Human Anatomy and Physiology - Core Concept Cheat Sheet

15: The Autonomic Nervous System

Key Terms

- **Autonomic Nervous System**: The autonomic nervous system is made up of afferent and efferent neurons that connect the autonomic nervous system to visceral effector organs.
- **Parasympathetic Division**: The parasympathetic division of the autonomic nervous system is active during periods of rest and digestion. The parasympathetic division innervation involves the cranial nerves, such as the facial nerve.
- **Sympathetic Division**: The sympathetic division of the autonomic nervous system is active during times of physical or mental stress on the body. As the system’s activity increases, skeletal muscles and heart rate are prepared for a fight-or-flight response.
- **Sensory Information**: The autonomic nervous system generates a response, based on the information received from the sensory branch.
- **Vagus Nerve**: The vagus nerve synapses with the intramural ganglion. There are many targets, including: the visceral organs of the neck, thoracic cavity and most of the abdominal cavity. This leads to stimulation of secretion and an increase in motility in the stomach and intestine.
- **Nicotinic and Muscarinic Receptors**: The nicotinic receptor subtype is located on all the ganglionic neurons. Muscarinic receptors are located at cholinergic neuroeffector junctions (small narrow synaptic clefts).
- **Alpha and Beta Receptors**: Alpha receptors are located primarily on the surface of smooth muscle cells in blood vessels. Beta receptors are located in the heart, liver, and skeletal muscles.
- **Autonomic Plexuses**: Within the abdominopelvic cavities, both the parasympathetic and sympathetic fibers mix in special plexuses.
- **Autonomic Control**: The control of the autonomic nervous system can be divided as follows: (1) sympathetic division is controlled from the posterior and lateral hypothalamus, and (2) the parasympathetic division is controlled from portions of the anterior and medial hypothalamus.

Parasympathetic Division

- Oculomotor Nerve (N III)
- Glossopharyngeal Nerve (N IX)
- Facial Nerve (N VII)
- Vagus Nerve (N X)
- Pelvic Nerves

The parasympathetic division of the autonomic nervous system is active during periods of rest and digestion. The parasympathetic division innervation involves the cranial nerves, such as the facial nerve.

Sympathetic Division

- Celiac Ganglion
- Superior Mesenteric Ganglion
- Inferior Mesenteric Ganglion

Levels of Autonomic Control

- The cerebral cortex communicates at a subconscious level with both the hypothalamus and the pons. It can dramatically influence the autonomic nervous system.
- The limbic system inputs the emotional state into the autonomic nervous system. Anger or fear directly impact the action of the sympathetic division.
- The hypothalamus is the control center for both the parasympathetic and sympathetic divisions of the autonomic nervous system.
- The medulla oblongata contains centers, such as the cardiac and respiratory centers. These act as processing centers for both parasympathetic and sympathetic complex visceral reflexes.

Autonomic Plexuses

- Cardiac Plexus
- Pulmonary Plexus
- Esophageal Plexus
- Celiac Plexus
- Inferior Mesenteric Plexus
- Hypogastric Plexus

Within the abdominopelvic cavities, both the parasympathetic and sympathetic fibers mix in special plexuses: cardiac, pulmonary, esophagus, celiac, inferior mesenteric and the hypogastric plexus.