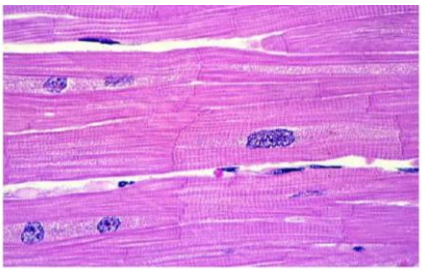
Circulation- Heart and Blood Vessels

- Circulatory system
- Heart
- Blood Vessels
- Lymphatic Vessels



Assist. Prof. Dr. Ihsan Muneer Ahmed

Department of Environmental Health

30.4.2025

Circulatory system

Circulatory system function:

- Responsible for the transport and homeostatic distribution of oxygen, nutrients, wastes, body fluids and solutes, body heat, and immune system components.
- It consists of two subsystems:

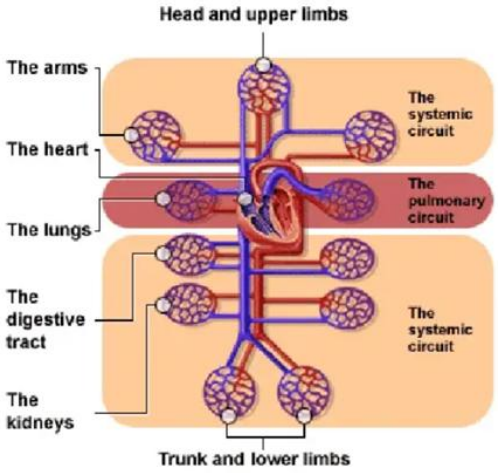
A. Cardiovascular system

B. Lymphatic system

A. Cardiovascular System

Four components :

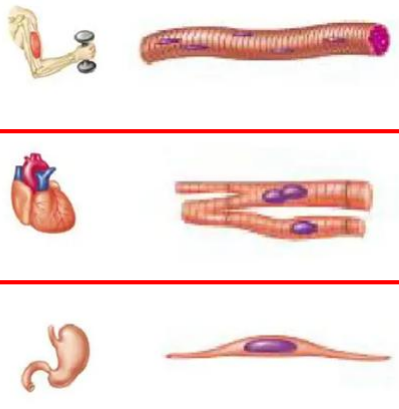
- Heart
- Arteries
- Veins
- Capillaries



3

Types of Muscles

- Skeletal
  - Striated, voluntary
- Cardiac
  - Heart, striated, involuntary
- Smooth
  - Nonstriated, involuntary

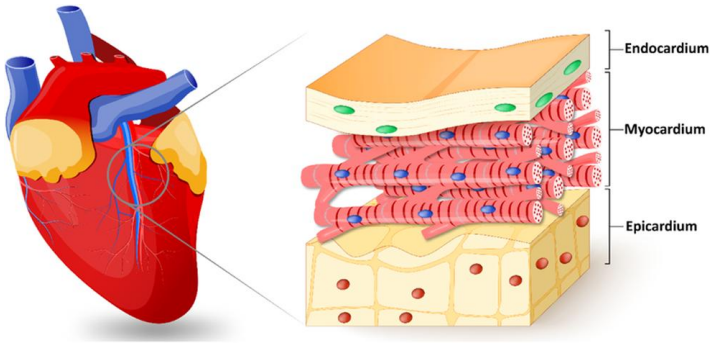


4

Heart

The heart consists of 3 layers

1. **Epicardium:** A single layer of squamous mesothelial cells.
2. **Myocardium:** A middle layer consists of cardiac muscle fibers.
3. **Endocardium:** The inner endothelial layer.



Cardiac muscle

1. Striated muscle, shows branching pattern.

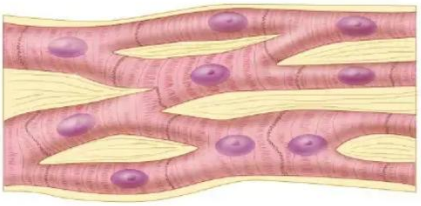
2. Involuntary muscle.

3. Uni nucleated, centrally placed ovoid nucleus.

4. Presence of intercalated disc.

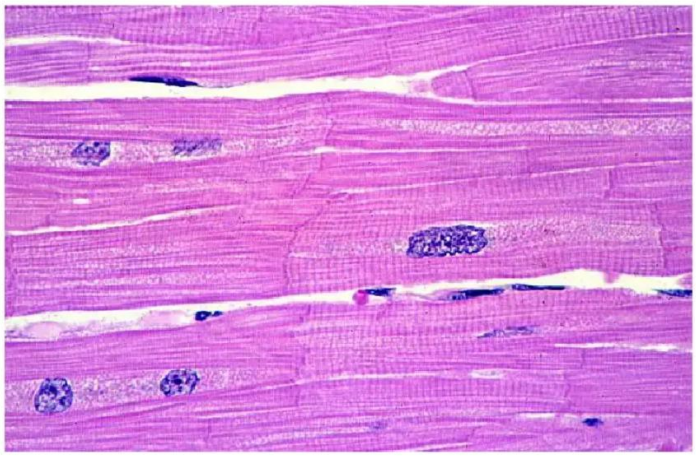
Cardiac muscle cells

- 15 μm wide X 100 μm long.
- Branched.
- Intercalated discs.
  - Desmosomes
    - adhesion
  - Gap junctions
    - transmit electrical impulses
    - Forms two networks – atrial and ventricular



7

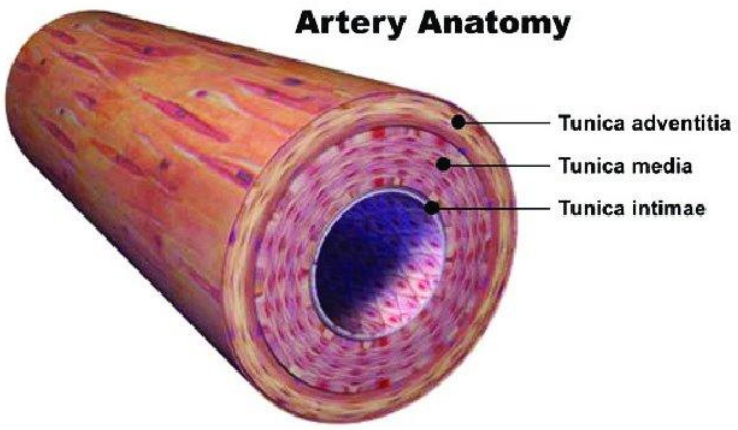
Cardiac muscle- High magnification



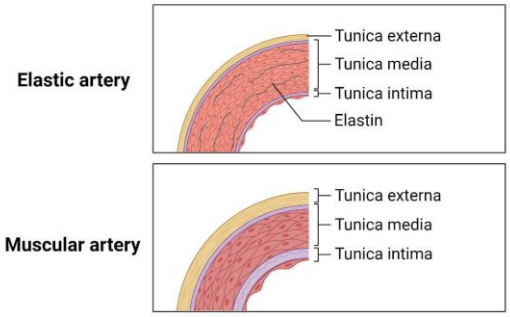
8

Blood Vessels: 1. Artery

Artery is consists of 3 layers



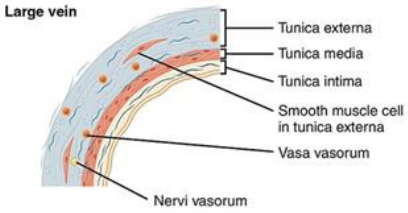
- **Elastic artery** -Prominent elastic fibres in the tunica media.
- **Muscular artery** - Prominent smooth muscle in the tunica media.



Blood Vessels: 2. Veins

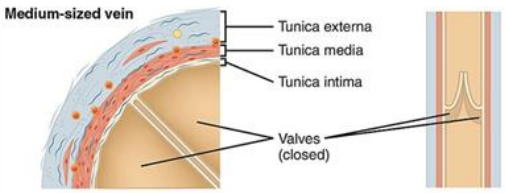
Large vein

Smooth muscle present in the tunica adventitia.



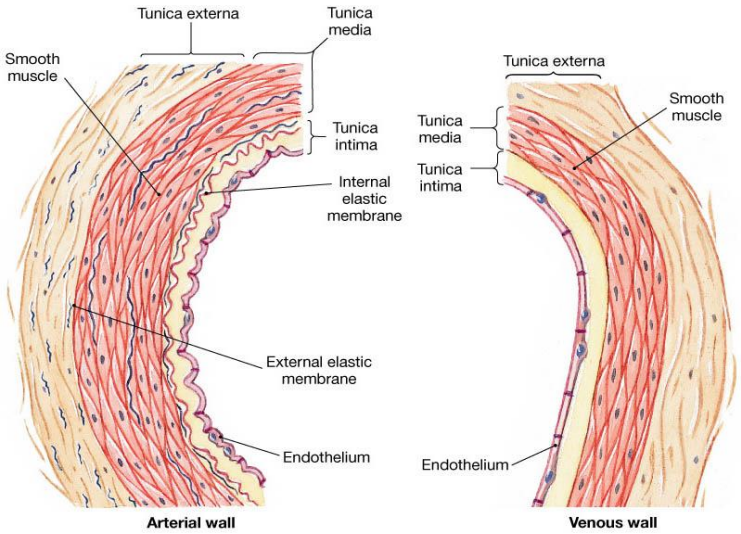
Medium sized vein

Three layers.



Comparison between a vein and artery

Artery	Vein
Thick wall	Thin wall
Shape less deformed	Shape flatted
Tunica intina crinkled	Tunica intina smooth
Three distinct layers	Layering indistinct
Tunica media prominent	Tunica media weak



13

B. Lymphatic system

Components of the lymphatic system

1. Lymph

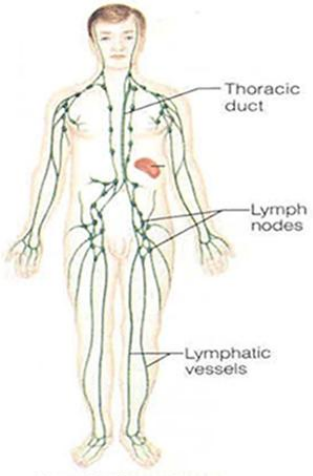
2. Lymphatic Vessels

- Lymphatic Capillaries Lymphatic Vessels
- Lymphatic Trunks Lymphatic Ducts

3. Lymphatic Organs

- Thymus
- Lymph Nodes
- Spleen Tonsils

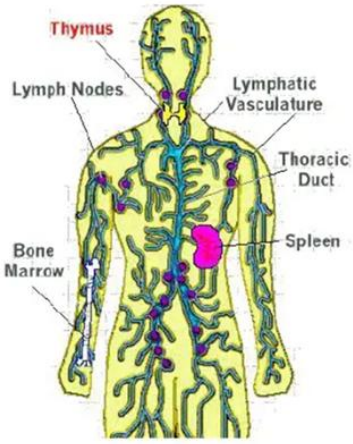
4. Lymphatic cells



Lymphatic system

14

Lymphatic vessels



- Body wide network of thin-walled vessels with abundant lymphatic valves.
- Walls made up of attenuated endothelium.
- Drains into lymph nodes.

Lymphatic vascular system

- Lymph moves only in one direction toward the junction of the lymph vessels with the large veins.
- Lacks a separate pump.

The lymphatic system includes three types:

1. Lymphatic capillaries
2. Lymphatic vessels
3. Lymphatic ducts

Lymphatic organs e.g lymph node

Features of lymph node

- A small bean-shaped structure that is part of the body's immune system.
- With afferent vessels (entering at the periphery) and efferent lymph vessels(emerging at the hilus)
- Arranged in groups along the blood vessels.
- Divided into superficial and deep groups