

1.5.3

The SNS and the PNS

The table below helps us compare and contrast some of the characteristics of the SNS and the PNS.

	Sympathetic		Parasympathetic	
	Preganglionic Neuron	Postganglionic Neuron	Preganglionic Neuron	Postganglionic Neuron
Neuron Length	Short to Medium	Medium to Long	Long	Short
Neurotransmitter Released	ACH	NE (except sweat glands and some blood vessels – ACH)	ACH	ACH

Characteristics of Sympathetic and Parasympathetic Nervous System.

Image by BYU-Idaho Student 2013

ACH is short for Acetylcholine and NE is short for Norepinephrine. Acetylcholine and Norepinephrine are neurotransmitters.

Sympathetic Division (SNS)

As you read these next sections, it might be helpful to look at the picture “**Organization of the ANS**” above as you read.

Cell bodies of the preganglionic axons of the sympathetic division are located in segments T1 through about L2 to L3 of the lateral horn of the spinal cord. From here, these axons project away from the spinal cord and enter a sympathetic chain ganglia, which are ganglia located along the spinal cord bilaterally.

The following are descriptions of four different routes taken by sympathetic axons traveling from the CNS, to their **effectors** (organs, glands, and vessels).

1. Preganglionic axons synapse at the sympathetic chain ganglia with a postganglionic neuron. The postganglionic neuron then leaves the sympathetic chain ganglia, enters a **spinal nerve** and travels to the skin and blood vessels throughout the body.
2. Preganglionic axons synapse at the sympathetic chain ganglia with a postganglionic neuron. The postganglionic neuron then leaves the sympathetic chain ganglia, enters a **sympathetic nerve** and travels to organs of the thoracic cavity.
3. Preganglionic axons enter and leave the sympathetic chain ganglion without synapsing and form a **splanchnic nerve** that travels to collateral ganglia. At these collateral ganglia, the preganglionic neurons synapse with postganglionic neurons which then extend to organs, glands, and vessels of the abdominopelvic cavity.
4. The last route for sympathetic axons is similar to those traveling through splanchnic nerves, but instead of synapsing in collateral ganglia, they travel straight through collateral ganglia. They then go to the **medulla of the adrenal gland**, where they synapse with cells that produce mostly epinephrine (EPI or Adrenaline) and norepinephrine (NE). These medullary cells function as modified postganglionic neurons and release secretory product directly into the blood rather than into a synapse. About 80% of adrenal medullary cells produce EPI and the other 20% produce NE. After release into the blood, these hormones travel to receptors throughout the body to elicit a "fight, flight, or flee" response.

Parasympathetic Division (PNS)

The parasympathetic division does not follow 4 pathways like the sympathetic division. The parasympathetic division sends preganglionic neurons from the cranial area and the sacral area. This is why it is also known as the *craniosacral* division. The vagus nerve is the major nerve of the cranial parasympathetic division. 75-80% of all parasympathetic fibers are found in the vagus nerve.



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