# Topic: HUMAN PHYSIOLOGY

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## Blood vessels

There are several kinds of blood vessels. Arteries and arterioles always carry oxygenated blood from the heart, the exception being the pulmonary arteries which carry venous blood. Venules and veins carry impure blood towards the heart except the pulmonary veins which carry pure blood. Capillaries are very minute blood vessels in which arterioles terminate and venules begin. They form a delicate network of vessels which ramify in most parts of the tissues of the body

## Arteries

They are composed of three layers, tunica adventitia, tunica media and tunica intima. The outer layer is protective in nature. The inner lining is very smooth and lined by a single layer of flat pavement cells. The middle layer is strong. It holds the vessel open and by means of contraction it exerts steady pressure on the blood. The thick walls of the larger arteries are themselves supplied with blood by a special system of tiny vessels known as the **vasa-vasorum.**

## Capillaries

These are microscopic blood vessels through which materials are exchanged between blood and interstitial fluids. They unite to form venules which in turn form veins to carry blood back to heart. Capillaries branch to form an extensive capillary network throughout the tissue. The network increases the surface area allowing a rapid exchange of large quantities of materials. Capillaries are minute vessels in which the arteries terminate. As the arterioles get smaller and smaller, the three coats gradually disappear until when the fine hair-like capillary vessels are formed. These consist of one layer, the inner endothelial coat of the arteries.

The extreme thinness of the vessels is highly suitable for filtration, diffusion, osmosis, etc.

**Veins**

Veins carry blood to heart. Each vein is made up of tunica adventitia, tunica media and tunica intima, similar to that of arteries. But the middle muscular layer is thinner, less firm and elastic than the arteries. At intervals they are thrown out into transverse folds and constitute a sort of incomplete valve. This helps to make the circulation one-way, by allowing blood to flow towards heart but not in opposite direction.

**Structure of the Heart**

The heart is a cone-shaped, hollow, muscular organ having the base above and the apex below. The apex inclines towards the left side. The heart is about the size of a closed fist. It is divided by a **septum** into two sides, right and left. Each side is further subdivided into two chambers, an upper chamber both on the right and the left side is called an **atrium** or auricle, and a lower chamber, a **ventricle.** The ventricles have the thickest walls. The walls of the left ventricle are thicker than that of the right as the force of contraction of the left ventricle is much greater. The walls of the auricles are composed of thinner muscles. The auricles and the ventricles of each side communicate with one another by means of the auriculoventricular opening which are guarded by valves on the right side by the **tricuspid** valve and on the left the **mitral valve**. The auriculoventricular valves permit the passage of blood in one direction only i.e. from auricle to ventricle and they prevent the blood flowing backwards from ventricle to auricle. The interior of each ventricular wall is marked by thickened column of muscle. These project as papillae, the papillary muscles, and at the end attached with thin tendinous cords called the **chordae tendineae**. They have a second attachment to the lower borders of the auriculoventricular valves and prevents the flaps of the valves being forced up into the auricle when the ventricles contract.

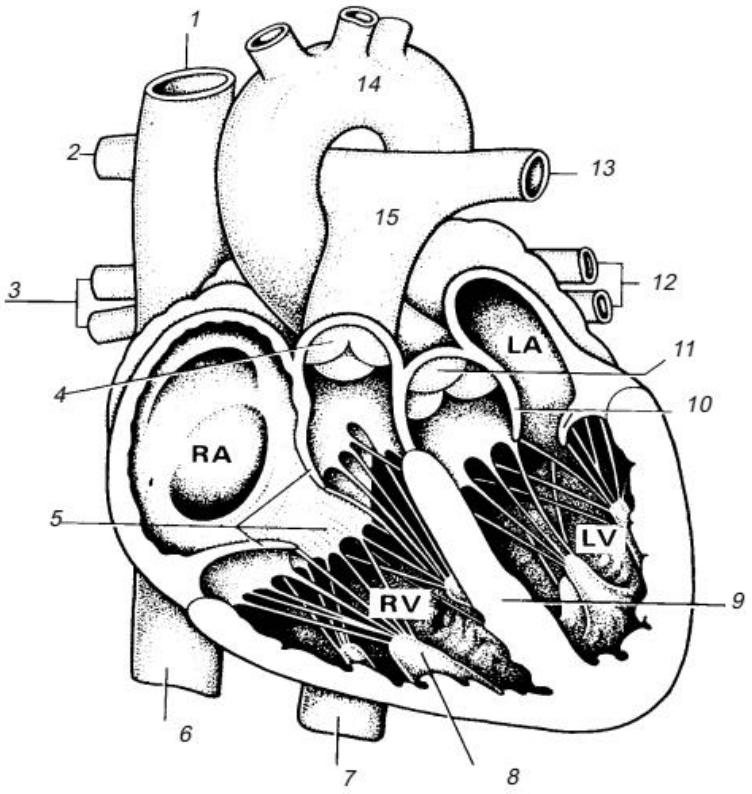


**Fig. 1. Structure of the heart**

1. superior vena cava
2. R.pulmonary artery
3. R.pulmonary veins
4. pulmonary valve
5. R.atrioventricular valve
6. inferior vena cava
7. aorta
8. papillary muscle with chordae tendinae
9. septum
10. L.atrioventricular valve
11. aortic valve
12. L.pulmonary veins
13. L.pulmonary artery
14. arch of aorta
15. pulmonary artery

The superior and inferior vena-cavae empty their blood into the right auricle. The pulmonary artery carries blood away from the right ventricles to the lungs for purification. The four pulmonary veins bring blood from the lungs to the left ventricle. The openings of the aorta and the pulmonary artery are guarded by the **semilunar valves**. The valve between the left ventricle and the aorta is called aortic semilunar valve. It prevents blood flowing backwards from the aorta to the

left ventricle. The valve between the right ventricle and the pulmonary artery is called pulmonary semilunar valve and prevents blood flowing backwards from the pulmonary artery into the right ventricle. The heart is composed by a specialised cardiac muscle, surrounded by a membrane of three layers namely the **pericardium** outer covering, the **myocardium** middle muscular layer and the **endocardium** the inner lining.