

"Spinal Cord (Part 3/4)"

Descending Tracts of Spinal Cord

» Definition:

- The nerve fibers descending in the white matter from different supraspinal levels are segregated into nerve bundles called as descending tracts

Table 4-4 Main Descending Pathways to the Spinal Cord^a

Pathway	Function	Origin	Site of Crossover	Destination	Branches to
Corticospinal tracts	Rapid, skilled, voluntary movements, especially distal ends of limbs	Primary motor cortex (area 4), secondary motor cortex (area 6), parietal lobe (areas 3, 1, and 2)	Most cross at decussation of pyramids and descend as lateral corticospinal tracts; some continue as anterior corticospinal tracts and cross over at level of destination	Internuncial neurons or α motor neurons	Cerebral cortex, basal nuclei, red nucleus, olivary nuclei, reticular formation
Reticulospinal tracts	Inhibit or facilitate voluntary movement; hypothalamus controls sympathetic, para-sympathetic outflows	Reticular formation	Some cross at various levels	α and γ motor neurons	Multiple branches as they descend
Tectospinal tract	Reflex postural movements concerning sight	Superior colliculus	Soon after origin	α and γ motor neurons	?
Rubrospinal tract	Facilitates activity of flexor muscles and inhibits activity of extensor muscles	Red nucleus	Immediately	α and γ motor neurons	?
Vestibulospinal tract	Facilitates activity of extensor inhibits flexor muscles	Vestibular nuclei	Uncrossed	α and γ motor neurons	?
Olivospinal tract	??	Inferior olivary nuclei	Cross in brainstem	? α and γ motor neurons	—
Descending autonomic fibers	Control sympathetic and parasympathetic systems	Cerebral cortex, hypothalamus, amygdaloid complex, reticular formation		Sympathetic and parasympathetic outflows	—

^aNote that the corticospinal tracts are believed to control the prime mover muscles (especially the highly skilled movements), whereas the other descending tracts are important in controlling the simple basic movements. For simplicity, the internuncial neurons are omitted from this table.

» General organization

- First order neuron
 - Cell body in the cerebral cortex
- Second order neuron
 - An internuncial neuron, situated in the anterior gray column of the spinal cord.
- Third order neuron
 - The lower motor neuron, in the anterior gray column
 - Innervates the skeletal muscle through the anterior root (and spinal nerve)

» Intersegmental tracts

- Short ascending and descending tracts that originate and end within the spinal cord
- Exist in the anterior, lateral, and posterior white columns.
- Interconnect the neurons of different segmental levels, and particularly important in intersegmental spinal reflexes.

» Upper Motor Neurons (UMNs)

- Are cortical neurons that give rise to corticobulbar or corticospinal tracts.
- Influence lower motor neurons (LMNs)
- Terminate directly on or via interneurons on LMNs.

» Lower Motor Neurons (LMNs)

- Are neurons that directly innervate skeletal muscles.
- Are found in the ventral horns of the spinal cord.
- Are found in the motor nuclei of CN III, CN IV to CN VII and CN IX to CN XII
 - (I, II and VIII not included)

- Side Note -

- Upper Motor Neurons (UMNs) reside in the cerebral cortex (primary motor cortex) and brainstem (e.g., corticospinal and corticobulbar tracts). Their axons descend to synapse on lower motor neurons.
- Lower Motor Neurons (LMNs) are located in the anterior horn of the spinal cord (for spinal nerves) and the brainstem motor nuclei (for cranial nerves). They directly innervate muscles.