

I. Spinal Cord

A. Functions

1. Transports sensory impulses toward the brain.
2. Transports motor impulses away from the brain towards an effector (muscle or gland).
3. Acts as a reflex center.
 - a. A **reflex** is an involuntary sequence of actions that occurs in response to a stimulus. Will look at these in more detail with the somatic and autonomic nervous system.

B. Structure

1. Begins at the medulla oblongata (between the atlas and axis) and extends to the 2nd lumbar vertebra (the vertebral column continues to grow after the spinal cord stops growing).
2. Contains **cervical and lumbar enlargements** due to the large numbers of axons entering and exiting the spinal cord for the arms and legs.
3. **Cauda equina** (horse's tail)
 - a. Because the spinal cord is shorter than the vertebral column spinal nerve roots hang down below the end of the cord in order to reach **intervertebral foramina** between the lower lumbar and sacral vertebrae.
 - b. The hanging nerve roots look like a horse's tail.
4. The end of the spinal cord is the **conus medullaris**.

C. Spinal meninges

1. These are an extension of the cranial meninges wrapping the brain.
2. The **dura mater** is the outermost layer extending to the 2nd sacral vertebra.
3. The **epidural space** surrounds the outside of the dura mater and is filled with adipose tissue to act as a cushion.
4. The **arachnoid mater** is the middle layer and extends to the second sacral vertebra.
5. The **subarachnoid space** is deep to the arachnoid mater and is filled with cerebrospinal fluid.
 - a. During a **spinal tap** a needle is inserted into this space within the lumbar region in order to remove cerebrospinal fluid.
6. The **pia mater** is the innermost layer adhering to the surface of the spinal cord.
 - a. The pia mater extends off the end of the spinal cord, anchoring the spinal cord to the coccyx and forming the **filum terminale**.

D. Cross section of the spinal cord

1. The gray matter (cell bodies) is interior forming the shape of the letter "H" in the center of the cord.
 - a. The gray matter is divided into regions known as horns.
 - i. **Anterior (ventral) horns** contain cell bodies of neurons (**lower motor neurons**) supplying impulses to skeletal muscles for the somatic nervous system.
 - ii. **Posterior (dorsal) horns** contain cell bodies of sensory neurons.
 - iii. **Lateral horns** contain cell bodies of neurons (**preganglionic neurons**) supplying impulses to cardiac and smooth muscle and glands for the autonomic nervous system.
2. The **gray commissure** connects the 2 halves of gray matter.

3. The **central canal** is a small space that extends the length of the cord carrying cerebrospinal fluid.
4. The white matter (axons of neurons) surrounds the gray matter and is organized into regions called **columns** or **funiculi**.
 - a. There are posterior, lateral and anterior columns.
 - b. Within each column are groups of axons forming **tracts**.
 - c. All of the axons within a tract may have a common origin, destination or be carrying similar information.
 - i. For example, all of the axons carrying sensory information for temperature will travel together within the same tract.
 - d. The tracts can be divided into **sensory (ascending) tracts** carrying sensory information towards the brain, or **motor (descending) tracts** carrying motor information away from the brain.
 - e. Tracts of the posterior column carry sensory information for light touch, proprioception (joint and muscle movement) and pressure.
 - f. Tracts of the lateral column
 - i. The **lateral spinothalamic tract** carries sensory information for pain and temperature.
 - ii. The **spinocerebellar tracts** carry sensory information on proprioception to the cerebellum.
 - iii. The **lateral corticospinal tract** carries axons of somatic motor neurons (upper motor neurons) transporting information from the cortex to a lower motor neuron which relays the impulse to a skeletal muscle.
 - iv. The **rubrospinal tract** carries motor information away from the cerebellum in order to coordinate body movements.
 - g. Tracts of the anterior column
 - i. The **anterior spinothalamic tract** carries sensory information for crude touch and pressure.
 - ii. The **anterior corticospinal tract** (see lateral corticospinal tract).

II. Spinal cord injuries

- A. 90% of the 10,000 new cases a year are young “macho” males.
- B. The injuries occur between 12 midnight and 5 a.m. and are associated with drugs and alcohol.
- C. Automobile accidents are the major cause.