

THE SPINAL CORD

Gray matter inner core (shaped like a butterfly) – cell bodies

Dorsal horn: location of CNS cell bodies for sensory neurons

Ventral horn: location of CNS cell bodies for motor neurons

White matter surrounds gray matter –myelinated axons going up or down (up for sensory, down for motor)

Dorsal root: The spinal nerve splits, and sensory axons pass this way to the spinal cord, then pass into the **dorsal root ganglion (DRG)**, where the cell bodies from unipolar sensory neurons are found. The axons of these neurons continue on to synapse in the dorsal horn with central nervous system sensory neurons.

Ventral root: Somatic motor axons and sympathetic motor axons leave via the ventral root.

All spinal nerves are mixed (meaning that sensory and motor axons are found in them).

- There are 31 pairs of spinal nerves. 8 cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccyx

The actual spinal nerve is very short. Immediately upon exiting the vertebral column, the nerve splits into the dorsal and ventral ramus.

Dorsal rami: nerves to skin and muscles of back

Ventral rami: nerves to skin and muscles of rest of the body; nerves to all internal organs and limbs.

Plexus: Complex nerve network

Cervical plexus: diaphragm/shoulder and neck muscles; includes phrenic nerve

Brachial: arm and hand

Lumbar: lower abdomen, hips, upper legs

Sacral: hips, legs; includes sciatic nerve

Spinal nerves leaving from T1-T12 have no plexus—straight intercostal nerves encircle the thorax (run between the ribs).

Sensory neurons fire action potentials from the periphery (for example, your finger) up to the spinal cord. The cell body for this neuron will always be found just outside the spinal cord in a swelling known as the dorsal root ganglion. Each spinal nerve serves one dorsal root ganglion. The neuron then travels into the dorsal horn of the spinal cord where it synapses with another neuron that will carry the message up to the lower brain. Another synapse or two later, the message will be received by the neurons of the postcentral gyrus, and the sensation processed.

Motor neurons receive their messages from the brain, often from the precentral gyrus. Once stimulated, the motor neuron will fire an action potential out the ventral root of the spinal cord and it will travel to its target organ to cause movement or secretion of a gland.

Reflexes bypass processing in the brain. Reflexes typically serve to protect us from physical injury. A very short reflex would involve a sensory neuron from a part of the leg that passes into the dorsal horn and then immediately synapses with a motor neuron in the ventral horn. The effect of the motor neuron would be to contract a muscle in our leg to keep us from falling.