Applied physiology

Introduction to the Cardiovascular System
Lecture 1

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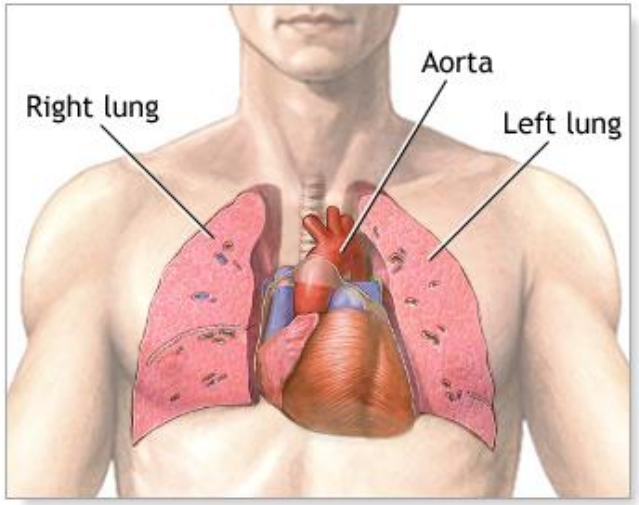
What is applied physiology?

- Physiology is the study of how the human body works when you're healthy and not. When you're sick or injured, normal physiology is disrupted.
- Applied physiology involves studying how the body responds to various external stimuli, such as exercise, diet, and environmental stressors. It uses this knowledge to optimise human performance and improve health outcomes.

Introduction

- The cardiovascular system is also called the (circulatory system).
- It consists of the heart, a muscular pumping device, and a closed system of vessels called arteries, veins and capillaries. As the name implies, the heart pumps blood in the circulatory system around a closed circle or circuit of vessels as it passes through the body's various "circulation ".
- The vital role of the cardiovascular system in maintaining hemostasis.
- Blood performs its ultimate transport function in microscopic capillaries. Nutrients and other essential materials pass from capillary blood into fluids surrounding the cell as waste products.

The Heart

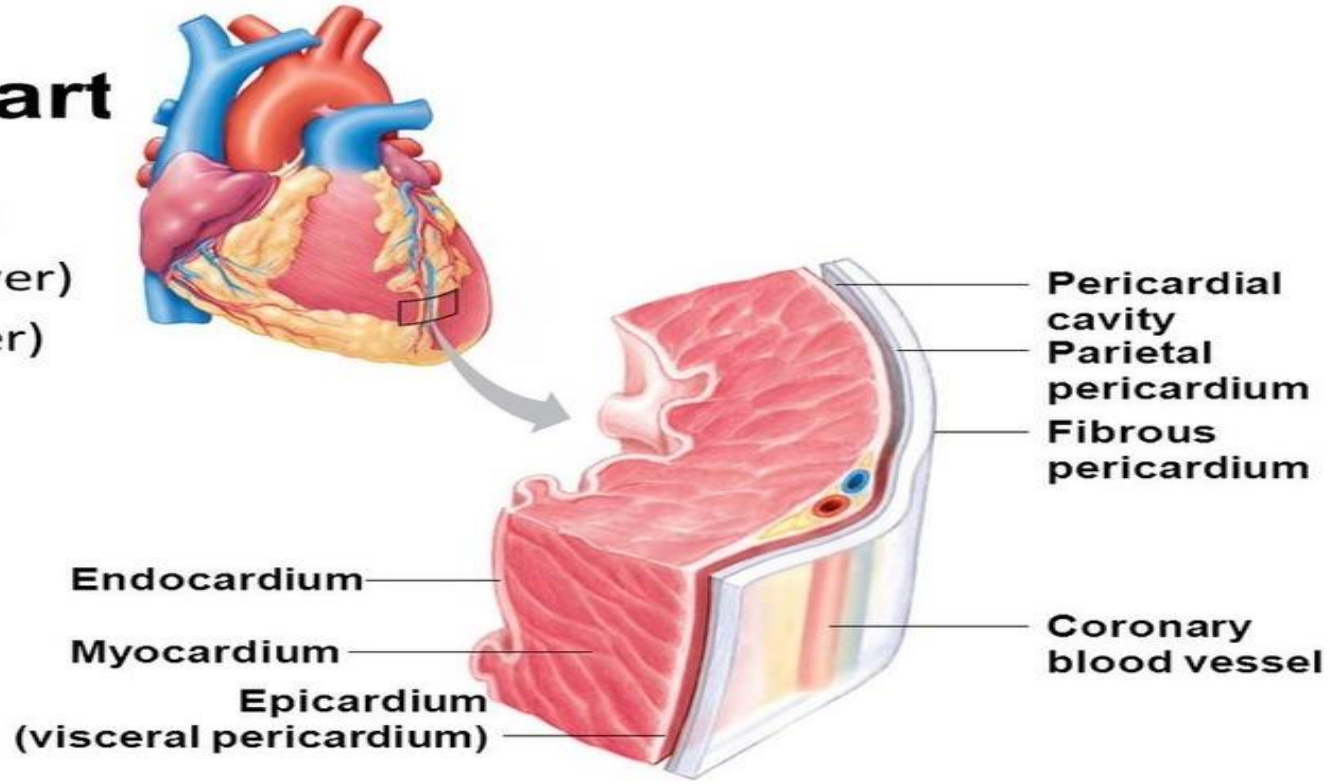


- The heart is a muscular pump that provides the force necessary to circulate the blood to all the tissues in the body. Its function is vital because the tissues need a continuous supply of oxygen and nutrients, and metabolic waste products have to be removed.
- When cells are deprived of these necessities, they soon undergo irreversible changes that lead to death. While blood is the transport medium, the heart is the organ that keeps the blood moving through the vessels.
- The normal adult heart pumps about 5 litres of blood every minute throughout life. If it loses its pumping effectiveness for even a few minutes, leading to death

Layers of the heart wall

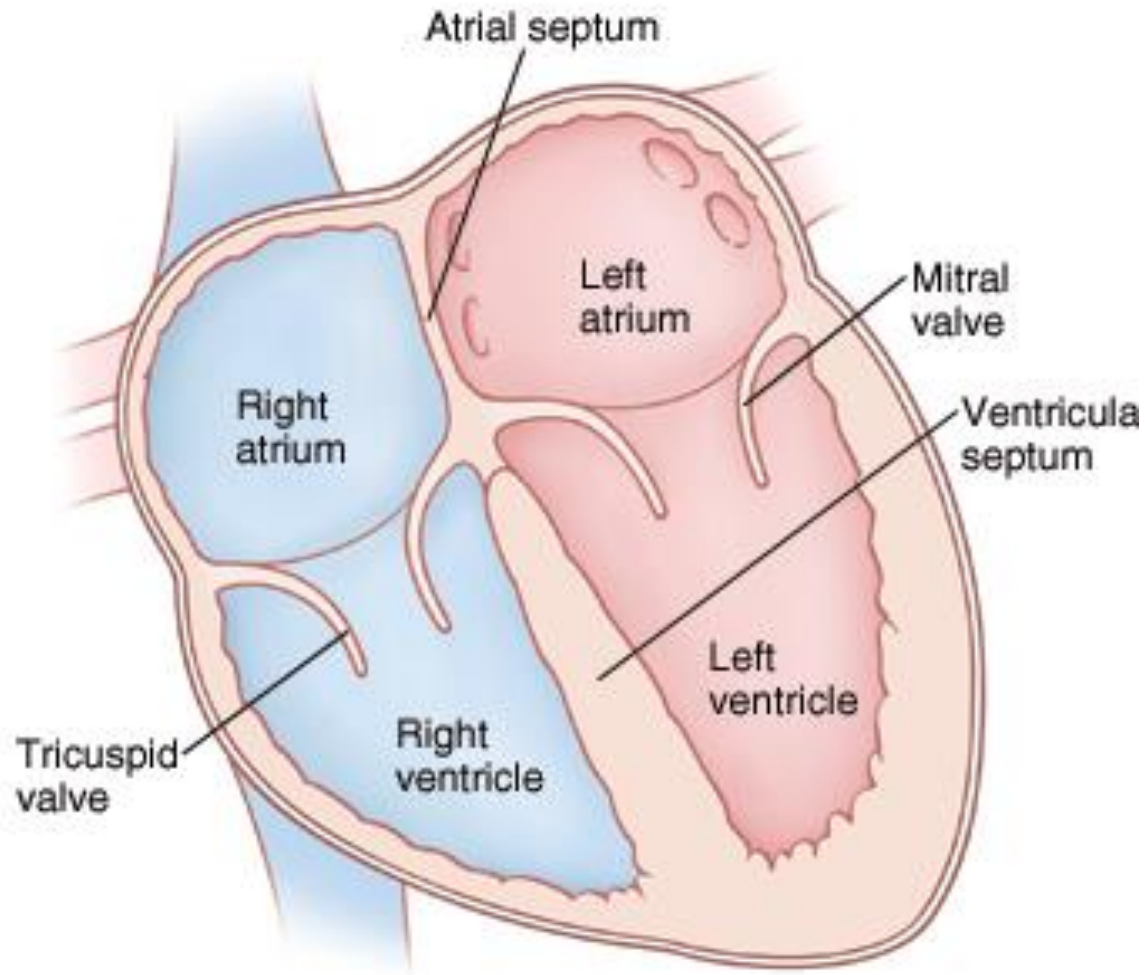
Wall of the Heart

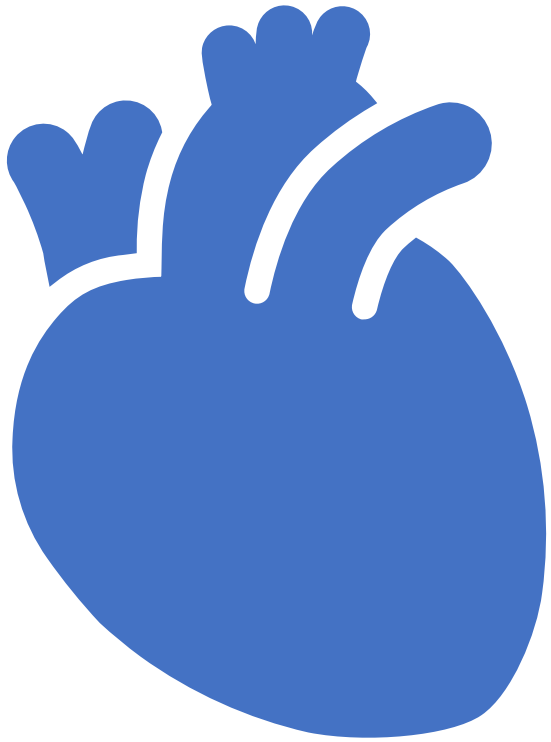
- **Epicardium** (outer layer)
- **Myocardium** (middle layer)
- **Endocardium** (inner layer)



Structure of the heart

The human heart is a four-chambered muscular organ shaped and sized roughly like a man's closed fist, with two-thirds of the mass to the left of the midline.





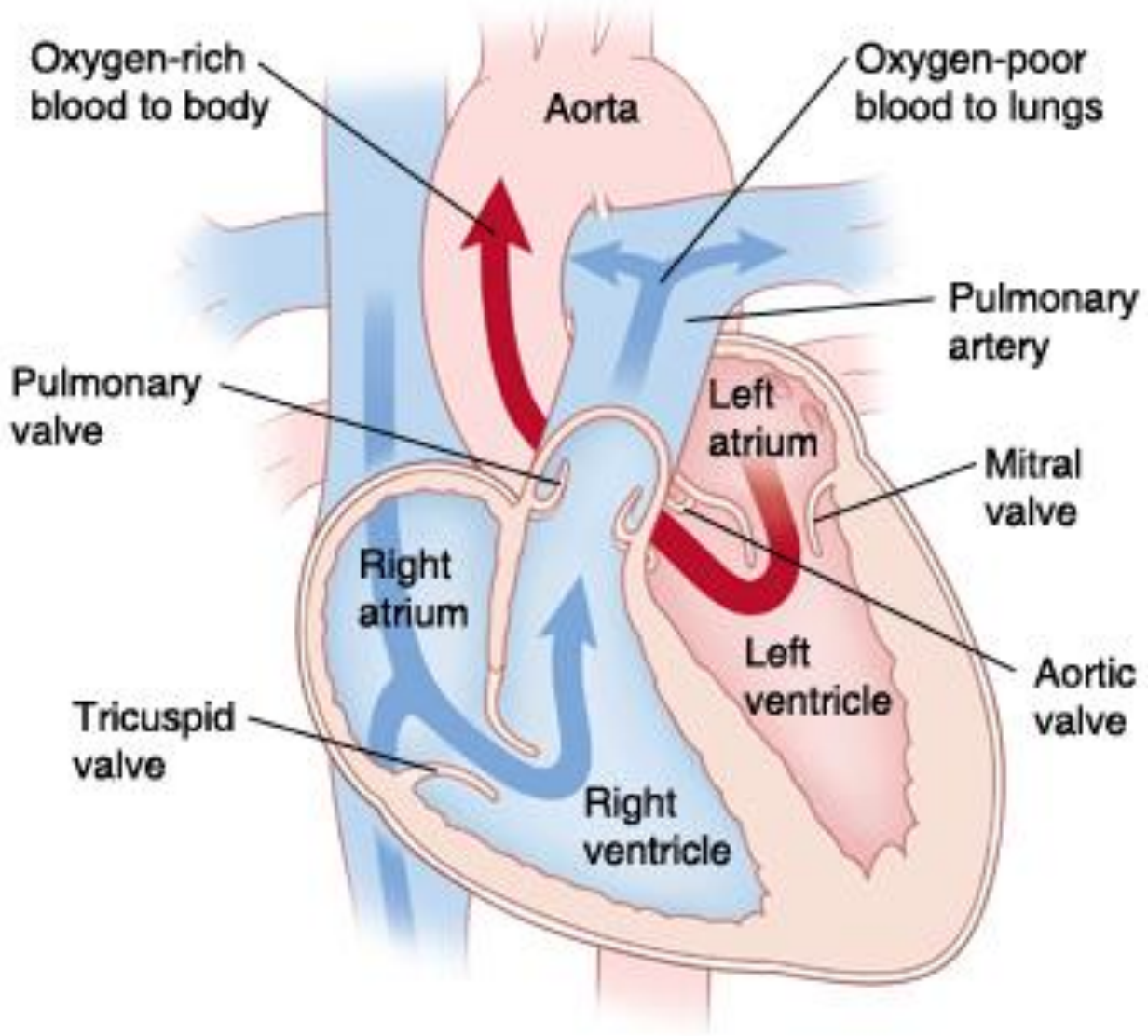
Chambers of the heart

The internal cavity of the heart is divided into four chambers:

- right atrium
- right ventricle
- left atrium
- left ventricle

Chambers of the heart

- The two atria are thin-walled chambers that receive blood from the veins.
- The two ventricles are thick-walled chambers that forcefully pump blood out of the heart. Differences in the thickness of the heart chamber wall are due to variations in the myocardium present, which reflects the amount of force each chamber is required to generate.
- The right atrium receives deoxygenated blood from systemic veins, and the left receives oxygenated blood from the pulmonary veins.
- The right ventricle pumps the low-oxygen blood to the lungs to pick up a fresh supply of oxygen. The left ventricle pumps the high-oxygen blood to the rest of the body.


Oxygen-rich blood to body
Aorta
Oxygen-poor blood to lungs
Pulmonary artery
Pulmonary valve
Left atrium
Mitral valve
Right atrium
Left ventricle
Aortic valve
Tricuspid valve
Right ventricle

Valves of the heart

- The heart includes two types of valves that are crucial for maintaining the blood flow in the correct direction. The valves between the atria and ventricle, known as atrioventricular valves (cuspid valve), and those at the bases of large vessels leaving the ventricles, known as semilunar valves, are key components of the heart's function.
- The RT atrioventricular valve is tricuspid; the LT atrioventricular valve is bicuspid; the valve between the Rt ventricle and pulmonary trunk is a pulmonary semilunar valve, and the valve between the left ventricle and aorta is an aortic semilunar valve.
- When the ventricles contract, the atrioventricular valve closes to prevent blood from flowing back into the atria; when the ventricle relaxes, semilunar valves close to prevent blood from flowing back into the ventricles.

Thank you