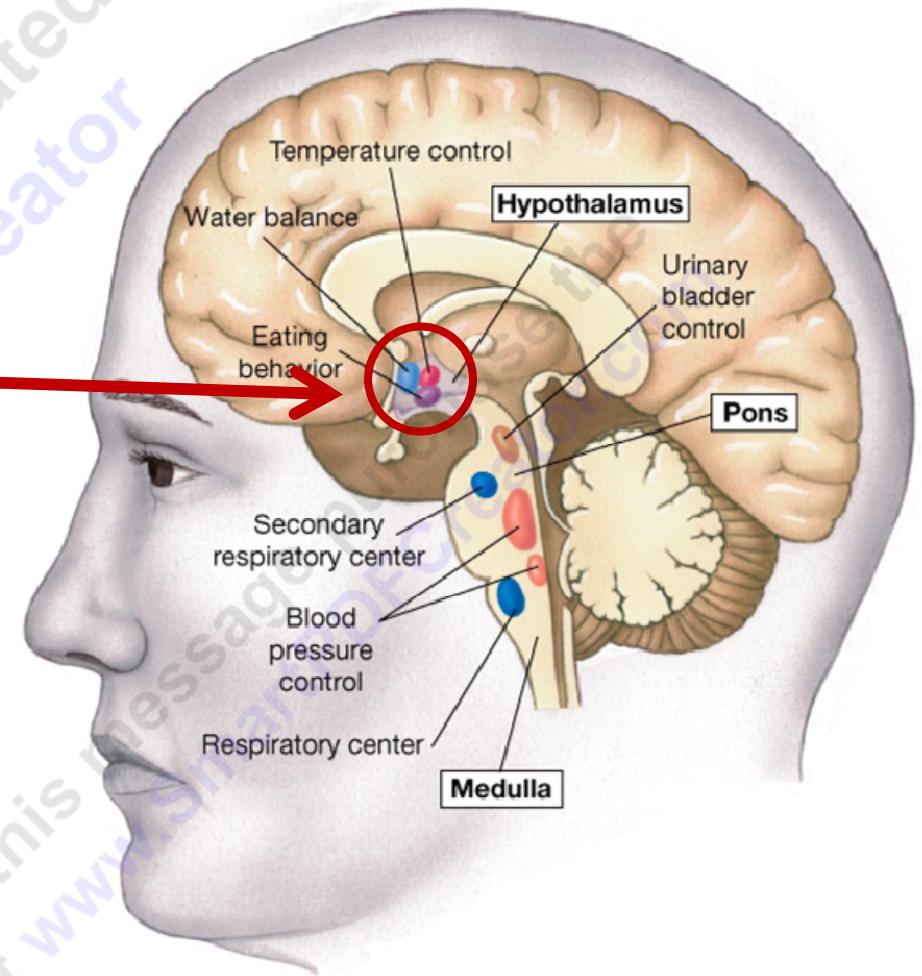


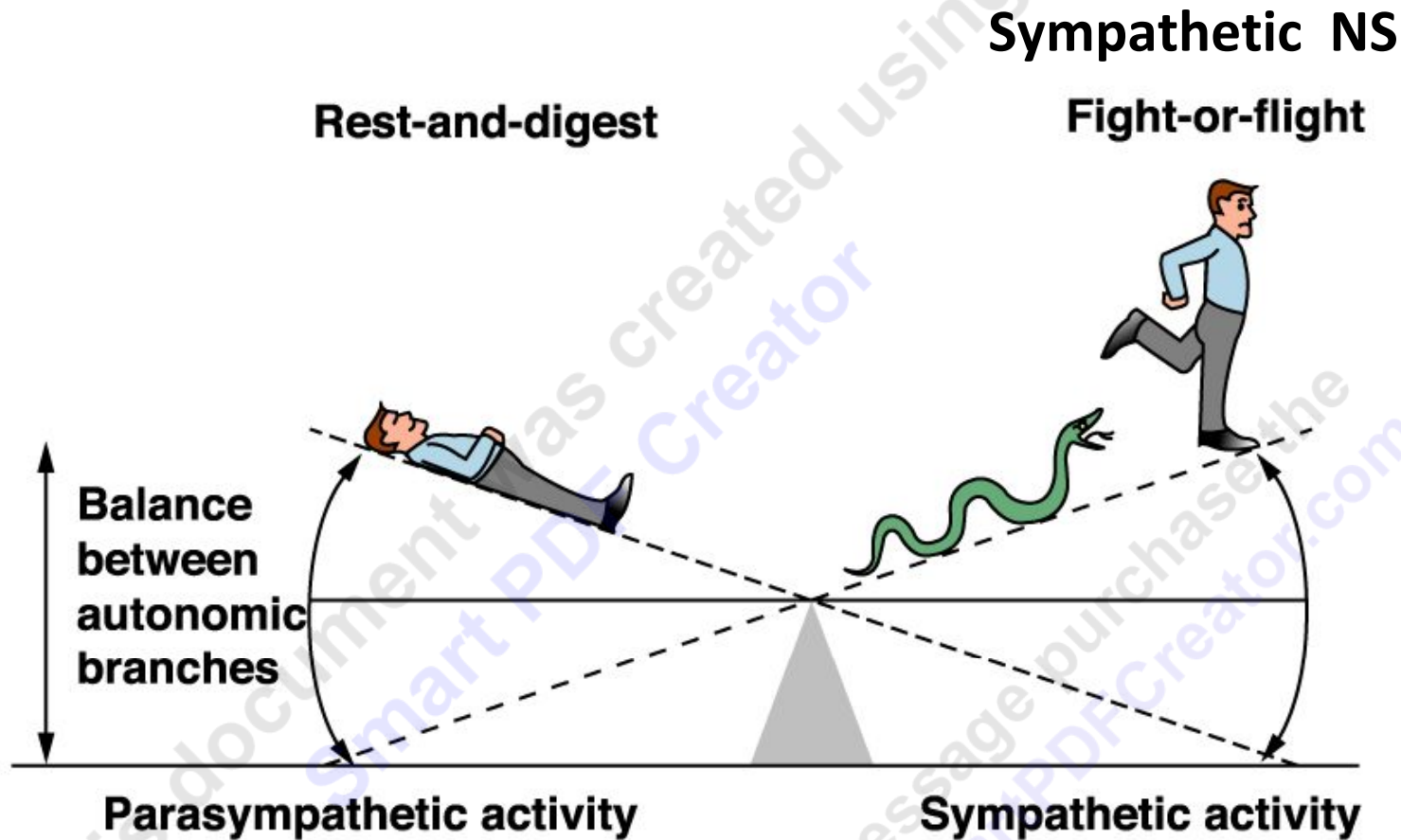
# **Introduction to the Autonomic Nervous system (ANS)**

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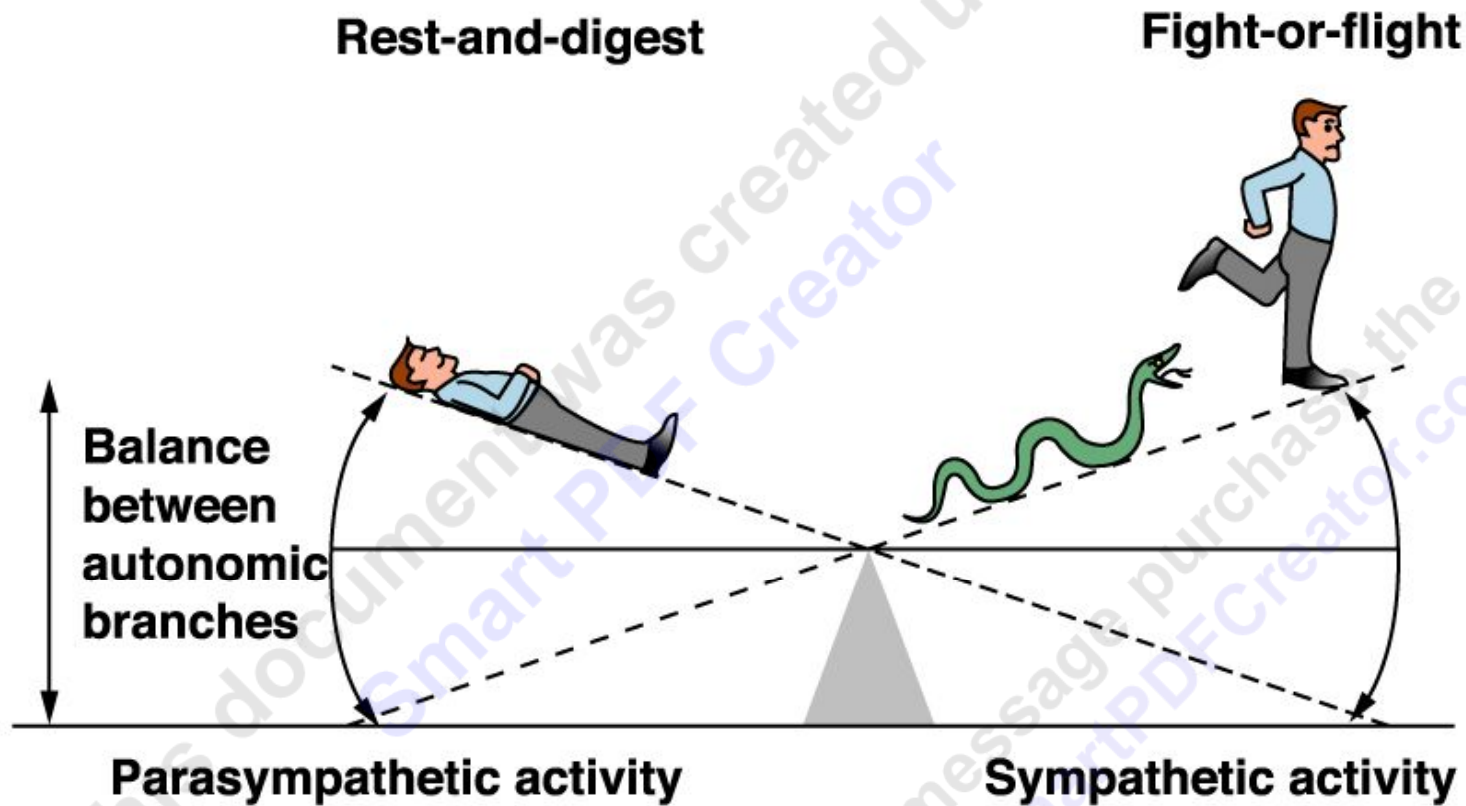
- ANS has two subdivisions:
- Sympathetic and Parasympathetic
- Higher control of the ANS is by Hypothalamus :
- Posterior hypothalamus controls Sympathetic NS
- Anterior hypothalamus controls Parasympathetic NS





- Sympathetic system is active during stress and activity , such as physical exercise ( as in sport ) ; and during increased mental & emotional activity such as in worry , anxiety, fear , anger , severe pain → preparing the body for action → fight or flight → to defend itself by attack or to escape from danger
- Its activation promotes mechanisms which increase energy production , accelerate metabolism .

## Parasympathetic NS

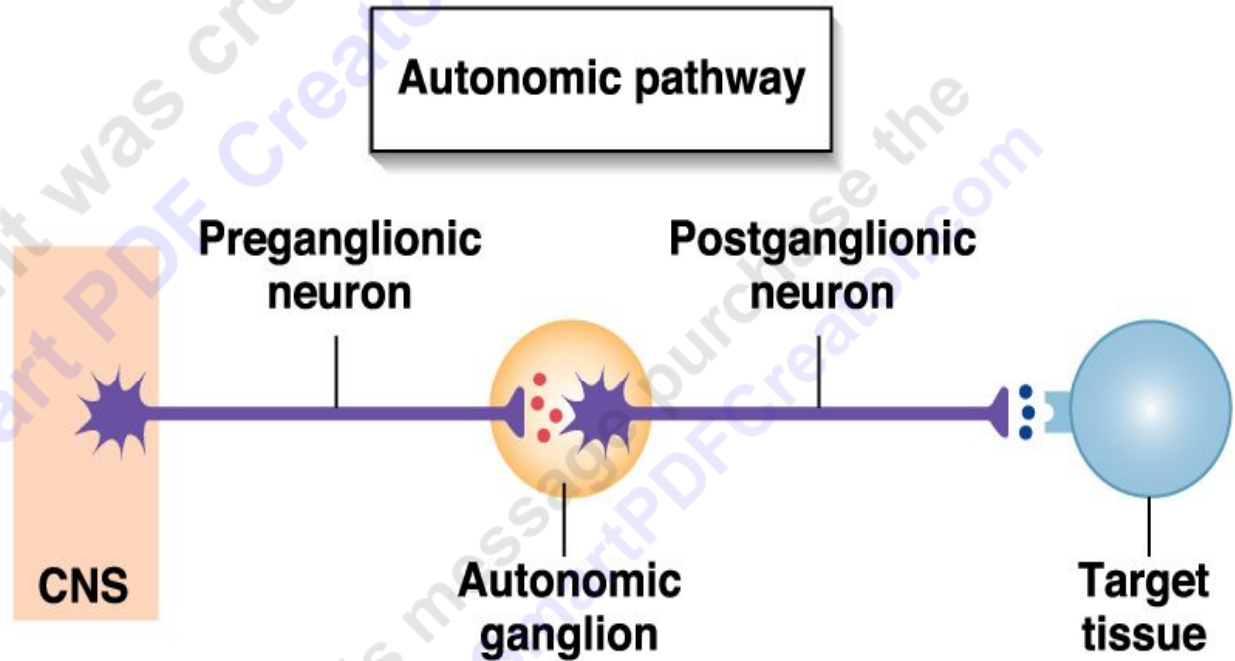


- Parasympathetic system activities is related to the relaxed state , rest and anabolism →
- It promotes vegetative functions ( nutritive , body-building , restorative functions & tissue repair )
- It is more active during feeding , digestion & rest & sleep .

# The Autonomic Outflow consists 2 Neurons neurons arranged in series:

- **Preganglionic nerves** : arise from the spinal cord in case of sympathetic system ( + brain & spinal cord in case of parasympathetic system )

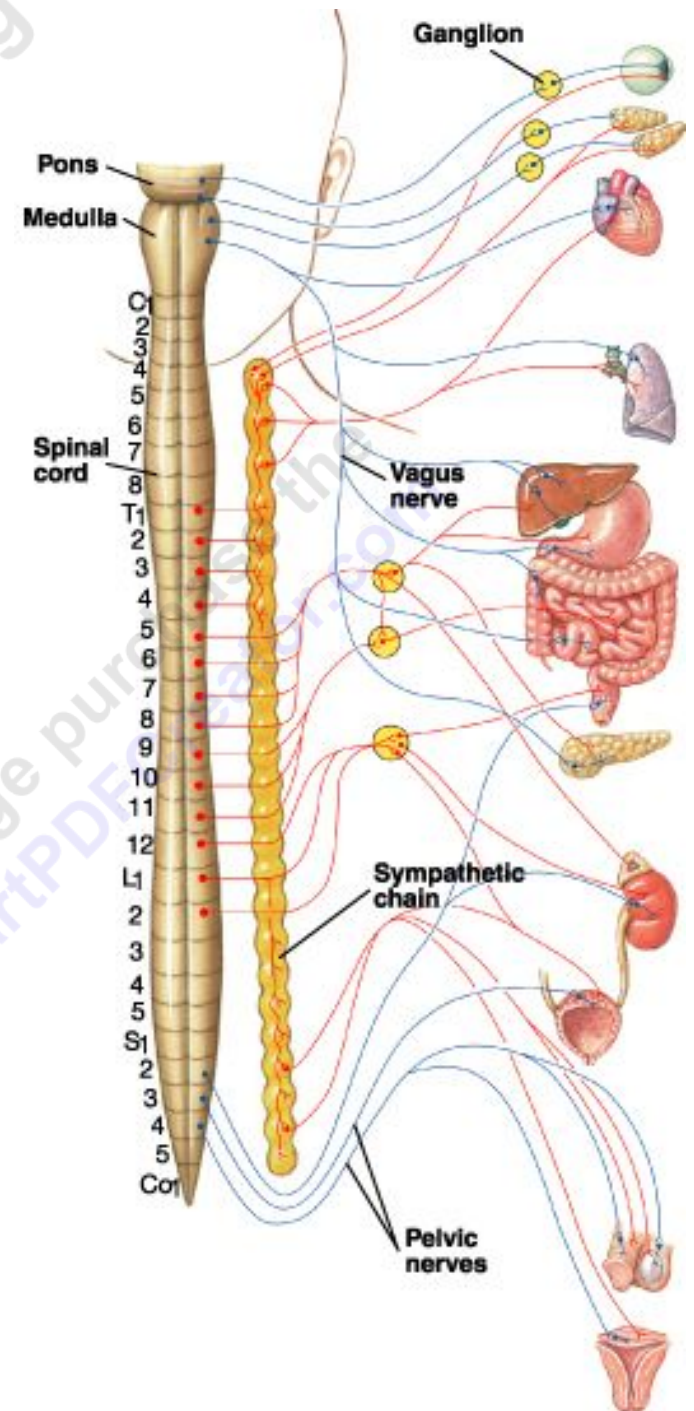
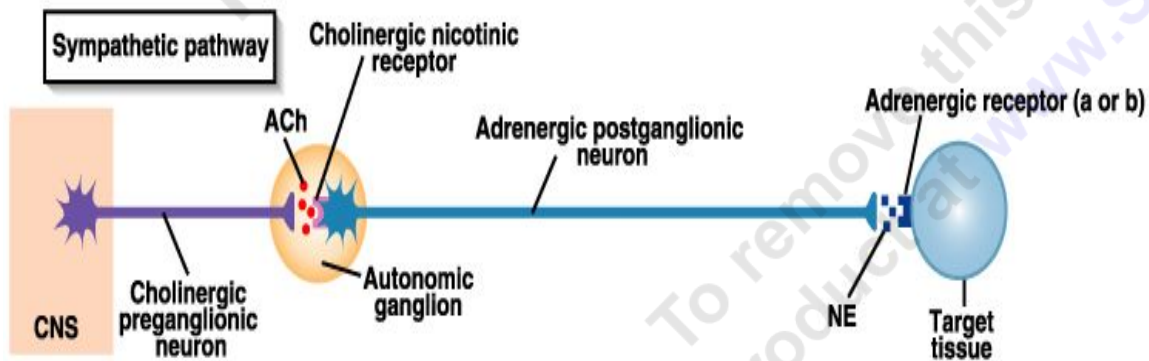
- **Postganglionic nerves** : arise from ganglia .





(1) Preganglionic nerves in the sympathetic system exit the CNS from the thoracic and lumbar segments of the spinal cord . Therefore , the sympathetic system is also called : “**Thoracolumbar Outflow**”

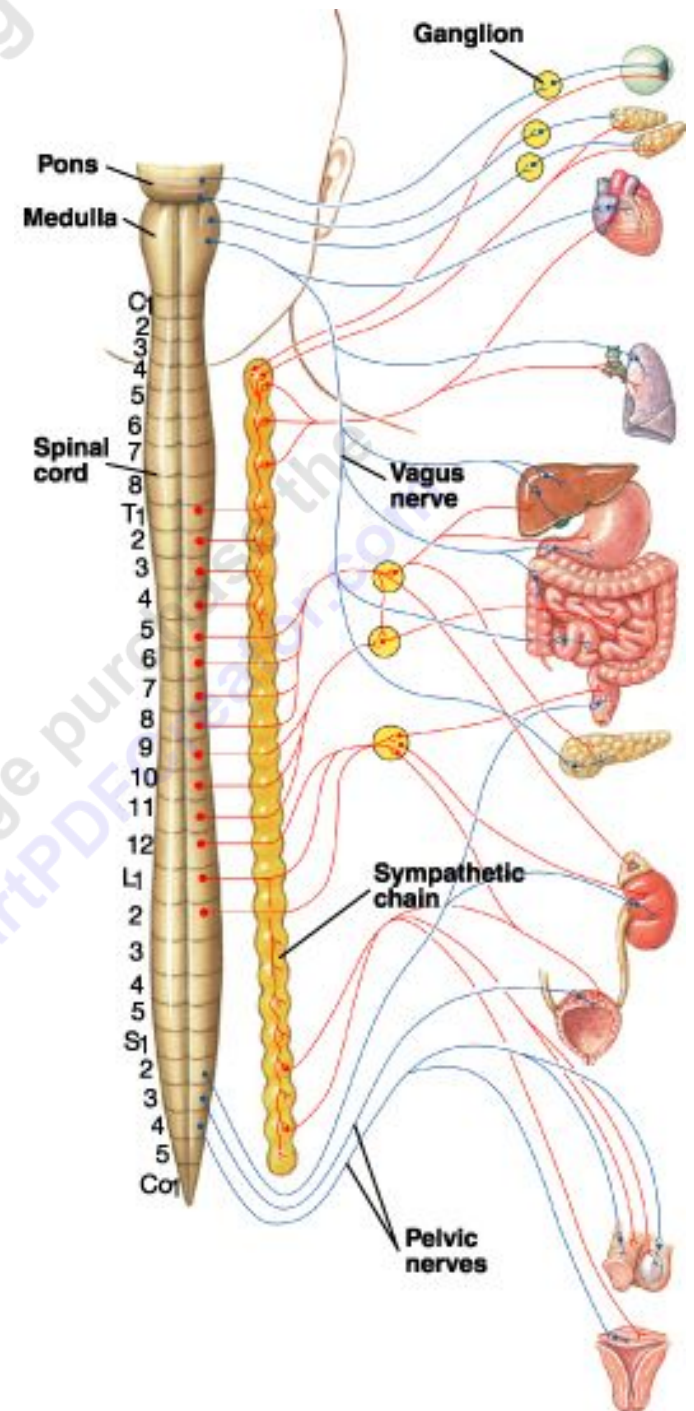
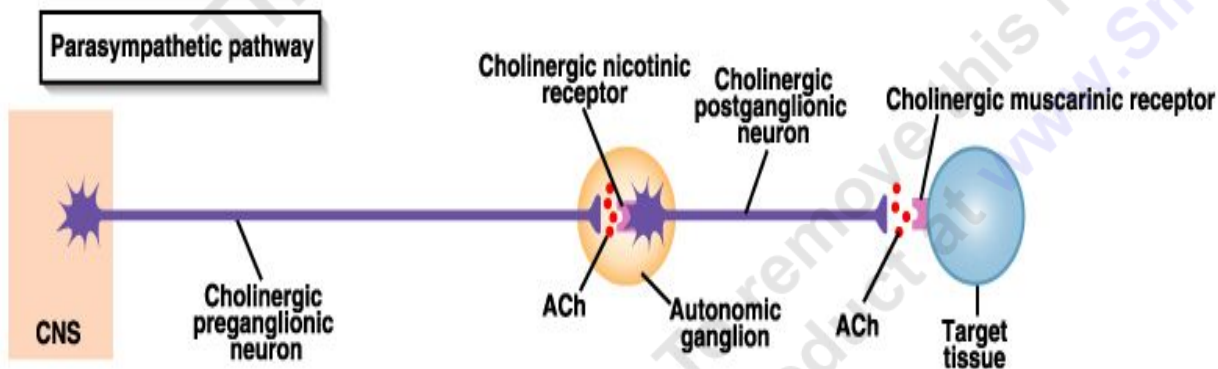
2) The preganglionic sympathetic fibers are shorter than the postganglionic fibers



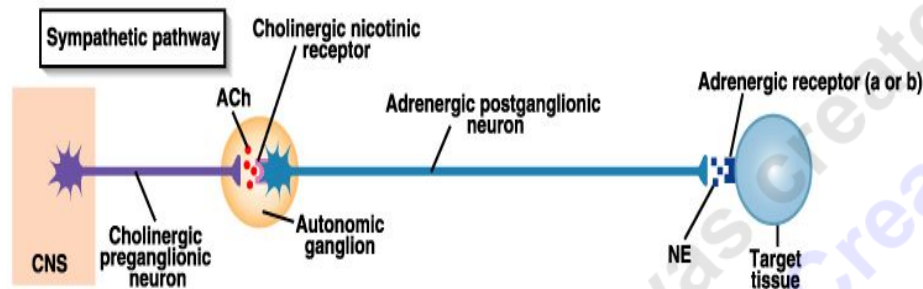
(1) Preganglionic nerves in the parasympathetic system exit the CNS from the cranium and sacral segments of the spinal cord .  
Therefore , the parasympathetic system is also called :

**“ Craniosacral Outflow “**

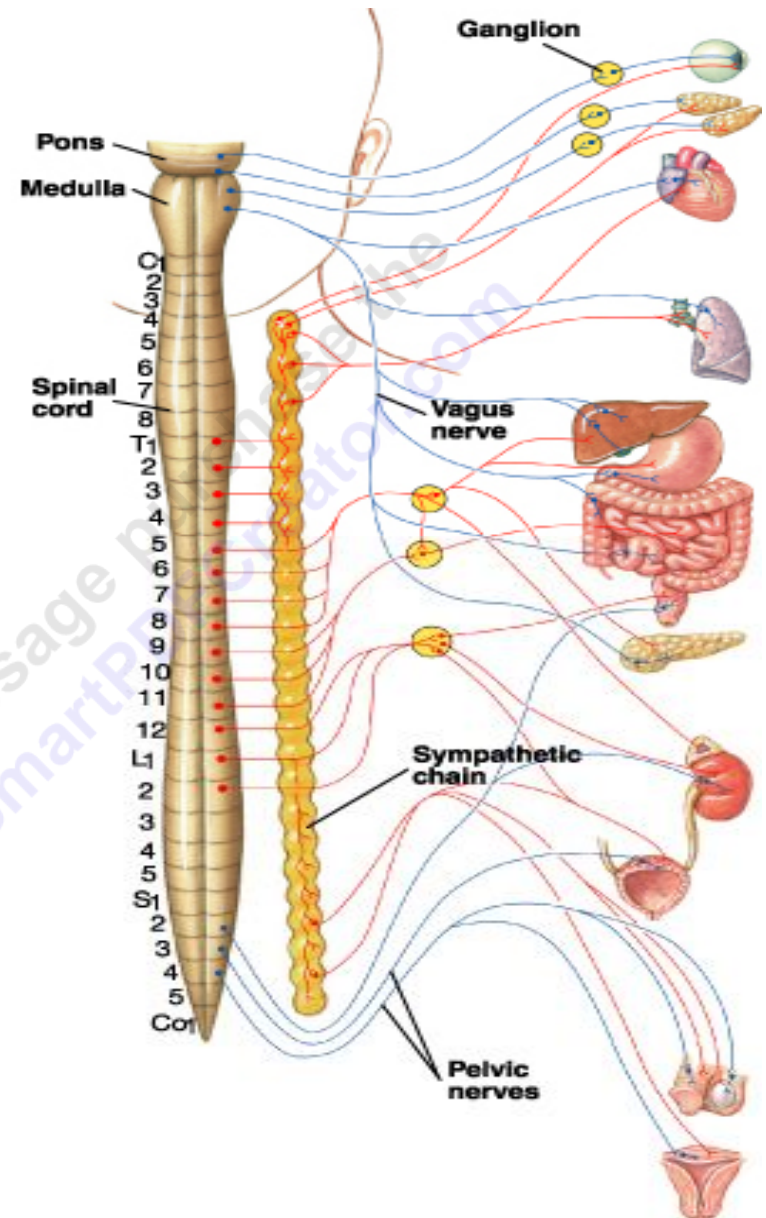
2) The preganglionic parasympathetic fibers are longer than the postganglionic ones .



# Sympathetic (Thoracolumbar) System

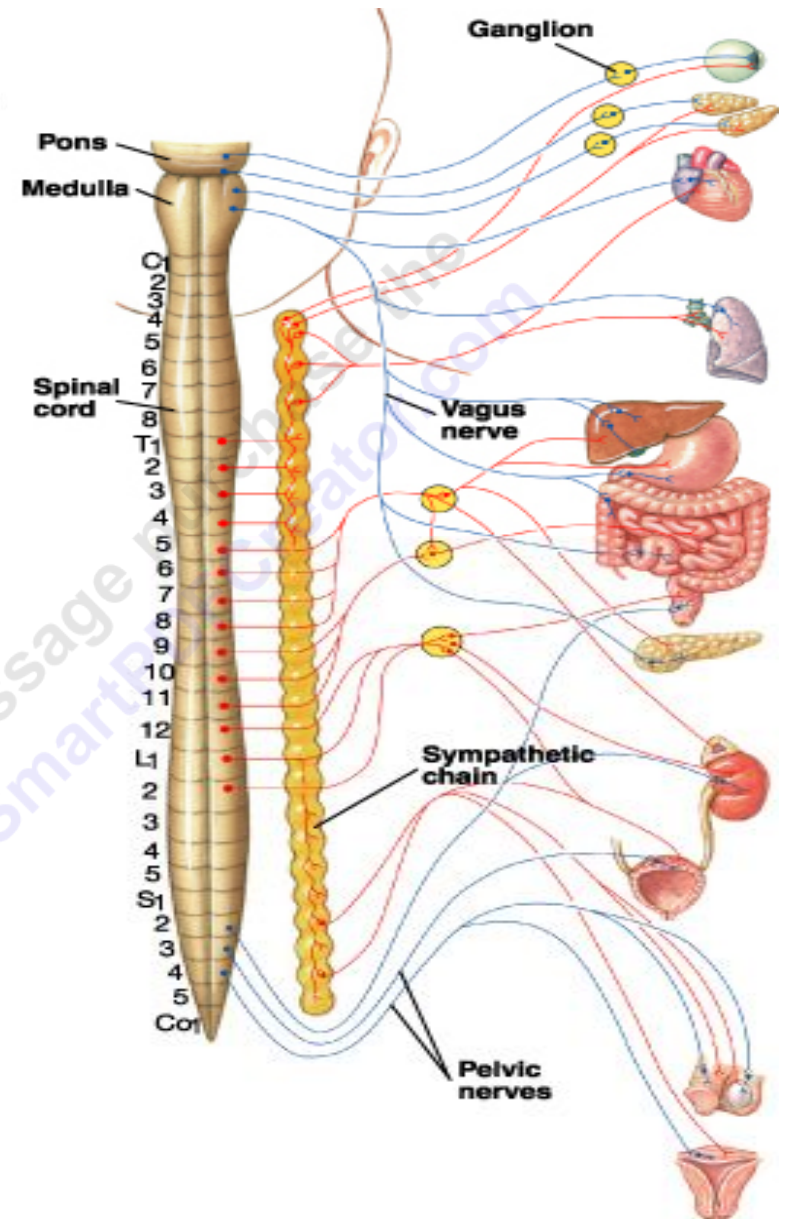
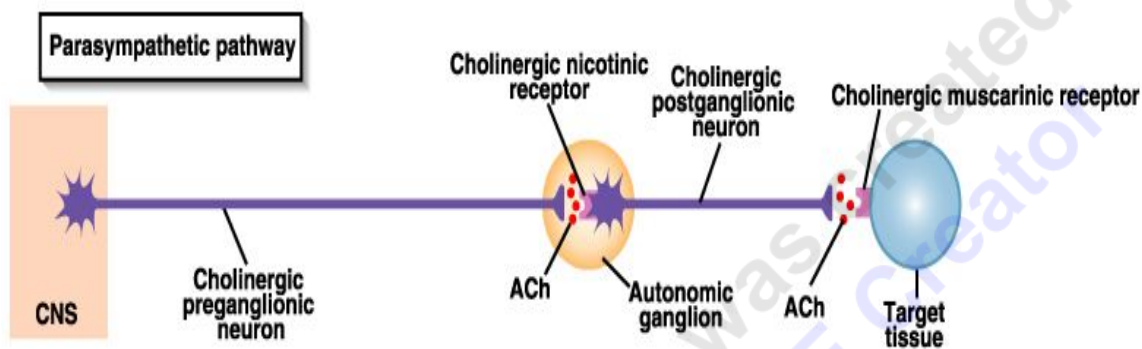


1. The preganglionic neuron cell-bodies are located in the CNS
2. Preganglionic fibers are myelinated
3. The postganglionic neuron cell-bodies are located in sympathetic ganglia , distant from their target tissues .
4. Postganglionic fibers are unmyelinated & longer than preganglionic fibers .
5. There is greater divergence . The ratio (pre/post) being = 1/10 ;
6. This divergence implies diffuse ( generalized ) actions .





# Parasympathetic (Craniosacral ) system



1. The preganglionic neuron cell-bodies are located in the CNS
2. Preganglionic fibers are myelinated
3. The postganglionic neuron cell-bodies are located in parasympathetic ganglia , close to their target tissues or embedded in their walls
4. Postganglionic fibers are unmyelinated & shorter than preganglionic fibers .
- 5 . There is little divergence , the ratio of pre- to postganglionic fibers is 1/3 .
6. This little divergence implies more specific , localized actions .

## Effect of sympathetic & parasympathetic stimulation

Organ	sympathetic	parasympathetic
<b>Heart</b>		
SA node	Increased heart rate	Decreased heart rate
Myocardium\	Increased force of contraction	Decrease force of contraction
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<b>Lung</b>	Dilatation of bronchioles	Constriction of bronchioles
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<b>Gastro-intestinal tract</b>	Decreased motility + Secretion + constricted sphincters	increased motility + secretion + relaxed sphincters
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<b>Metabolism</b>	Increased metabolic rate + catabolism dominates	Anabolism dominates

Organ	sympathetic	parasympathetic
<b>Pupil of the eye</b>	Dilatation of pupil	Constriction of pupil
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<b>Glands</b>	Slight secretion	Copious secretion
Nasal		
Lacrimal		
Parotid		
Submandibular		
Gastric		
Pancreatic		
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<b>Blood vessels</b>	Constriction	Little or no effect

- Thanks !