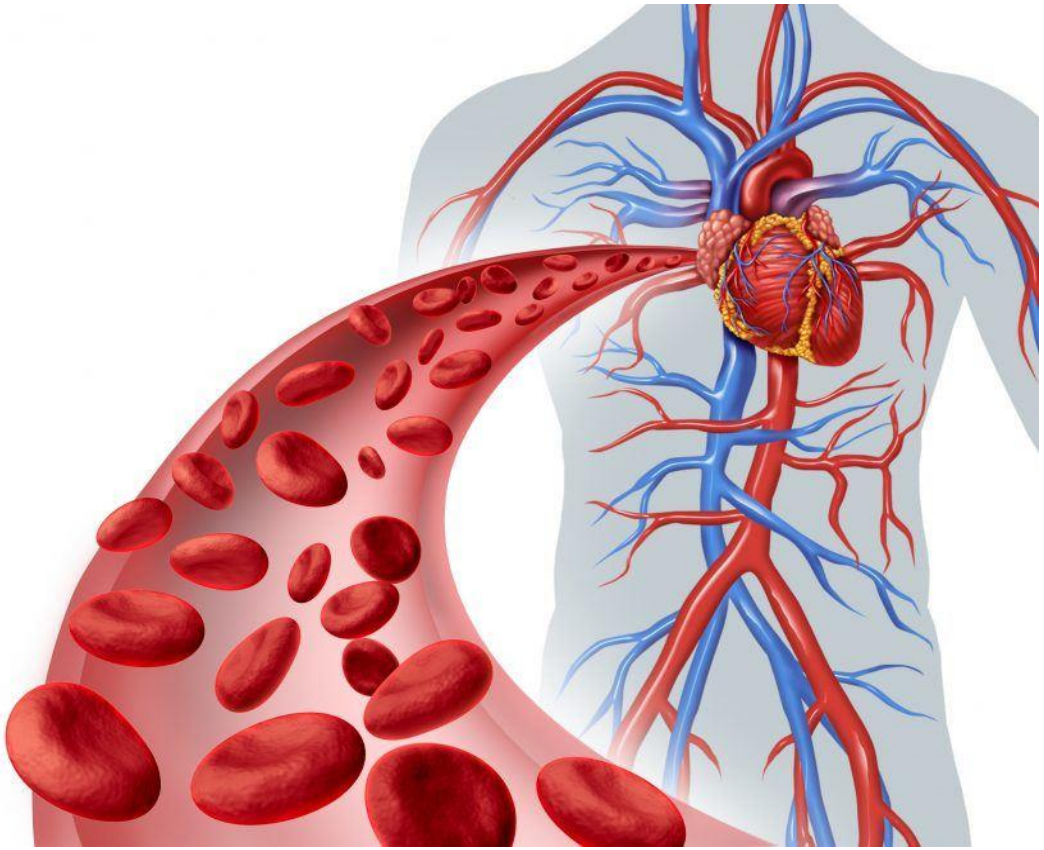
General Histology / Year 2



circulatory system
Cardiovascular System
Lecture 2

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circulatory system

- **The circulatory system comprises two major systems: the cardiovascular system and the lymphatic vascular system.**
- **The cardiovascular system consists of the heart, major arteries, arterioles, capillaries, venules, and veins that form a closed system of blood vessels that carry blood. In an adult the total length of its vessels is estimated at between 100,000 and 150,000 km.**
- **The system are two major circuits that distribute blood to the body:-**
- **The systemic circulation and the pulmonary circulation.**
- **Both of these circuits depend on the pumping action of the heart to distribute the blood throughout the body.**

circulatory system

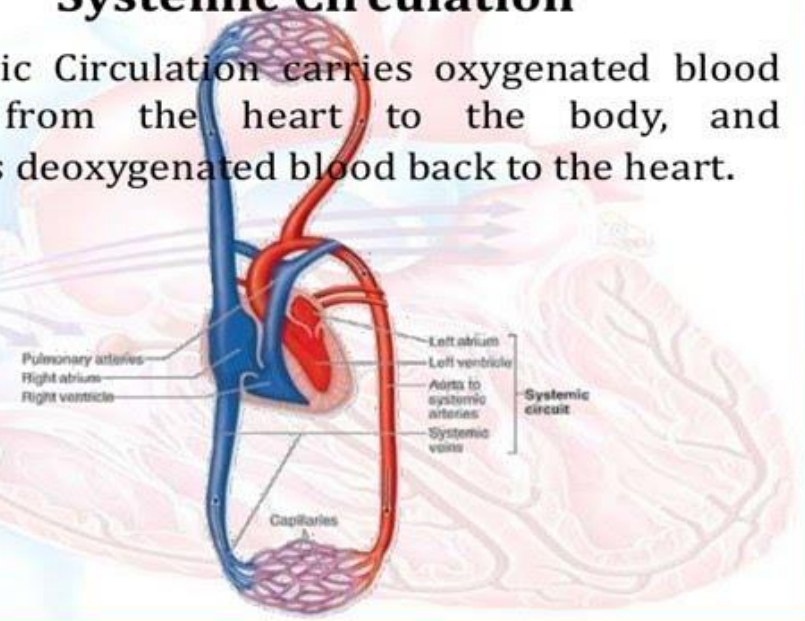
- **The systemic circulation carries the blood from the heart to all organs, tissues, and cells by arterial vessels and then back to the heart by the venous vessels.**
- **The pulmonary system carries blood from the heart to the lungs for gaseous exchange and the oxygenated blood back to the heart for distribution by the systemic circulation.**
- **The right side of the heart is the pulmonary circuit.**
- **The left side of the heart is the systemic circuit.**

Difference Between

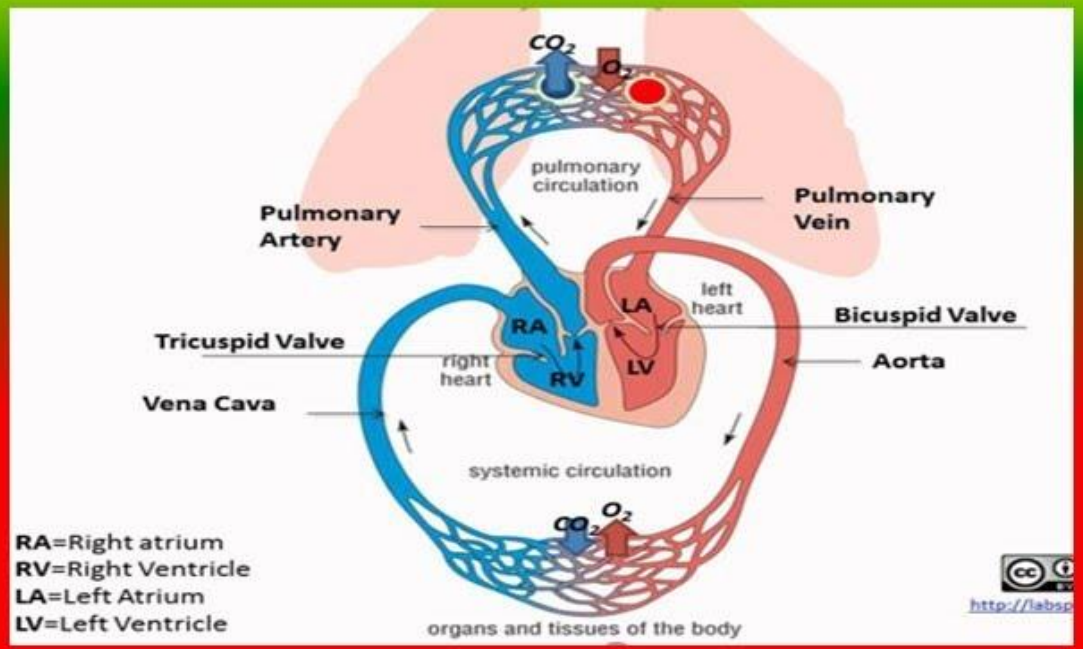
Systemic Circulation

Systemic Circulation

- Systemic Circulation carries oxygenated blood away from the heart to the body, and returns deoxygenated blood back to the heart.



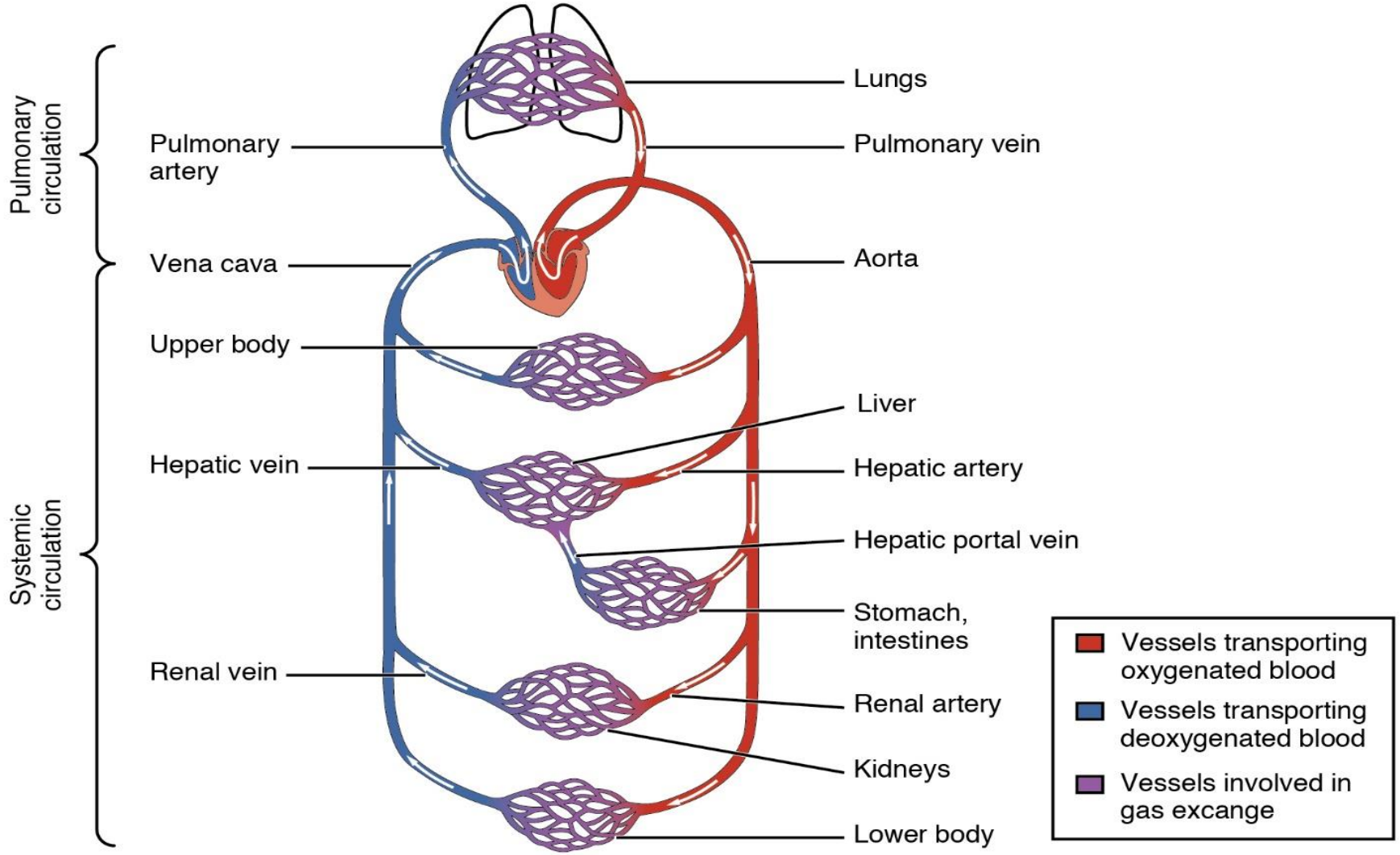
Pulmonary Circulation



Blood(vascular)System

- **The main functions of the blood vascular system are gaseous exchange; temperature control; and transport of oxygen, carbon dioxide, nutrients, hormones, metabolic products, cells of immune defense system.**
- **Function (transport).**
- **Gases (respiration).**
- **Nutrients (digestion).**
- **Waste (excretion).**
- **Hormones (endocrine).**
- **White blood cells (immune).**

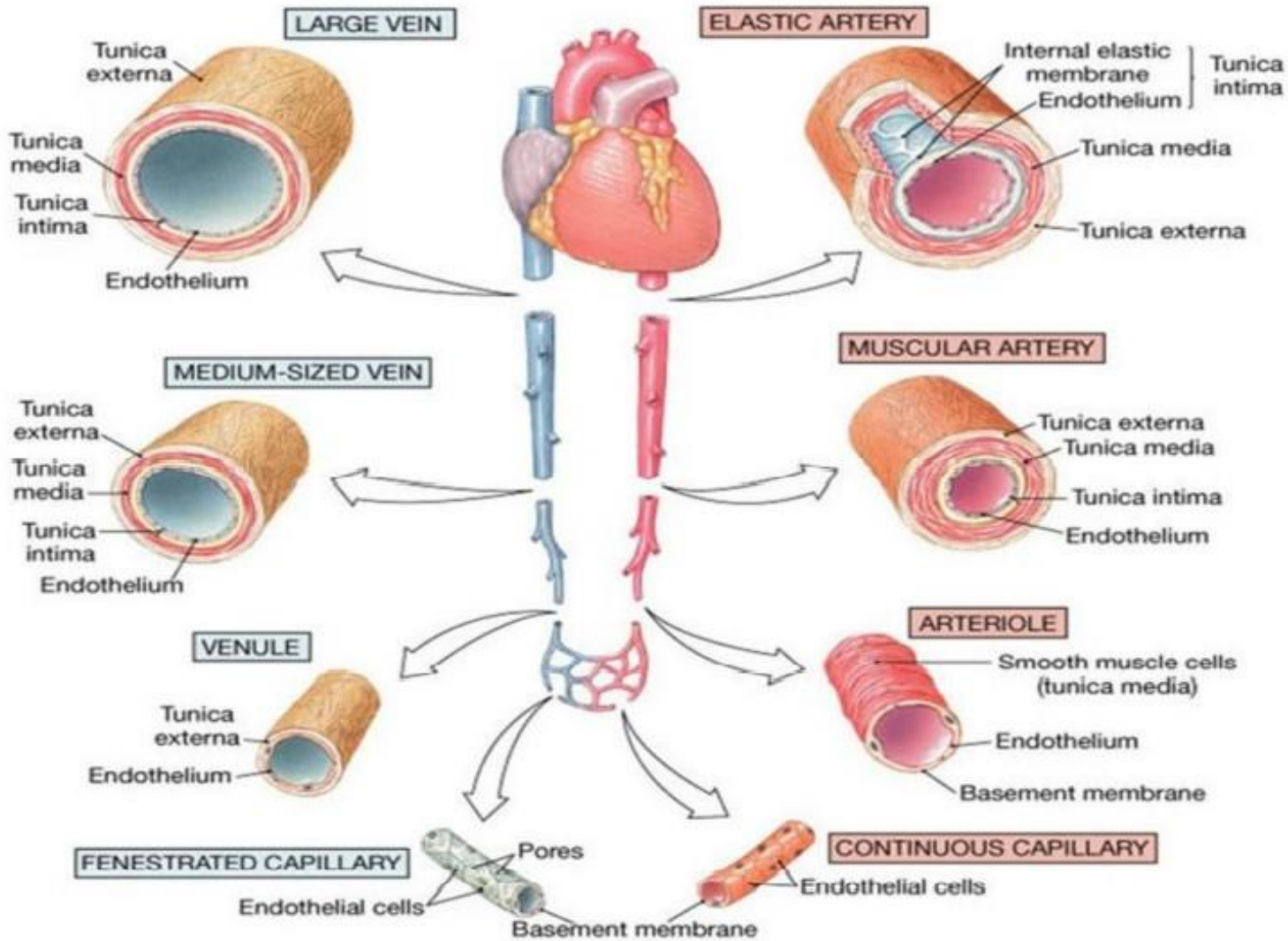
The systemic circulation and the pulmonary circulation



Main Pathway of Blood in the Body?

- **Heart –**
- **Arteries – >10 mm , 2–10 mm , 0.1–2 mm**
- **Arterioles – 10–100 µm**
- **Capillaries – 4–10 µm**
- **Venules – 50–100 µm**
- **Veins – >10 mm , 1–10 mm , 0.1–1 mm**
- **Back to the heart…**

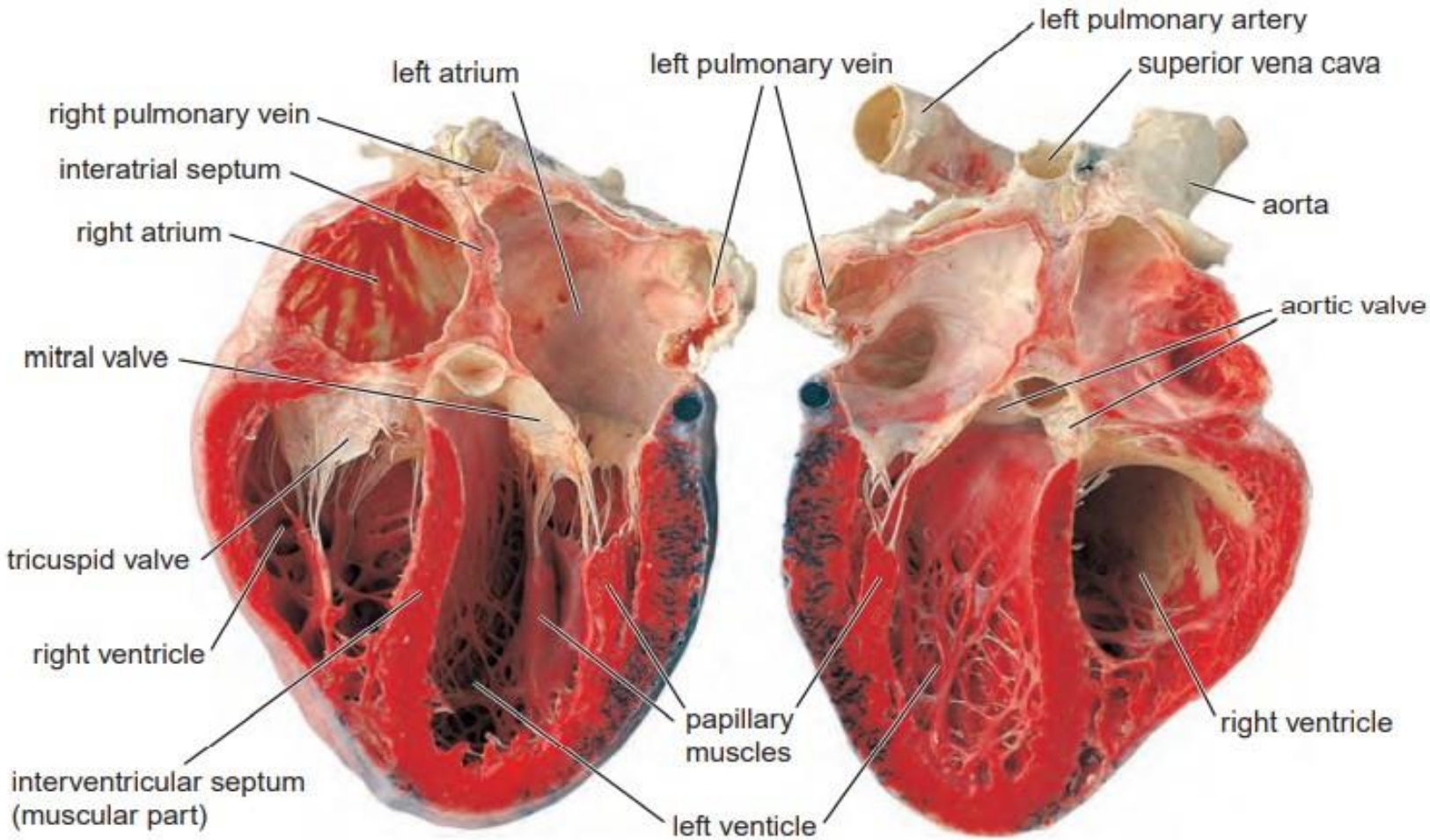
Blood vessel types and functions



Heart

- **Main organ of the circulatory system. It is located between the lungs in the thoracic cavity.**
- **About the size of a closed fist.**
- **Normal beat is about 60 to 100 beats per minute.**
- **Heart pumps oxygen-poor blood to the lungs and oxygen-rich blood to the body.**
- **The heart is made up of four chambers - A left and right side Atrium (an upper chamber) Ventricle, right and left ventricle(a lower chamber).**
- **Valves prevent blood from going backwards, Separate atrium and ventricles.**

Heart


left pulmonary artery
left atrium
left pulmonary vein
superior vena cava
right pulmonary vein
interatrial septum
aorta
right atrium
aortic valve
mitral valve
tricuspid valve
right ventricle
papillary muscles
right ventricle
interventricular septum (muscular part)
left venticle

Histological Structure of the heart wall

- **The wall of the heart consists of three layers: an inner endocardium (deepest layer), a middle myocardium (muscle layer), and an outer epicardium (outermost layer).**
- **The endocardium consists of a simple squamous epithelium - endothelium.**
- **Deeper to the endocardium is the subendothelial layer of connective tissue that contains elastic, collagen fiber.**
- **Here are found small blood vessels and Purkinje fibers.**
- **Cardiac valves :- Folds of the endocardium.**

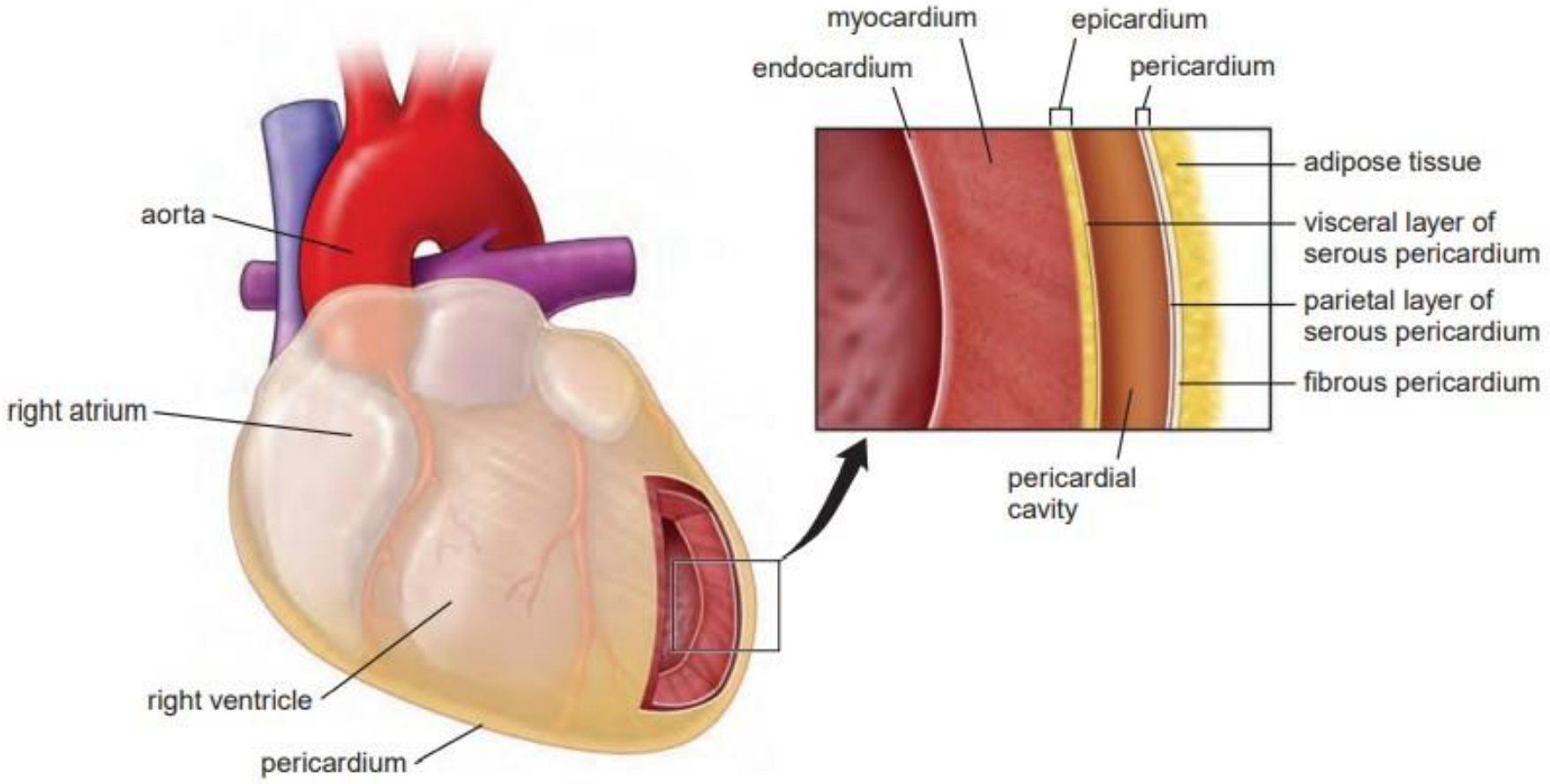
Histological Structure of the heart wall

- **The myocardium is the thickest layer and consists of cardiac muscle fibers.**
- **Variation in thickness depends on the function of each chamber; thicker in ventricles than atria and thicker in left ventricle than right ventricle.**
- **[The cardiac muscle is located in the wall of the heart].**
- **The cardiac muscle tissue characterize by :-**
- **1-Presence of long branched and anastomose fibers.**
- **2-Each fiber consists of one or two centrally located nuclei.**
- **3-Presence of intercalated discs used for attachment of the fibers.**
- **4-The striations are less distinguish than in skeletal muscles.**
- **5-The sarcoplasm consists of numerous mitochondria, to supply energy requires for muscle contraction.**

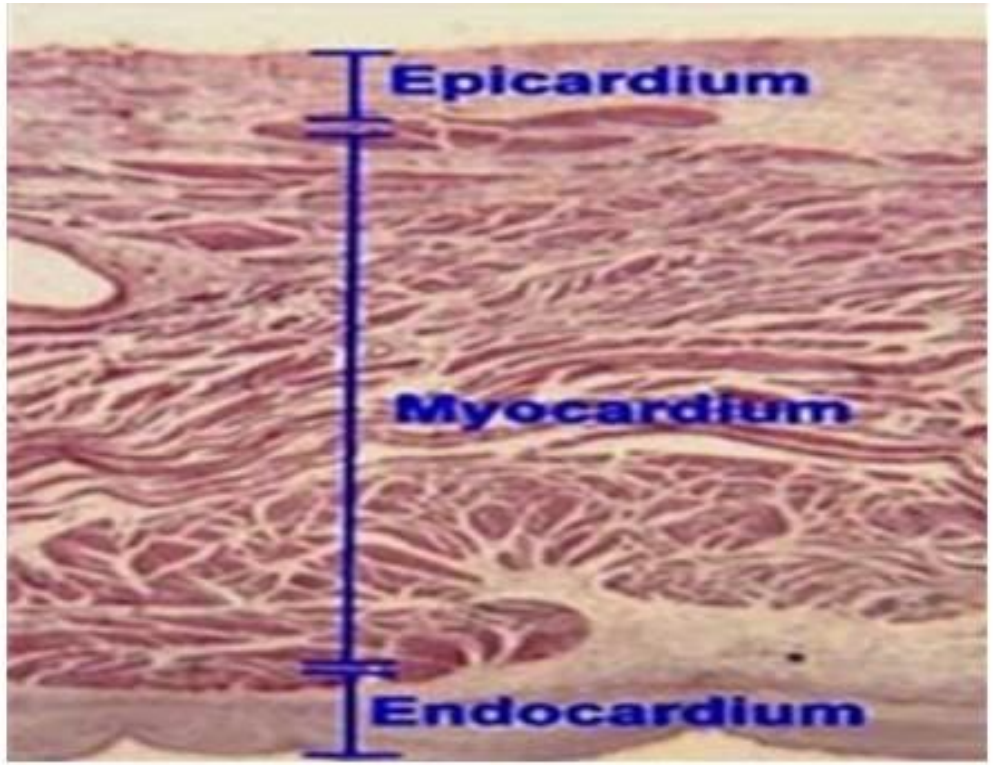
Histological Structure of the heart wall

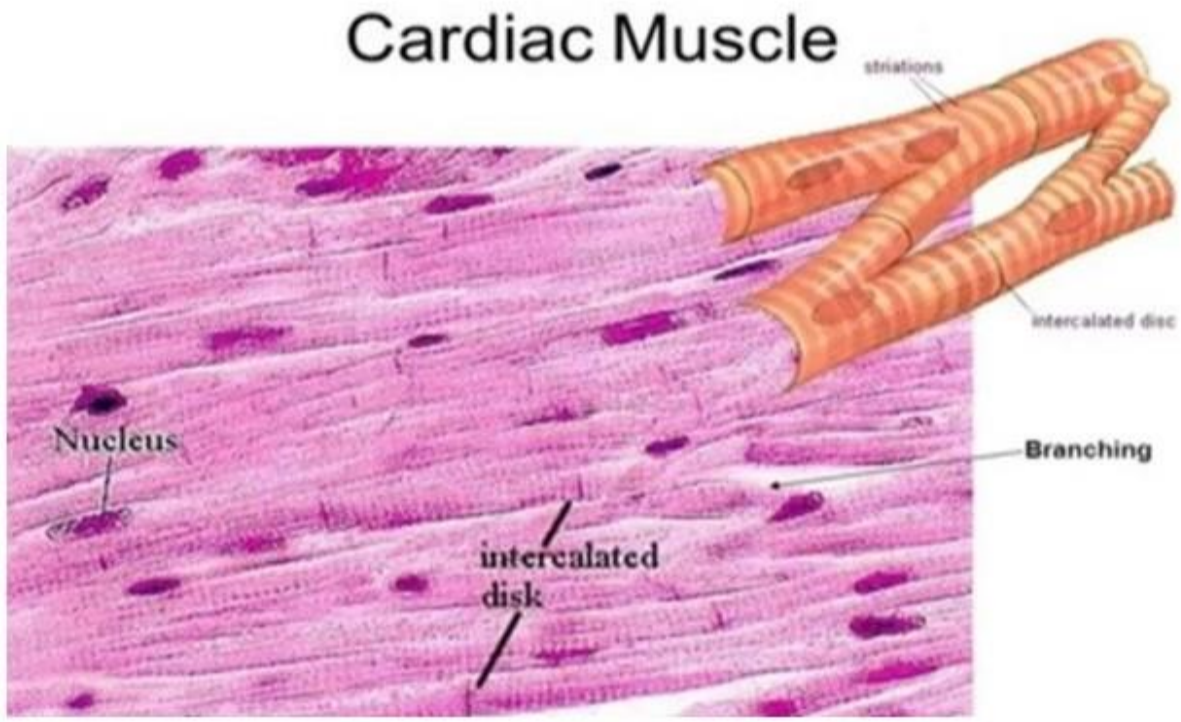
- **[Purkinje fibers]**
- **The Purkinje fibers characterize by :-**
- **1-Thicker and larger than cardiac muscle fibers and contain a greater amount of glycogen.**
- **2-They also contain fewer contractile filaments.**
- **3-Purkinje fibers are part of the conduction system of the heart.**
- **4- These fibers are located beneath the endocardium on either side of the interventricular septum and are recognized as separate tracts.**
- **The epicardium consists of a simple squamous epithelium known as mesothelium, and an underlying subepicardial layer of connective tissue. The subepicardial layer contains coronary blood vessels, nerves, and adipose tissue.**

Anatomical Structure of the heart wall

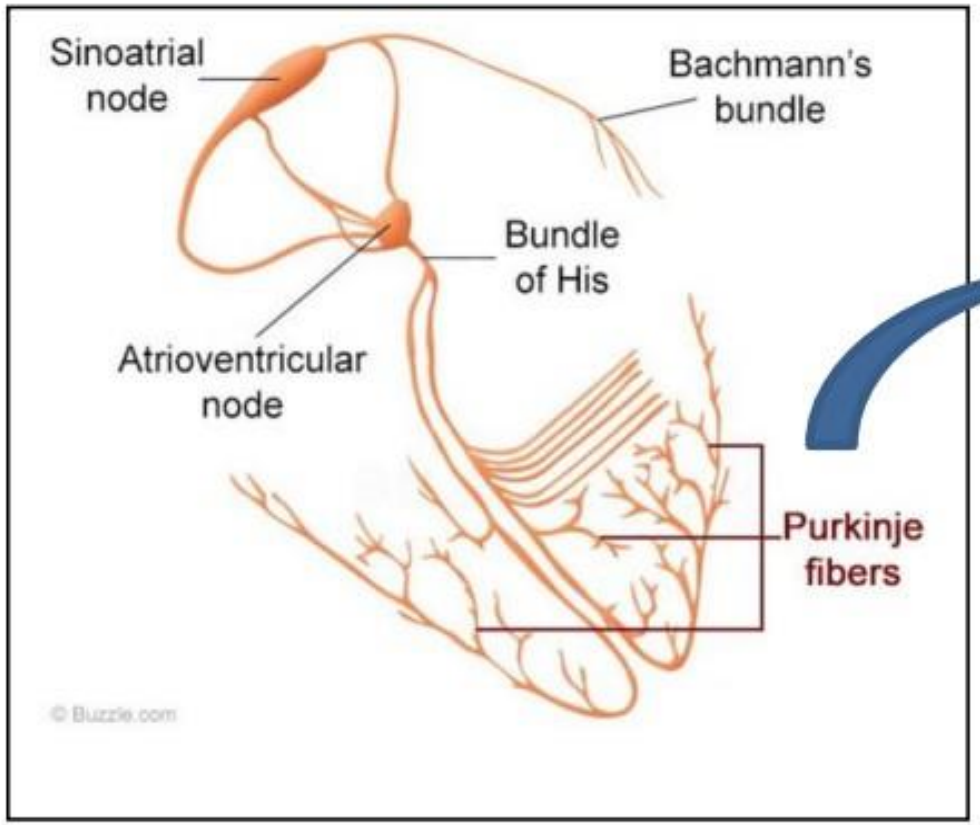


Histological Structure of the heart wall





Purkinje fibers



Histological Structure of the heart wall