Department of Veterinary Physiology

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B.V.Sc. & A.H.

1st Year (2023-24)

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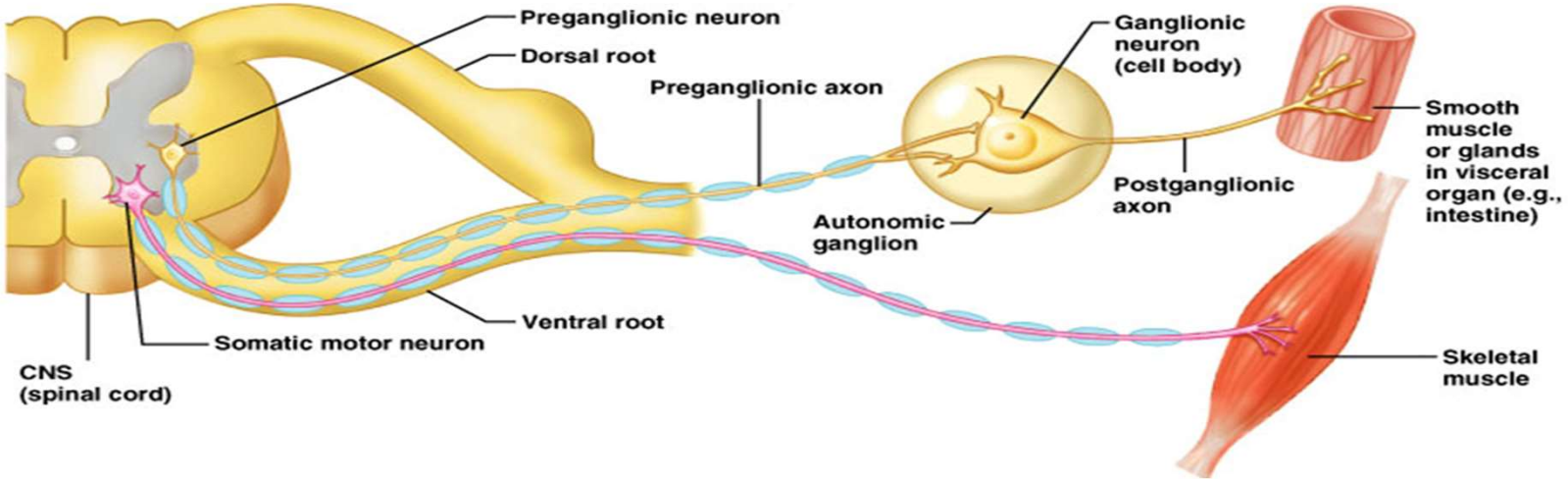
Autonomic Nervous System



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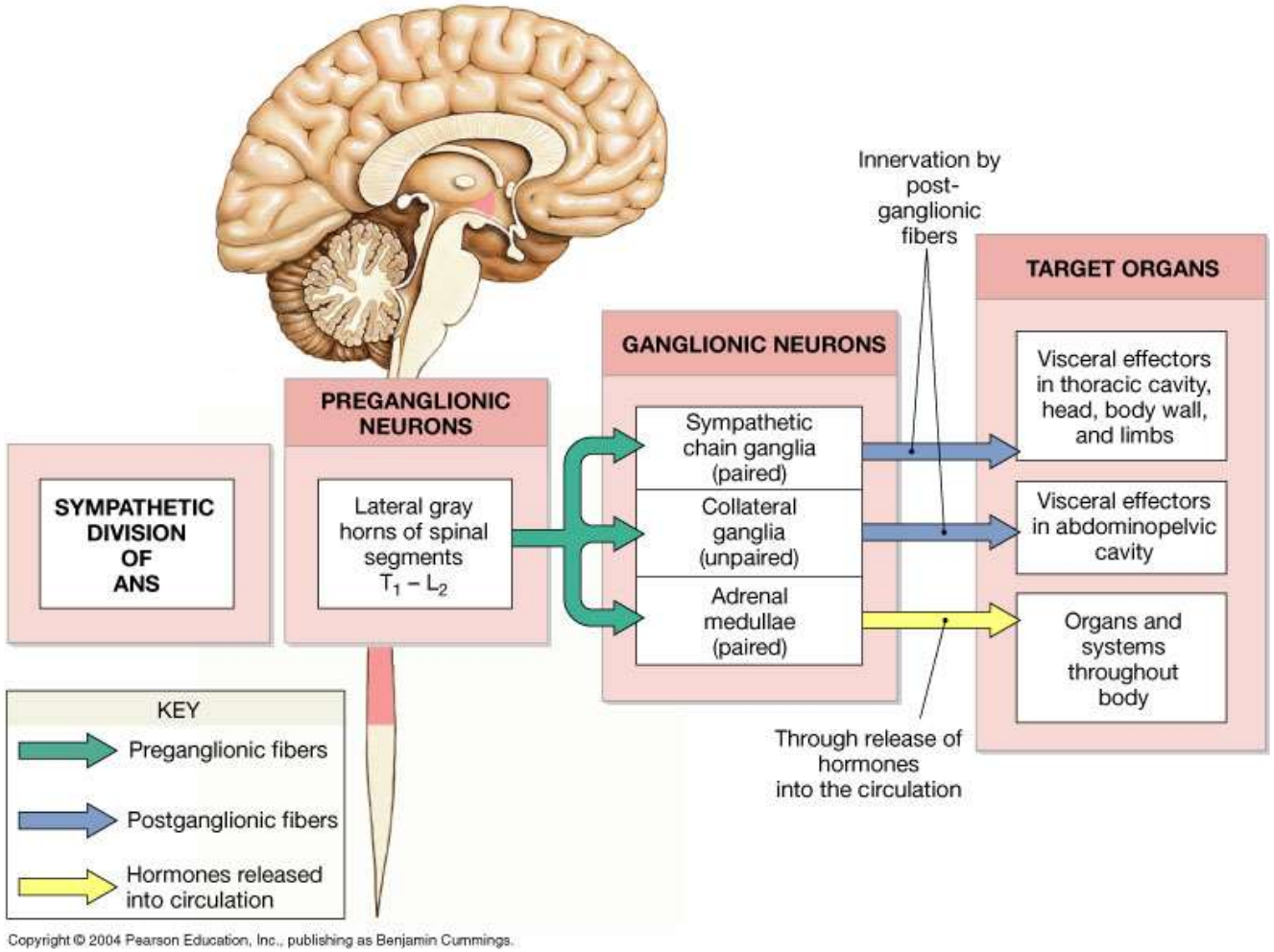
Lecture-3 :Sympathetic Nervous System

Sympathetic Nervous System

- Sympathetic Preganglionic Neurons
- Sympathetic Ganglia
- Postganglionic Sympathetic Neurons
- Distribution of Sympathetic neurons
- Effect of Sympathetic stimulation

Organization: Sympathetic NS



Sympathetic Nervous System

- Also called ***Thoracolumbar*** system
- All preganglionic sympathetic fibers
  - Arises from lateral horn of spinal cord
  - Leave the spinal cord with the ventral roots of the spinal nerve
  - Cell body located in gray matter from T1-L2
- Sympathetic trunk extend the entire length of spinal cord
- Post ganglionic fibers pass to effector organ

Sympathetic Nervous System

All preganglionic sympathetic fibers-

- Arises from lateral horn of spinal cord
- Leave the spinal cord with the ventral roots of the spinal nerve
- Cell body located in gray matter from T1-L2

Sympathetic Nervous System

All preganglionic sympathetic fibers are:

- Short
- Myelinated
- Type B fiber

- Leave the spinal cord via ventral root
- Pass via the white rami communicates to the paravertebral ganglia
- Terminates in sympathetic ganglia
- Synapses with postganglionic neurons

Sympathetic Nervous System

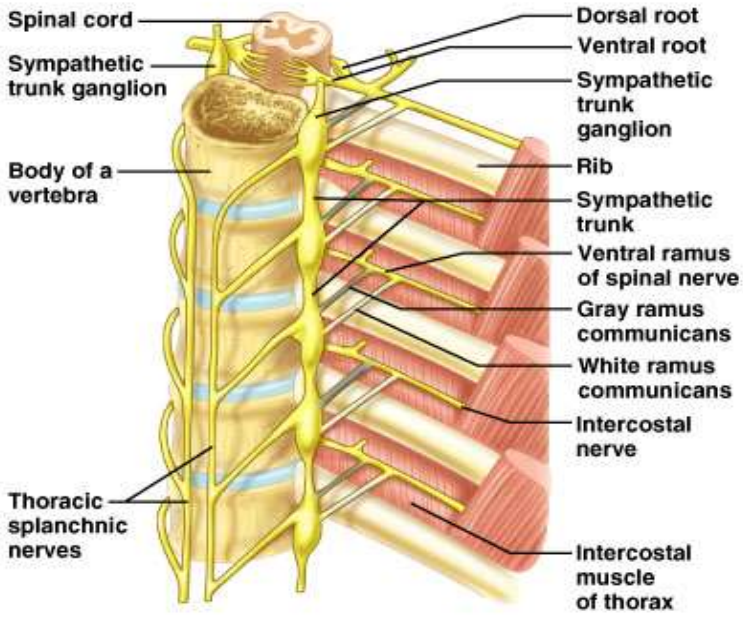
Destination of the preganglionic fibers after reaching the sympathetic trunk

- Preganglionic fibres after reaching the sympathetic trunk may-
  1. Terminate in the same ganglia that it enters
  2. Pass upward & terminate in the other ganglia
  3. Pass downward & terminate in the other ganglia
  4. Leave the sympathetic trunk without synapsing & terminate in other ganglia which lies out side the sympathetic trunk

Sympathetic Ganglia

- Ganglia: Structures where synapsing between pre and post ganglionic fibers occurs
- One preganglionic fiber synapses with several post ganglionic neurons
- Important groups of sympathetic ganglia are-
  1. Sympathetic trunk (Paravertebral ganglia)
  2. Prevertebral ganglia
  3. Peripheral ganglia

Sympathetic Trunk Ganglia



Postganglionic Sympathetic Neuron

- All Postganglionic Sympathetic Neuron arises from sympathetic ganglia
- Cell body located in ganglion
- These are -
  - Short &
  - Nonmyelinated
  - Type C fibers

Postganglionic Sympathetic Neuron

Postganglionic Sympathetic Fibers may-

Pass through gray ramus communicantes and re-enter ventral root to reach a spinal nerve and innervate the-

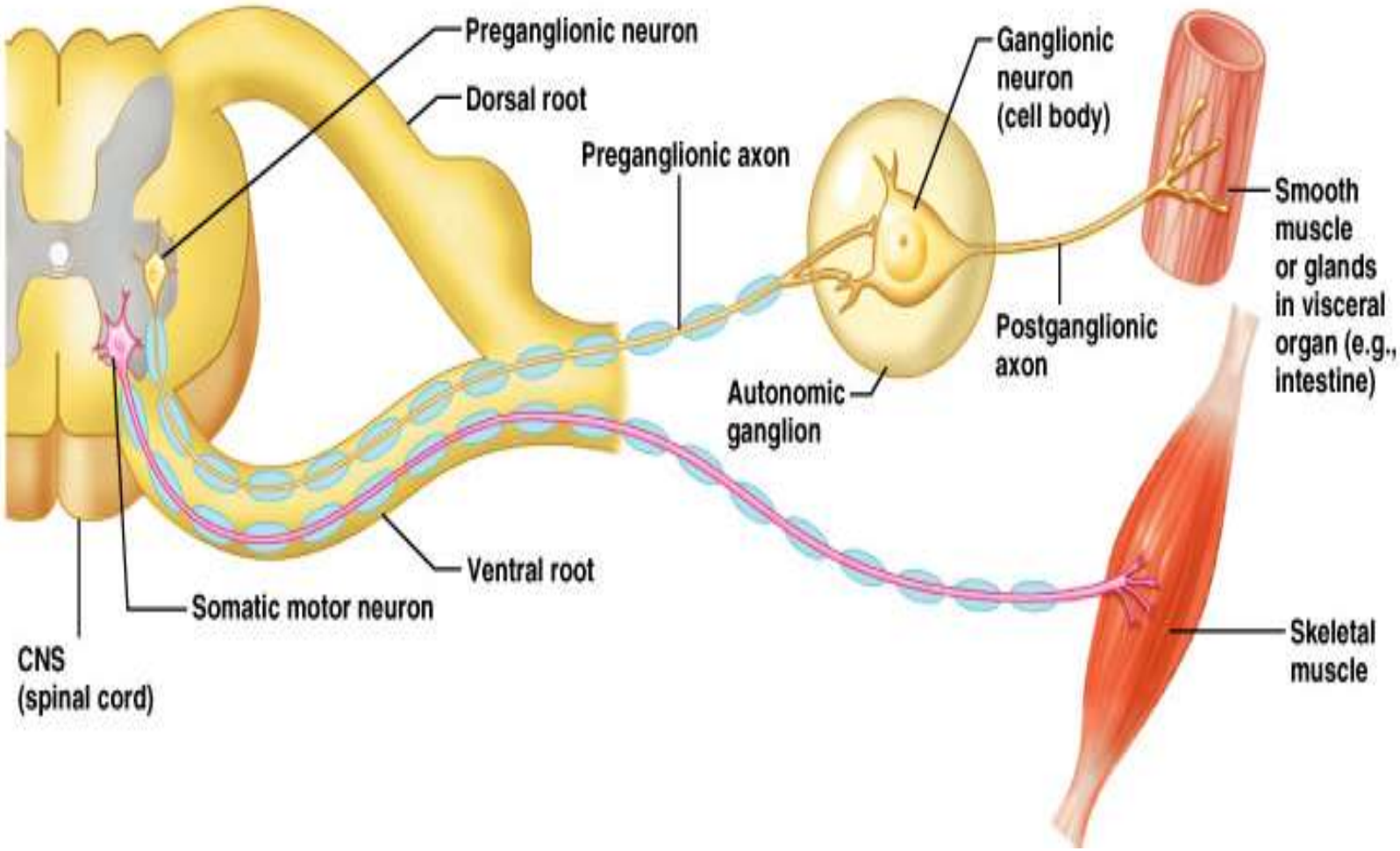
- Sweat gland
- Blood vessels
- Piloerector muscle

Postganglionic Sympathetic Neuron

Postganglionic Sympathetic Fibers may-

1. Pass through gray ramus communicantes and re-enter ventral root to reach a spinal nerve

2. Reach a cranial nerve through communicating branch & distributed through it
3. Pass into a vascular branch and distributed to branches of vessels
4. Innervate the visceral organs


Preganglionic neuron
Dorsal root
Preganglionic axon
Ganglionic neuron (cell body)
Smooth muscle or glands in visceral organ (e.g., intestine)
Postganglionic axon
Autonomic ganglion
Ventral root
Somatic motor neuron
CNS (spinal cord)
Skeletal muscle

Distribution of Sympathetic neurons

Segmental level	Area of distribution
1. T1,T2	Head & Neck
2. T3,T4	Thoracic viscera
3. T5 toT9	Upper limb
4. T10 to L2	Lower Limb
5. T6 toT12	Upper Abdominal Viscera
6. L1,L2	Lower Abdominal Viscera
7. T1toT12	Thoracic & abdominal Vessels

Effect of Sympathetic stimulation

System/organ	Effects
CVS	Cardiac stimulation
Heart	
SAN	+ve Chronotropic Effect
AVN	+ve Dromotropic Effect
Purkinje Fibers	+ve Bathmotropic Effect
Myocardium	+ve Inotropic Effect
Blood Vessels	Vasoconstriction – Splanchnic Cutaneous
	Vasodilatation-skeletal blood vessels

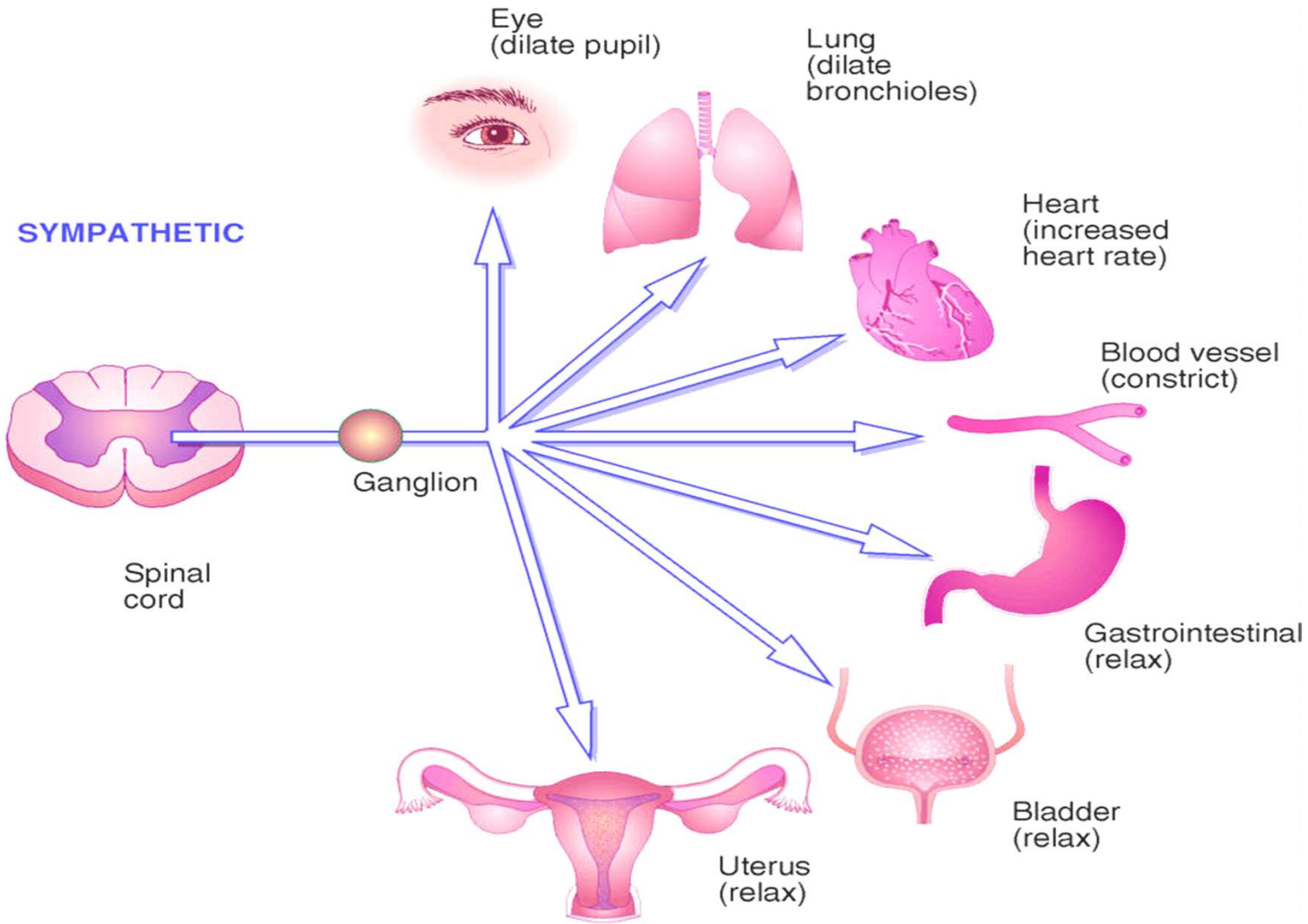
Effect of Sympathetic stimulation

System/organ	Effects
CVS	Cardiac stimulation
HR	Increases
SV	Increases
CO	Increases
SBP	Increases
DBP	Increases
PVR	Increases

Effect of Sympathetic stimulation

System/organ	Effects
Respiratory	Bronchodilatation Tachypnea
GIT	Relaxation of smooth muscle Constriction of sphincters
CNS	Increased alertness Loss of sleep
Genitourinary	Relaxation of detruser Constriction of sphincters Ejaculation in male

Sympathetic responses



1-Sympathetic cholinergic innervations is seen in-

A. Apocrine sweat glands
B. Eccrine sweat glands
C. Iris
D. Pancreas

2-Preganglionic sympathetic fibres are--

A. Small & Myelinated
B. Small & Nonmyelinated
C. Large & Myelinated
D. Large & Unmyelinated

3-Preganglionic sympathetic fibers innervating the heart are arises from--

A. C1-C6
B. T1-L2
C. T12-L5
D. T1-T5

4-Precapillary to post capillary resistance ratio is about--

A. 4:1
B. 1:2
C. 2:1
D. 1:4

5-Sympathetic Fibres to the heart are-

A. Endocardial
B. Epicardial
C. Serotonergic
D. Glycinergic

Applied Physiology

1. Horner's syndrome
2. Sympathomimetic drugs
3. Sympatholytic drugs
4. Parasympathomimetic drugs
5. Parasympatholytics drugs
6. Ganglion blocker

Thank
You!!!