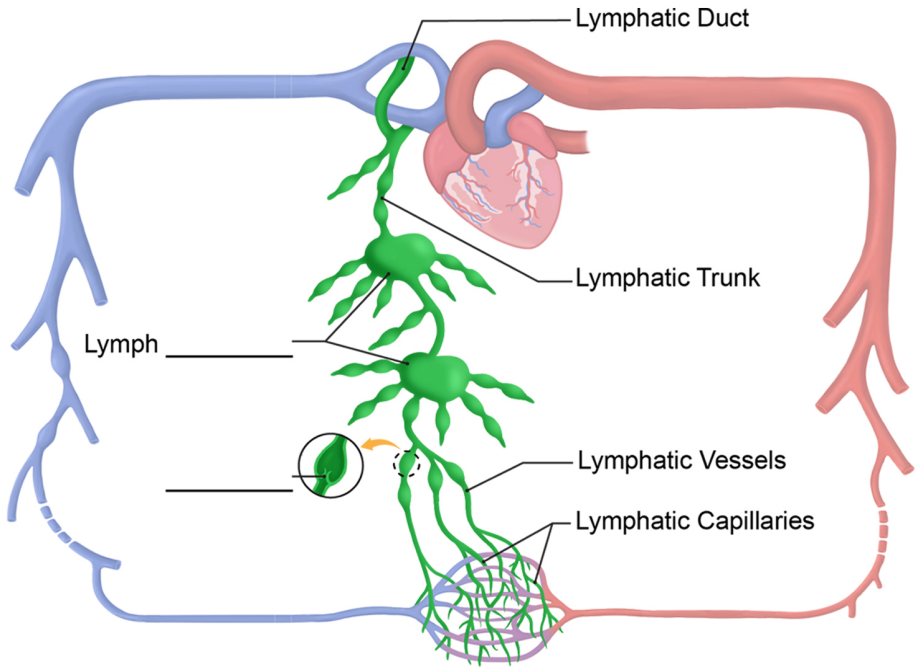
TOPIC: LYMPHATIC VASCULATURE

Types of Lymphatic Vessels

◆ As lymph moves, it travels through the following _____ types of lymphatic vessels:

1. **Lymphatic Capillaries**: _____ of lymphatic vessels - collects interstitial fluid to form _____.
2. **Lymphatic Vessels**: collect lymph from _____ lymphatic capillaries.
3. **Lymphatic Trunks**: collect lymph from merging lymphatic vessels.
4. **Lymphatic Ducts**: empties lymph into veins at the _____ of lymphatic vessels.



EXAMPLE

Which part of the lymphatic system is most closely associated with cardiovascular capillary beds?

a) Lymphatic capillaries.

b) Lymphatic trunks.

c) Lymph nodes.

d) Thymus.

PRACTICE

At the end of the lymphatic system, lymph is returned to the _____; specifically to the _____.

a) Bloodstream; subclavian arteries.

b) Lymphoid organs; subclavian arteries.

c) Lymphoid organs; subclavian veins.

d) Bloodstream; subclavian veins.

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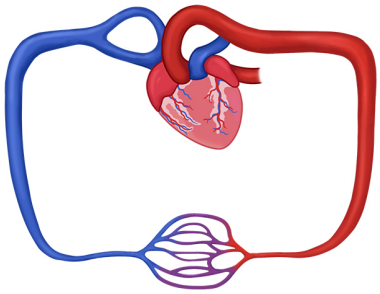
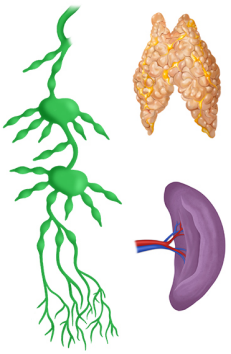
Cardiovascular System vs. Lymphatic System

Cardiovascular System	Lymphatic System
Vasculature forms a *circulatory* network or loop	Vasculature is "linear" with a definitive beginning & end.
Transports blood: red & viscous.	Transports lymph: clear & fluid.
Optimized for nutrient & gas exchange.	Optimized for returning lost fluid to cardiovascular system & for immune surveillance/response.
Heart acts as pump, creating a high-pressure system.	_____ an organ that serves as a pump, creating a low-pressure system.
_____ variation in vessel locations across individuals.	More variation in vessel locations across individuals.
Larger vessels have a wall made of 3 tunics.	Larger vessels also have a wall made of 3 tunics.
Some veins have valves to prevent blood backflow.	Lymphatic vessels have even _____ valves.
Blood capillaries are usually _____ permeable to large substances	Lymphatic capillaries are _____ permeable to large substances.
	

EXAMPLE

Which of the following is NOT common to both lymphatic trunks & cardiovascular veins?

a) A wall consisting of 3 tunics (layers).

b) Transport of erythrocytes.

c) Valves to prevent backflow.

d) Anatomical variations among the population of the exact location of vessels.

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PRACTICE

Which of the following is NOT a function of lymphatic vessels?

a) Return of leaked proteins to the blood.

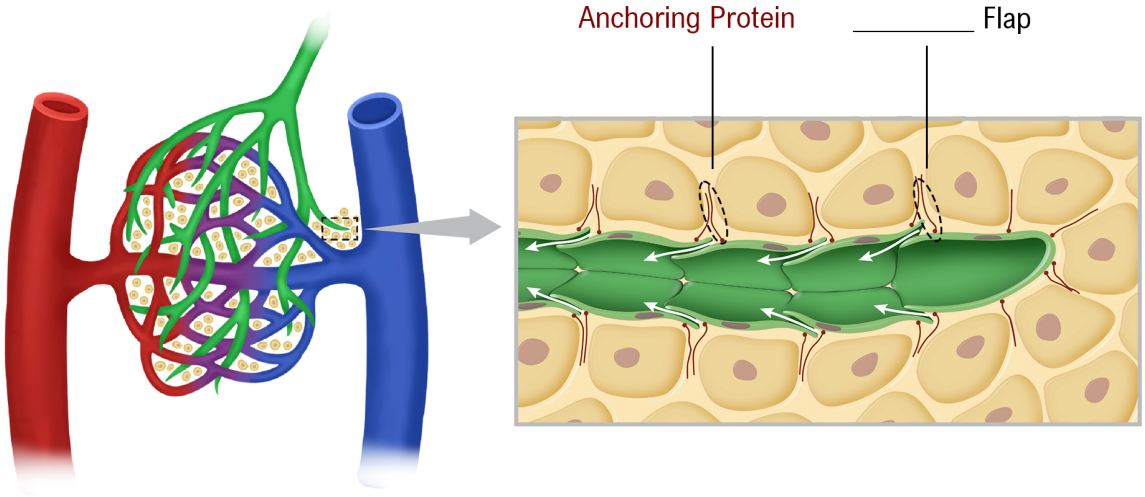
b) Transportation of fat from the intestine to the blood.

c) Delivery of nutrients to tissues.

d) All of the above are functions of lymphatic vessels.

Lymphatic Capillaries

- Lymphatic Capillaries are _____ *permeable* than blood capillaries due to their unique structure:
- Adjacent endothelial cells overlap, forming one-way _____.
  - Flaps open to allow interstitial fluid to enter, but then close so lymph cannot leak out.
  - Open flaps allow relatively _____ substances to enter.



EXAMPLE

Lymphatic capillaries are so permeable that it was once thought that they were open-ended, like a straw. However, an issue with this exact design is that it would also allow lymph to easily leak out of lymphatic capillaries. How does the overlapping endothelial structure overcome this issue?

a) Overlapping cells form a one-way valve that allows fluid to enter but not escape.

b) The pressure in the lymphatic capillary is never higher than in the surrounding tissue, so fluid can't escape.

c) It forms a tight seal that prevents fluid from entering or leaving.

d) It forms a semi permeable membrane so that substances can enter via active transport or facilitated diffusion.

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PRACTICE

Why is it important for lymphatic capillaries to be closely associated with cardiovascular capillaries?

a) They take up the erythrocytes that leak out of the cardiovascular capillaries.

b) They need to deliver oxygen and nutrients to the cardiovascular capillaries.

c) They take up some fluid that has leaked out of cardiovascular capillaries.

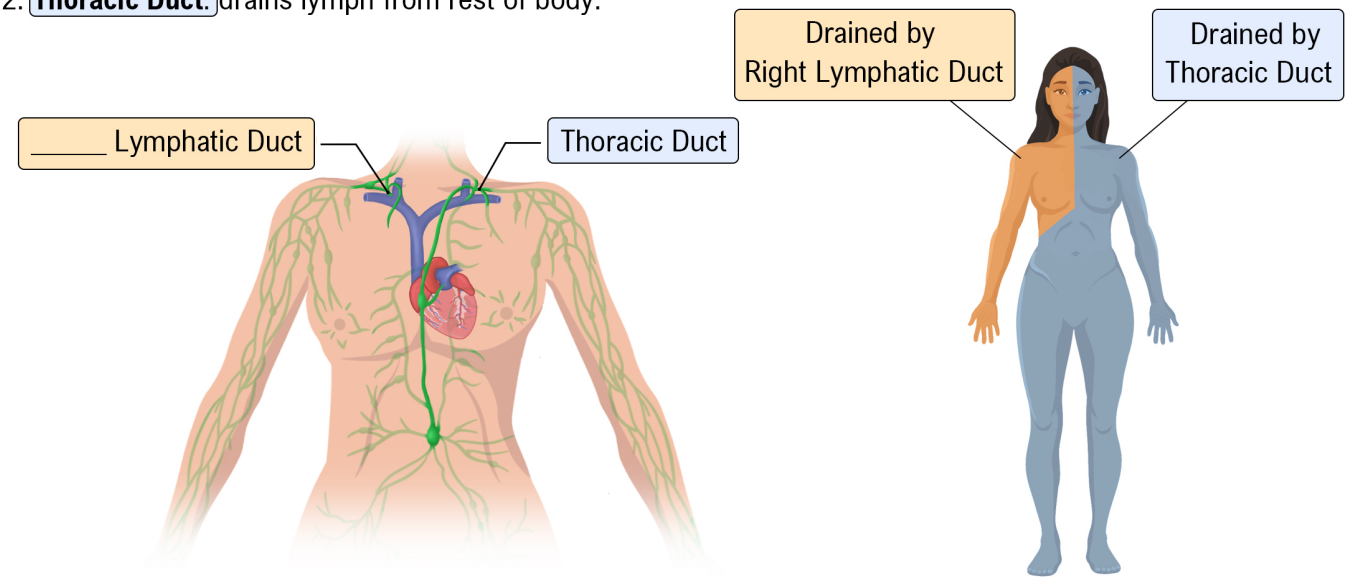
d) They need to receive CO_2, which is released by the cardiovascular capillaries.

Lymphatic Ducts

◆ *Recall*: Lymphatic Ducts are the _____ lymphatic vessels & empty their lymph into veins near the heart.

- There are _____ major lymphatic ducts:

1. **Right Lymphatic Duct**: very short duct draining lymph from _____ side of head/thorax & right arm.
2. **Thoracic Duct**: drains lymph from rest of body.



EXAMPLE

Which of the following correctly describes the path of lymph originating in the right foot?

a) Lymphatic capillary > lymphatic vessel > lymphatic trunk > right lymphatic duct.

b) Lymphatic capillary > lymphatic vessel > lymphatic trunk > thoracic duct.

c) Lymphatic capillary > lymphatic trunk > lymphatic vessel > right lymphatic duct.

d) Lymphatic capillary > lymphatic trunk > lymphatic vessel > thoracic duct.

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PRACTICE

True or False: Lymph originating from your head is always drained through the thoracic duct.

a) True.

b) False; it is always drained through the right lymphatic duct.

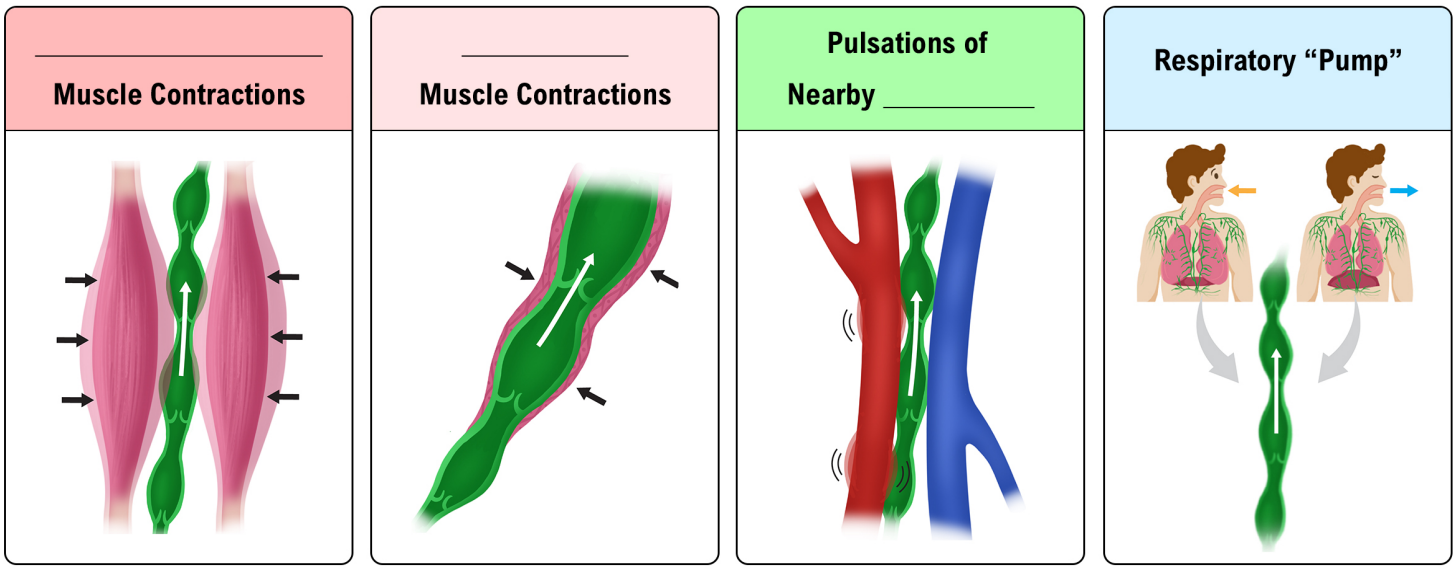
c) False; the left side is drained by the thoracic duct while the right side is drained by the right lymphatic duct.

d) False; the right side is drained by the thoracic duct while the left side is drained by the right lymphatic duct.

e) False; there are no lymphatic capillaries in your head.

Transport of Lymph

- Unlike the cardiovascular system, the lymphatic system _____ a direct pump to keep fluid moving.
  - A _____ of mechanisms contribute to lymph flow!



EXAMPLE

Which of the following is not a mechanism used by the lymphatic system to propel lymph?

a) Pulsation of nearby arteries.

b) Contraction of nearby skeletal muscle.

c) Contraction of cardiac muscle alows the heat to serve as a pump for lymph.

d) Contraction of smooth muscle.

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PRACTICE

After sitting for hours on a long flight where movement is limited, people may experience some swelling in their legs and feet. Which of the following explains this phenomenon?

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a) Smooth muscle is not active, so lymph is not circulated effectively.

b) Skeletal muscles in the legs and feet are inactive, reducing the rate of lymph flow.

c) The respiratory “pump” from breathing is not as effective.

d) The change in air pressure at high altitude significantly disrupts lymph flow, particularly in the lower body.