



Tikrit University  
College of Veterinary Medicine

# Divisions of the nervous system

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## **Divisions of the nervous system**

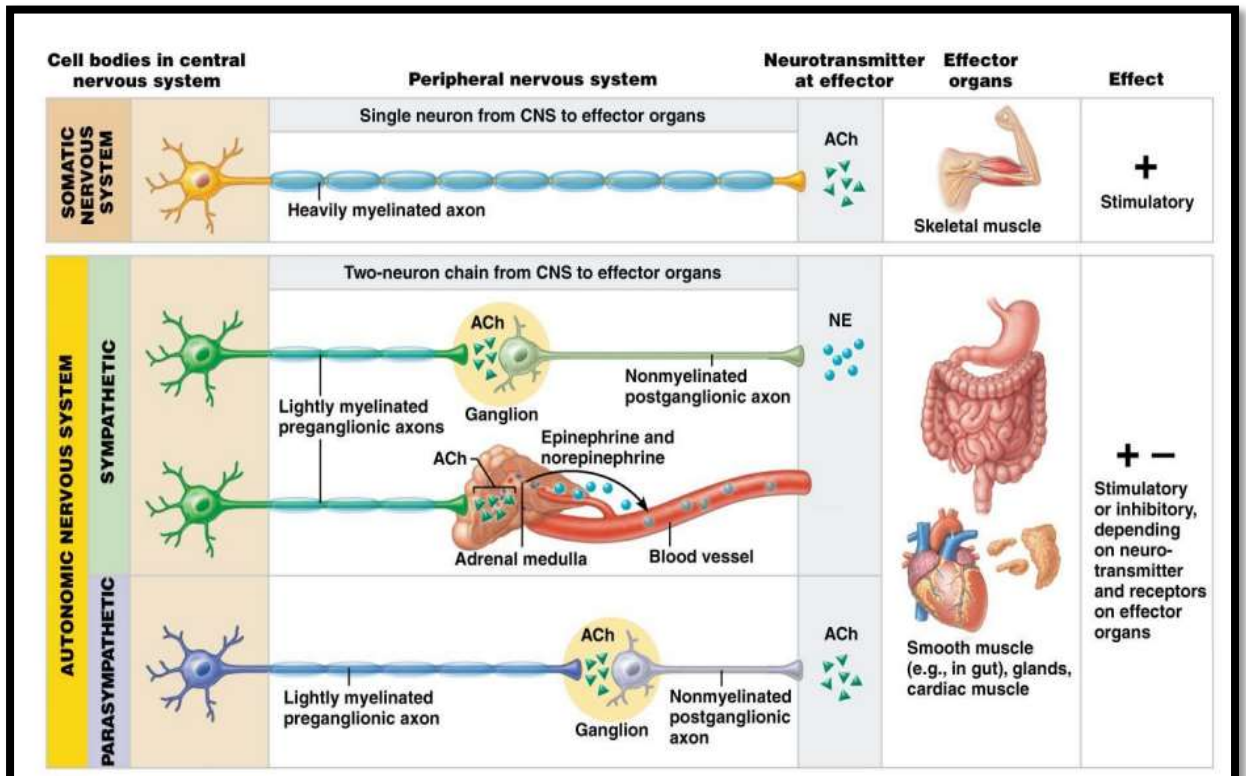
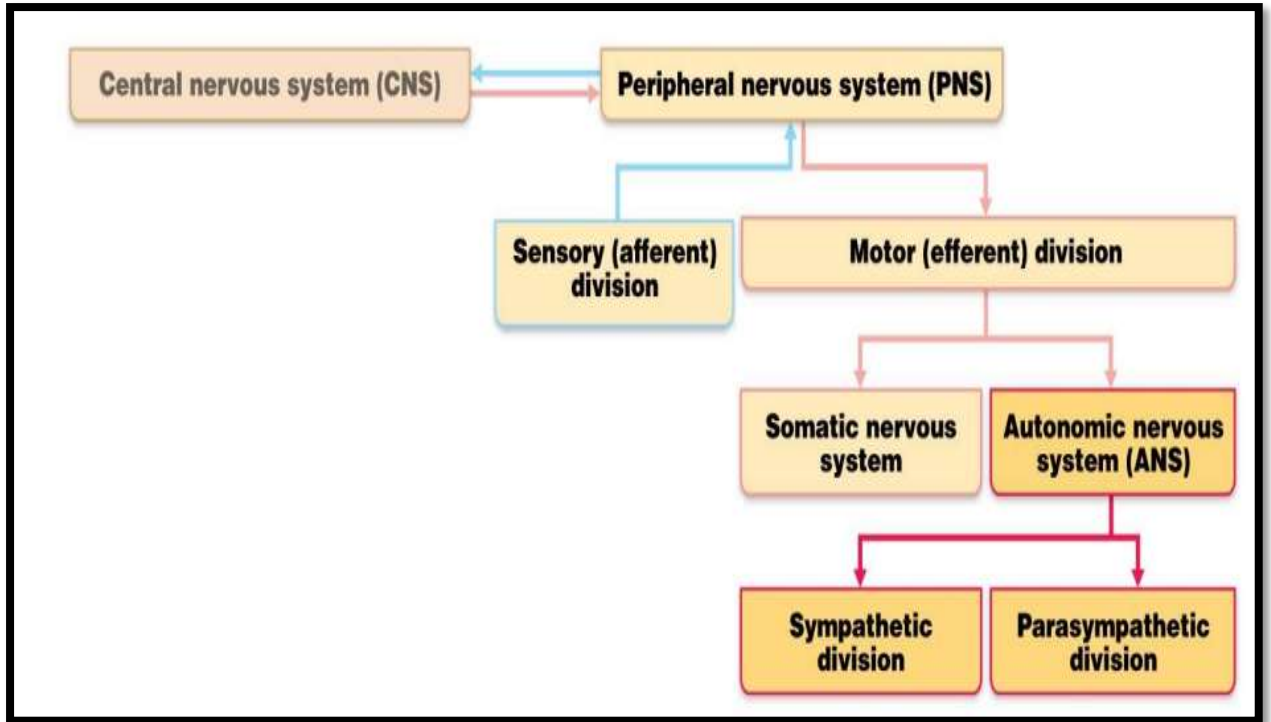
♣ The nervous system consists of the central nervous System (CNS) and the Peripheral Nervous System (PNS).

CNS is composed of the brain (located in the cranial cavity) and the spinal cord (located in the vertebral cavity), which serve as the main control centers for all body activities.

PNS is composed of nerves derived from the brain and spinal cord (12 pairs of cranial nerves and 31 pairs of spinal nerves) which serve as linkage between the CNS and the body.

PNS can be subdivided into sensory (afferent) nerves and motor (efferent) nerves. Sensory nerves send nerve impulse from the body to CNS to effector organs. Motor nerves are divided into the somatic nervous system (SNS) which regulates the voluntary contraction of the skeletal muscles, and autonomic nervous system (ANS) which regulates the involuntary control of smooth, cardiac muscles and glands.

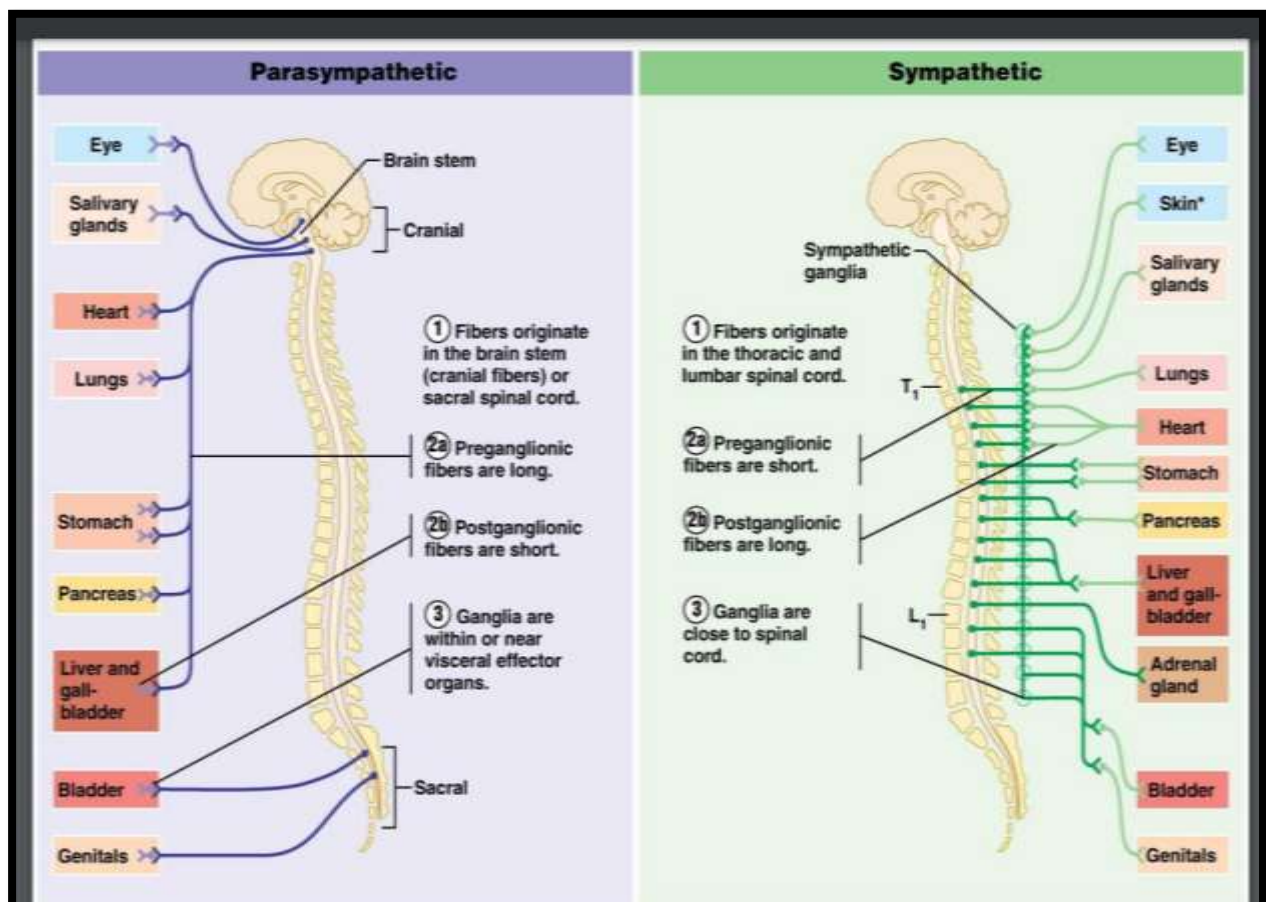
Finally, the ANS can be divided into sympathetic and parasympathetic branches where in general sympathetic nerves stimulate activities of the effect or organs (except digestive organs) and parasympathetic nerves inhibit activities of the effect or organs (except digestive organs).



ANS together with the endocrine system controls the body's internal organs .

- It innervates smooth muscles, cardiac muscle , and glands , controlling the circulation of blood , activity of the G.I . Tract and body temp .
- Characteristics :
  1. Innervates smooth muscle , cardiac muscle and glands of internal organs .
  2. Involuntary , are reflexes controlled .
  3. Two neuron chain
    - a. preganglionic neurons – originate in the brain or spinal cord .
    - b. postganglionic neurons – originate in the ganglion located outside the CNS .

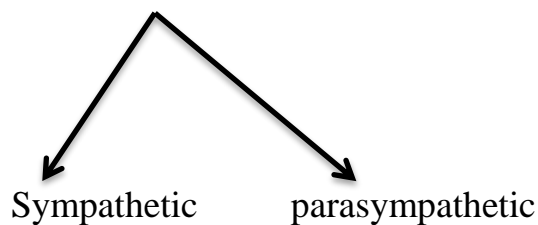
### Anatomy of ANS



**Two neuron chain:**

- a. cell body of first neuron is in CNS.
- b. Axon of first neuron: preganglionic fibers synapse with soma of second neuron.
- c. second neuron is in ganglia outside the CNS (in PNS).
- d. Axon of second neuron: postganglionic fibers innervates effector organ.

Tow division

**Sympathetic Nervous System**

Generally stimulates the effector organ (except in digestive tract) .It is activated in emergencies, flight– or– fight reaction, in the sense that the body can either quickly flee or "take a stand".

-The preganglionic fibers of the sympathetic nervous system produce Acetylcholine and are called **cholinergic** fibers.

-Most postganglionic fibers produce norepinephrine (noradrenalin) and are called adrenergic fibers (exceptions are the sweat glands and blood vessels in skin).

-Location of ganglia is within a few cm of CNS, along the vertebral column (Para vertebral and prevertebral [collateral] ganglia).

-Sympathetic fibers originate from the thoracolumbar region of the spinal cord (T1 – L2 ).

-Short preganglionic fibers.

- Long postganglionic fibers.

-Postganglionic fibers are distributed throughout the body.

-Postganglionic fibers run from the ganglion to the organs that they supply.

### Functions of the Sympathetic Nervous System

FEAR, FIGHT, FLIGHT - The sympathetic nervous system enables the body to be prepared for the Fear-Flight-Fight situations. - Dominance by the sympathetic system is caused by physical or emotional stress “Emergency situations”: Emergency, Exercise, Embarrassment, Excitement. - Sympathetic responses also contribute to Increase in heart rate , blood pressure , and cardiac output. - It diverts blood flow away from the GIT “splanchnic vessels ”and skin via vasoconstriction. - It has a stimulatory effect on organs and physiological systems, responsible for rapid sensory activity (pupils in the eye) and movement (skeletal muscle). - Blood flow to skeletal muscles, lungs is not only maintained, but enhanced (by as much as 1200%), in case of skeletal muscles. - Increase pupil size, bronchial dilatation, and contraction of sphincters and metabolic changes such as the mobilisation of fat and glycogen.

### Parasympathetic division

- Generally inhibits the effector organ (except in digestive tract).
- All pre and postganglionic fibers product Ach and are cholinergic.
- Location of ganglia (terminal ganglia) is in or near effector organ.
- Pregarglionic fibers arise from the CNS (brain stem) and sacral region of spinal cord (S2 – S4 ).
- Long preganglionic fibers.
- Short postganglionic fibers.
- Postganglionic fibers are limited to the head, viscera of chest, abdomen and pelvis.

### Functions of the Parasympathetic Nervous System

REST AND DIGEST - In physiological terms, the parasympathetic system is concerned with conservation and restoration of energy, as it causes a reduction in heart rate and blood pressure, diameter of airways and diameter of pupil and facilitates digestion and absorption of nutrients,



and consequently the excretion of waste products. - The chemical transmitter at both pre and postganglionic synapses in the parasympathetic system is Acetylcholine (Ach)