

Meninges and Tracts

The nervous system consists of two main divisions: the **central nervous system** (CNS), consisting of **brain** and **spinal cord**, and the **peripheral nervous system**, consisting of **cranial** and **spinal nerves**, and their associated **ganglia**.

Three membranes surround both spinal cord and brain: **dura mater**, **arachnoid mater**, and **pia mater**. The dura mater is a tough, fibrous coat that encloses the spinal column and cauda equina, which is a bundle of nerve roots from the lumbar, sacral and coccygeal spinal nerves. The dura mater runs rostrally and is continuous beyond the foramen magnum with the dural meninges, which cover the brain. Caudally, the dura ends on the filum terminale at the level of the lower end of the second sacral vertebra. The dura is separated from the walls of the vertebral canal by the extradural space, which contains the internal vertebral venous plexus. The dura extends along the nerve roots and is continuous with the connective tissue that surrounds the spinal nerves. The inner surface of the dura is in direct contact with the arachnoid mater.

The arachnoid mater is a relatively fragile, impermeable layer that covers the spinal cord, the brain and spinal nerve roots, and is separated from the pia by the wide subarachnoid space, which is filled with cerebrospinal fluid. The pia mater is a highly vascularized membrane closely apposed to the spinal cord. It thickens on each side between the nerve roots to form lateral supports, anchored to the arachnoid, which suspend the spinal cord securely in the center of the dural sheath.

The **spinal cord** is an approximately cylindrical column, continuous with the medulla oblongata, that extends in adults from the foramen magnum to the lower border of the first lumbar vertebra. Structurally, the cord contains central gray matter, roughly H-shaped, consisting of the

anterior and **posterior horns** and joined by a thin commissure containing the **central canal**, which is connected to the fourth ventricle. The gray matter is surrounded by white matter, which consists mainly of ascending and descending tracts, and has been divided arbitrarily into **anterior**, **lateral**, and **posterior columns**. The individual tracts will be dealt with in more detail later.

In the peripheral nervous system, there are 12 pairs of **cranial nerves**, which leave the brain through foramina (apertures) in the skull, and 31 pairs of **spinal nerves**, which leave the spinal cord through vertebral foramina. There are eight cervical, 12 thoracic, five lumbar, five sacral, and one coccygeal pair of spinal nerves. The spinal nerves are linked to the cord by **dorsal (posterior)** nerve roots, which carry afferent nerves into the CNS, and **ventral (anterior)** nerve roots, which carry efferent nerves away from the CNS. Afferent fibers are also called sensory fibers, and their cell bodies are situated in the swellings or **ganglia** on the dorsal roots.

