

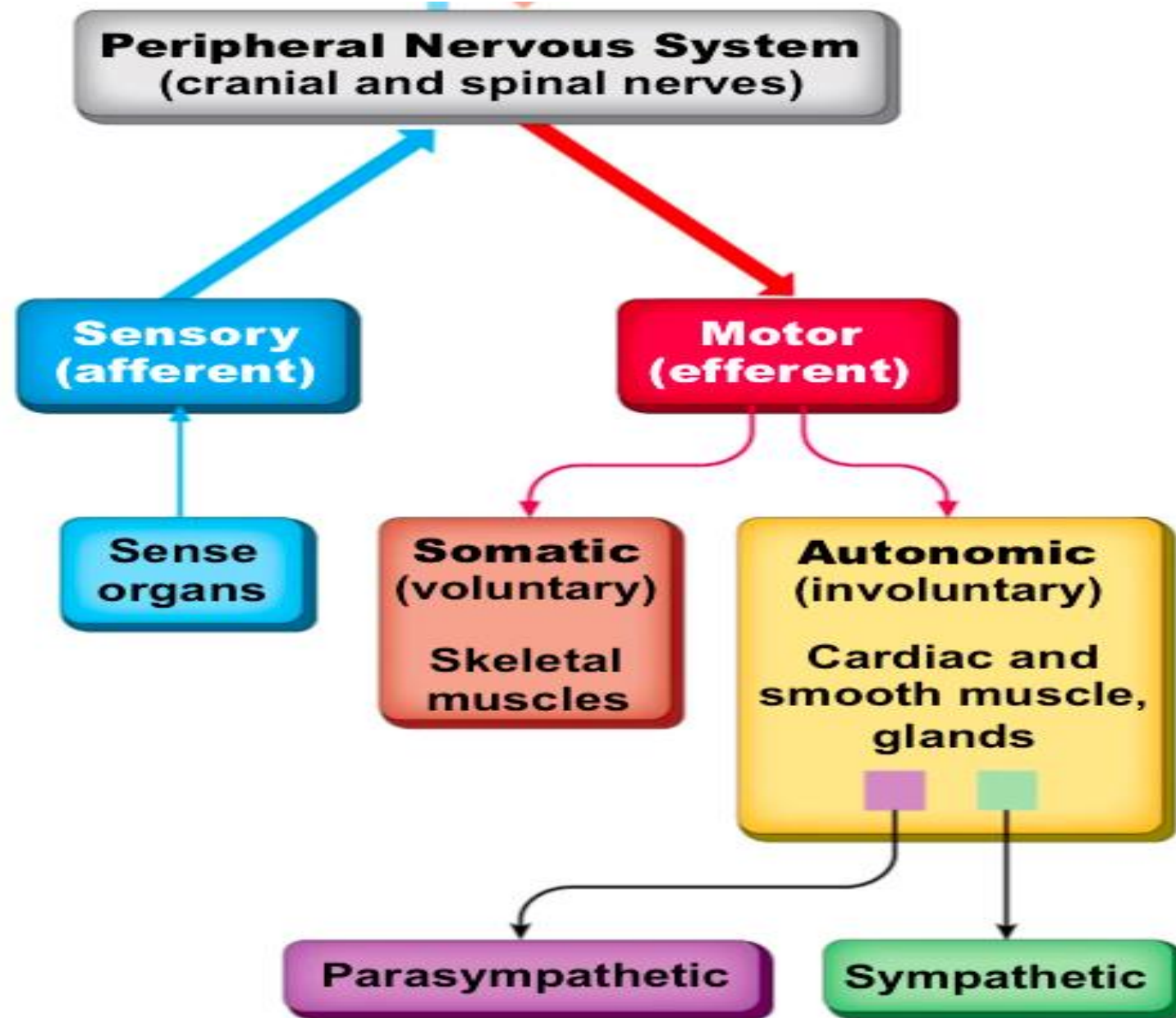
PERIPHERAL NERVOUS SYSTEM

M. M. Shinde

K. K. Wagh College of Pharmacy

Introduction and Classification

- The peripheral nervous system refers to parts of the nervous system **outside the brain and spinal cord**. It includes the cranial nerves, spinal nerves and their roots and branches, peripheral nerves, and neuromuscular junctions.
- The main function of the PNS is to connect the CNS to the limbs and organs, essentially serving as a relay between the brain and spinal cord and the rest of the body.
- The peripheral nervous system is further subdivided into the somatic nervous system and the autonomic nervous system.
- The *somatic nervous system* consists of nerves that go to the skin and muscles and is involved in conscious activities.
- The *autonomic nervous system* consists of nerves that connect the CNS to the visceral organs such as the heart, stomach, and intestines. It mediates unconscious activities.



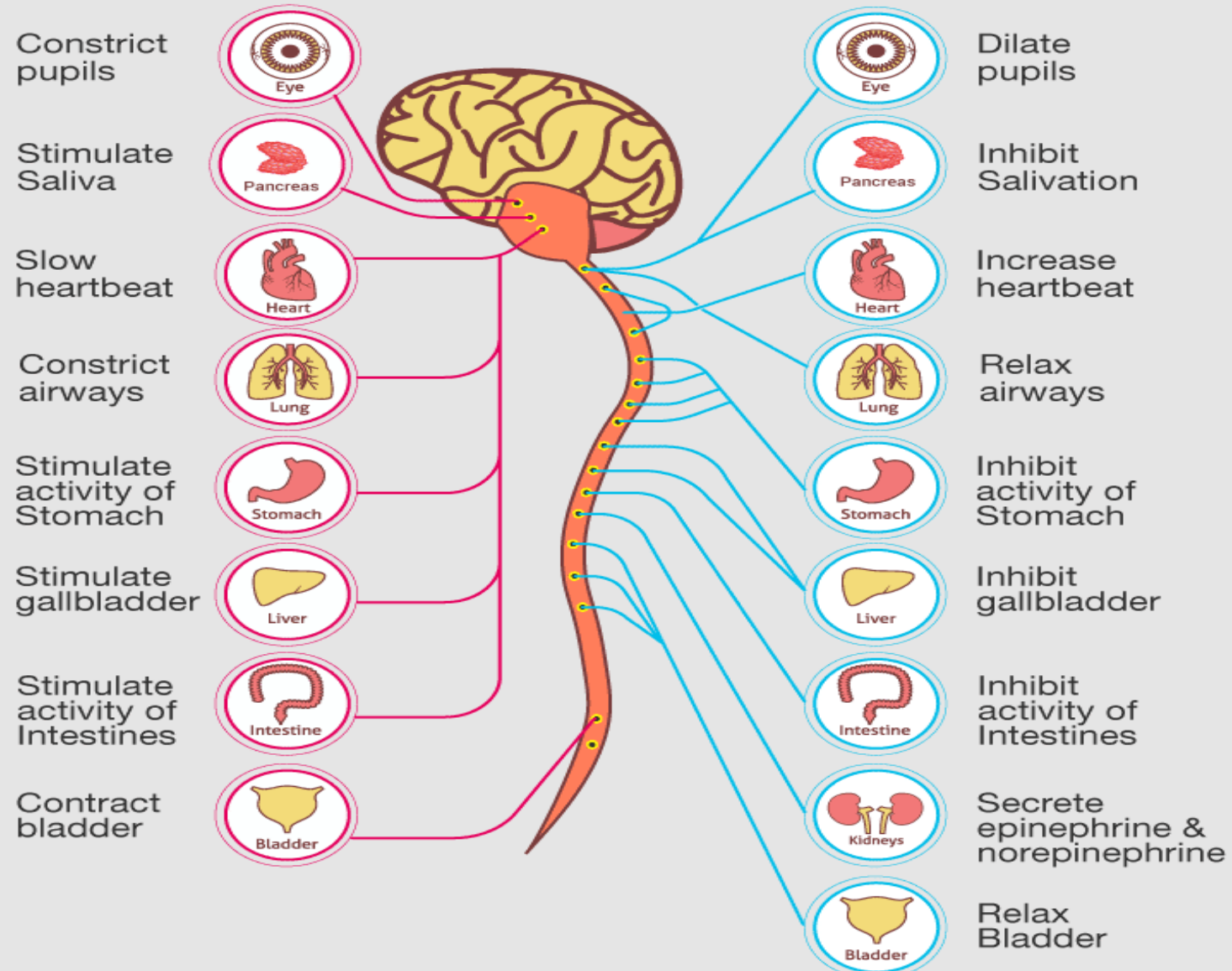
Sympathetic Nervous System

- The sympathetic nervous system is part of the autonomic nervous system
- The origin of the sympathetic nervous system is found within the thoracic and lumbar segments of the spinal cord also known as the thoracolumbar division (T1 to L2,3)
- The sympathetic pathway can be divided into three following components:
 1. *The preganglionic neurons*
 2. *The sympathetic ganglia*
 3. *The postganglionic neurons*

PARASYMPATHETIC NERVES

Vs

SYMPATHETIC NERVES



Difference between Sympathetic and parasympathetic nervous system

Sympathetic nervous system is a part of the autonomic nervous system that serves to accelerate the heart rate, constrict blood vessels, and raise blood pressure

Originates from cranial, thoracic, and lumbar regions of the central nervous system

Prepares the body for an intense physiological activity

Action is a quick response

Ganglions are found close to the central nervous system.

Pre-ganglionic fibers are short

Parasympathetic nervous system is a part of the autonomic nervous system that serves to slow the heart rate, increase intestinal and glandular activity, and relax the sphincter muscles

Originates from cranial and sacral regions of the central nervous system

Relaxes the body by inhibiting high energy functions

Action is a slow response

Ganglions are found away from the central nervous system but close to the effector

Pre-ganglionic fibers are long

Post-ganglionic fibers are long

A large number of post-ganglionic fibers are found

Covers a large area in the body

Generates a diffused effect at its target area

Noradrenaline is released at the effector

Generates an excitatory homeostatic effect

Increases heart beat, blood level, and metabolic rate

Post-ganglionic fibers are short

A small number of post-ganglionic fibers are found

Covers a small area in the body

Generates a localized effect at its target area

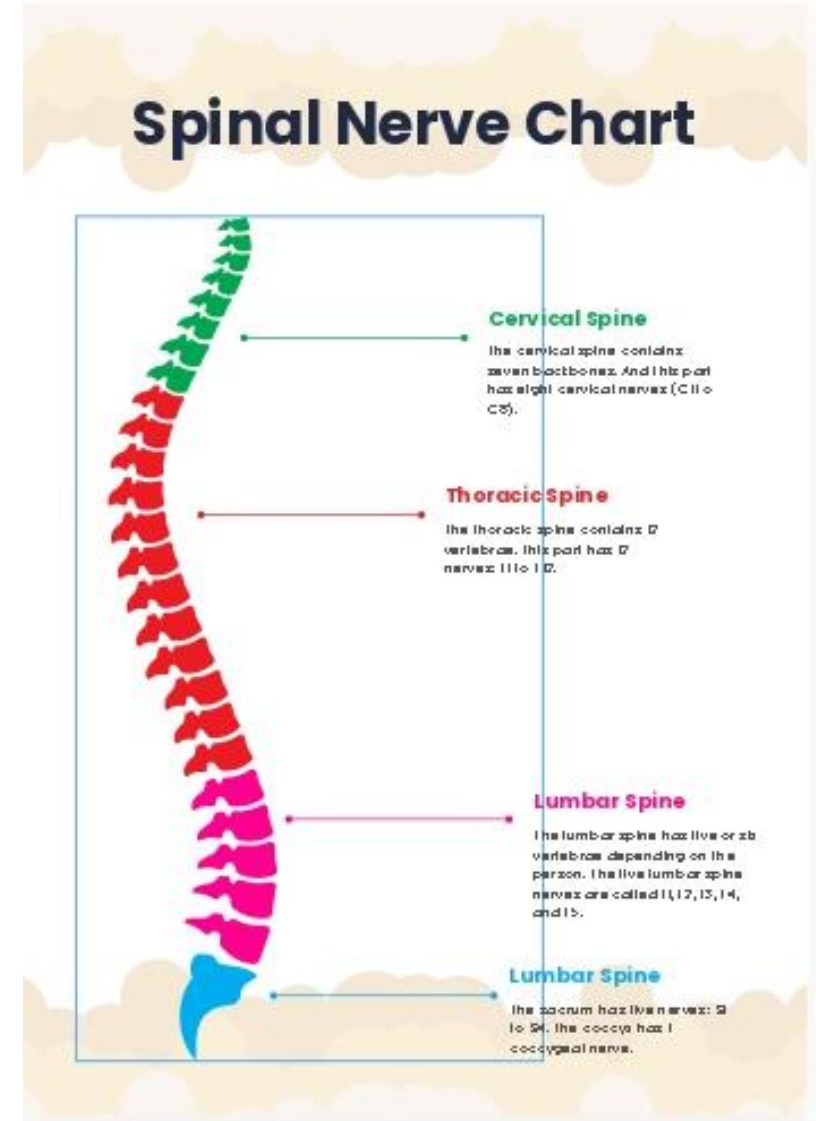
Acetylcholine is released at the effector

Generates an inhibitory homeostatic effect

Decreases heart beat, blood level, and metabolic rate

Spinal nerves

- Spinal nerves are bundles of nerve fibers connected to the spinal cord that carry information to and away from the spinal cord. Spinal nerves supply all the areas of the body except most head and neck region.
- Spinal nerves are mixed nerves sending motor, sensory, and autonomic signals between the CNS and the body and they belong to the peripheral nervous system (PNS).
- In humans there are 31 pairs:
 1. Cervical nerves- 8
 2. Thoracic nerves- 12
 3. Lumbar nerves- 5
 4. Sacral nerves- 5
 5. Coccygeal nerves- 1



Cranial Nerves

- ***Olfactory nerve:*** Sense of smell.
- ***Optic nerve:*** Ability to see.
- ***Oculomotor nerve:*** Ability to move and blink your eyes.
- ***Trochlear nerve:*** Ability to move your eyes up and down or back and forth.
- ***Trigeminal nerve:*** Sensations in your face and cheeks, taste and jaw movements.
- ***Abducens nerve:*** Ability to move your eyes.
- ***Facial nerve:*** Facial expressions and sense of taste.
- ***Auditory/vestibular nerve:*** Sense of hearing and balance.
- ***Glossopharyngeal nerve:*** Ability to taste and swallow.
- ***Vagus nerve:*** Digestion and heart rate.
- ***Accessory nerve (or spinal accessory nerve):*** Shoulder and neck muscle movement.
- ***Hypoglossal nerve:*** Ability to move your tongue.

Cranial nerve	Name	Sensory and/or motor	Major function	Location of cells whose axons form the nerve
I	Olfactory nerve	Sensory	Sense of smell	Nasal epithelium
II	Optic nerve	Sensory	Vision	Retina
III	Oculomotor nerve	Motor	Eye movements; pupillary constriction and accommodation; muscle of upper eyelid	Oculomotor nucleus in midbrain; Edinger-Westphal nucleus in midbrain
IV	Trochlear nerve	Motor	Eye movements (intorsion, downward gaze)	Trochlear nucleus in midbrain
V	Trigeminal nerve	Sensory and motor	Somatic sensation from face, mouth, cornea; muscles of mastication	Trigeminal motor nucleus in pons; trigeminal sensory ganglion (the gasserian ganglion)
VI	Abducens nerve	Motor	Eye movements (abduction or lateral movements)	Abducens nucleus in pons
VII	Facial nerve	Sensory and motor	Controls the muscles of facial expression; taste from anterior tongue; lacrimal and salivary glands	Facial motor nucleus in pons; superior salivatory nuclei in pons; geniculate ganglion
VIII	Vestibulocochlear (auditory) nerve	Sensory	Hearing; sense of balance	Spiral ganglion; vestibular (Scarpa's) ganglion
IX	Glossopharyngeal nerve	Sensory and motor	Sensation from posterior tongue and pharynx; taste from posterior tongue; carotid baroreceptors and chemoreceptors; salivary gland	Nucleus ambiguus in medulla; inferior salivatory nucleus in pons; glossopharyngeal ganglia
X	Vagus nerve	Sensory and motor	Autonomic functions of gut; cardiac inhibition; sensation from larynx and pharynx; muscles of vocal cords; swallowing	Dorsal motor nucleus of vagus; nucleus ambiguus; vagal nerve ganglion
XI	Spinal accessory nerve	Motor	Shoulder and neck muscles	Spinal accessory nucleus in superior cervical cord
XII	Hypoglossal nerve	Motor	Movements of tongue	Hypoglossal nucleus in medulla