Summary: Nervous System Structure and Function

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April 13, 2020

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1 Overview: actors and structures of the nervous system

1.1 Structure of the Neuron

In contrast with the chemical message-reliant **endocrine** system, the **nervous system** is capable of quickly conveying particular messages to and from different actors in the body through **neurons**— chemically and electrically signaling nerve cells. Typically, a neuron consists of:

- A **cell body** containing the nucleus and organelles
- Extensions that convey signals

In some cases, a **neuron** may be referred to as a **nerve**, should it be wrapped in connective tissue.

1.2 Structure of the Nervous System

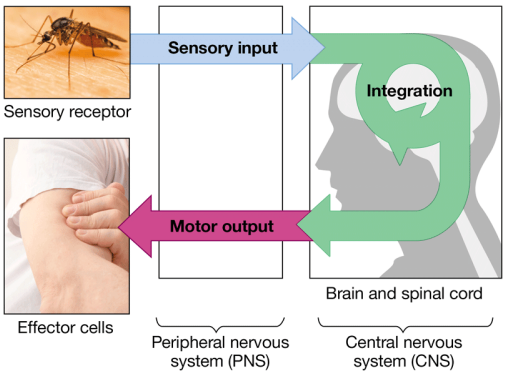

Figure 1: The three functions of the nervous system, exemplified in the human body.

The nervous system can be divided into two spatially distinct systems: the **central nervous system (CNS)** and the **peripheral nervous system (PNS)**. The former of the aforementioned anatomical divisions—the CNS —is comprised by the *brain* and the *spinal cord* (where applicable). The latter consists of neurons that work in conjunction with the CNS to transmit and convey information through the body. These systems function with the goal of providing utility with respect to three functions:

1. **Sensory input**: the flow of signals from sensory receptors, through the PNS to the CNS
2. **Integration**: the formation of appropriate responses to certain stimuli
3. **Motor output**: the application of responses generated through integration via **effector cells** (e.g., muscle, gland cells)

In the nervous system, implementation of these three functions is achieved through the utilization of three distinct classes of neruons: **sensory neurons**, **interneurons**, and **motor neurons**. Sensory neurons are responsible for making data collected from the sensory receptors available to the central nervous system. Of course, this data must *integrated*. This is achieved by the interneurons. The last of the aforementioned functions, motor output, is provided by motor neurons, which apply responses generated through integration via effector cells.

For example, consider the pathway of data from the outside world to effector cells with respect to a **reflex**, such as the "knee jerk:"

1. A tendon in the knee is tapped
2. The quadricep muscles are stretched
3. The stretch is detected by a sensor receptor
4. The stretch is conveyed to the spinal cord via a sensory neuron
5. A motor neuron in the CNS receives data regarding the "tap"
6. Several interneurons are made aware of the event
7. A motor neuron signals the quadriceps to contract