

Difference Between Preganglionic and Postganglionic Neurons

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Key Difference - Preganglionic vs Postganglionic Neurons

The nervous system is an important organ system of living organisms. It involves many different functions including coordination of the body functions and responding to stimuli. Neurons are the basic structural and functional units of the nervous system. Different types of neurons are present in the nervous system. Preganglionic and postganglionic neurons are examples of such different neuron types. They differ in both physiology and function. **Preganglionic neurons are a set of nerve fibers of the autonomic nervous system that connects the central nervous system to the ganglia. Postganglionic neurons are a set of nerve fibers that present in the autonomic nervous system connecting the ganglia to the effector organs.** This is the **key difference** between preganglionic and postganglionic neurons.

What are Preganglionic Neurons?

Preganglionic neurons are a group of nerve fibers of the autonomic nervous system that connect the central nervous system (brain and spinal cord) to the ganglia. All the preganglionic fibers of the autonomic nervous system are said to be cholinergic, meaning that these nerve cells use acetylcholine as their neurotransmitter during the signal transmission. Cholinergic property of these nerve fibers is common to both sympathetic nervous system and parasympathetic nervous system of the autonomic nervous system. All these neurons are myelinated for efficient transmission of nerve impulses.

There is a small difference between the preganglionic neurons of the sympathetic nervous system and parasympathetic nervous system. The preganglionic neurons of the sympathetic nervous system are much shorter than the preganglionic neurons of the parasympathetic nervous system. This difference is due to the fact that, preganglionic neurons of the sympathetic nervous system are located closer to the spinal cord than the preganglionic neurons of the parasympathetic nervous system. The parasympathetic nervous system is more closely located to the effector organs.

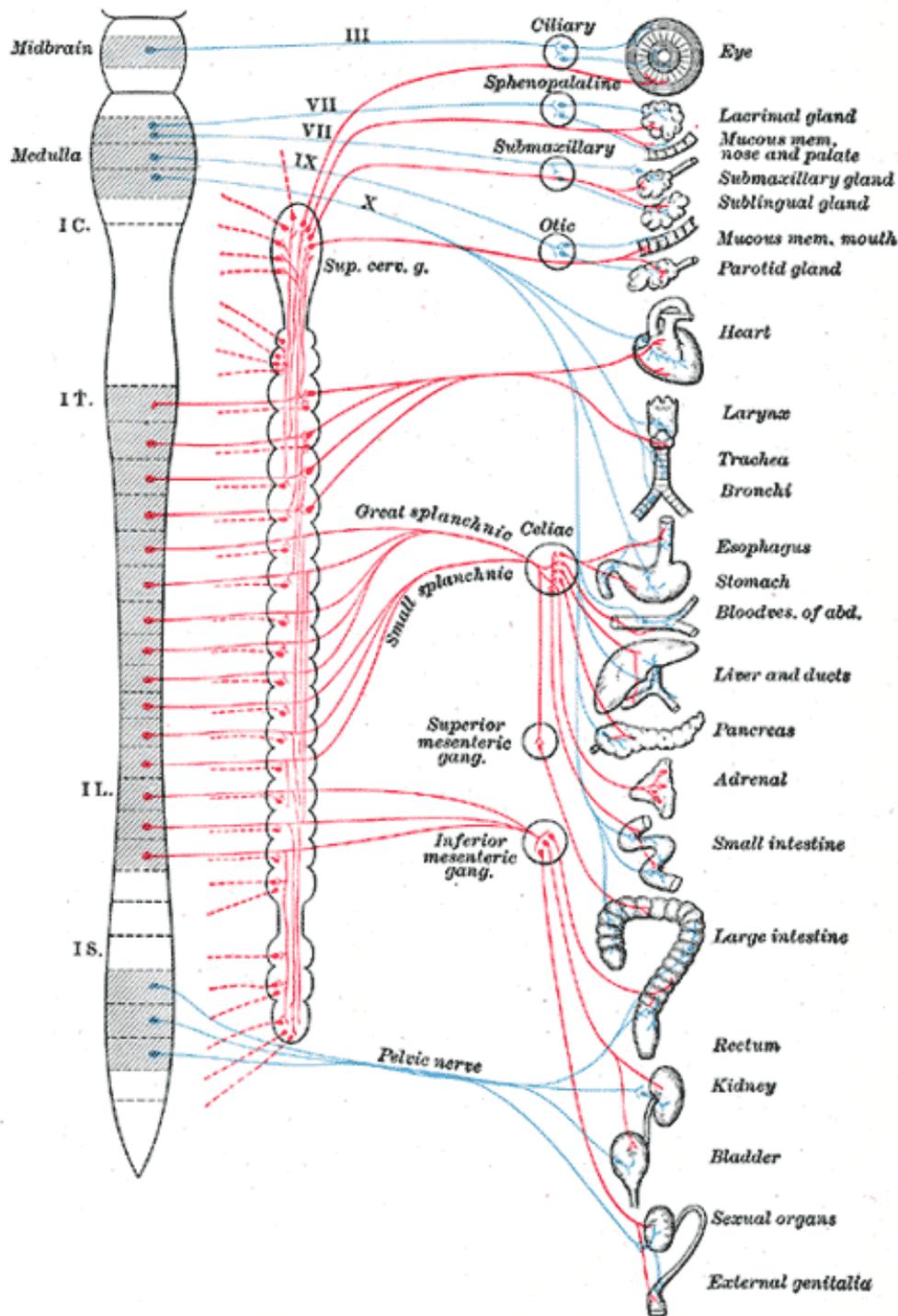


Figure 01: Preganglionic Neurons

In the context of spinal cord exit points, preganglionic neurons of sympathetic and parasympathetic nervous systems differ. The sympathetic nervous system possesses a thoracolumbar outflow, which means the preganglionic neurons begins at the points of T1 to L2 of thoracic and lumbar portions of the spinal cord respectively. The parasympathetic nervous system consists of a craniosacral outflow, which means the preganglionic nerve fibers begins at the cranial nerves CN2, CN7, CN9, CN10 and sacral nerves S2, S3 and S4 of the spinal cord.

What are Postganglionic Neurons?

In the context of postganglionic neurons, they are the set of nerve fibers that present in the autonomic nervous system which connect the ganglia to the effector organs. The interaction of the postganglionic neurons with the effector organs responsible for creating different activity changes within the organ through biochemical regulations. The postganglionic neurons of both sympathetic and parasympathetic nervous systems contain few differences. The postganglionic neurons of sympathetic system are adrenergic. This means these neurons use adrenaline, noradrenaline as the neurotransmitters.

The postganglionic neurons of parasympathetic are cholinergic similar to preganglionic neurons. Therefore these neurons use acetylcholine as the neurotransmitter. At the synapses that are present within the ganglia, preganglionic nerve fibers release acetylcholine that involves the activation of nicotinic acetylcholine receptors present in the postganglionic neurons. As a response to this particular stimulus, postganglionic neurons release norepinephrine that results in the activation of adrenergic receptors present in the peripheral tissues of the target organ.

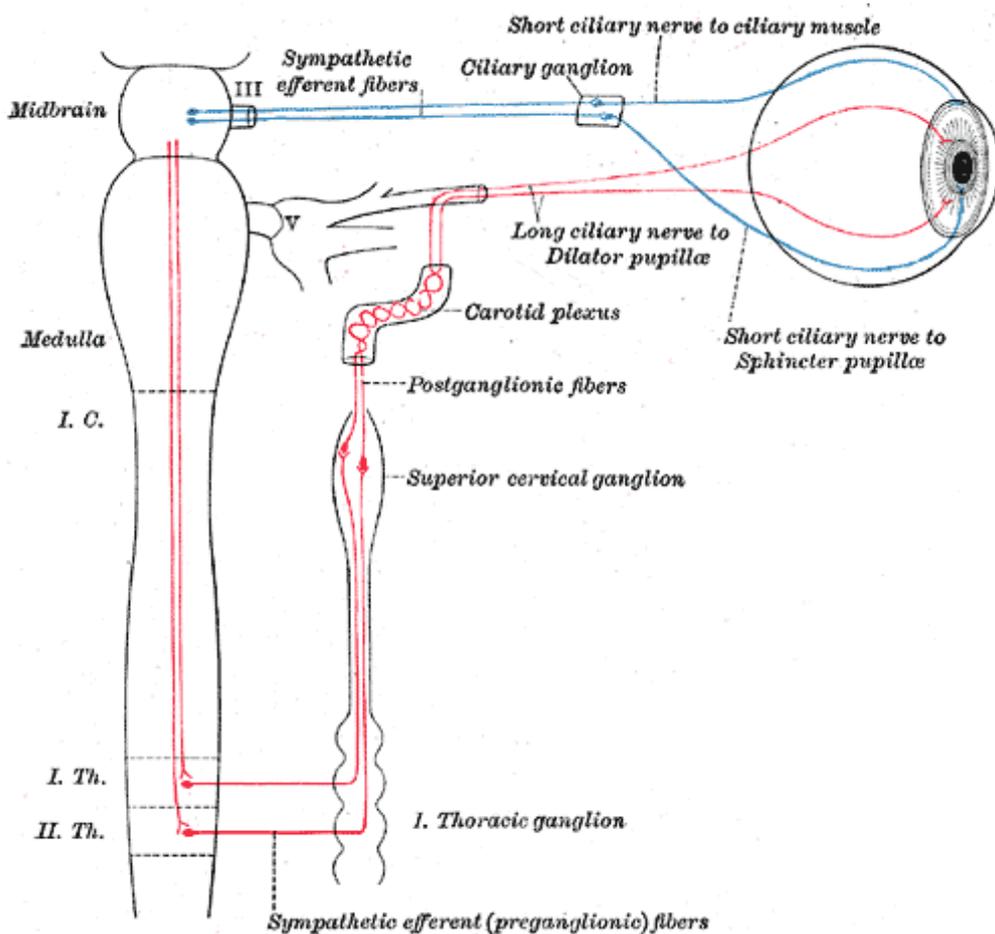


Figure 02: Postganglionic Neurons

There are two exceptions in the context of responding to acetylcholine effect by postganglionic neurons. They include chromaffin cells of the adrenal medulla and postganglionic neurons of sweat glands where they secrete acetylcholine to activate muscarinic receptors. The chromaffin cells of adrenal medulla function as postganglionic neurons. The development of adrenal medulla takes place in the sympathetic nervous system. Finally, it functions as a modified sympathetic ganglion.

What are the Similarities Between Preganglionic and Postganglionic Neurons?

- Both are types of neurons or nerve cells present in the nervous system.
- Both involve in the response generation for a particular stimulus.
- Both types are present in sympathetic and parasympathetic nervous systems.

What is the Difference Between Preganglionic and Postganglionic Neurons?

Preganglionic vs Postganglionic Neuron	
Preganglionic neurons are a set of nerve fibers of the autonomic nervous system that connect the central nervous system to the ganglia.	Postganglionic neurons are a set of nerve fibers that present in the autonomic nervous system which connects the ganglion to the effector organ.
Connection with the Central Nervous System	
Preganglionic neurons are connected to the central nervous system.	Postganglionic neurons are not directly connected to the central nervous system.
Connection with Effector Organs	
Preganglionic neurons are not connected with effector organs.	Postganglionic neurons are connected with effector organs.

Summary - Preganglionic vs Postganglionic Neurons

Preganglionic neurons are the set of nerve fibers of the autonomic nervous system that connect the central nervous system to the ganglia. All the preganglionic fibers that belong to the autonomous nervous system are cholinergic. Postganglionic neurons are a set of nerve fibers that present in the autonomic nervous system which connect the ganglia to the effector organs. The interaction of these postganglionic neurons with the effector organ is responsible for creating changes within the effector organ. The postganglionic neurons of the sympathetic system are adrenergic. The postganglionic

neurons of parasympathetic are cholinergic. This is the difference between preganglionic and postganglionic neurons.

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