

The Circulatory System

272 Descriptive Histology

3 Nov. 2019

Objectives

By the end of this lecture we will be able to:

- ▶ Understand the structure of the **Circulatory System**
- ▶ Differentiate between **Arteries** , **Veins** and **Capillaries** structurally and functionally.
- ▶ Explain the structure of the heart.
- ▶ Understand the difference between capillaries and sinusoids



Circulatory system has 2 functional parts

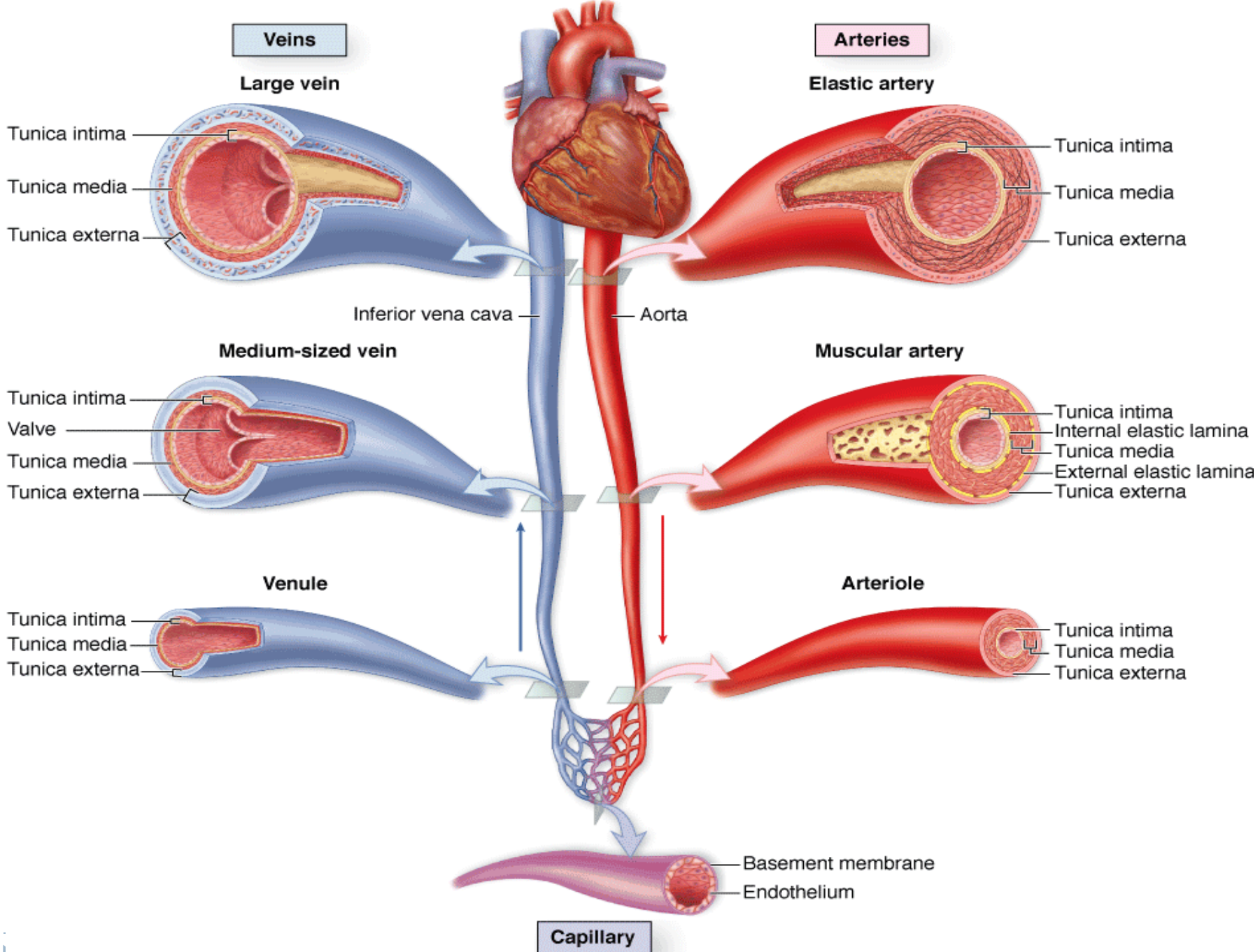
I. Blood vascular system

- a. Distributes nutrients, gases, hormones to all parts of the body also collects wastes produced during cellular metabolism.
- b. Consists of a range of blood **vessels** (arteries, arterioles, capillaries, venules, veins) and a **muscular pump (heart)**.
- c. Blood is the fluid found within the blood vascular system.



https://www.youtube.com/watch?v=oE8tGkP5_tc





<https://www.youtube.com/watch?v=0fvStYfxS9U>

<https://www.youtube.com/watch?v=v43ej5lCeBo>

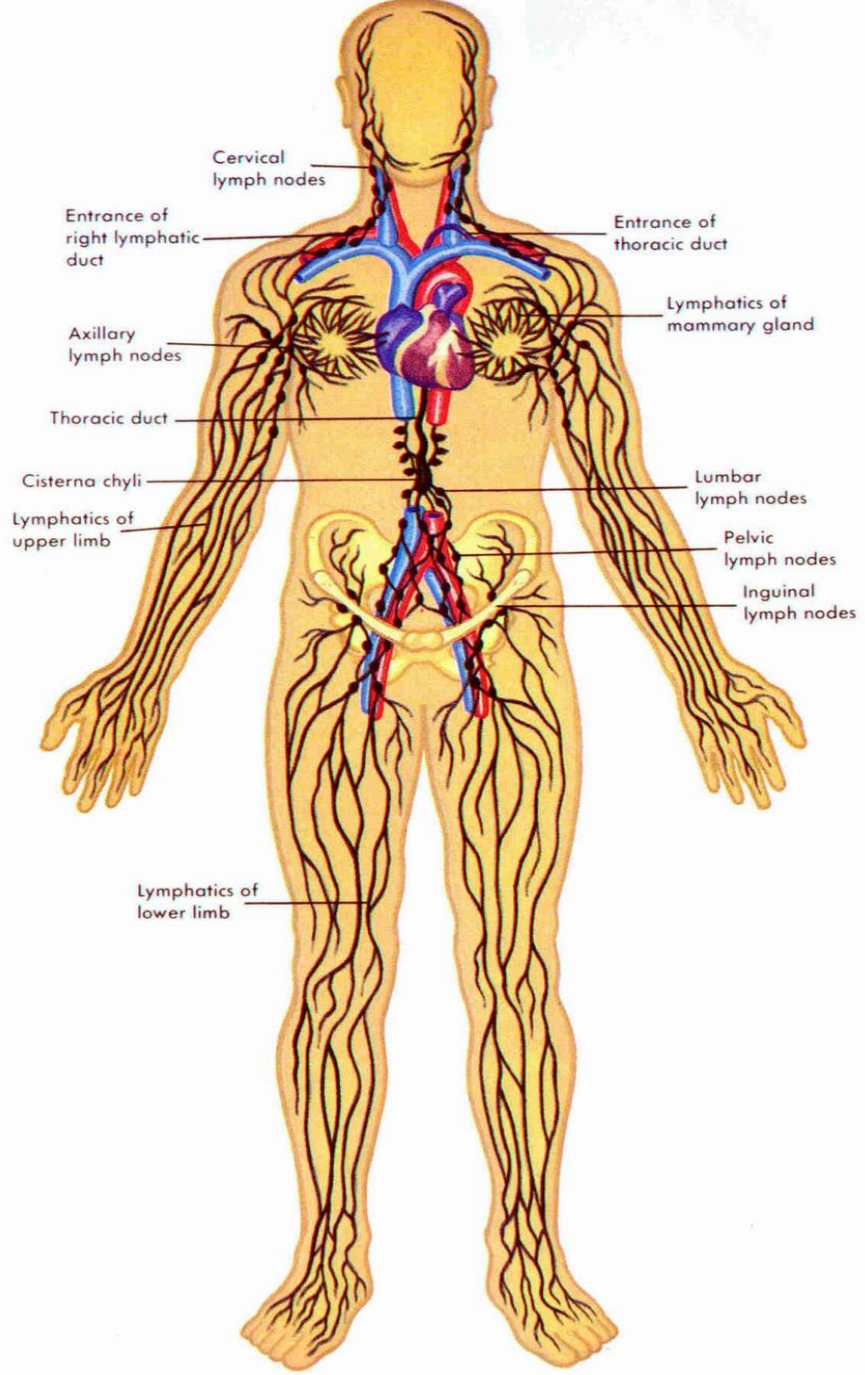


The circulatory system is subdivided into two functional parts con.

2. Lymph vascular system

- a. Collects tissue fluid from tissues and returns it to the blood vascular system.
- b. Consists of blind-ended capillaries (**lymphatic capillaries**) connected to venous vessels (**lymphatic vessels**) and various **lymphoid organs** (e.g. lymph nodes).
- c. **The fluid** found within the lymph vascular system is **lymph**. Composition of lymph in smaller lymphatic vessels is very similar to tissue fluid.





LYMPHATIC SYSTEM

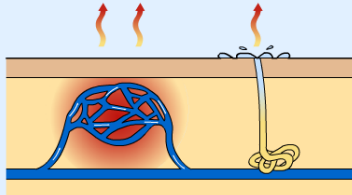
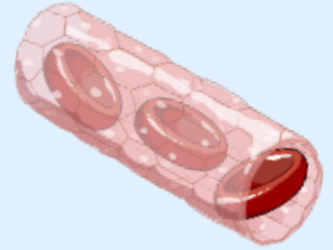
<http://www.youtube.com/watch?v=BX8fBlme9vQ>



Functions of the circulatory system

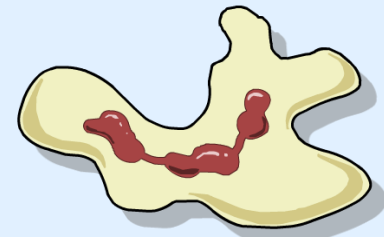
The circulatory system has three main functions:

1. **Transporting** substances around the body. These include oxygen, glucose, carbon dioxide, nutrients, water and waste products.



2. **Controlling** body temperature.

3. **Protecting** the body. Blood contains cells and anti-bodies that fight infection and clotting agents to stop bleeding.



Tissue Component of Vascular wall

The vascular wall is composed of three basic structure

1. Endothelium
2. Muscle
3. Connective Tissue

Tunica Intima

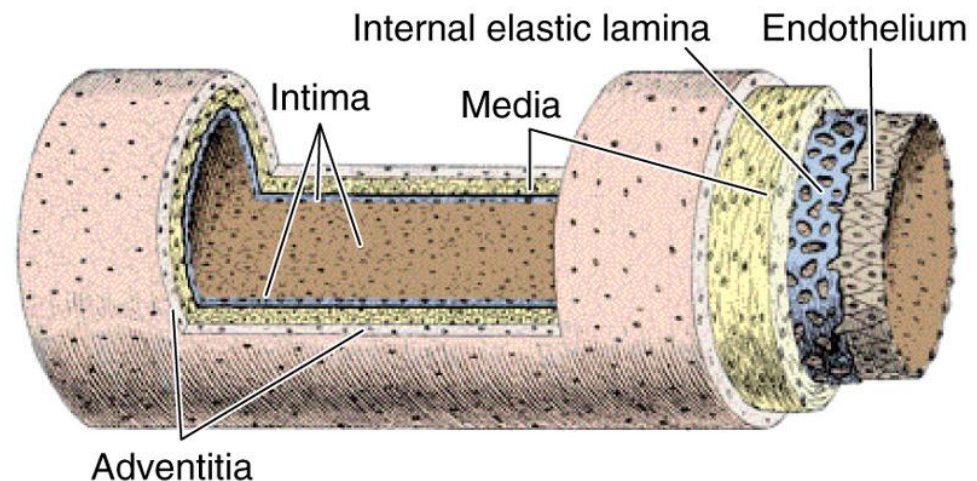
Endothelium supported by basement membrane and delicate collagenous tissue.

Tunica Media

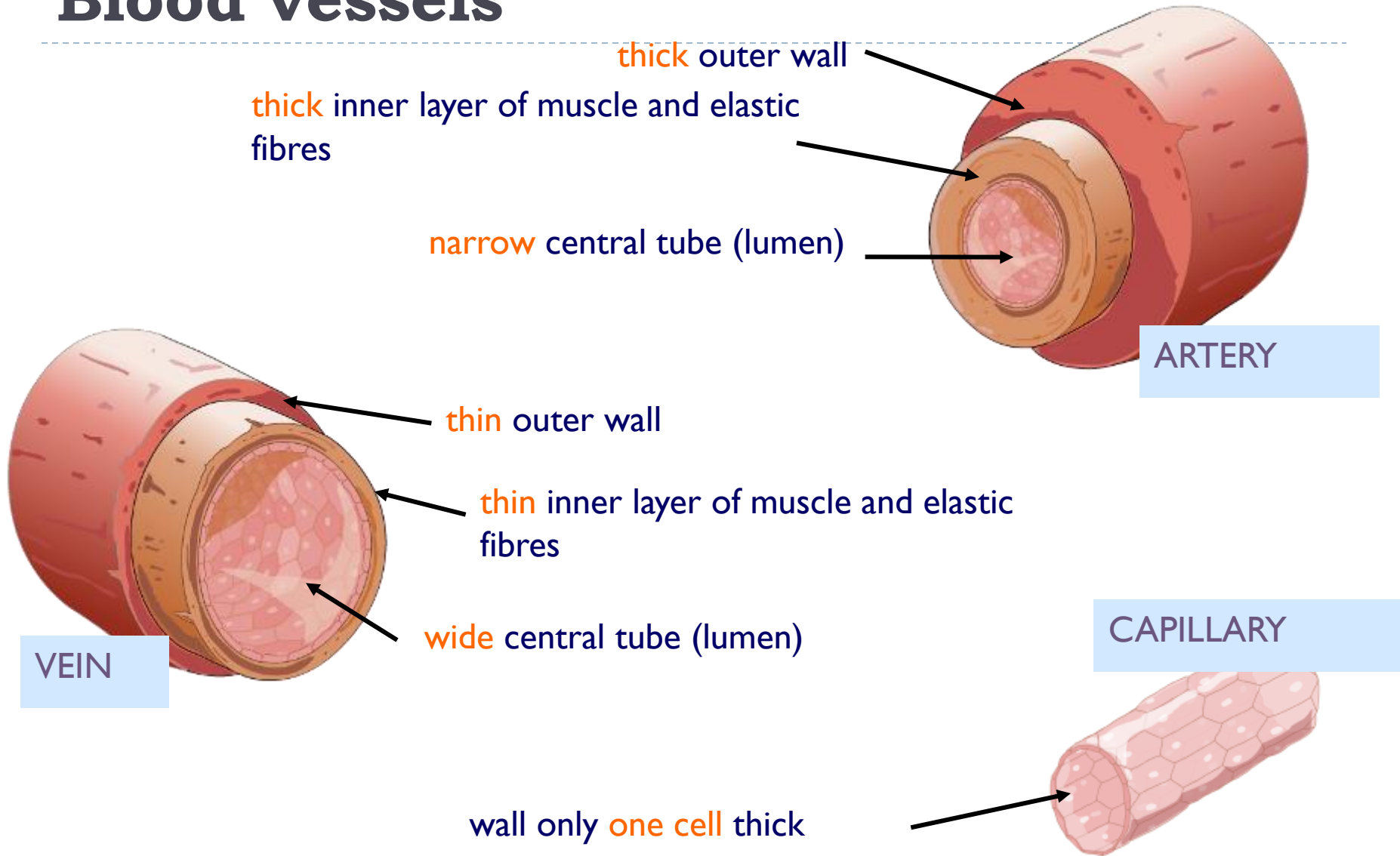
Muscle and CT

Tunica Externa (adventitia)

CT



Blood vessels



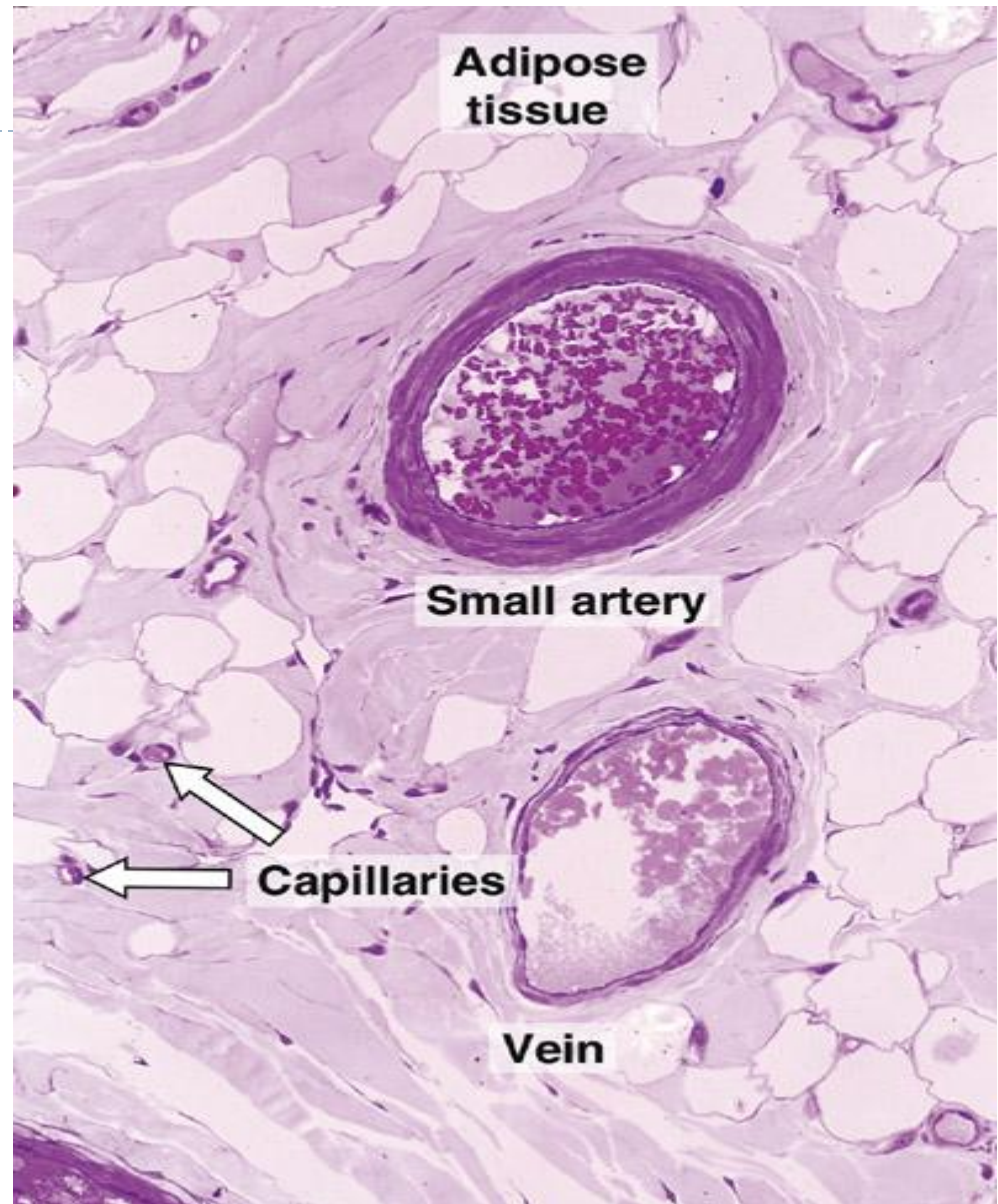
VEIN

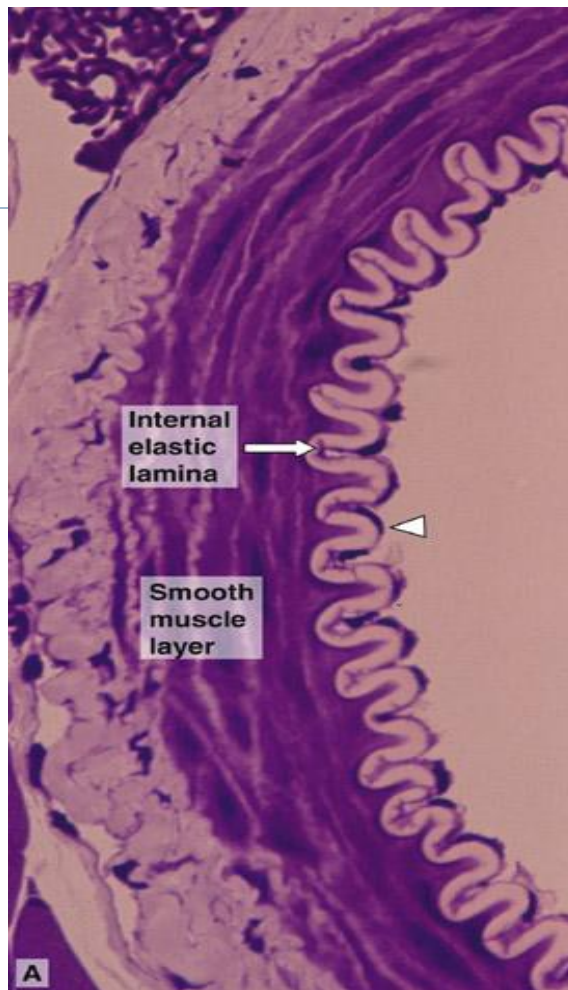
ARTERY

CAPILLARY

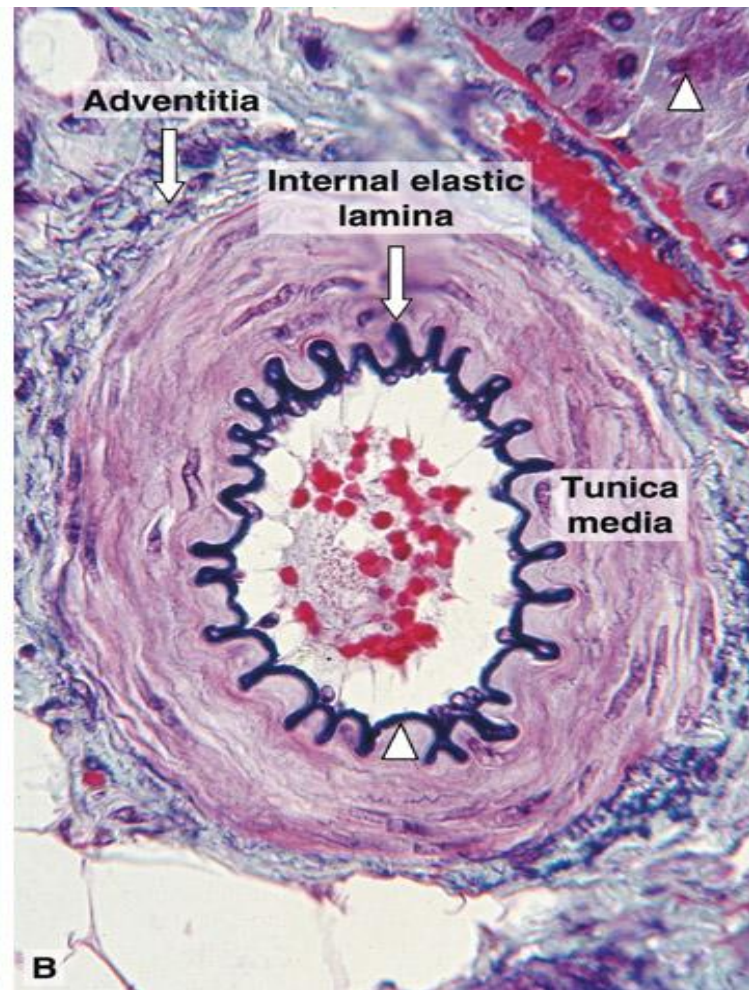


Cross section through a small artery and its accompanying muscular vein. Because of vasodilatation, the arteriole is unusually filled with blood. At this stage the internal elastic lamina is not distinguished. Many other small arterial branches and capillaries can be seen in the surrounding connective tissue. Pararosaniline—toluidine blue (PT) stain. Medium magnification.





A small artery with a distinctly stained internal elastic lamina (arrowhead



Cross sections of small arteries. A: The elastic lamina is not stained and is seen as a pallid lamina of scalloped appearance just below the endothelium (arrowhead).

<https://www.youtube.com/watch?v=TabosXR4odA>



Homework

What is the difference between capillaries and sinusoids?



<https://www.youtube.com/watch?v=oHMmtqKgs50>



Heart

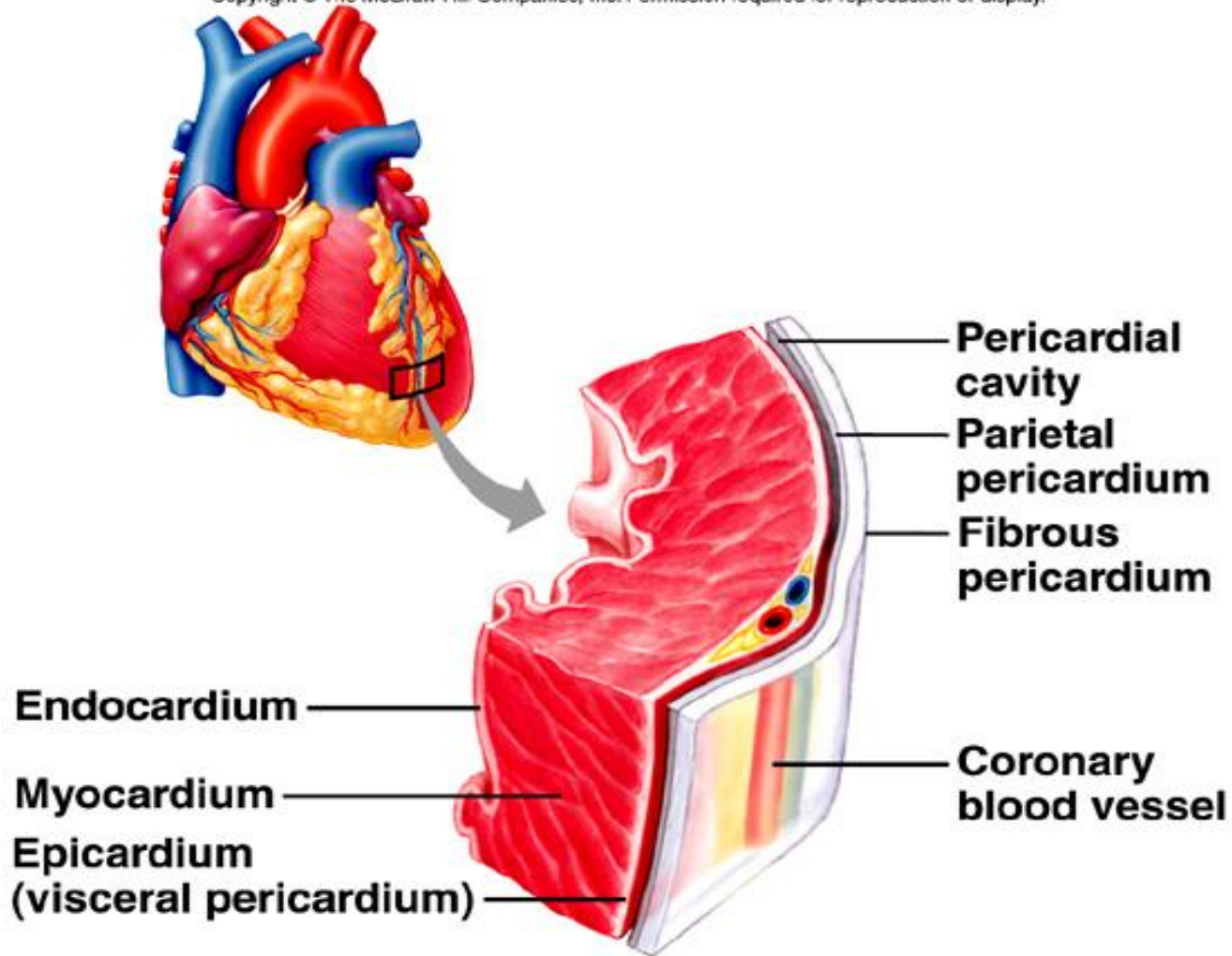
The heart wall can be viewed as a three-layered structure.

- a. Inner layer = **endocardium**
- b. Middle Layer = **myocardium**
- c. Outer layer = **epicardium (also called the pericardium)**



Heart

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Heart impulse generating and conducting system.

<http://www.youtube.com/watch?v=NJzJKvkWWDc>



Red blood cells

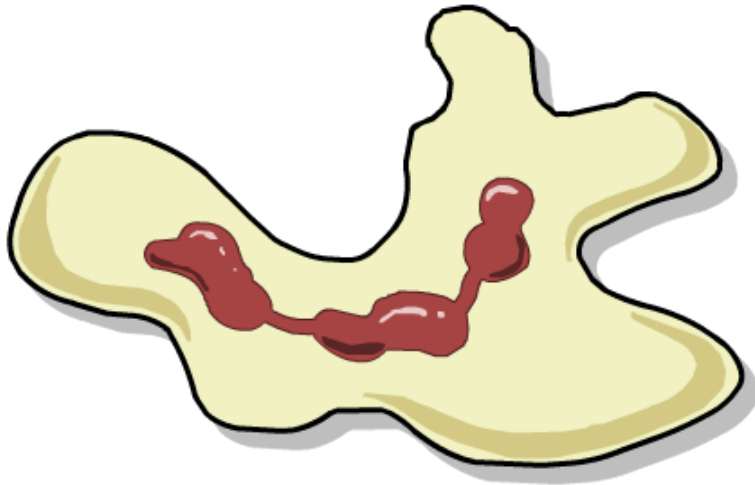
Blood is made up of a number of different elements.
The most common cell in blood is the **red blood cell**.

- Also called **erythrocytes**.
- **Disc-shaped**.
- Made in the **bone marrow**.
- Contain a red-coloured compound called **haemoglobin** which bonds with oxygen to form **oxyhaemoglobin**.
- Transport oxygen to the tissues.



White blood cells

Blood also contains **white blood cells**.



- Also called **leucocytes**.
- They are bigger than red blood cells and have large nuclei.
- Act as the body's **defence system**.

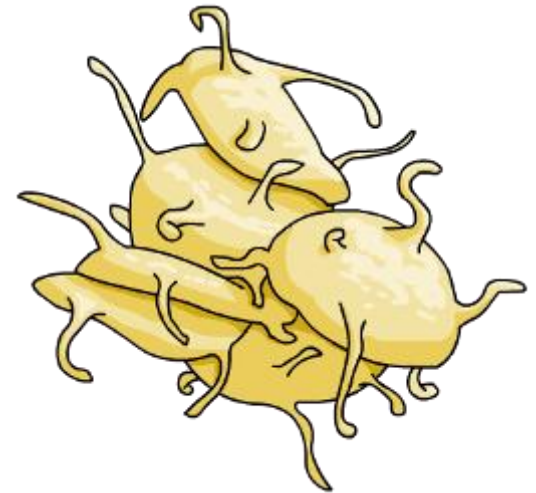
- Some white blood cells **surround and consume** harmful microbes.
- Some produce chemicals called **antibodies** that fight infection.



Platelets

Platelets are also carried in the blood.

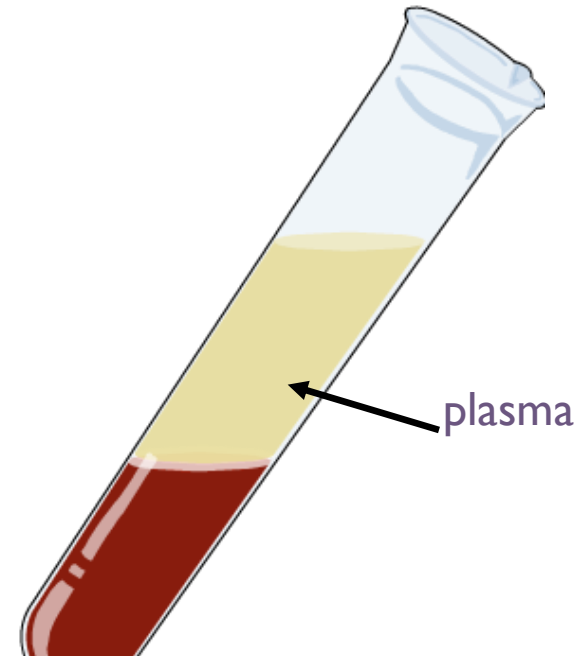
- Formed in red bone marrow.
- Produce **thrombokinase** – a chemical needed for blood clotting.
- Platelets help to repair tissues and **close wounds** both internally and externally.
- When needed, they grow into irregular shapes and stick together to form a **plug** over the wound.



Plasma

The blood cells and platelets are suspended in a substance called **plasma**. Plasma is made up of:

- 90% water
- inorganic salts
- glucose
- antibodies
- urea and other waste products
- plasma proteins.



Plasma can be separated from the other components of blood using a centrifuge.



https://www.youtube.com/watch?v=CRh_dAzXuoU



Revision Questions

- ▶ What is the Circulatory System?
- ▶ What is the function of the Circulatory System?
- ▶ What is the Histological structure of the blood vessels?
- ▶ What is the Histological structure of the Heart?
- ▶ Describe the muscle on the blood vessels?
- ▶ Describe the connective tissue on the blood vessels?
- ▶ What are atherosclerotic lesions?
- ▶ What are Carotid Bodies and Carotid sinuses?

