

CARDIOVASCULAR SYSTEM

- The cardiovascular system can be thought of as the transport system of the body. This system has three main components: the heart, the blood vessel and the blood itself.
- The heart is the system's pump and the blood vessels are like the delivery routes. Blood can be thought of as a fluid which contains the oxygen and nutrients the body needs and carries the wastes which need to be removed.
- The following information describes the structure and function of the heart and the cardiovascular system as a whole.

Anatomy of heart – structure and functions:

- The heart is a conical, hollow, muscular organ, and is roughly cone-shaped.
- It is about 12cm long, 9cm across the broadest point and about 6cm thick.
- The pericardium is a fibrous covering which wraps around the whole heart.
- It holds the heart in place but allows it to move as it beats. The wall of the heart itself is made up of a special type of muscle called cardiac muscle.
- The heart is a muscular organ located in the chest, between the lungs, and slightly to the left of the sternum. It is responsible for pumping blood throughout the body to provide oxygen and nutrients to the tissues and organs. The anatomy of the heart includes the following parts:
- **Pericardium:** The heart is surrounded by a tough, fibrous, and double-walled sac called the pericardium. It protects and anchors the heart in the chest.
- **Epicardium:** This is the outermost layer of the heart wall. It is a thin, transparent layer that covers the heart's surface.
- **Myocardium:** The myocardium is the middle and thickest layer of the heart wall. It is composed of cardiac muscle cells that contract to pump blood out of the heart.
- **Endocardium:** The endocardium is the innermost layer of the heart wall. It lines the chambers of the heart and is continuous with the endothelium of blood vessels.
- **Atria:** The heart has two upper chambers called atria. They receive blood from the veins and pump it into the ventricles.
- **Ventricles:** The heart has two lower chambers called ventricles. They receive blood from the atria and pump it out of the heart into the arteries.
- **Atrioventricular valves:** These valves are located between the atria and ventricles. They prevent blood from flowing back into the atria when the ventricles contract.
- **Semilunar valves:** These valves are located between the ventricles and the arteries. They prevent blood from flowing back into the ventricles when the heart relaxes.
- **Septum:** The septum is a thick wall that separates the left and right sides of the heart. It prevents oxygen-rich and oxygen-poor blood from mixing.
- Overall, the anatomy of the heart is complex, with various structures working together to maintain a healthy blood flow through the body.

Chambers of the Heart

- The heart has two sides, the right side and the left side. The heart has four chambers. The left and right side each have two chambers, a top chamber and a bottom chamber. The two top chambers are known as the left and right atria (singular: atrium). The atria receive blood from different sources.
- The left atrium receives blood from the lungs and the right atrium receives blood from the rest of the body. The bottom two chambers are known as the left and right ventricles. The ventricles pump blood out to different parts of the body.
- The right ventricle pumps blood to the lungs while the left ventricle pumps out blood to the rest of the body. The ventricles have much thicker walls than the atria which allows them to perform more work by pumping out blood to the whole body.

Blood Vessels

- Blood Vessels are tubes which carry blood. Veins are blood vessels which carry blood from the body back to the heart. Arteries are blood vessels which carry blood from the heart to the body.
- There are also microscopic blood vessels which connect arteries and veins together called capillaries.
- There are a few main blood vessels which connect to different chambers of the heart. The aorta is the largest artery in our body. The left ventricle pumps blood into the aorta which then carries it to the rest of the body through smaller arteries.
- The pulmonary trunk is the large artery which the right ventricle pumps into. It splits into pulmonary arteries which take the blood to the lungs. The pulmonary veins take blood from the lungs to the left atrium. All the other veins in our body drain into the inferior vena cava (IVC) or the superior vena cava (SVC).
- These two large veins then take the blood from the rest of the body into the right atrium.

Valves

- Valves are fibrous flaps of tissue found between the heart chambers and in the blood vessels. They are rather like gates which prevent blood from flowing in the wrong direction. They are found in a number of places.
- Valves between the atria and ventricles are known as the right and left atrioventricular valves, otherwise known as the tricuspid and mitral valves respectively. Valves between the ventricles and the great arteries are known as the semilunar valves.
- The aortic valve is found at the base of the aorta, while the pulmonary valve is found at the base of the pulmonary trunk. There are also many valves found in veins throughout the body. However, there are no valves found in any of the other arteries besides the aorta and pulmonary trunk.

The main arteries which branch off the aorta and take blood to specific parts of the body are:

- **Carotid arteries**, which take blood to the neck and head
- **Coronary arteries**, which provide blood supply to the heart itself

- **Hepatic artery**, which takes blood to the liver with branches going to the stomach
- **Mesenteric artery**, which takes blood to the intestines
- **Renal arteries**, which takes blood to the kidneys
- **Femoral arteries**, which take blood to the legs

Blood circulation, blood vessels in Heart

The heart is the center of the circulatory system, and it pumps blood to all parts of the body through a network of blood vessels. The blood vessels in the heart include:

Arteries: Arteries are blood vessels that carry oxygenated blood away from the heart to the rest of the body. The largest artery in the body is the aorta, which arises from the left ventricle and branches out to supply blood to all the major organs and tissues.

Arterioles: Arterioles are smaller arteries that regulate blood flow to the capillaries.

Capillaries: Capillaries are the smallest blood vessels in the body, and they allow for the exchange of oxygen, nutrients, and waste products between the blood and tissues.

Venules: Venules are small veins that collect blood from the capillaries and transport it to the larger veins.

Veins: Veins are blood vessels that carry deoxygenated blood back to the heart from the body. The largest vein in the body is the vena cava, which brings blood from the lower and upper body to the right atrium of the heart.

In terms of blood circulation, the heart is divided into two separate circuits: pulmonary circulation and systemic circulation.

- Pulmonary circulation begins when the right ventricle of the heart pumps deoxygenated blood through the pulmonary artery to the lungs. In the lungs, the blood releases carbon dioxide and picks up oxygen, becoming oxygenated. The oxygenated blood then flows back to the left atrium of the heart through the pulmonary veins.
- Systemic circulation begins when the left ventricle pumps oxygenated blood through the aorta to the rest of the body. The oxygenated blood is delivered to the capillaries, where it releases oxygen and nutrients to the tissues and picks up carbon dioxide and waste products. The deoxygenated blood then flows back to the right atrium of the heart through the vena cava, and the process begins again.

In summary, the blood vessels in the heart are crucial to maintaining a healthy circulatory system and ensuring that oxygen and nutrients reach all parts of the body.