Name _____ Date _____

6–13. MICROSCOPIC OBSERVATION OF A VEIN AND AN ARTERY

Instructions: (1.) Read the text and study the diagrams. (2.) Do the investigation. (3.) Use the text and your observations to help you to answer the questions.

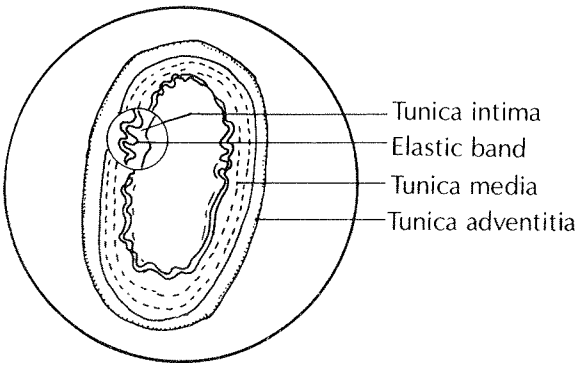


Diagram A: Cross-section of an artery

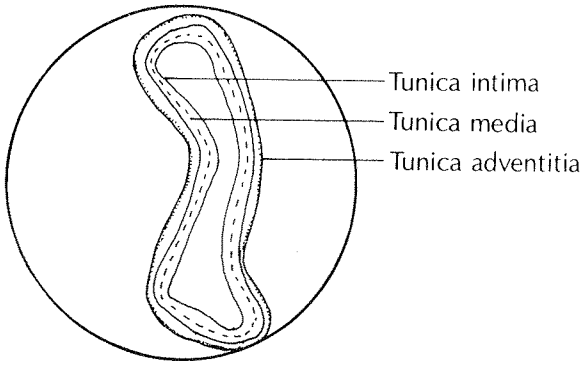


Diagram B: Cross-section of a vein

By observing cross sections of veins and arteries through the microscope, you can see their similarities and differences. Both have three layers: an inner layer called the "tunica intima," which forms the inside wall of the blood vessel; a middle layer called the "tunica media"; and an outer layer called the "tunica adventitia." In both veins and arteries, the tunica intima contains elastic fibers and a smooth inner layer of cells called "endothelium"; the tunica media contains circular layers of smooth muscle cells; and the tunica adventitia is composed of long, nonelastic fibers called "collagen."

Because veins and arteries have different jobs to do, they are designed differently. Compare Diagram A with Diagram B and notice that

1. the artery is open and the vein is collapsed;
2. the tunica media of the artery is thicker than the tunica media of the vein; and
3. only the artery has a dark band of elastic tissue.

Your arteries are designed to withstand pressure. A band of elastic tissue in the tunica intima allows an artery to expand or stretch each time the heart contracts and releases blood into the aorta. If this band of elastic tissue were not present, your arteries could rupture from the resulting shock wave of pressure. This elasticity also allows an artery to shrink to its original size after the blood has been distributed.

The smooth muscle cells of your arteries help them to regulate your blood pressure. The tunica media has three or more layers of circularly arranged smooth muscle cells. Smooth muscles, unlike skeletal and cardiac muscles, contract slowly and can remain in the contracted state for long periods.

You can compare an artery to a garden hose, and the smooth muscle to your hand; if you squeeze the hose with your hand, the water will come out with more force because the pressure on the hose has been increased. When the smooth muscles that surround an artery contract, the diameter of the artery gets smaller, and this causes an increase in your blood pressure.

Smooth muscles also help arterioles to distribute your blood to the organs where it is needed most. For example, after you eat a large meal, more blood is needed around your stomach and intestines. Arterioles act like on-and-off valves; each one has a band of smooth muscle that can completely shut off the flow of blood to the capillary and can redirect blood to other areas of the body.

Blood leaving a capillary is under reduced pressure; in fact, there is not enough pressure to return the blood to the heart. Fortunately, contracting skeletal muscles help to move the blood. When the skeletal muscles are doing work, such as moving the bones of the skeleton, nearby veins are compressed and the blood inside is then pushed toward the heart. There is one problem with this kind of pumping action: When the skeletal muscles relax, gravity can make the blood flow backward through the vein. To prevent this, many veins, especially those in the lower parts of your body, contain one-way valves that allow the blood to flow in only one direction—toward the heart.

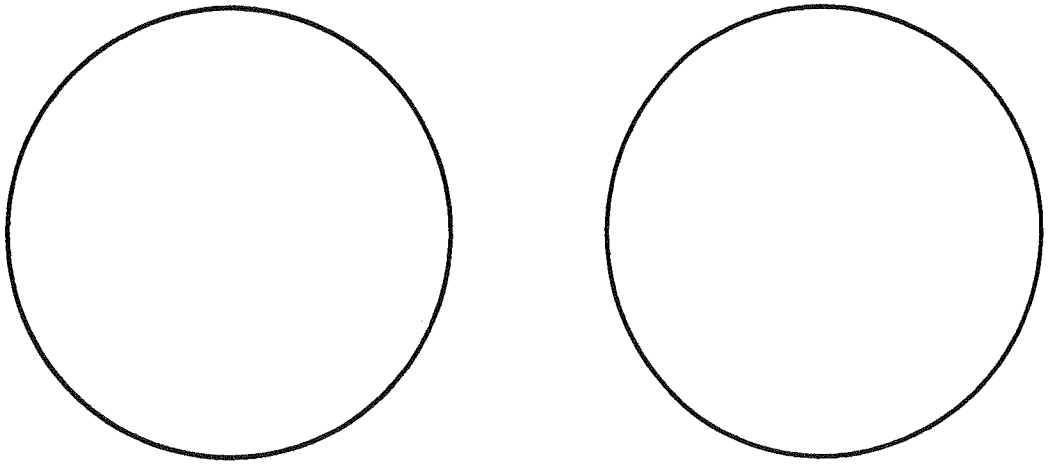
While doing this investigation, you will learn to identify, describe, and compare the parts of veins and arteries.

Step one: Obtain the following materials:

- ☐ microscope
- ☐ prepared microscope slides of a vein and an artery

Step two: Using 100X magnification, sketch the vein and artery in the indicated circles.

Step three: Use Diagrams A and B to help you to label your sketches.



Vein Artery

Level One Questions:

1. Both veins and arteries have _____ layers.
2. What is the innermost layer called? _____
3. What is the middle layer called? _____
4. What is the outermost layer called? _____
5. What two tissues are found in the tunica intima?

_____

6. What tissue is found in the tunica media?

_____

7. What is collagen? In which layer is it found?

_____

8. Your arteries are designed to withstand _____.

9. A band of _____ tissue in the tunica intima allows the artery to expand or stretch.

10. Elasticity also allows the artery to _____ to its original size after the blood has been distributed.

11. The structure of your arteries helps them to regulate your blood _____.

12. Where is blood most needed after you eat a large meal?

_____

13. _____ act like shut-off valves that can redirect blood to other areas of your body.

14. Blood leaving a capillary is under _____ pressure.

15. Contracting _____ muscles help to move the blood.

16. Many veins contain one-way _____ to prevent blood from flowing _____.

17. Diagrams C and D show how the valves in a vein prevent the back flow of blood. What do the small circles in these diagrams represent?

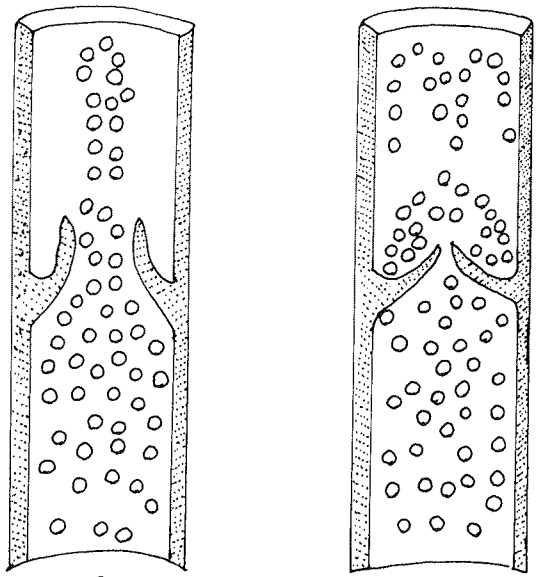
_____

18. Which diagram shows the valve open?

C D (Circle one.)

19. Which diagram shows the valve closing?

C D (Circle one.)



Level Two Questions:

20. How does the structure of your arteries help to regulate your blood pressure?

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_____

21. How do the arterioles help to redistribute your blood?

_____

_____

22. How do skeletal muscles help to pump the blood toward the heart?

_____

_____

23. Study Diagrams C and D. How does the valve inside the vein work?

_____

_____

Level Three Question:

24. Not all veins have valves. In which area of the body do you think valves are not needed? Explain your answer.

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