Anatomy of the Heart & Circulatory System

(Text Page 109-111 & 113-115)

Three Primary Functions of the Cardiovascular System

1. *Pump blood*:
    a) Delivery of O_2 and nutrients to all cells
    b) Removal of CO_2 and other metabolic waste from cells
    c) The liver can purify the blood
    d) The kidneys can maintain fluid and electrolyte balances

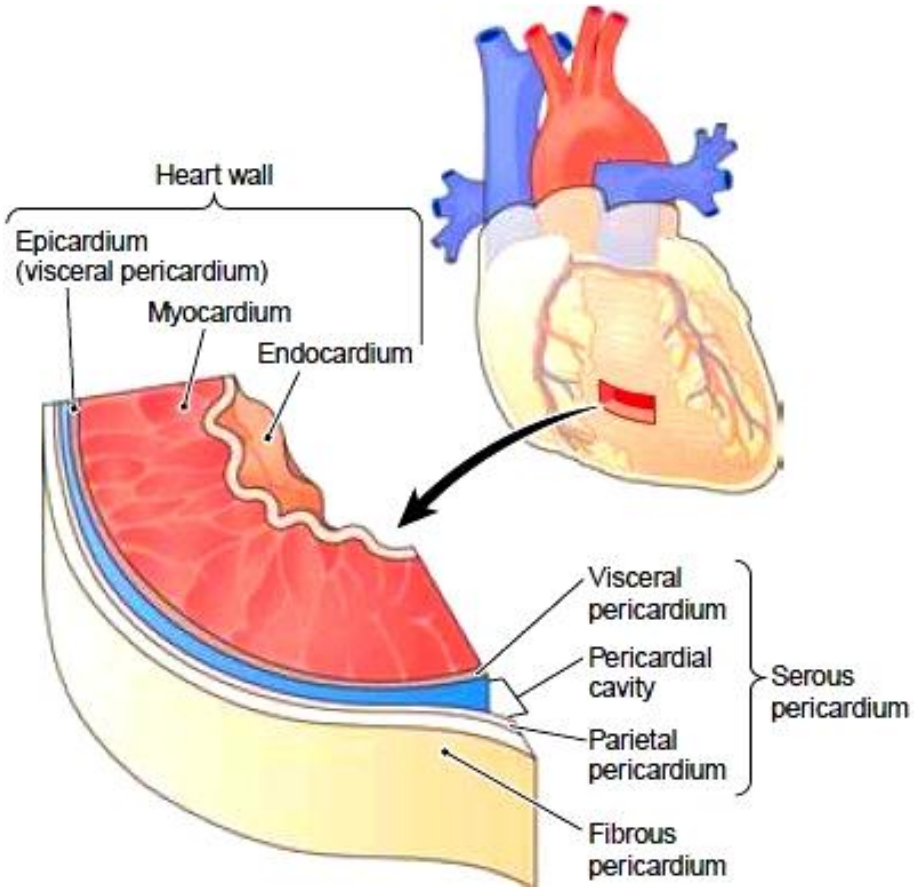
2. *Prevention of infection* (enhanced production of white blood cells if needed)
3. *Maintains body temperature.*

The heart is a hollow organ made of cardiac muscle (muscular pump) in the thoracic cavity that beats approximately 100 000 times per day. This fist sized organ is composed of three layers:

1) **Pericardium**: A thin closed sac that surrounds the heart and is filled with aqueous fluid that reduces the friction produces by the heart's repeated contractions.

2) **Myocardium:** the thickest part of the wall and is composed mostly of cardiac muscle. In other words, the heart itself.

3) **Endocardium**: the inner layer that lines the heart chambers.



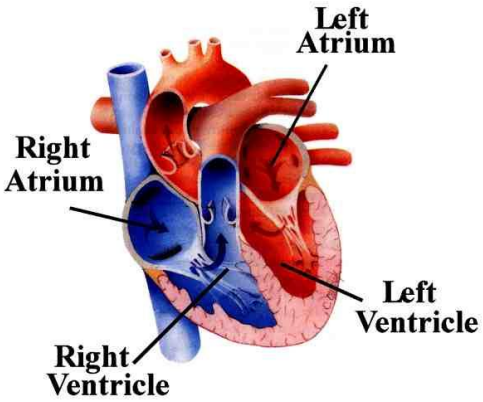
Four Chambers of the Heart:

Two Atria:

- Right atrium gets deoxygenated blood from the superior and inferior vena cava.
- The Left atrium gets oxygenated blood from pulmonary veins.

Two Ventricles:

- Right Ventricle pumps blood to the lungs to get oxygenated and remove CO2. (Pulmonary circulation)
- Left Ventricle has thicker walls and pumps blood to the body (Systemic Circulation)



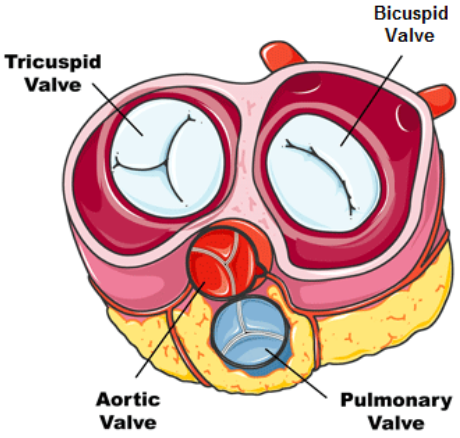
Heart Valves

The human heart contains **four valves** that control the direction of blood flow, ensuring a steady flow from the atria to the ventricles and from the ventricles the blood vessels. These valves are **one way valves** that open when blood pressure builds on one side and close when it increases on the other.

Two Atrioventricular Valves *(gateway to Ventricles)*

The right **atrioventricular** valve between the right atrium and the right ventricle is called the **tricuspid valve** because it contains three flaps.

The left **atrioventricular** valve between the left atrium and the left ventricle is called the **bicuspid valve** because it contains three flaps.



Two Semilunar Valves *(Gateway to Lungs and Aorta)*

Between the ventricles and the arteries are the **semilunar valves**. These valves consist of three semicircular flaps of tissue. When the ventricles contract, this forces the semilunar valves open.

Blood flow from the ventricles to the large arteries, and the backflow of blood causes the valve to close preventing any blood to return to the ventricles.

Heart Sounds "Lub Dub"

- "**LUB**" = Closing of the atrioventricular valves
  - Contraction and emptying of the ventricles (Systole)
- "**DUB**" = Closing of the semilunar valves
  - Contraction and emptying of the atria (Diastole)

The Cardiac Cycle

- **Systole:** when ventricles contract and empty – Atria fill "Lub"
- **Diastole:** when ventricles relax and fill – Atrial contraction and emptying "Dub"

Blood circuit in the heart

1) Blood low in oxygen (rich in CO_2) enters the right side of the heart from the **superior** and **inferior vena cavae.**

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2) This blood empties directly in the right atrium.

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3) The blood is pumped from here into the right ventricle

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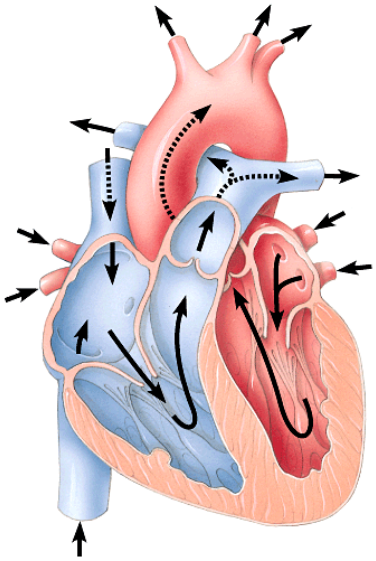
4) When the right ventricle is full, the muscle in its wall contract, forcing blood into the **pulmonary arteries** that lead into the lungs. *(Notice that this is the only artery that carries blood low in oxygen and high in CO_2)*



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5) In the lungs, the blood is oxygenated, returned to the heart via the pulmonary veins and the blood empties in the left atrium.

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6) The blood is then pumped into the left ventricle.

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7) When the left ventricle is full, the muscle in its wall contract, forcing blood into the **aorta**

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8) The aorta, the largest artery in the body carries oxygenated blood away from the heart, delivering it to the cells and the tissues of the body.