# Autonomic Motor Pathways

## Objectives

1. To describe the anatomical organization, *neurotransmitters*, and function of the Parasympathetic Nervous System, including the organization and innervation of the Cranial, Thoracic, and Abdominal-Pelvic ganglia.
2. To describe the anatomical organization, *neurotransmitters*, and function of the Sympathetic Nervous System, including the organization and innervation of the Sympathetic Chain Ganglia, the Celiac and Mesenteric Ganglia, and the Adrenal Medulla.

## Methods

### *Parasympathetic Nervous System*

Use the tables that follow as a guide and answer all of the accompanying questions.

### *Sympathetic Nervous System*

Use the tables that follow as a guide and answer all of the accompanying questions.

## *Parasympathetic Nervous System*

### Brainstem origin

| Source | Route | Destination |
|---|---|---|
| Preganglionic Cell Bodies in Medulla Oblongata | Preganglionic axons synapse on Ganglionic Cell Bodies in Cranial, Thoracic ,and Abdominal Ganglia | Postganglionic Axons synapse on target cells in Head, Thorax, and Abdomen |

1. What neurotransmitter is secreted by the preganglionic axons?
2. Where do the preganglionic axons synapse?
3. What neurotransmitter is secreted by the postganglionic axons?
4. Where do the post ganglionic axons synapse?
5. List 2 examples of actions of the postganglionic neurotransmitter in each the

    a) Head

    b) Thoracic region

    c) Abdominal region

### Sacral Spinal origin

| Source | Route | Destination |
|---|---|---|
| Preganglionic Cell Bodies in Sacral Spinal Cord | Preganglionic axons synapse on Ganglionic Cell Bodies in Pelvic Ganglia | Postganglionic Axons synapse on target cells in Pelvis |

1. What neurotransmitter is secreted by the preganglionic axons?
2. Where do the preganglionic axons synapse?
3. What neurotransmitter is secreted by the postganglionic axons?
4. Where do the post ganglionic axons synapse?
5. List 2 examples of actions of the postganglionic neurotransmitter in the

    a) Pelvic region

## *Sympathetic Nervous System*

### Sympathetic Chain Ganglia

| Source | Route | Destination |
|---|---|---|
| Preganglionic Cell Bodies in Spinal Cord | Preganglionic axons synapse on Ganglionic Cell Bodies in Chain Ganglia | Postganglionic Axons synapse on target cells in Head, Thorax, Skin, and Blood vessels in skeletal muscles |

1. What neurotransmitter is secreted by the preganglionic axons?
2. Where do the preganglionic axons synapse?
3. What neurotransmitter is secreted by the postganglionic axons?
4. Where do the post ganglionic axons synapse?
5. List 2 examples of actions of the postganglionic neurotransmitter in each the

    a) Head

    b) Thoracic region

    c) Skin

    d) Blood vessels in skeletal muscles

### Sympathetic Celiac and Mesenteric Ganglia

| Source | Route | Destination |
|---|---|---|
| Preganglionic Cell Bodies in Spinal Cord | Preganglionic axons synapse on Ganglionic Cell Bodies in Celiac and Mesenteric Ganglia | Postganglionic Axons synapse on target cells in Abdomen and Pelvis |

1. What neurotransmitter is secreted by the preganglionic axons?
2. Where do the preganglionic axons synapse?
3. What neurotransmitter is secreted by the postganglionic axons?
4. Where do the post ganglionic axons synapse?
5. List 2 examples of actions of the postganglionic neurotransmitter in each the

    a) Abdominal region

    b) Pelvic region

## Adrenal Medulla

| Source | Route | Destination |
|---|---|---|
| Preganglionic Cell Bodies in Spinal Cord | Preganglionic axons synapse on Ganglionic Cell Bodies in Adrenal Medulla | Ganglionic Axons do not leave Adrenal Medulla; “neurotransmitters” go into blood |

1. What neurotransmitter is secreted by the preganglionic axons?
2. Where do the preganglionic axons synapse?
3. What neurotransmitter / hormone is secreted by the ganglionic neurons?
4. Where do the post ganglionic axons synapse?
5. List 2 examples of actions of the postganglionic neurotransmitter / hormone in each the

    a) Head

    b) Thoracic region

    c) Skin

    d) Blood vessels in skeletal muscles

    e) Abdominal region

    f) Pelvic region

# Discussion:

1. When is the parasympathetic nervous system generally active? When is the sympathetic nervous system generally active?
2. Briefly summarize the functions and actions of the parasympathetic and sympathetic nervous systems.
3. Speculate why the autonomic nervous system has ganglia.
4. Consider a reason why the neurotransmitter of the parasympathetic postganglionic neurons is different than of the sympathetic postganglionic neurons.
5. Explain why the same neurotransmitter can have different effects on different tissues / organs.
6. Explain why norepinephrine acting as a hormone can have the same effects as norepinephrine acting as a neurotransmitter.