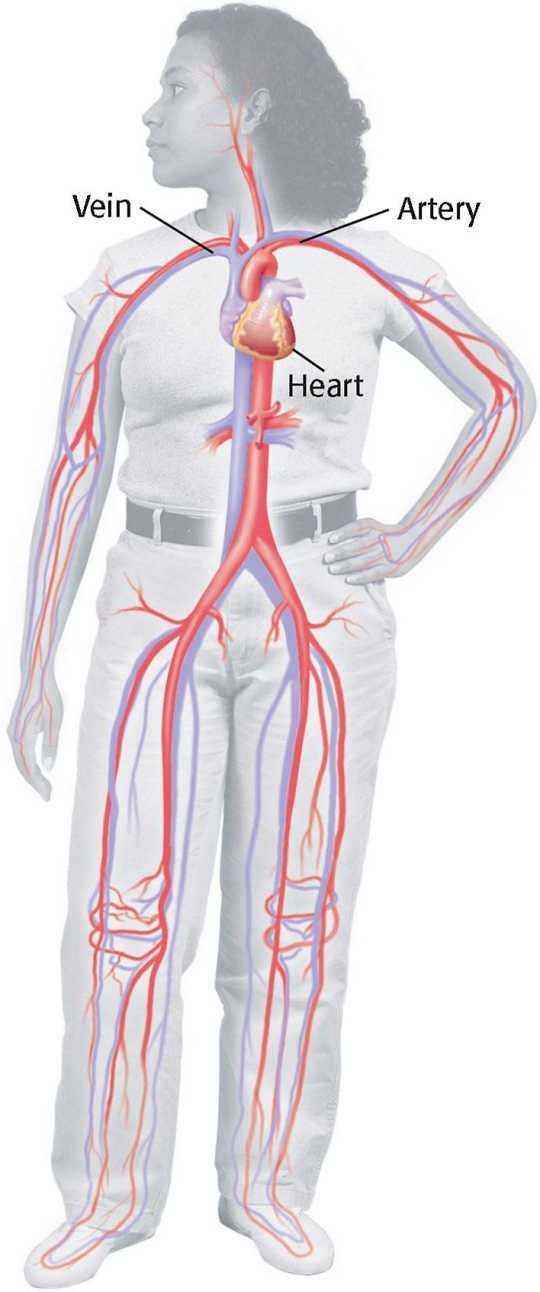
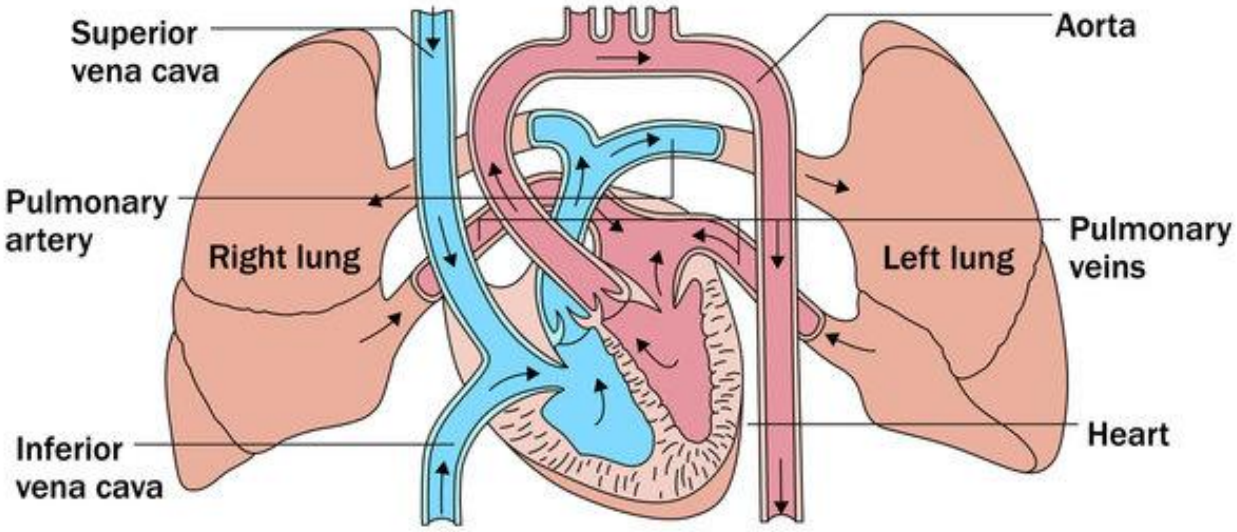
Circulatory System
(aka Cardiovascular System)

<u>Function</u>:

Carries needed substances (oxygen and other nutrients) to cells and carries wastes away from cells.

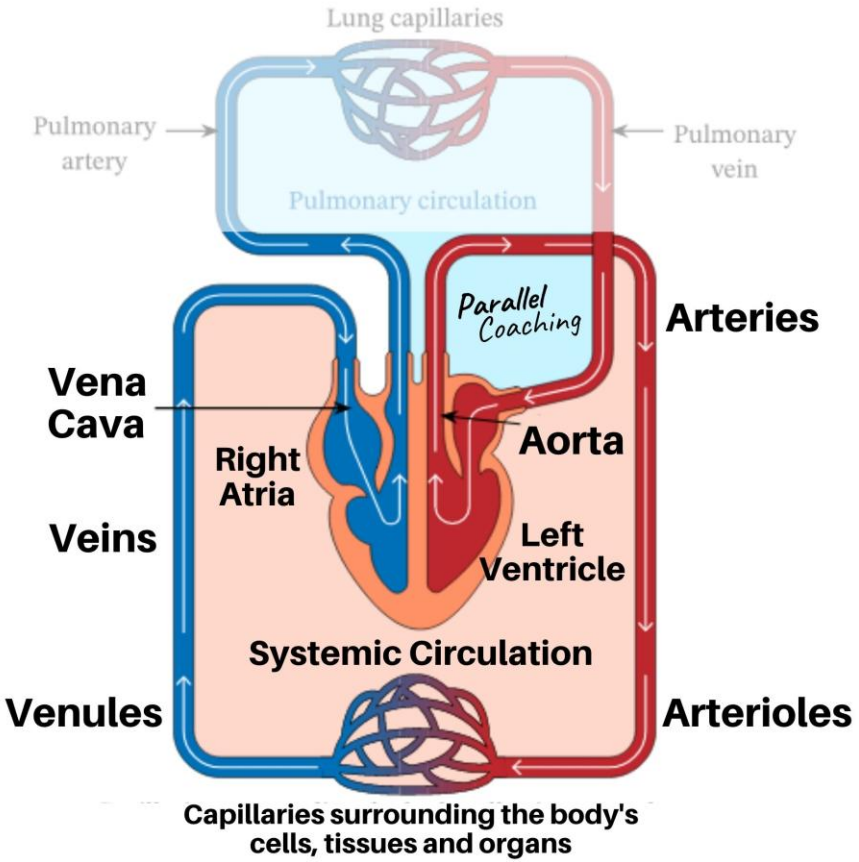


Pulmonary circulation



Pulmonary circulation is a vital process that involves the movement of blood between the heart and the lungs. It starts when blood loaded with carbon dioxide travels from the heart to the lungs through the pulmonary arteries. In the lungs, carbon dioxide is exchanged for oxygen through tiny air sacs called alveoli. The oxygen-rich blood then returns to the heart through the pulmonary veins. This freshly oxygenated blood is pumped out by the heart to deliver oxygen to all parts of the body. In summary, pulmonary circulation helps our bodies to breathe by refreshing our blood with oxygen and removing waste carbon dioxide.

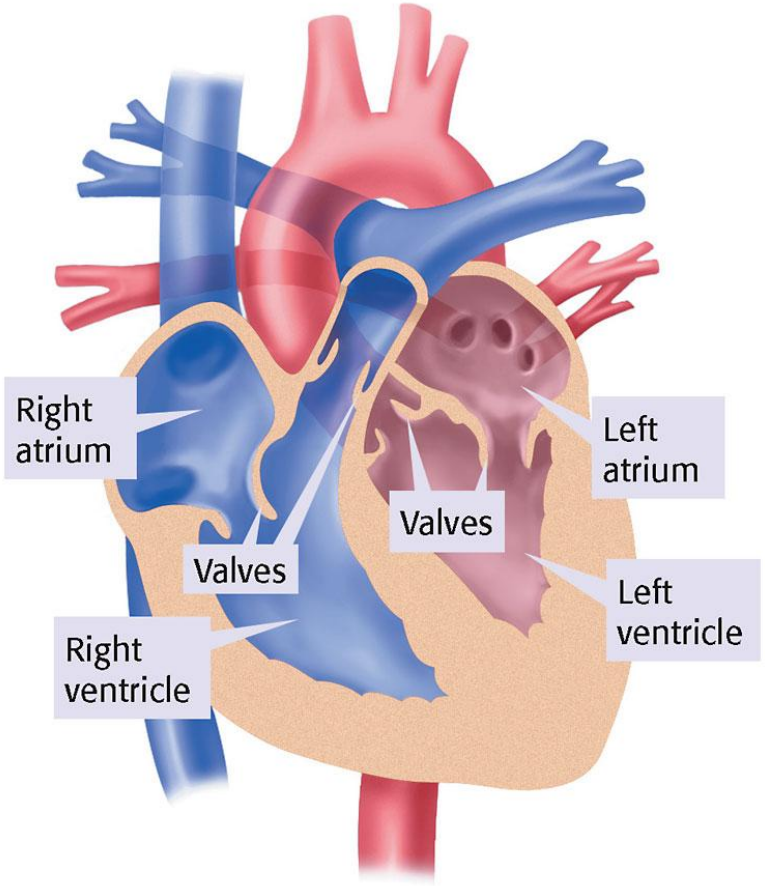
Systemic circulation is the process by which oxygen-rich blood is pumped from the heart to all parts of the body, delivering nutrients and oxygen to cells while removing waste products like carbon dioxide. It begins when oxygen-rich blood leaves the heart through the **aorta**, the body's main artery. From there, the blood travels through smaller arteries and arterioles to reach every organ and tissue in the body. Along the way, nutrients and oxygen are released from the blood into the cells, while waste products like carbon dioxide are picked up. The deoxygenated blood then returns to the heart through veins, where it is pumped to the lungs for oxygenation through pulmonary circulation. In short, systemic circulation is responsible for distributing oxygen and nutrients to the body's cells and removing waste products to keep us healthy and functioning properly.



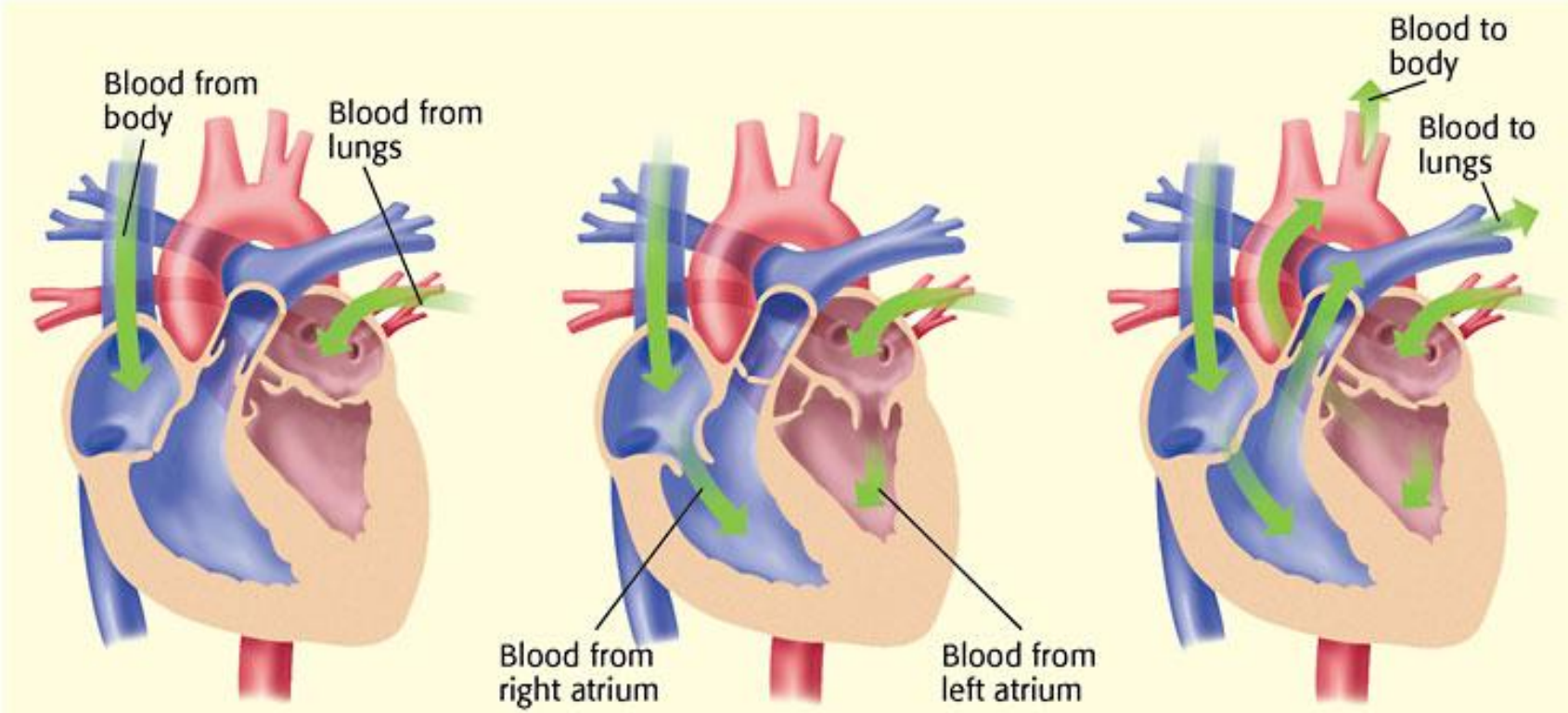
Organs

- Heart
  - Hollow, muscular organ that pumps blood throughout the body.

•The **right atrium** is the upper chamber on the right side of the heart. It receives blood from the body through a large vein called the **vena cava**.
•The **right ventricle** is the lower chamber on the right side of the heart. It pumps blood to the lungs through an artery called the **pulmonary artery**.
•The **left atrium** is the upper chamber on the left side of the heart. It receives blood from the lungs through a vein called the **pulmonary vein**.
•The **left ventricle** is the lower chamber on the left side of the heart. It pumps blood out to the body through a large artery called the **aorta**.



Path of Blood Through the Heart



1. Blood enters the atria first. The left atrium receives oxygen-rich blood from the lungs. The right atrium receives oxygen-poor blood from the body.
2. When the atria contract, blood is squeezed into the ventricles.
3. While the atria relax, the ventricles contract and push blood out of the heart. Blood from the right ventricle goes to the lungs. Blood from the left ventricle goes to the rest of the body.

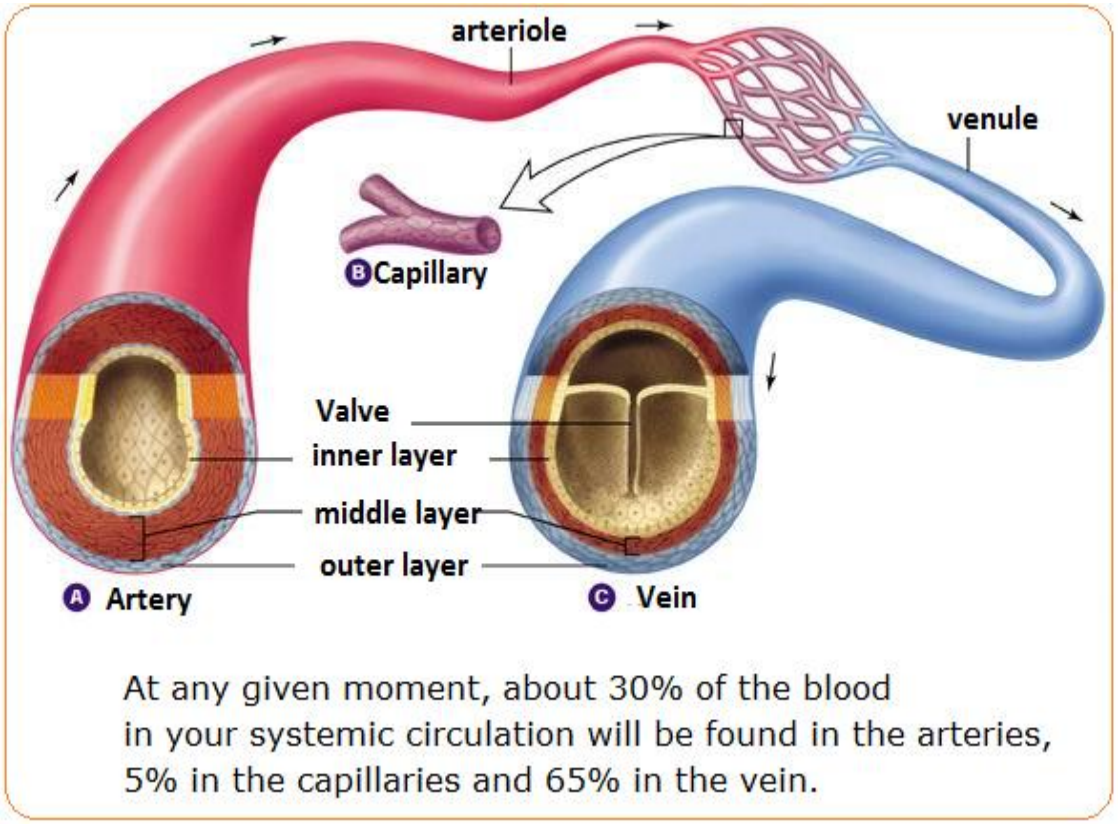
Video animation

- https://www.youtube.com/watch?v=46u2ON6d4mg

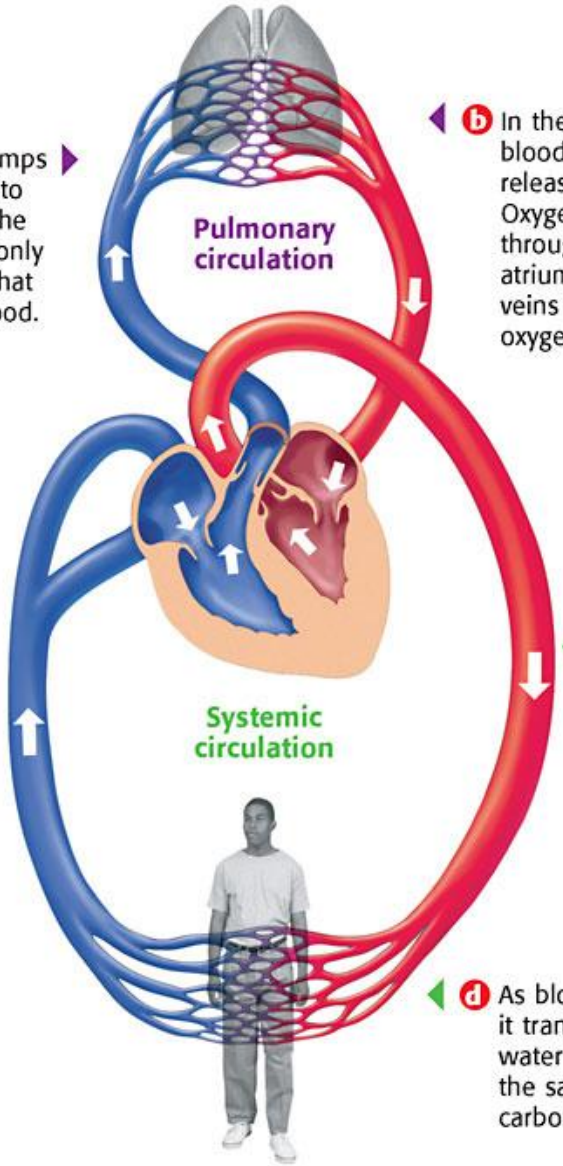
This video describes the structure and function of the heart. The heart is a muscular organ that is divided into **four chambers**: **the right atrium**, **right ventricle**, **left atrium**, and **left ventricle**. The **superior and inferior vena cava** carry **deoxygenated blood** to the right atrium. The blood then flows through the **tricuspid valve** to the **right ventricle**. From the right ventricle, the blood travels through the **pulmonary valve** to the lungs for **oxygenation**. The oxygenated blood returns to the heart through the **pulmonary veins** and enters the **left atrium**. The blood then flows through the **mitral valve** to the **left ventricle**. Finally, the blood leaves the left ventricle through the **aortic valve** and travels to the rest of the body. This process is repeated continuously to keep the body supplied with oxygenated blood.

Organs – Blood Vessels

- Arteries
  - Blood vessel that carries oxygen-rich blood away from the heart and to the body parts.
- Capillaries
  - Small blood vessels where materials are exchanged between the blood and the body's cells (oxygen & carbon dioxide)
- Veins
  - Carries oxygen-poor blood (w/carbon dioxide) back to the heart (to be pumped out to the lungs)



Flow of Blood Through the Body



a The right ventricle pumps oxygen-poor blood into arteries that lead to the lungs. These are the only arteries in the body that carry oxygen-poor blood.

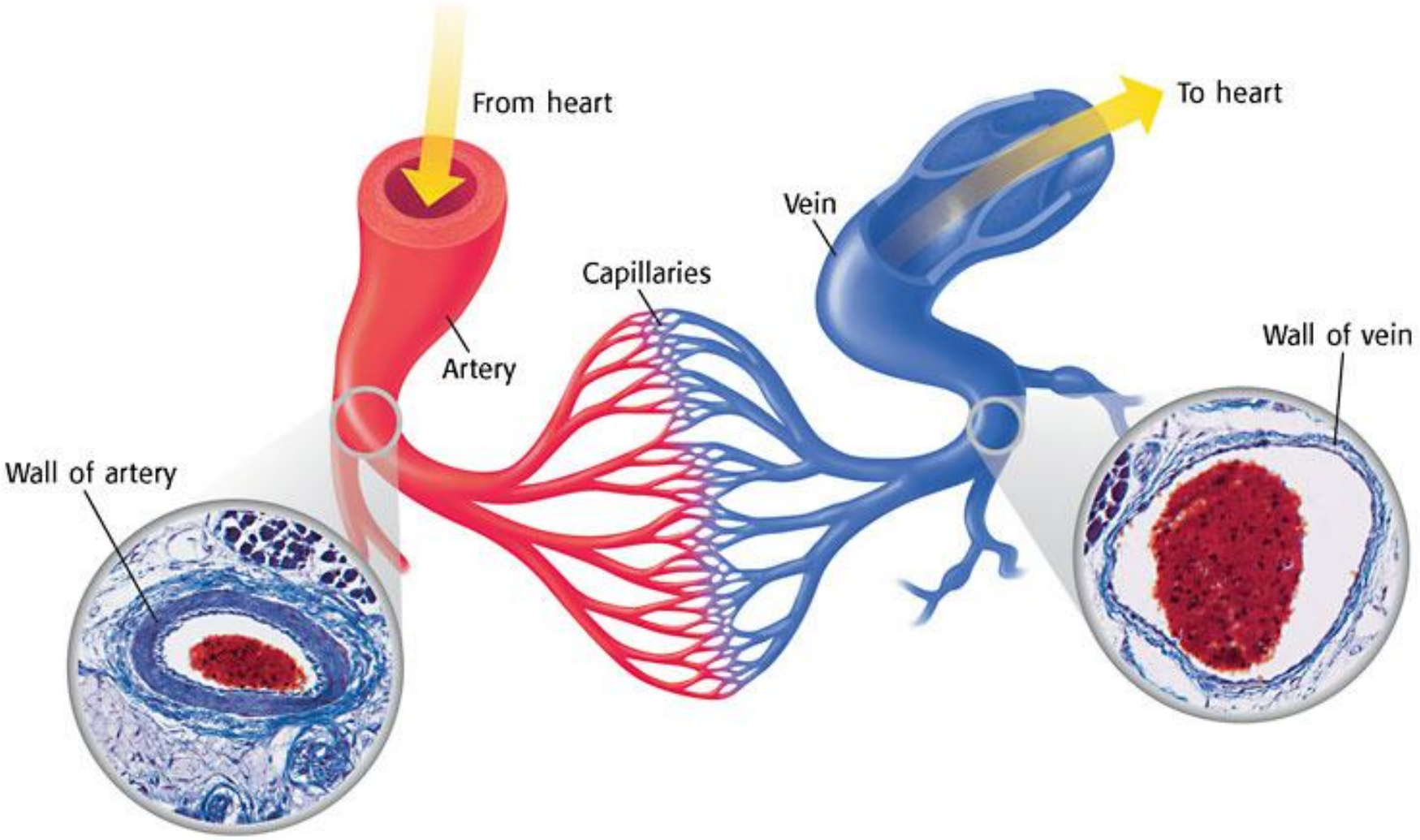
b In the capillaries of the lungs, blood takes up oxygen and releases carbon dioxide. Oxygen-rich blood travels through veins to the left atrium. These are the only veins in the body that carry oxygen-rich blood.

c The heart pumps oxygen-rich blood from the left ventricle into arteries and then into capillaries.

d As blood travels through capillaries, it transports oxygen, nutrients, and water to the cells of the body. At the same time, waste materials and carbon dioxide are carried away.

e Oxygen-poor blood travels back to the heart and is delivered into the right atrium by two large veins.

Blood Vessels



Heart attack

The heart, like other parts of our body, needs oxygen-rich blood to work properly. This blood is supplied by the **coronary arteries**, which wrap around the heart. However, sometimes fat can build up in these arteries, a condition known as **atherosclerosis**, reducing the flow of oxygen. High blood pressure, high cholesterol, and smoking are three major risk factors for this buildup. If the plaque in the arteries tears, it triggers the body's emergency repair system, leading to the formation of a clot that can block blood flow to the heart. This blockage can cause a heart attack, where heart muscle cells begin to die. Contrary to what we see in movies, heart attacks don't always involve dramatic chest-grabbing scenes; they can start with mild discomfort and progress gradually. Recognizing symptoms early is crucial because irreversible damage can start within 30 minutes of blockage, leading to half of deaths within the first 4 hours. Doctors can perform procedures like angioplasty to reopen blocked arteries, but quick action is essential.

https://www.youtube.com/watch?v=Lj7gM6eIDu0

Videos and songs about blood flow

https://www.youtube.com/watch?v=FOFLv8wGTwE

https://www.youtube.com/watch?v=_vZ0lefPg_0