

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Autonomic Nervous system

Lectures

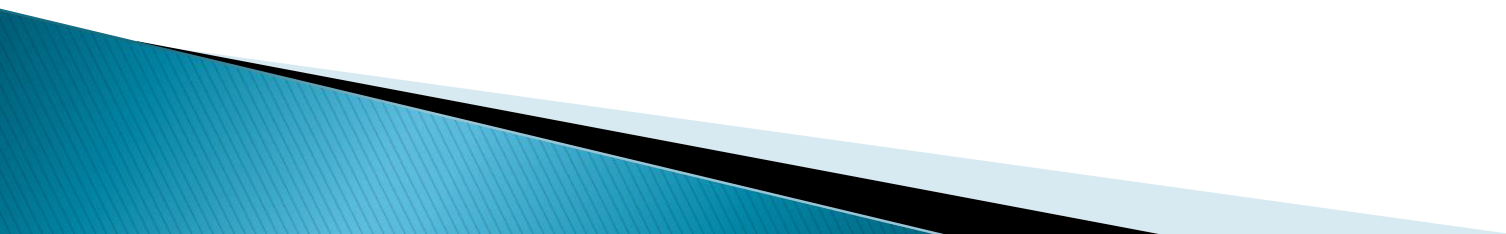
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Professor of Physiology



▶ Objectives :

- ▶ Students should know the functional structure of autonomic nervous system .
- ▶ Students should know characters of functional divisions of autonomic nervous system .



Autonomic nervous system

–Definition: It is a part of the peripheral nervous system ▶

–Function: It controls the visceral function ▶

–Action: It acts involuntary by a slower action(response)

– Reflex arc of ANS:is characterized by

1–**Afferent** :Sensory nerve fibers enter the spinal cord through the **posterior (dorsal) root**.

2–**Efferent** fibers leave the spinal cord through the **anterior(ventral) root**.

–**origin** Preganglionic cfibers from lateral horn cells

–**pathway** is formed of two cells –**preganglionic** cell (comes from CNS).

–**postganglionic** cell (lies out side CNS).

3–**Chemical Transmitter** :is acetylcholine or norepinephrine.

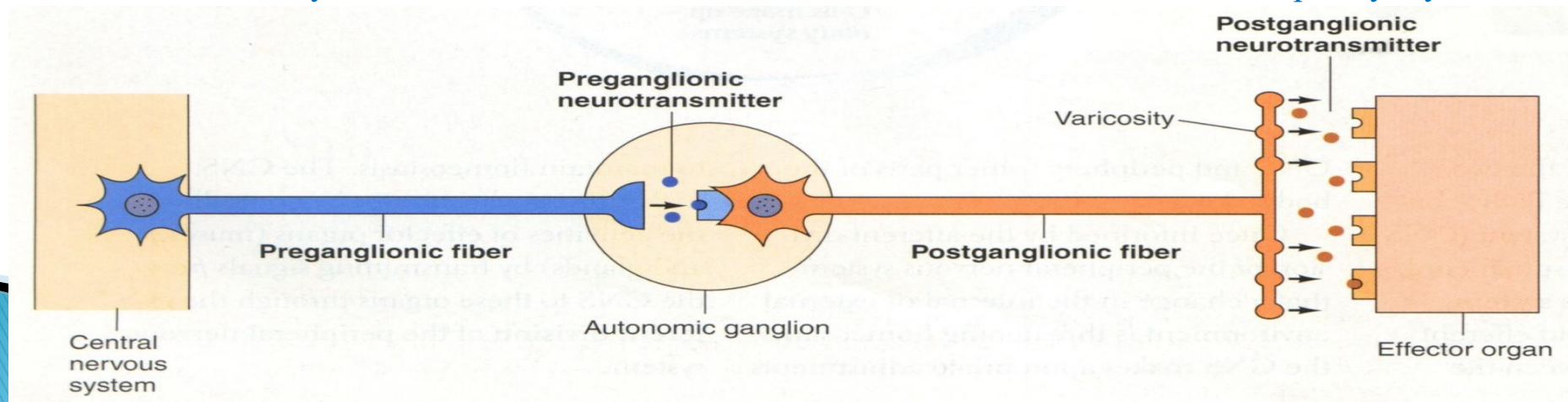
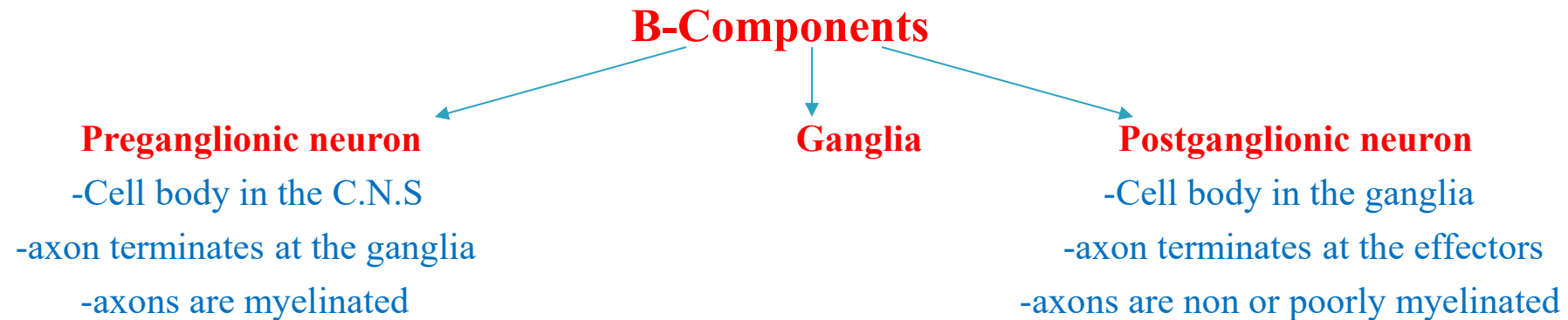
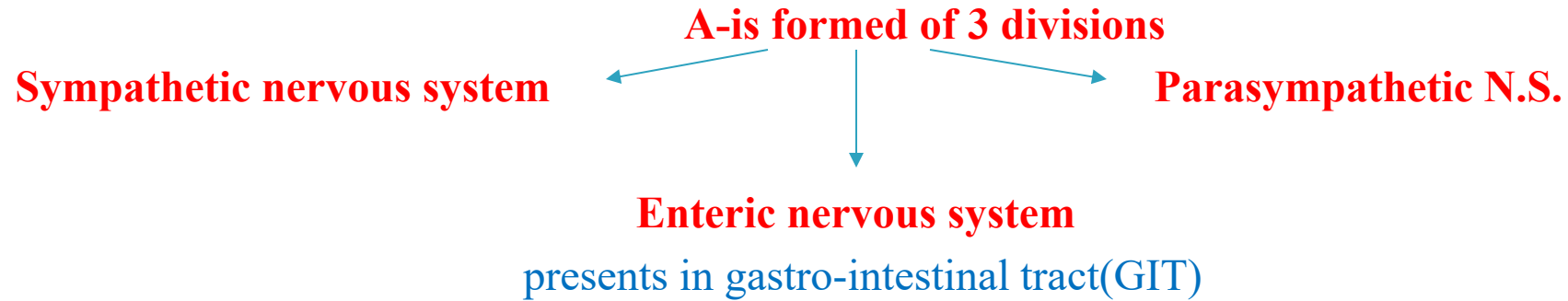
4– **Effector**: is the viscera .

5–**Response** : modulate the intrinsic activity of the organs(→excitation or inhibition)

General function of autonomic nervous system

- 1–Autonomic N system is usually modulator and not initiator for the visceral functions.
 - 2–There is normal basal activity in sympathetic and parasympathetic systems (tone).
 - 3–It prepares the body to face stress (by sympathetic NS).
 - 4–It helps in regulation of body temperature .
 - 5–It helps in regulation of (cardio–vascular system) .
 - 6–It helps in regulation of **respiratory system..**
 - 7–It helps in regulation of digestive system.
 - 8–It helps in regulation of urinary system.
 - 9–It helps in regulation of reproductive system.
- 

Organization of autonomic nervous system



Autonomic Ganglia

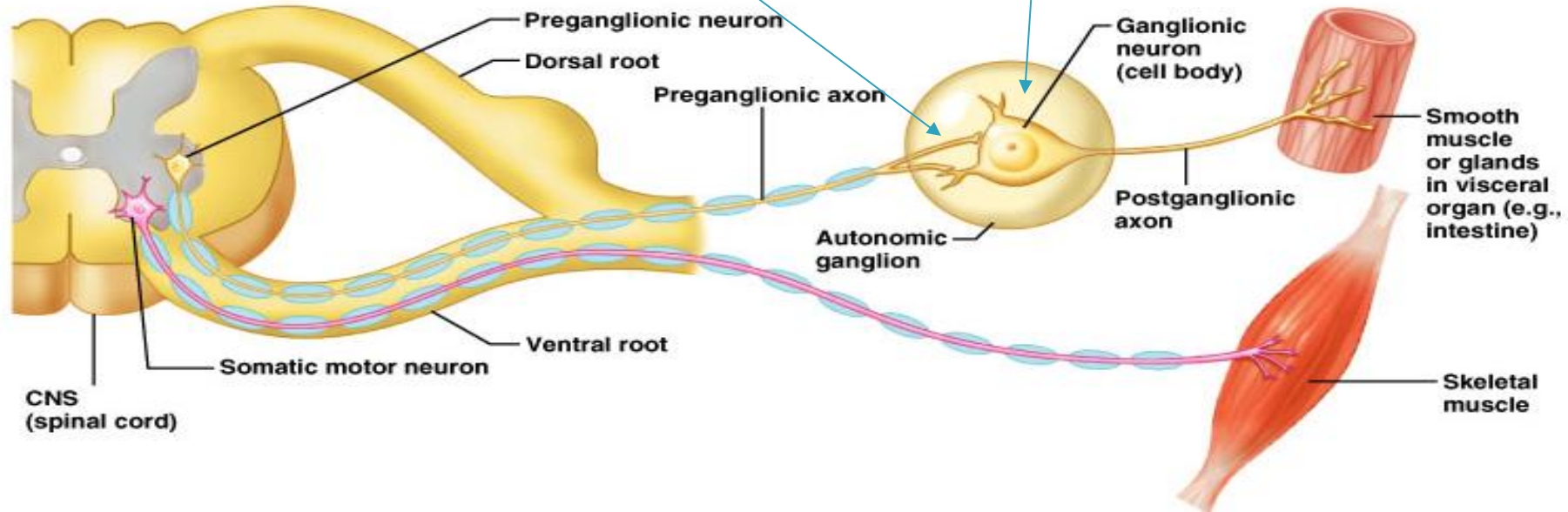
Definition:

Ganglion :

- is a collection of cell bodies of postganglionic neurons outside central nervous system .
- is the site of synapse (relay) of preganglionic fibers with postganglionic neurons .

Synapse :

- is the site of contact between the nerve terminal of one neuron and cell body of another neuron .



Types of ganglia

A-Sympathetic Ganglia are
Lateral Ganglia(Paravertebral) Number is 24 Ganglia

- form 2 the sympathetic chains
- Cervical 3 (Superior, middle, inferior)
- Thoracic 12
- Lumber 4
- Sacral 4
- Coccygeal 1

Collateral Ganglia(Prevertebral)

lie around the origin of 3 large arteries from
the abdominal aorta are only relay for sympathetic preganglion

- Coeliac ganglia
- Superior mesenteric
- Inferior mesenteric

NB:Adrenal medulla is a modified ganglia stimulated by preganglionic cholinergic
fibers of greater splanchnic nerve .

B-Parasympathetic Ganglia (Terminal ganglia)

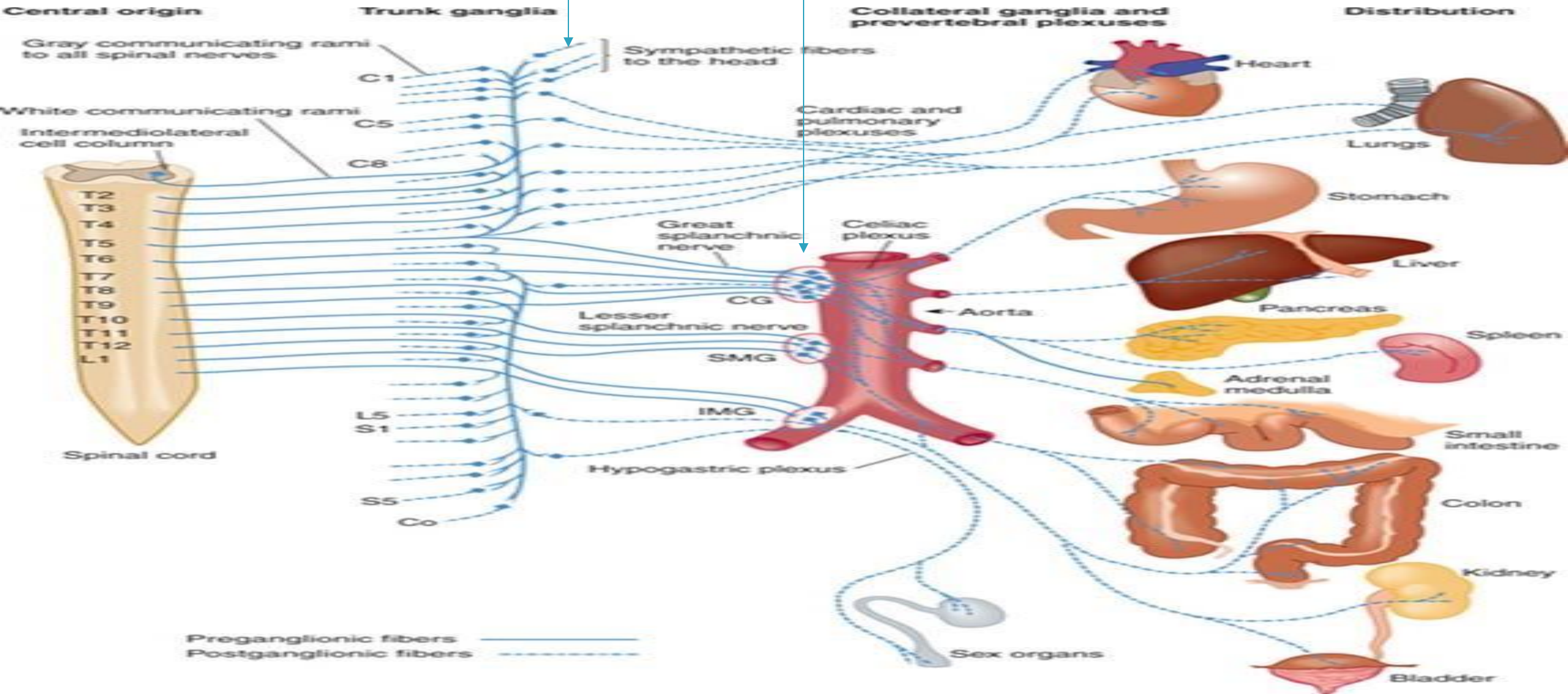
- are lie very close to or within the visceral wall.
- help the action of parasympathetic to be localized .

Autonomic ganglia

Lateral

Collateral

Terminal



Functions of the ganglia

1 –Relay station

The preganglionic fibers may pass through ganglia with relay or without synapse with the postganglionic neurons .

2–Distribution center (mainly)

–The preganglionic fibers diverge with postganglionic fibers as follows;

A–at the sympathetic ganglia the ratio between the preganglionic and post ganglionic neurons is 1: 30
this produces → diffuse ,and generalized (mass)effects .

B–at the parasympathetic ganglia ratio between the preganglionic and post ganglionic neurons is 1 : 3
this produces →localized effects

–Explain the action of sympathetic is generalized while that of parasympathetic is localized

due to a–The character of distribution at the autonomic ganglia . ▶

b–Sympathetic stimulation of adrenal medulla associated with secretion of
adrenaline and noradrenaline into blood . ▶

3– Integrative center ▶

Sympathetic ganglia receive information from the peripheral organs and CNS, ▶

These signals are modulated, then final neural outputs are distributed to the organs ▶
through the postganglionic fibers. ▶

4–Site of action of autonomic drugs ▶

Stimulatory drug

eg; Nicotine in small dose

Inhibitory drug ▶

eg –Nicotine in large dose ▶
–Hexamethonium ▶

Autonomic Nervous System

- ▶ **Preganglionic autonomic fibers**

- originate in

- Midbrain
 - Hindbrain
 - Spinal cord.

- ▶ They are -myelinated

- type B fibers

- ▶ **Autonomic ganglia are located in**

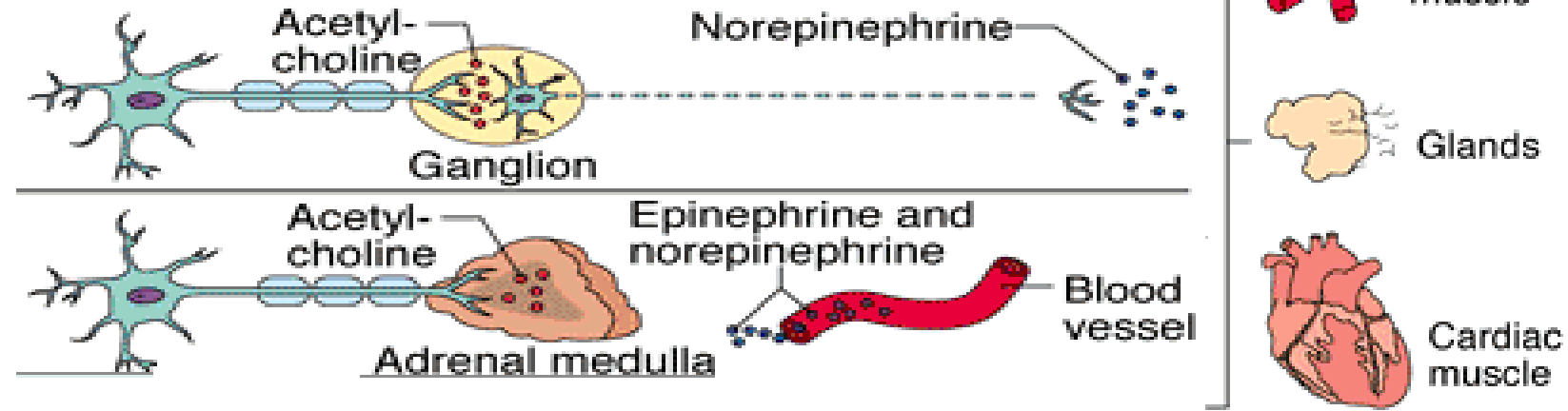
- Head
 - Neck
 - Abdomen.

- ▶ **Postganglionic autonomic fibers arises from ganglia innervate the target tissue**

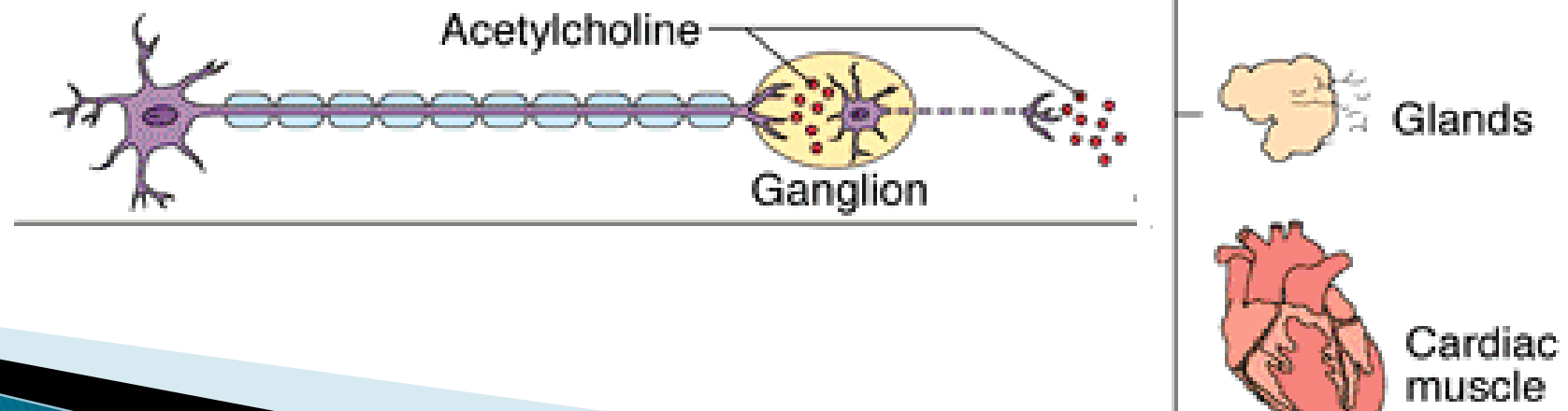
- ▶ They are unmyelinated

- type B fibers

Sympathetic NS



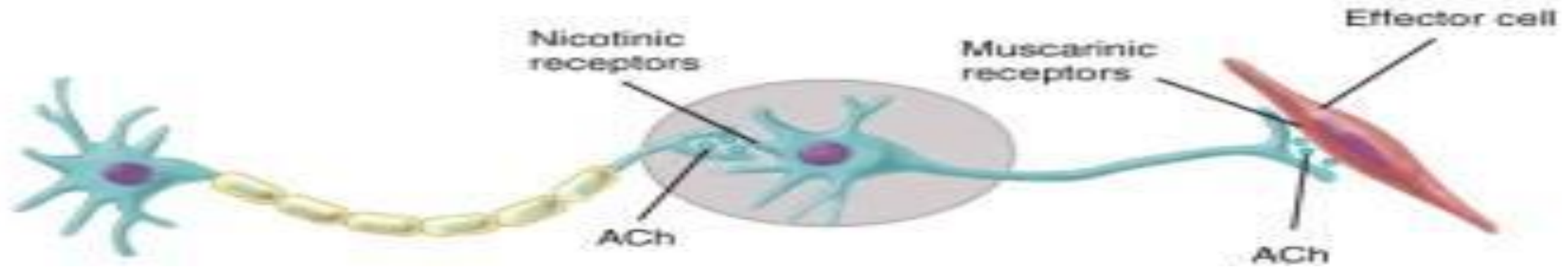
Parasympathetic NS



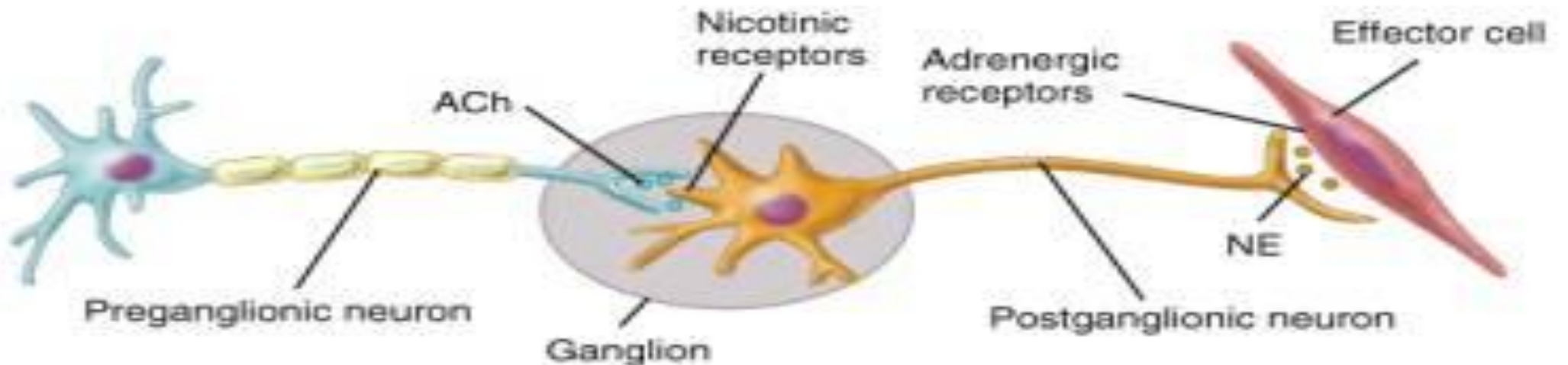
ANS nerve fibers

are classified according to type of the released NT

-They are—cholinergic fibers which release acetyl choline (ACh)



-adrenergic fibers which release NE



Comparison between

Sympathetic NS

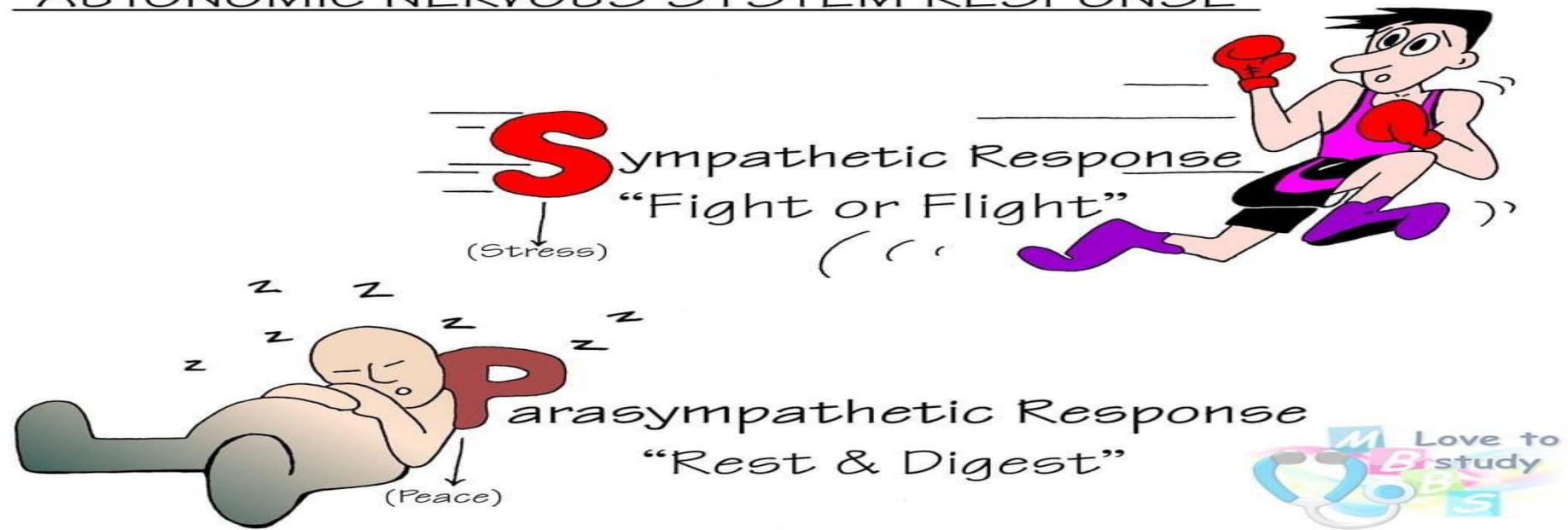
Parasympath.NS

Origin	thoraco-lumbar	cranio-sacral
Action	Acts during stress Hypo glycemia Hypothermia Hypotension ↑ during stress ↑ -catabolic (glycogenolysis) (lipolysis) glucose ABP	acts during food intake sleep food intake anabolic genesis
Pregangl Fib	short	long
Postgangl Fib	long	short

NB: SNS is usually opposite to PNS

NB: Not all the viscera supplied by SNS and PNS

"AUTONOMIC NERVOUS SYSTEM RESPONSE"



take it EASY

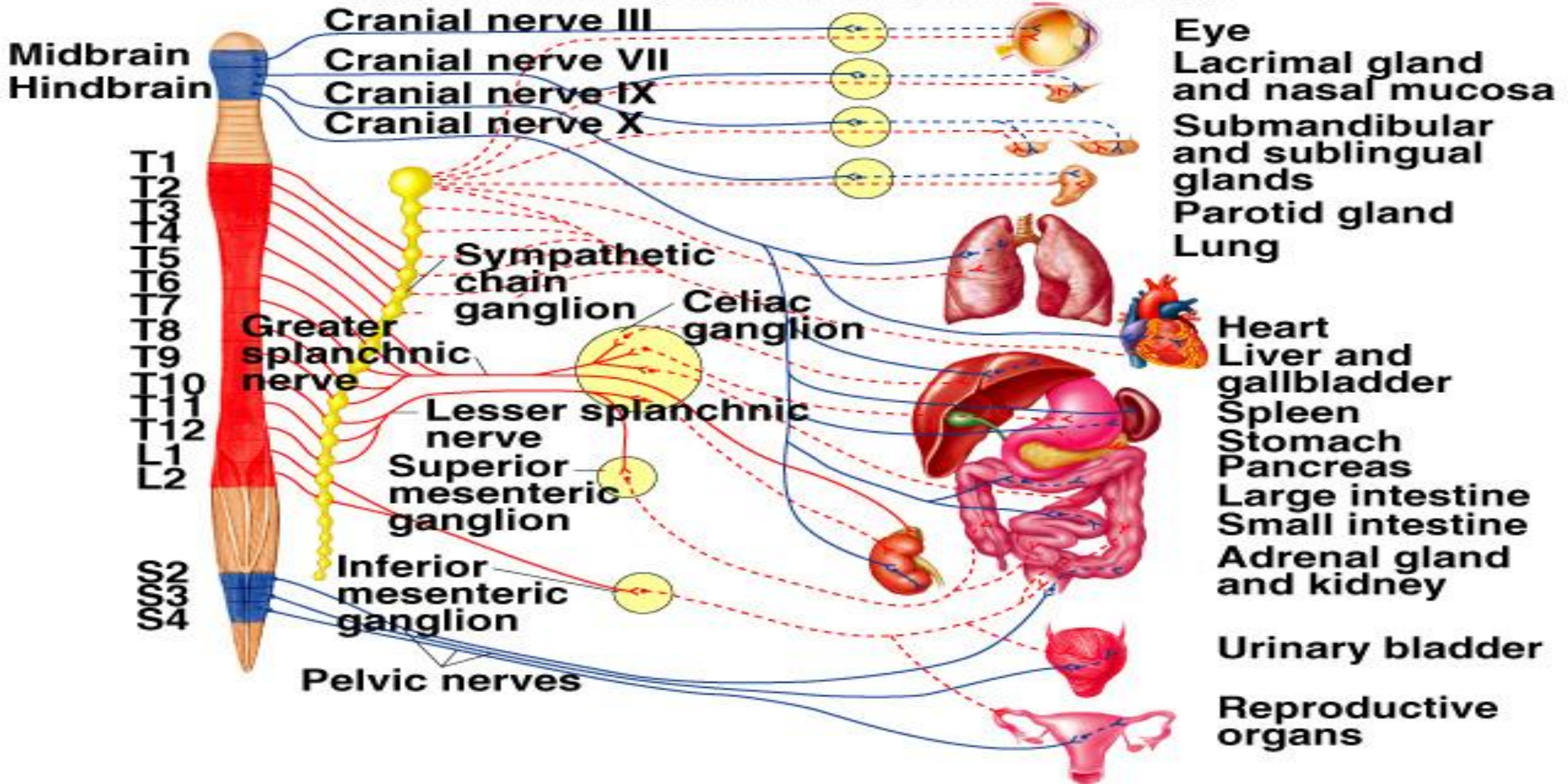


take it **EASY!**

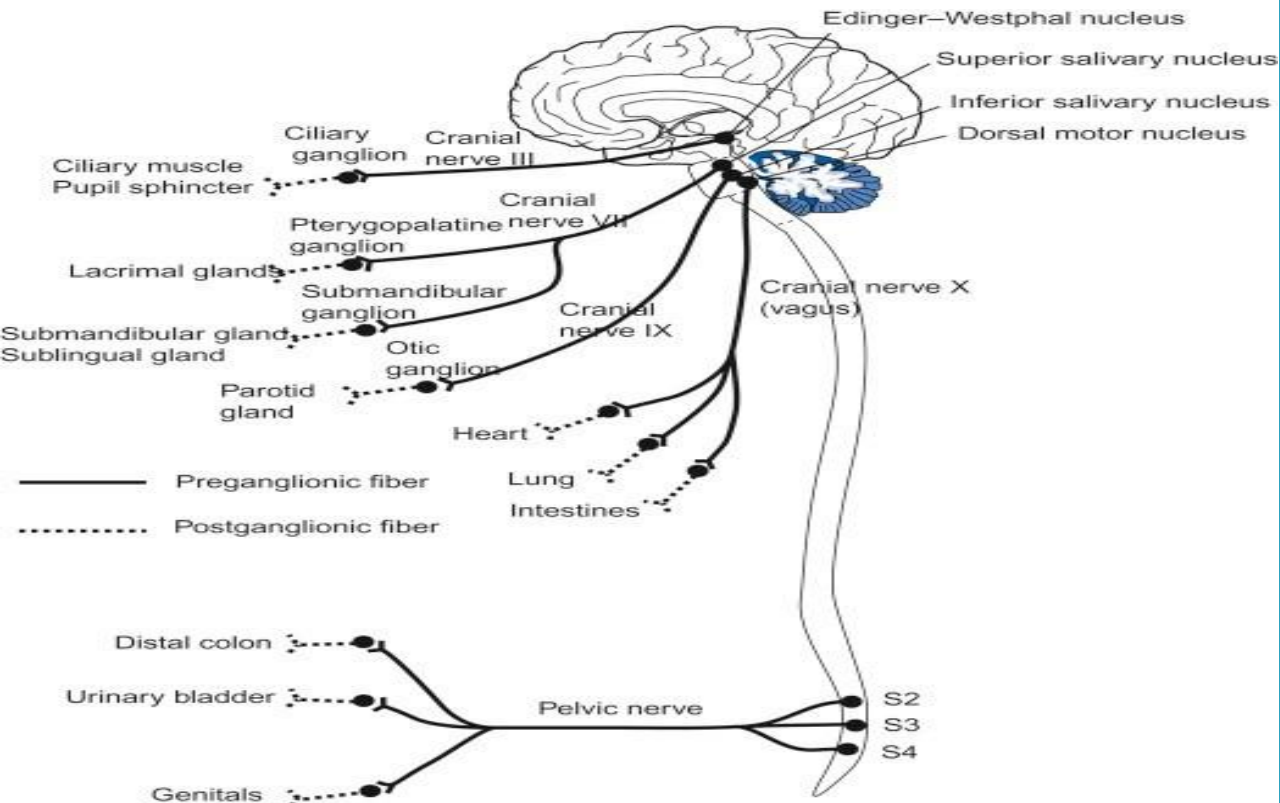


Autonomic Nervous System

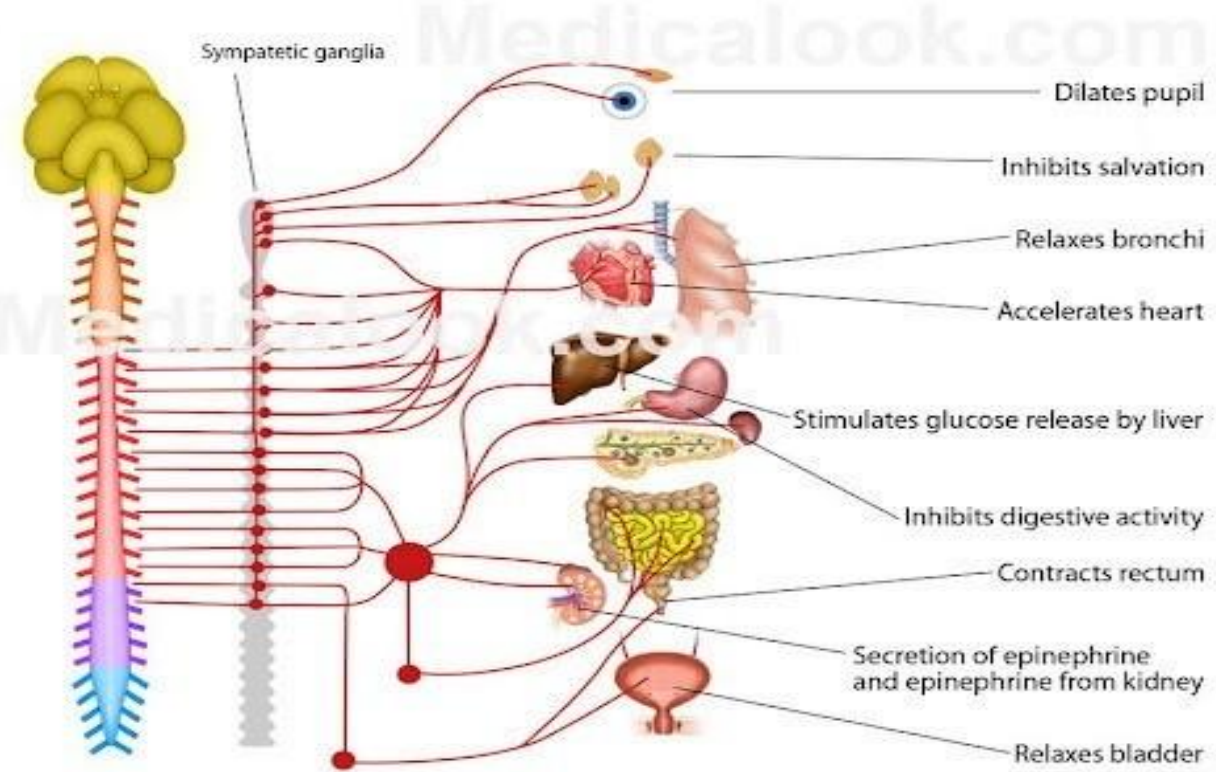
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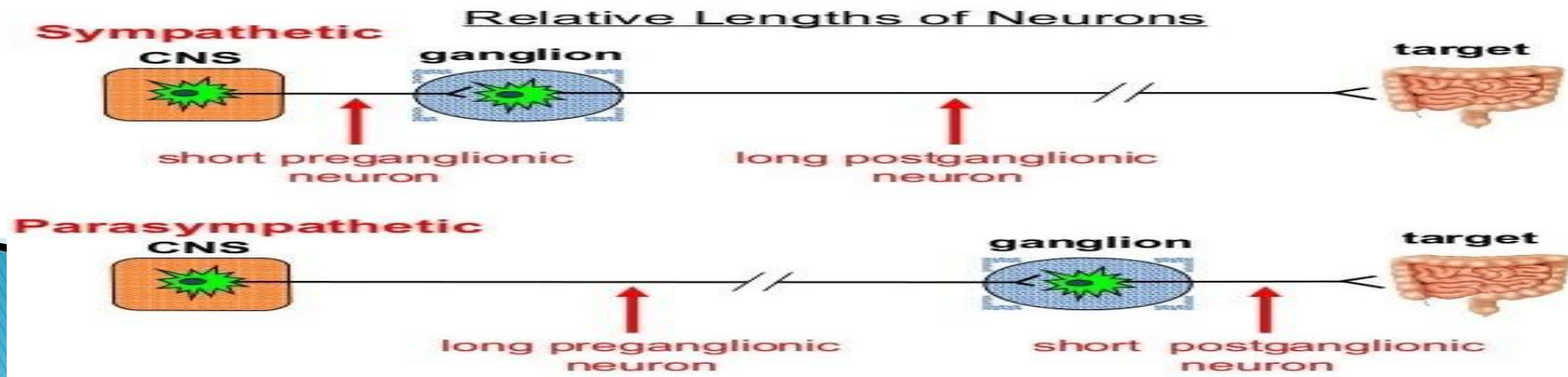
Parasympathetic NS



Sympathetic NS



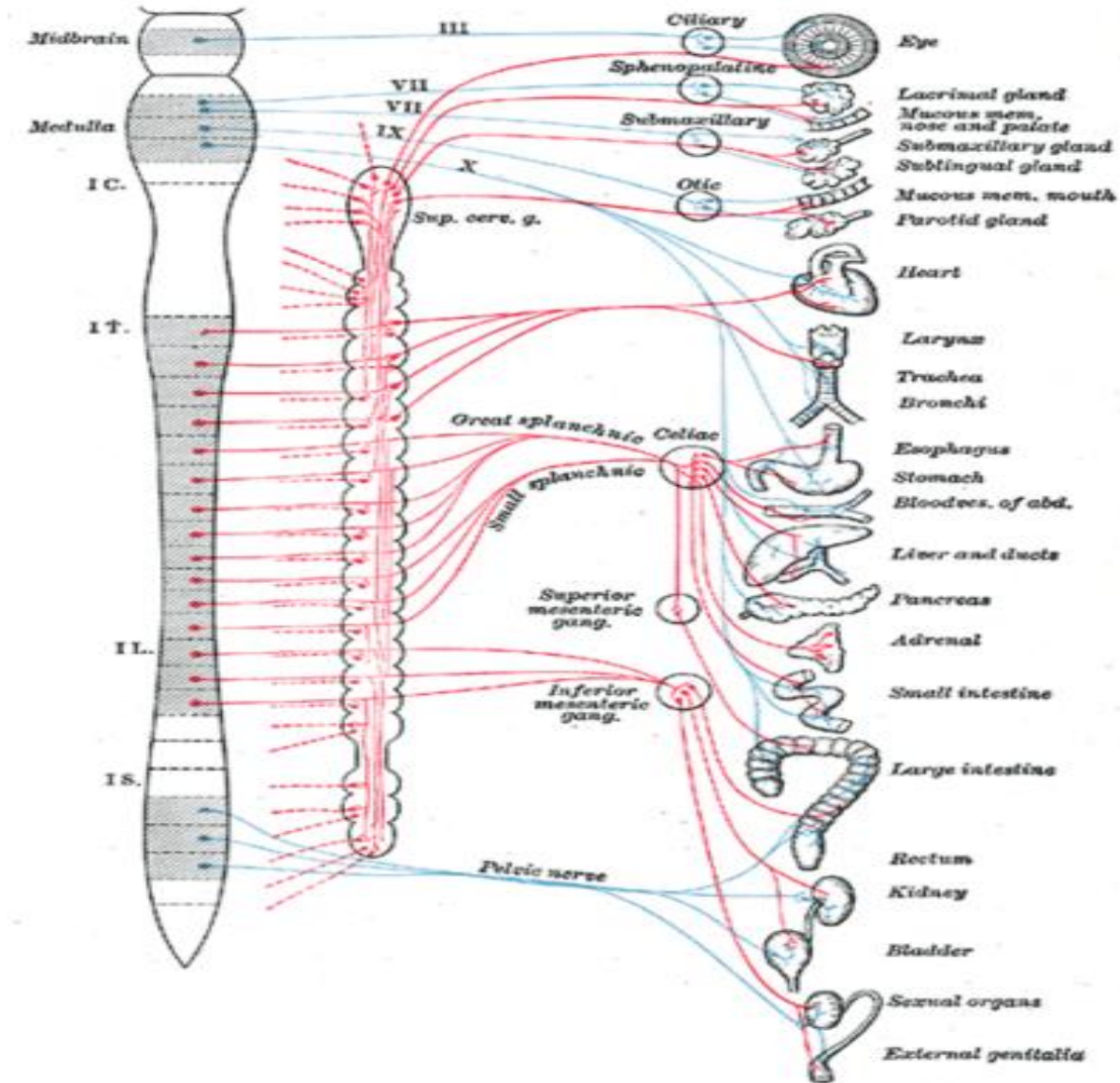
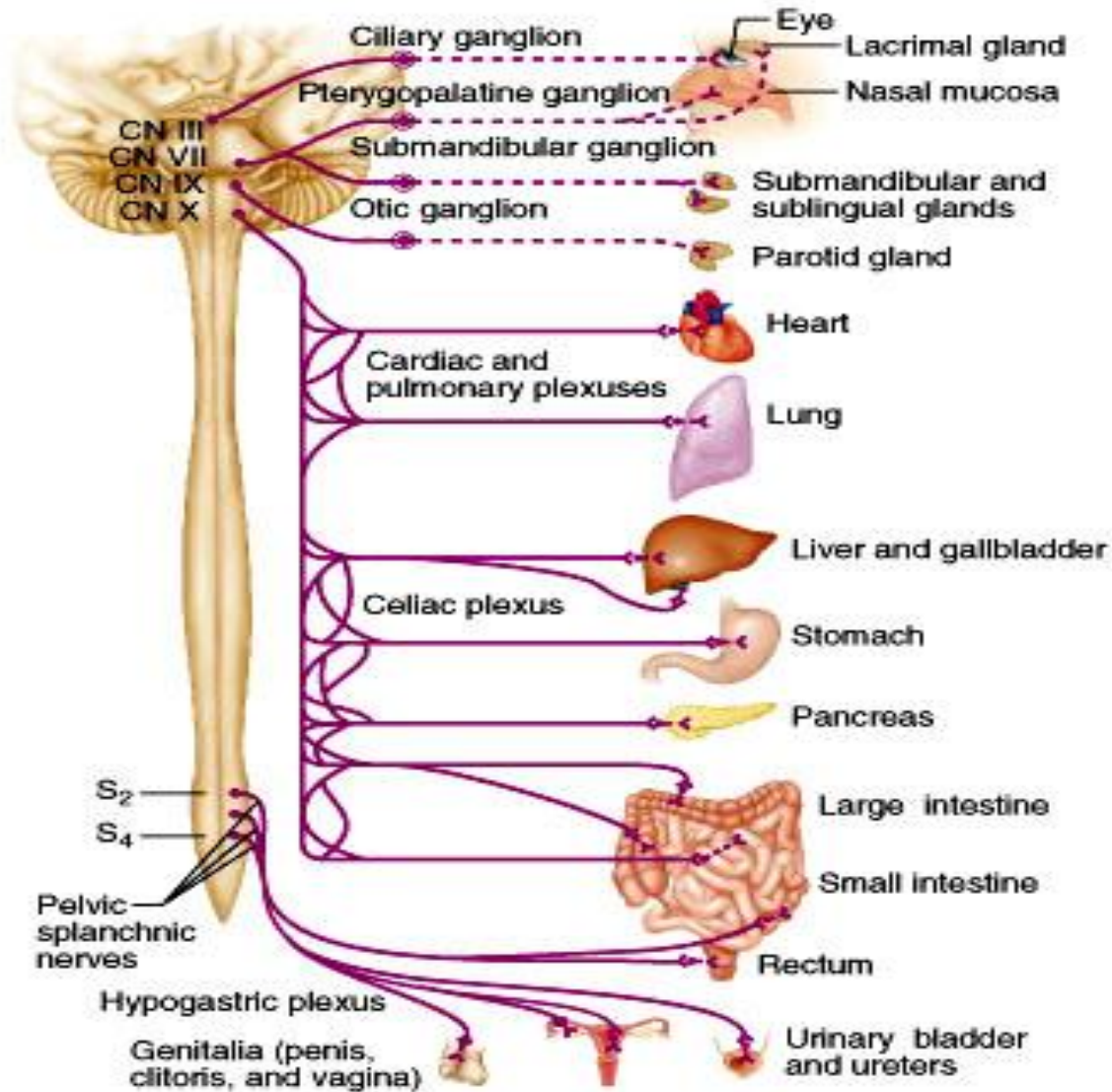
Differences between Sympathetic & Parasympathetic



ANS

Parasympathetic NS

Sympathetic NS



الحمد لله

THANK YOU

