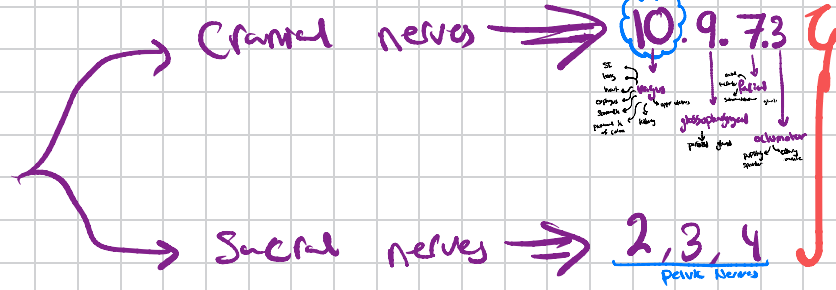


* ParaSympathetic
nerve
fibers



Vagus N has 75% of par nerve fibers are in it

Vagus
facial
trigeminal
oculomotor

These parasympathetic nerves are LONGER than sympathetic nerves Why??

Because they extend until they reach terminal ganglion that is near effector organ [refer to slide 6]

Notes:

* Changes in heart rate are called \rightarrow chronotropic

* When Asthma attacks, patients are given bronchodilators that work like sympathetic NS norepinephrine

* Para Sympathetic is the main actor in digestion.

* adults have an external sphincter, that's why urination is voluntary [Complex Nervous system]

* Children on the other hand, have no external sphincter that causes involuntary urination

Parasympathetic Division

pupil constriction occurs in parasympathetic & is called:

Miosis

bronchoconstriction \leftarrow

In parasympathetic:
 \downarrow rate of depolarization, making it harder to reach threshold [↑↑ pace maker potential] \downarrow
 Brady cardia

* dilates sphincters in gall bladder to allow secretions to go to duodenum to digest fats

* ↑↑ insulin secretion

Pupils constrict



Salivation



Airways constrict



Heart rate slows



Stomach digests



Intestines digest



Bladder constricts



Reproductive system increases blood flow



gonads & uterine \rightarrow Sympathetic

+ sphincter relaxes

vasodilation \rightarrow release of Nitric oxide

Sympathetic Division

Pupil dilation occurs during Sympathetic and is called:

Mydriasis

↑↑ ciliosuspensory contraction of pupil also helps in far vision

bronchoconstriction \leftarrow

↑↑ in myocardial contractility and is called positive Chronotropic action

↑↑ BP

* ↑↑ glucagon secretion [glycogen \rightarrow glucose] \rightarrow enhances glycogenolysis in breakdown of glycogen

* constriction of inner sphincter

Pupils dilate



Saliva inhibited



Airways dilate



Heart rate increases



Stomach inhibits digestion



Liver releases glucose



Intestines inhibit digestion



Kidneys release adrenaline



Bladder relaxes



Reproductive system decreases blood flow



① ejaculation in males
 ② uterus contraction in females

Physiological anatomy of Sympathetic nervous system (Thoracolumbar division)

why? because this is where the preganglionic N. fibers are located on the spinal cord

- Preganglionic neurons originate in spinal cord segments between cord segments **T1 and L2**
- **Preganglionic fibers** leaves the spinal cord and make synapses in the sympathetic ganglia
- Sympathetic ganglia
- Two **paravertebral sympathetic chains** of ganglia (also called the **sympathetic trunk**), that are interconnected with the spinal nerves on the side of the vertebral
- **Prevertebral ganglia** or **collateral ganglia** (the celiac, superior mesenteric, aortico-renal, inferior mesenteric, and hypogastric ganglia
- Postganglionic fibers leaves ganglia and terminate and synapse with visceral organs

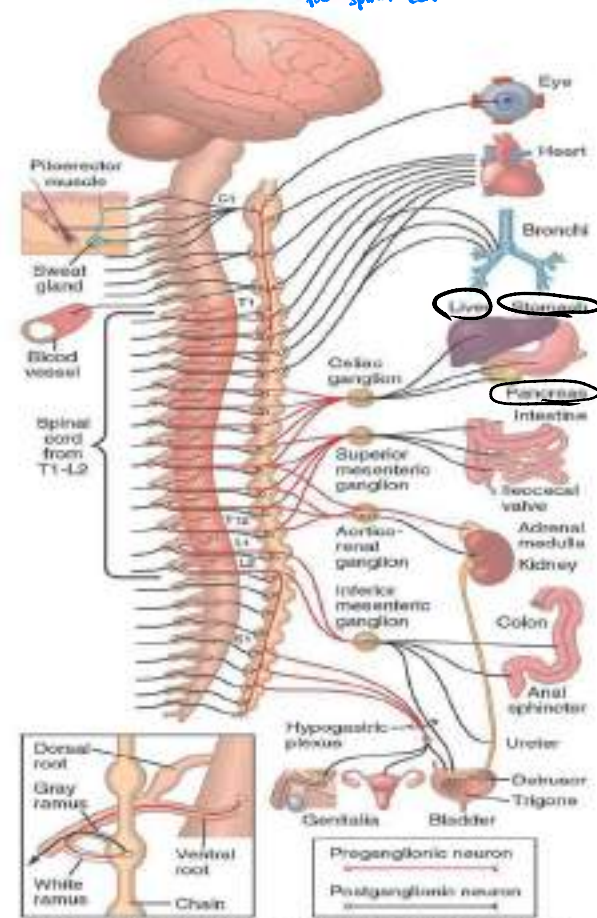


Figure Sympathetic nervous system. The black lines represent postganglionic fibers, and the red lines show preganglionic fibers.

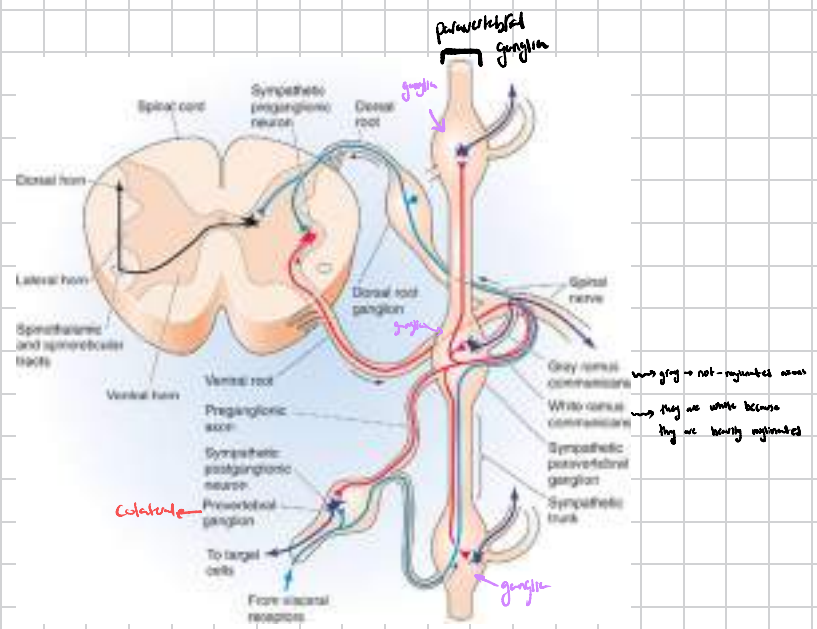
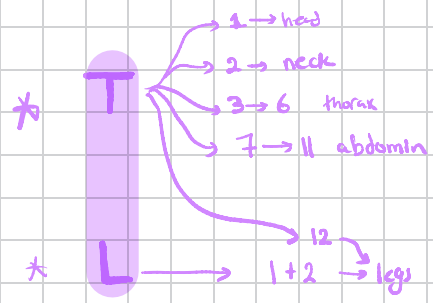
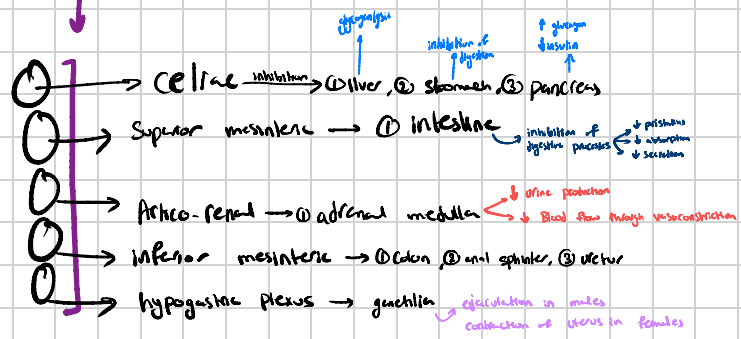
Sympathetic

Spine



Paravertebral Sympathetic ganglia chains = Sympathetic trunk

Co-lateral paravertebral ganglia



* Intermediate section of vertebral column where we have cell bodies of preganglia → travels through ventral root to white rami, where it faces 3 options:

1. Travel laterally to a collateral ganglion & synapse back and forth through splanchnic N.
2. Descend down another level of spinal cord and goes down or up ganglia where it synapses, then goes to gray rami.
 - Becomes part of spinal N + exits
 - 3 options after that
 - * ganglia will use synapse back to go to splanchnic N. [leave through ganglia]
3. Travel laterally to a collateral ganglion & synapse back and forth through splanchnic N.

PHYSIOLOGICAL ANATOMY OF THE SYMPATHETIC SYSTEM

- ❑ The peripheral portion of the Sympathetic System include:
 - Two **paravertebral sympathetic chains** of ganglia (also called the **sympathetic trunk**), that are interconnected with the spinal nerves on the side of the vertebral column.
 - **Prevertebral ganglia** or **collateral ganglia** (the celiac, superior mesenteric, aortico-renal, inferior mesenteric, and hypogastric).
 - Nerves extending from the ganglia to the different internal organs.
- ❑ The sympathetic nerve fibers originate in the spinal cord along with spinal nerves between cord segments **T1 and L2** and pass first into the sympathetic chain and then to the tissues and organs that are stimulated by the sympathetic nerves

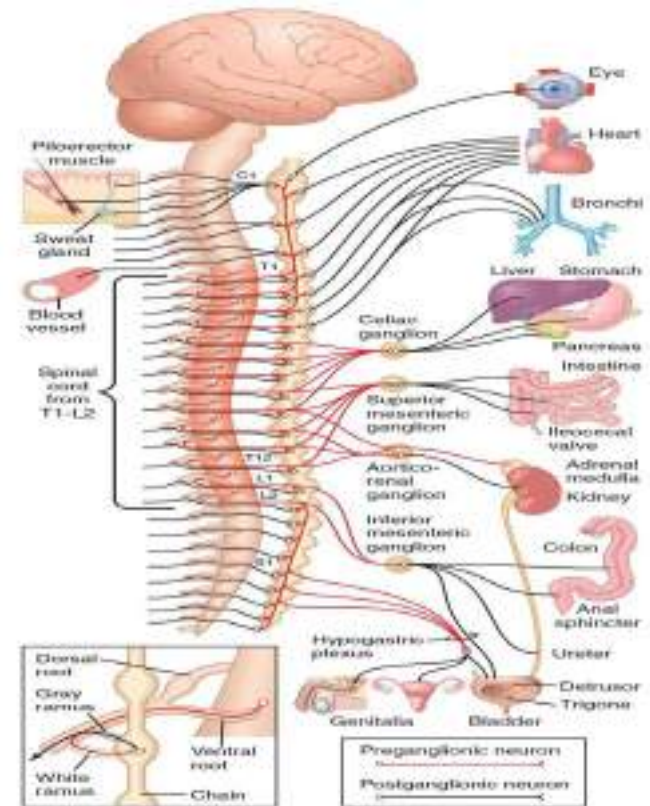


Figure Sympathetic nervous system. The black lines represent postganglionic fibers, and the red lines show preganglionic fibers.

Physiological Anatomy Sympathetic nervous system

- Unlike a single neuron in the skeletal motor pathway, the sympathetic pathway is composed of two neurons, a preganglionic neuron and a postganglionic neuron.
- The cell body of each preganglionic neuron lies in the intermediolateral horn of the spinal cord; its fiber passes through a ventral root of the cord into the corresponding spinal nerve.
- The preganglionic sympathetic fibers leave the spinal nerve and pass through a white ramus into one of the ganglia of the sympathetic chain. Then fibers can take one of the following three courses:
 - Synapse with postganglionic sympathetic neurons in the ganglion that they enter.
 - Pass upward or downward in the chain and synapse in one of the other ganglia of the chain.
 - Pass for variable distances through the chain and then through one of the sympathetic nerves radiating outward from the chain, finally synapsing in a peripheral sympathetic ganglion (collateral ganglia) about halfway between the CNS and the innervated organs.

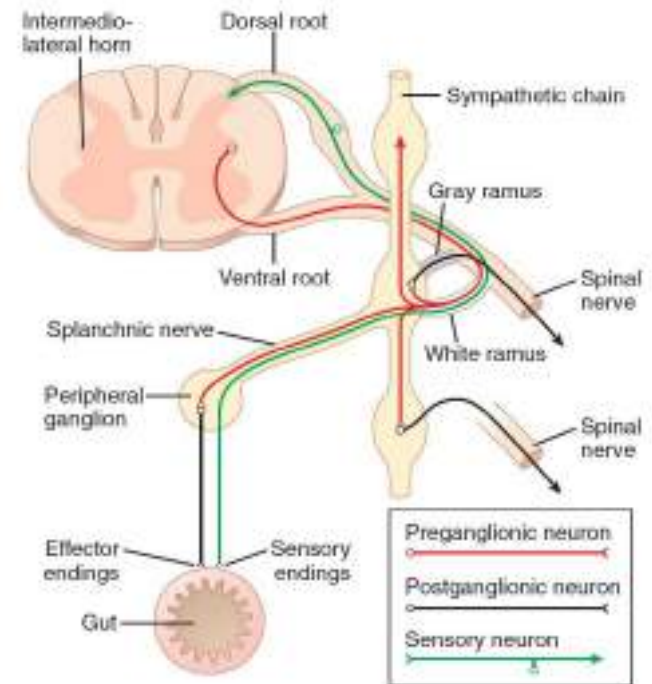


Figure Nerve connections among the spinal cord, spinal nerves, sympathetic chain, and peripheral sympathetic nerves.

Physiological Anatomy Sympathetic nervous system

- The postganglionic sympathetic neuron originates either in one of the sympathetic chain ganglia or in one of the peripheral sympathetic ganglia. From either of these two sources, the postganglionic fibers then travel to their destinations in the various organs.
- Some of the postganglionic fibers pass back from the sympathetic chain into the spinal nerves through **gray rami** at all levels of the cord. These sympathetic fibers are all **very small type C fibers**, and they extend to all parts of the body by way of the skeletal nerves.
- The sympathetic pathways that originate in the different segments of the spinal cord are not necessarily distributed to the same dermatomes as somatic nerves.

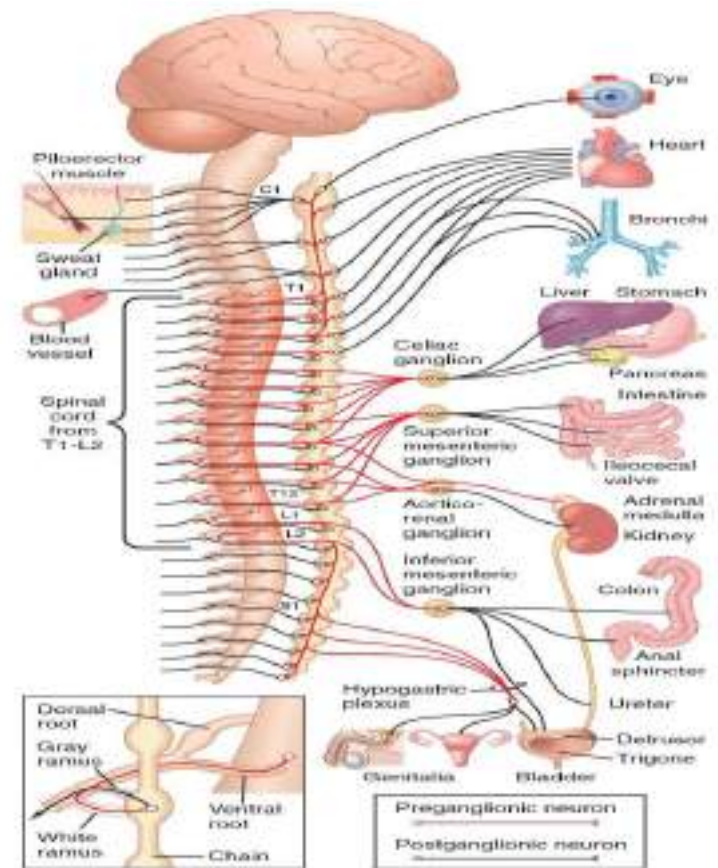


Figure Sympathetic nervous system. The black lines represent postganglionic fibers, and the red lines show preganglionic fibers.

Sympathetic nervous system anatomy

& vice versa
 higher body parts
 higher sympathetic nerves
 *

- Instead, the sympathetic fibers from:
 1. Cord segment T1 generally pass up the sympathetic chain to terminate in the head.
 2. Cord segment T2 terminates in the neck.
 3. Cord segments T3, T4, T5, and T6 terminate into the
 1. thorax.
 1. Cord segments T7, T8, T9, T10, and T11 terminate into the
 2. abdomen.
 2. Cord segments T12, L1, and L2 terminate into the legs.
- It should be noted that the sympathetic distribution shows great degree of overlaps between humans.

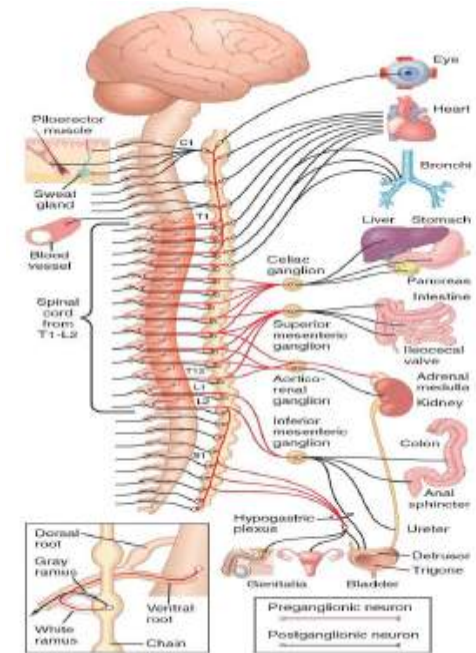


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