Human Nerve Chapter

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Experiments

Basic Level Difficulty Rating: Can Be Done With:

HN-1: Auditory and Visual Reflexes 3 AHK/214, HK/214, PK/214

HN-2: Stretch Receptors and Reflexes 3 AHK/214, HK/214, PK/214

HN-3: Human Nerve Conduction Velocity 4 AHK/214, HK/214, PK/214

HN-4: Hand vs. Foot Reactions 3 AHK/214, HK/214, PK/214

HN-5: Visual Reflexes and Color Stimulation 3 AHK/214, HK/214, PK/214

Overview

During daily activities, animals must detect changes in their internal and external environments and react to those changes in an appropriate manner to maintain a constant internal environment and respond to changes in the external environment. In vertebrates, these functions are controlled by two organ systems that integrate and coordinate with each other, the nervous and the endocrine systems. Nervous systems perform these basic functions:

- Receiving sensory input from the internal and external environments through receptors.
- Integrating the inputs in a central location to determine an appropriate response.
- Producing a motor response that causes one or more muscles to contract and move a body part, or cause an organ to release molecules that trigger responses in other cells or organs.

The vertebrate nervous system is organized into two major divisions: the central nervous systems (CNS), which is composed of the brain and the spinal cord; and, the peripheral nervous system (PNS), which is composed of all the nerves not within the CNS. The majority of the nerves that are in the PNS are composed of the axons of nerve cells whose cell bodies (somas) are in the central nervous system.

The peripheral nervous system is divided into the somatic and the autonomic nervous systems. The somatic nervous system senses changes in the external environment through receptors that respond to sound, light, taste, pressure, and odors. The receptors generate signals that is propagated to the brain or the spinal cord through the sensory neurons in the peripheral nervous system. Once the signals are integrated with additional information in the central nervous system, signals that control muscles are generated and propagated to the effected muscles through the motor neurons in the somatic nervous system.

The autonomic nervous system is divided into the sympathetic, parasympathetic, and enteric nervous systems. The sympathetic nervous system creates responses to impending danger or stress by increasing physiological parameters like heart rate, blood pressure, and adrenaline levels. The parasympathetic nervous system restores physiological parameters to levels normally seen during rest and relaxation like a slow heart rate, vasodilation, and functioning of the digestive and urogenital systems. The enteric nervous system manages all aspects of digestion from the esophagus to the colon

A reflex, like the myotactic reflex, is the simplest circuit involving a receptor, sensory nerves, the spinal cord, motor neurons, and muscle. The reflex is managed through single synapses between sensory axons and motor neurons. The required circuitry for this reflex is confined to the spinal cord.

Sensory information also ascends to higher centers in the brain, but the brain is not nee the reflex.

More complex reflexes involve interneurons, that connect the sensory axons to the mot more than one population of motor neurons. Since more neurons and synapses are involved, it takes longer to generate a more complex response to the stimulus. One example of complex response is the flexion withdrawal reflex, where a stimulus to one leg causes withdrawal of the stimulated leg and extension of the other.