Al-Mustaqbal University

College of Engineering and Technologies

Biomedical Engineering Department

Systemic Physiology I

Lecture: 3

The heart and circulatory system

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The Heart

-Human heart is a four chambered pump, well adapted to separation of oxygen rich and oxygen poor blood handled by left and the right side of the heart respectively. **Thin wall atria** receive blood, which reaches into **thick-walled ventricles** that pump blood into systemic and pulmonary circuits through great vessels.

Different Layers of the Heart Wall

Three layers of tissue form the heart wall namely:

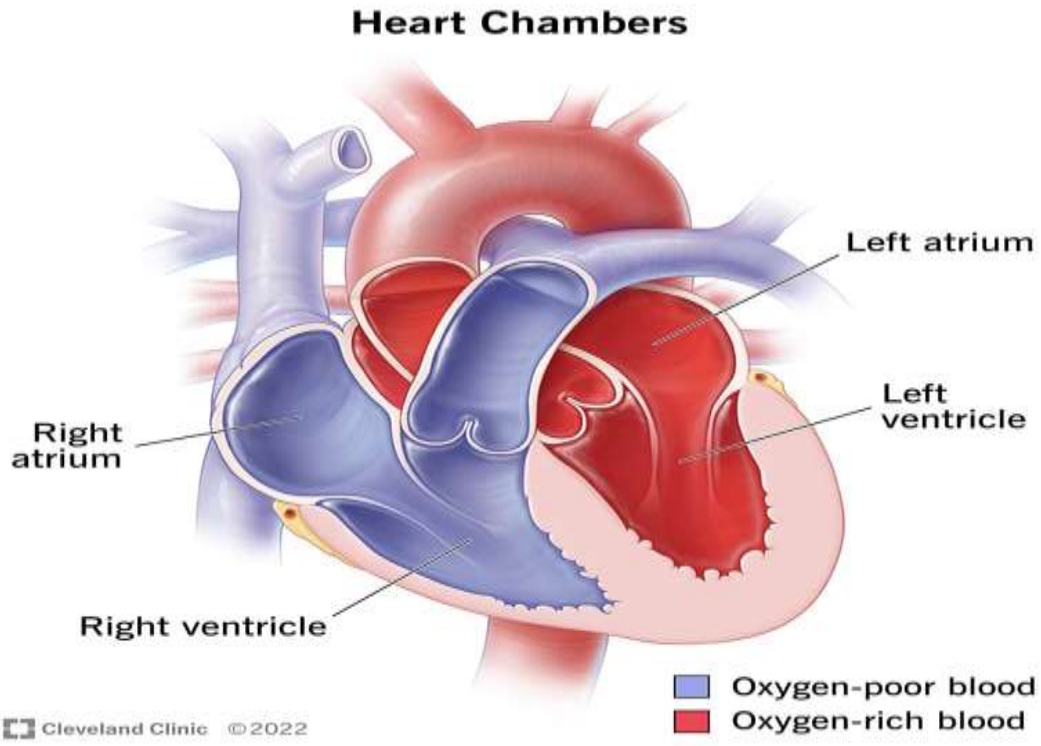
- Epicardium – the external layer.
- Myocardium – the center layer.
- Endocardium – the innermost layer.

Together, these three layers play a significant role in the normal working of the human heart.

Heart chambers

The heart is divided into four chambers, namely:

- Right upper chamber – Right atrium.
- Right lower chamber – Right ventricle.
- Left upper chamber – Left atrium.
- Left lower chamber – Left ventricle.



The **atria**, which are thin-walled chambers, receive blood from the veins and pump it to the ventricles. The **ventricles**, which are thick-walled chambers, pump the blood out of the heart. The atria and ventricles are connected together by valves which ensure that blood flows only in one direction inside the heart.

The wall that separates the left and right sides of the heart is called the **septum**. The left side of the heart receives oxygen-rich blood from the pulmonary veins (the only veins that carry oxygenated blood from the lungs to the heart) and pumps it into the aorta (the largest artery), while the right part of the heart receives low-oxygen blood directly from the largest vein or the vena cava and transports it to the lungs via the pulmonary artery.

Valves of the Heart - How do they help with blood flow?

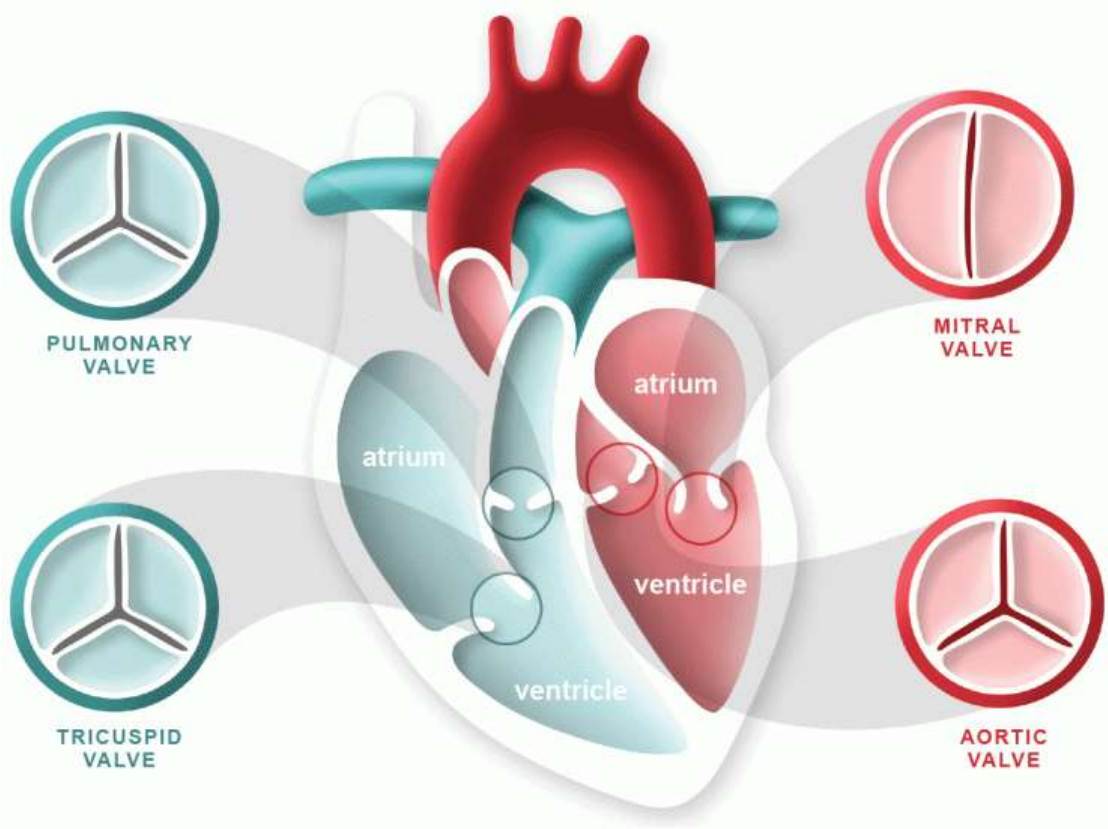
The heart valves act like gates at the chamber openings, they open and close to allow blood to flow through the chambers. Their main function is to ensure that blood flows only in one direction through the heart.

The atrioventricular (AV) valves are located between your upper and lower heart chambers. They include:

- **Tricuspid valve** – This valve opens to facilitate blood flow from the right atrium to the right ventricles.
- **Mitral valve** – This valve opens to allow blood to flow from the left atrium to the left ventricle.

Semilunar (SL) valves, which are located between the ventricles and the arteries that emerge from the heart, consist of:

- **Aortic valve** – This valve manages the blood flow from the left ventricle to the aorta.
- **Pulmonary valve** – This valve opens to allow blood to flow from the right ventricle to your pulmonary artery.



For a healthy functioning of valves, it is important that:

1. The valve is properly formed and flexible.

2. The valves are able to open fully so that the blood can pass through without any obstruction.

3. The valves are able to shut tightly so that the leakage of blood back into the heart chambers does not occur.

Circulatory system