What is the Sympathetic Division?

Worksheet

The sympathetic division is the autonomic branch that arises from the thoracolumbar spinal cord (T1-L2) and prepares the body for action by increasing heart rate, dilating airways, and redirecting blood to skeletal muscles.

Questions

1. The sympathetic division's preganglionic neurons arise from which region of the spinal cord?

A) Cervical only
B) Thoracolumbar (T1-L2)
C) Sacral only
D) Cranial nerves only

2. What neurotransmitter do most sympathetic postganglionic neurons release?

A) Acetylcholine
B) Dopamine
C) Norepinephrine
D) GABA

3. Which structure allows sympathetic preganglionic fibers to synapse close to the spinal cord?

A) Adrenal cortex
B) Sympathetic chain ganglion
C) Vagus nerve
D) Sacral plexus

4. Which of these is a typical sympathetic effect?

A) Slowed heart rate
B) Constricted pupils
C) Dilated bronchioles
D) Increased salivation

5. During a job interview, a candidate's hands become sweaty and their heart pounds. Which sympathetic structures are involved?

6. A runner about to start a sprint feels their pupils widen and airways open. Explain the sympathetic mechanism.

7. The adrenal medulla is a unique sympathetic 'organ.' What makes its innervation different from other targets?

8. Define: Where do sympathetic preganglionic neurons originate?

9. Define: What is the main neurotransmitter released by sympathetic postganglionic neurons?

10. Define: What is the sympathetic chain ganglion?

Answer Key

1. B) Thoracolumbar (T1-L2) - Sympathetic outflow is called 'thoracolumbar' because it originates from T1 to L2.

2. C) Norepinephrine - Sympathetic postganglionic neurons typically release norepinephrine onto target organs.

3. B) Sympathetic chain ganglion - The paravertebral sympathetic chain ganglia sit right beside the spinal cord for quick synapsing.

4. C) Dilated bronchioles - The sympathetic division dilates airways (bronchioles) to increase oxygen intake during stress.

5. Stress activates preganglionic neurons in the thoracic spinal cord (T1-T4 for the heart) Signals pass through sympathetic chain ganglia Postganglionic fibers release norepinephrine onto the heart and sweat glands Result: increased heart rate and sweating

6. Anticipation of exertion triggers sympathetic outflow from the spinal cord Postganglionic fibers act on the dilator pupillae muscle and bronchial smooth muscle Pupils dilate to improve vision; bronchioles widen to increase airflow This maximizes oxygen delivery for the upcoming sprint

7. The adrenal medulla is directly innervated by preganglionic sympathetic fibers, with no postganglionic neuron in between It acts like a modified sympathetic ganglion When stimulated, it releases adrenaline and noradrenaline directly into the bloodstream This produces a body-wide, hormonal amplification of the sympathetic response

8. In the lateral horn of the spinal cord, from thoracic segment T1 to lumbar segment L2 (thoracolumbar outflow).

9. Norepinephrine (noradrenaline), acting mostly on adrenergic receptors.

10. A row of paravertebral ganglia alongside the spinal cord where most preganglionic fibers synapse.