Welcome back from spring break everyone!! Test 2 is next week, so make sure you’re preparing enough in advance. You’ve got this, keep up the hard work!

Remember: The tutoring center offers free individual and group tutoring for this course. Our group tutoring session will be Thursdays from 6:45-7:45 PM in the basement of Sid Rich, room 74. You can reserve your spot at https://baylor.edu/tutoring. Hope to see you there!

**Keywords:** Autonomic nervous system, Sympathetics, Parasympathetics, Effects on vessels and the heart

**Topic of the Week: Autonomic Nervous System**

The **autonomic nervous** system is a 2-neuron system.
- Pre-ganglionic neurons: transfer neurotransmitters
- Post-ganglionic neurons: go to effector organ

The autonomic nervous system controls **involuntary actions** and innervates **visceral organs**.
- Afferent and efferent innervation

Sympathetic and parasympathetic divisions:
**Parasympathetics**: CN III, CN VII, CN IX, and CN X
- Synapse near or within the target organ
**Sympathetics**: originate from the lateral horn of the spinal cord T1-L2
- Synapse at sympathetic/collateral ganglia
  - The sympathetic ganglia contain cell bodies of post-ganglionic sympathetic nerves

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**Highlight #1: Pathways of Sympathetic Neurons**

Pathway #1: pre-ganglionic neuron synapses at a ganglion at the same level

*This image was taken from humanphysiology.academy.*
Pathway #2: pre-ganglionic neuron synapses at a ganglion at a level higher or lower

Pathway #3: pre-ganglionic neuron passes through the sympathetic chain without synapsing to synapse in a collateral ganglion (near the unpaired branches of the abdominal aorta; these will be covered in more detail later in the course)
- These nerves are called splanchnic nerves and travel to abdominal organs!

A few key terms:
- **White communicating ramus**: takes pre-ganglionic sympathetics from the spinal nerve into the sympathetic ganglion
- **Gray communicating ramus**: takes post-ganglionic from the sympathetic ganglion out through the ventral ramus
  - Pathway #3 does not involve the gray communicating ramus

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**Highlight #2: Parasympathetics**

The parasympathetic nervous system has the following functions:
- GI motility
- Innervates pelvic organs
- Constricts the pupils (CN III)
- Slows down heart rate
- Lacrimation (CN VII)
- Salivation (CN VII and IX)
- Dilates vessels

CN III, VII, IX, and X will be covered in more detail soon!

*Parasympathetics have NO EFFECT on sweat glands, arrector pili muscles (goose bumps), or peripheral blood vessels!

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**Highlight #3: Autonomic Effects on Vessels and the Heart**

**Sympathetics:**
- Vessels → vasoconstriction of peripheral vessels and vasodilation in skeletal muscle tissues
- Heart → increase cardiac output, contractility, and heart rate

**Parasympathetics:**
- Vessels → no effect on peripheral vessels
- Heart → decrease cardiac output, contractility, and heart rate

*As a rule of thumb, think of the sympathetic division as “fight or flight” and the parasympathetic division as “rest and digest”!

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**Week 9 Knowledge Checkpoint:**

1. Where do the pre-ganglionic sympathetic neurons synapse?

2. If a sympathetic neuron is traveling to the head, where will its pre-ganglionic neuron most likely synapse?
   - A. At the sympathetic ganglion at same level
   - B. At the sympathetic ganglion higher
   - C. At the sympathetic ganglion lower
   - D. Within the target organ

3. Describe the general pathway of a sympathetic neuron that will synapse at a ganglion at the same level.

4. Which of the following cranial nerves has parasympathetic functions?
   - A. CN II
   - B. CN VI
   - C. CN X
   - D. CN III

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**THINGS YOU MAY STRUGGLE WITH!**

1. *The pathways of sympathetic neurons*: If it helps, draw it out! Make sure you know that sympathetic neurons traveling to the abdominal organs are called splanchnic nerves and DO NOT synapse in the chain!
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Answers
1. In the sympathetic chain – UNLESS they are traveling to abdominal organs!
2. B
3. Lateral horn gray matter → ventral root → spinal nerve → white communicating ramus → synapse with post-ganglionic in the chain → gray communicating ramus → ventral ramus
4. C and D