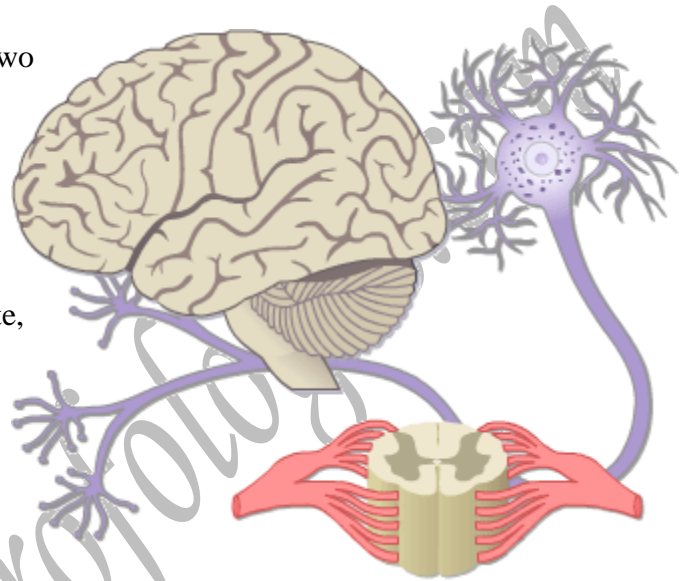




The Nervous System

Conditions both within the body and in the environment are constantly changing. The nervous system directs the complex processes of the body's internal environment and also provides a link to the external world. This allows us to respond to changes both from internal sources as well as from external stimuli.

The nervous system is broken down into two major parts, the central nervous system, which includes the brain and spinal cord and the peripheral nervous system, which includes all nerves, which carry impulses to and from the brain and spinal cord. These include our sense organs, the eyes, the ears, our sense of taste, smell and touch, as well as our ability to feel pain.



Central Nervous System

Spinal Cord

The spinal cord is a long bundle of neural tissue continuous with the brain that occupies the interior canal of the spinal column and functions as the primary communication link between the brain and the rest of the body. The spinal cord receives signals from the peripheral senses and relays them to the brain.

Brain Stem

The brain stem is the part of the brain that connects the cerebrum and diencephalons with the spinal cord.

Medulla Oblongata

The medulla oblongata is located just above the spinal cord. This part of the brain is responsible for several vital autonomic centres including:

- The respiratory centre, which regulates breathing.
- The cardiac centre that regulates the rate and force of the heartbeat.
- The vasomotor centre, which regulates the contraction of smooth muscle in the blood vessel, thus controlling blood pressure.

The medulla also controls other reflex actions including vomiting, sneezing, coughing and swallowing.

Pons

Continuing up the brain stem, one reaches the Pons. The pons lie just above the medulla and act as a link between various parts of the brain. The pons connect the two halves of the cerebellum with the brainstem, as well as the cerebrum with the spinal cord. The pons, like the medulla oblongata contains certain reflex actions, such as some of the respiratory responses.

Midbrain

The midbrain extends from the pons to the diencephalon. The midbrain acts as a relay centre for certain head and eye reflexes in response to visual stimuli. The midbrain is also a major relay centre for auditory information.

Diencephalon

The diencephalon is located between the cerebrum and the mid brain. The diencephalon houses important structures including the thalamus, the hypothalamus and the pineal gland.

Thalamus

The thalamus is responsible for "sorting out" sensory impulses and directing them to a particular area of the brain. Nearly all sensory impulses travel through the thalamus.

Hypothalamus

The hypothalamus is the great controller of body regulation and plays an important role in the connection between mind and body, where it serves as the primary link between the nervous and endocrine systems. The hypothalamus produces hormones that regulate the secretion of specific hormones from the pituitary. The hypothalamus also maintains water balance, appetite, sexual behaviour, and some emotions, including fear, pleasure and pain.

Cerebellum

The functions of the cerebellum include the coordination of voluntary muscles, the maintenance of balance when standing, walking and sitting and the maintenance of muscle tone ensuring that the body can adapt to changes in position quickly. Cerebrum: The largest and most prominent part of the brain, the cerebrum governs higher mental processes including intellect, reason, memory and language skills. The cerebrum can be divided into 3 major functions:

- Sensory Functions - the cerebrum receives information from a sense organ, i.e. eyes, ears, taste, smell, feelings, and translates this information into a form that can be understood.
- Motor Functions - all voluntary movement and some involuntary movement.
- Intellectual Functions - responsible for learning, memory and recall.

Meninges

The meninges are made up of 3 layers of connective tissue that surround and protect both the brain and spinal cord. The layers include the dura mater, the arachnoid and the pia matter.

Cerebrospinal Fluid

The cerebrospinal fluid is a clear liquid that circulates in and around the brain and spinal cord. Its function is to cushion the brain and spinal cord, carry nutrients to the cells and remove waste products from these tissues.

Peripheral Nervous System

Nerves

Nerves are made up of specialized cells, which act as little wires, transmitting information to and from the central nervous system and brain. Nerves form the network of connections that receive signals, known as sensory input, from the environment and within the body and transmit the body's responses, or instructions for action, to the muscles, organs, and glands. Nerve cells are located outside the central nervous system or spinal cord.

Eyes

The eyes are organs, which provide us with visual information from the external world, which is transmitted and interpreted by the brain.

Ears

The ears are the organ used for both hearing and equilibrium. The ear can be divided into three sections, the outer that includes the parts of the ear we see and the ear canal, which connects the external ear to the middle ear. It is separated from the middle ear by the tympanic membrane or eardrum. The middle ear contains three small bones that conduct sound waves. The inner ear contains sensory receptors and the mechanisms responsible for equilibrium.

Taste

The sense of taste is perceived through the taste buds, which are located in various parts of the mouth, but are primarily concentrated on the tongue. Taste is experienced in four different ways - sweet, sour, salty or bitter. It is interesting to note, that only substances in solution can be perceived by the taste buds.

Smell

The receptors for smell are located in the upper part of the nasal cavity in the olfactory epithelium. The sense of smell can distinguish a greater variety of substances than the sense of taste. Here too, substances that are detected by these receptors must be in solution.

Tactile Sensation

There are several other types of receptors located throughout the body. They are considered general senses and provide us with tactile sensations including the feeling of pressure, heat, cold, pain and touch.