestion, metabolism, and thermoregulation.
- Functioning primarily at a subconscious level, the autonomic nervous system innervates smooth and cardiac muscles and the glands.
- The autonomic nervous system is traditionally partitioned into the sympathetic system and the parasympathetic system, based on the region of the brain or spinal cord in which the autonomic nerves have their origin.
- The autonomic nervous system may be phylogenetically organized by proceeding from primitive structures that conserve metabolic resources and regulate visceral homeostasis, to structures that mobilize for fight-flight behaviors, and finally to structures found only in mammals that promote social and emotional behavior.

The part of the nervous system that controls visceral (internal organ) functions of the body. The autonomic nervous system (see **illustration**) innervates smooth and cardiac muscles and the glands, and regulates visceral processes involuntarily, including those associated with cardiovascular activity, digestion, metabolism, and thermoregulation. The autonomic nervous system functions primarily at a subconscious level. It is traditionally partitioned into the sympathetic system and the parasympathetic system, based on the region of the brain or spinal cord in which the autonomic nerves have their origin. The sympathetic system is defined by the autonomic fibers that exit thoracic and lumbar segments of the spinal cord. The parasympathetic system is defined by the autonomic fibers that either exit the brainstem via the cranial nerves or exit the sacral segments of the spinal cord. *See also:* BRAIN; CARDIOVASCULAR SYSTEM; GLAND; MUSCLE; MUSCULAR SYSTEM; NERVOUS SYSTEM (VERTEBRATE); PARASYMPATHETIC NERVOUS SYSTEM; SPINAL CORD; SYMPATHETIC NERVOUS SYSTEM.

The defining features of the autonomic nervous system were initially limited to motor fibers innervating glands and smooth and cardiac muscles. This arbitrary definition limited the autonomic nervous system to visceral efferent fibers and excluded the sensory fibers that accompany most visceral motor fibers. Although the definition is often expanded to include both peripheral and central structures (such as the hypothalamus), contemporary literature continues to define the autonomic nervous system solely as a motor system. This bias



The autonomic nervous system is traditionally partitioned into the sympathetic system and the parasympathetic system, based on the region of the brain or spinal cord in which the autonomic nerves have their origin. (Copyright © McGraw-Hill Education)

ignores the importance of the afferent pathways. Moreover, it confuses the study of the dynamic regulatory function of the autonomic nervous system because the regulation of visceral state and the maintenance of homeostasis implicitly assume a feedback system with the necessary constituents of motor, sensory, and regulatory components. Thus, from a functional perspective, the autonomic nervous system includes afferent pathways conveying information regarding the visceral organs and the brain areas (such as the medulla and hypothalamus) that interpret the afferent feedback and exert control over the motor output back to the visceral organs. *See also:* CENTRAL NERVOUS SYSTEM; HOMEOSTASIS; MOTOR SYSTEMS.

Phylogeny provides insights into the functional and anatomical organization of the autonomic nervous system. The autonomic nervous system may be phylogenetically organized by proceeding from primitive structures that conserve metabolic resources and regulate visceral homeostasis, to structures that mobilize for fight-flight behaviors, and finally to structures found only in mammals that promote social and emotional behavior. Paralleling these functional shifts are increases in the interaction between visceral and somatic neurons and increases in influences from higher brain structures. *See also:* NEUROBIOLOGY; NEURON; PHYLOGENY.

Keywords

autonomic; autonomic nervous system; brain; cardiac muscle; gland; motor fiber; nervous system; parasympathetic; parasympathetic system; smooth muscle; spinal cord; sympathetic; sympathetic system

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Additional Readings

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