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Module Title: Introduction to Physiology

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Poster

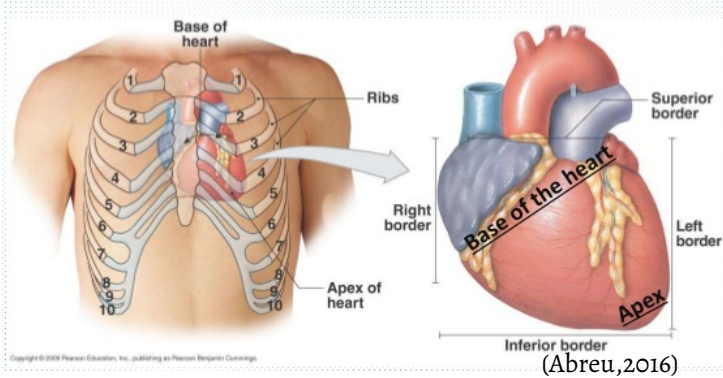
Lecturer: Giriahar Katti

THE CARDIOVASCULAR SYSTEM

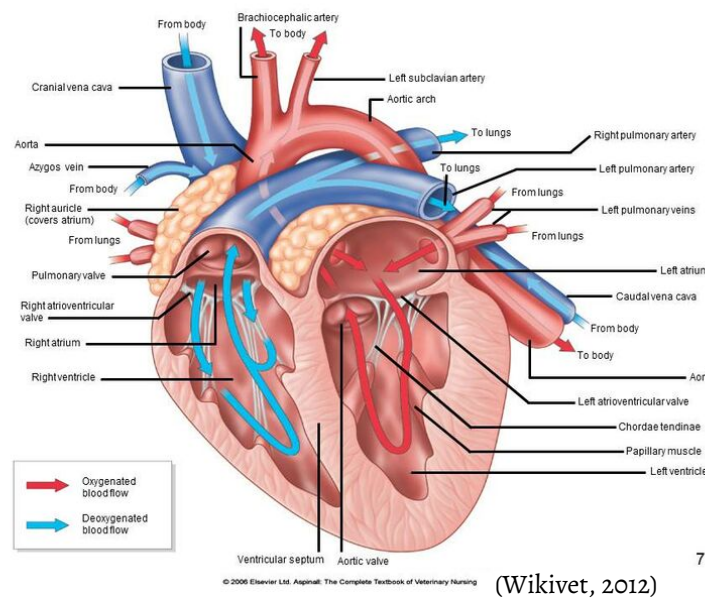
The Cardiovascular system is made up of the heart, blood vessels and blood(Taylor, 2020).

STRUCTURE OF HEART

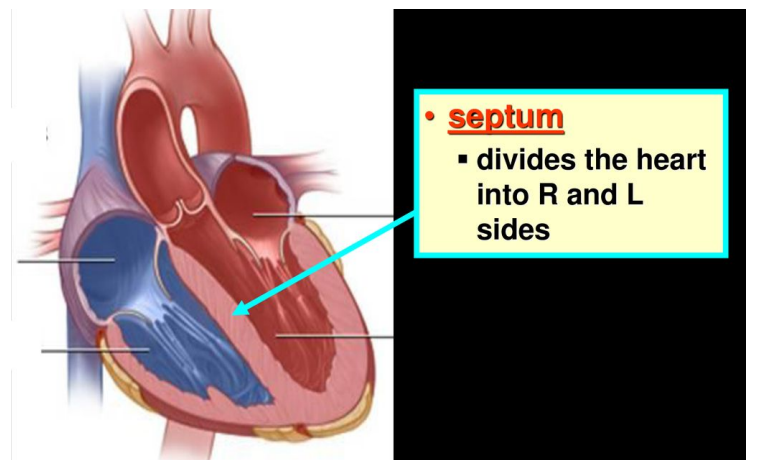
HEART POSITION IN THE THORAX



The heart is located in the pericardium, a protection sac and attached to the diaphragm and inner surface of the sternum (Jarvis and Saman, 2018).



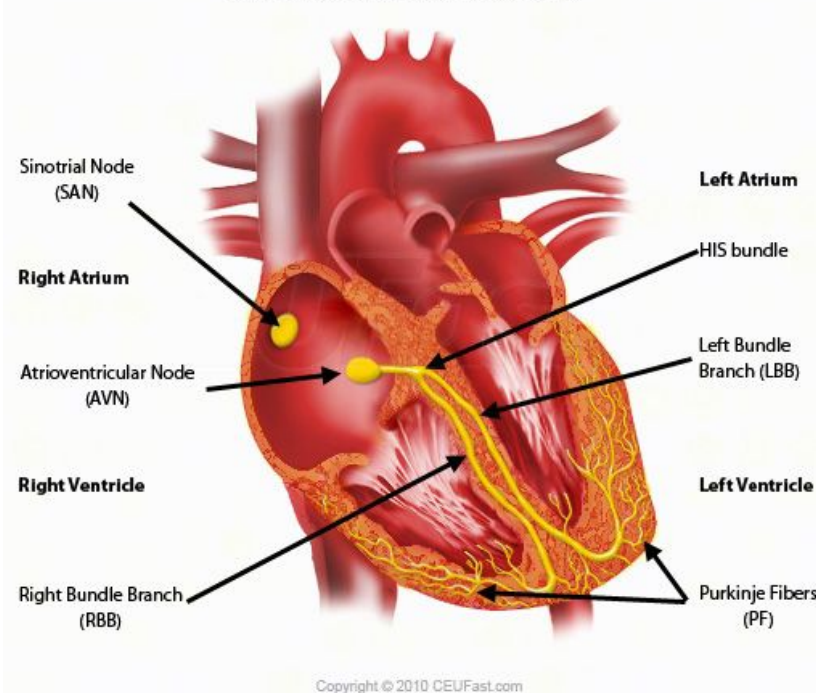
The heart has four chambers and is divided into two sides, the left and the right. The upper chambers are called the atria, which is located on the left and right, and the lower chambers are called ventricles which are also located on the left and right of the heart (BBC, 2014).



(slideplayer.com, 2021)

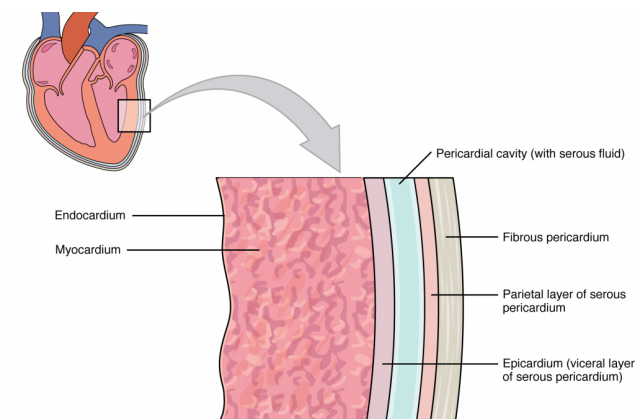
The septum separates the two sides of the heart. The right atrium and ventricle make up most of the sternocostal surface of the heart, while the left atrium and ventricle make up the diaphragmatic surface (Crumbie, 2021).

Cardiac Conduction system



(Pinterest, 2021)

According to the BBC (2021), the heart's beat is started due to the sino-atrial node (SAN), which can be found at the top of the right atrium and sets the rate at which the heart contracts. The SAN sends out electrical impulses, which are called atrial systole, to the muscular wall of both atria. The impulses then pass through another node within the heart called the atrioventricular node (AVN), located at the lower part of the right atrium. When the impulses from the SAN reaches AVN, it passes to the conducting fibres, which travel down the central heart wall.

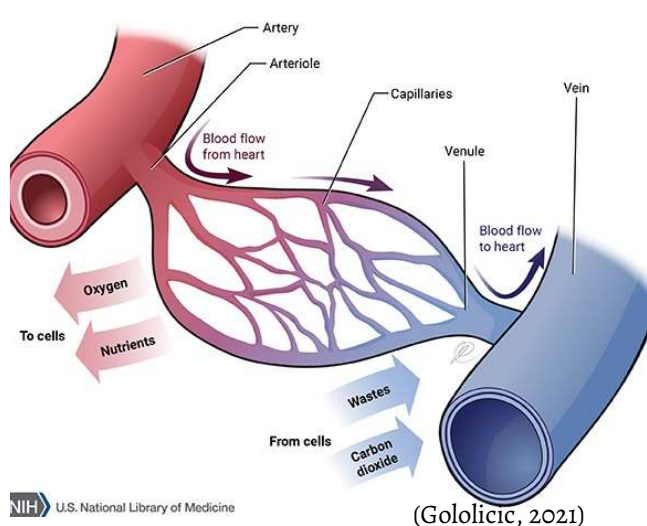


(Lindsay *et al.* (2021)

The heart wall has three layers of tissues: a solid outer fibrous pericardium and the inner serous pericardium. The more delicate part of the serous pericardium has two layers: the parietal pericardium combined with the fibrous pericardium and inner visceral pericardium (Lindsay *et al.*, 2021).

FUNCTUION OF THE HEART

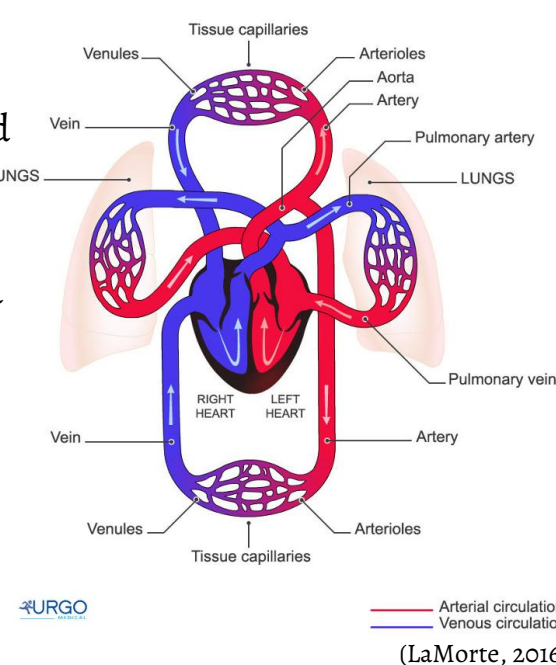
The heart is a double pumped system known as Pulmonary and Systemic circulation, which pumps oxygenated and deoxygenated blood around the body (Taylor, 2020). The heart is the essential organ of the cardiovascular system. It is a muscle that works in conjunction with an extensive network of blood vessels throughout the body and contracts autonomously and rheumatically (Jarvis and Sam, 2018).



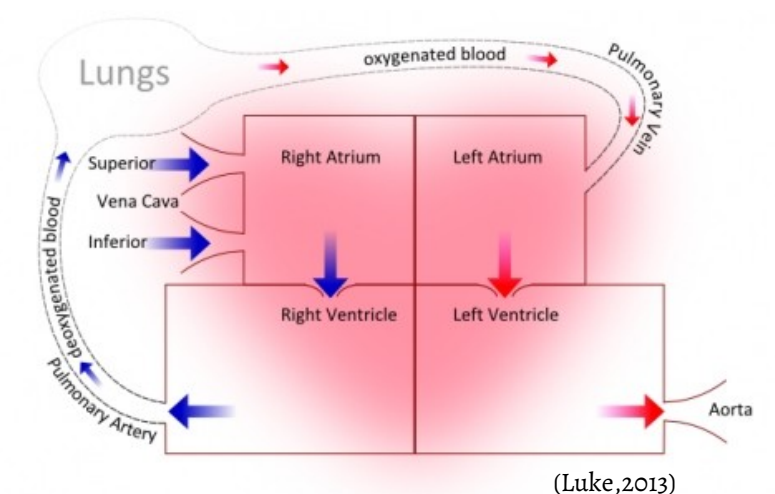
(Gololitic, 2021)

According to Milnor (1990), the blood vessel in the circulatory system consists of the arteries, capillaries and veins, which all have their function in the body.

- Arteries- they carry blood that has been ejected from the left and right ventricles to all parts of the body. The arteries are like branches, and the further they separate, the shorter the arteries get.
- Capillaries- this vessel is also known as the microcirculation and have endothelial cells which act as a delivery point from the arterial and venous. Oxygen, hormones, nutrients, and many other drugs will pass through the capillaries to the body and the waste substances from the body.
- Veins- the primary function is to carry blood back into the heart lacking oxygen, and as they reach closer to the heart, it gets bigger in size.

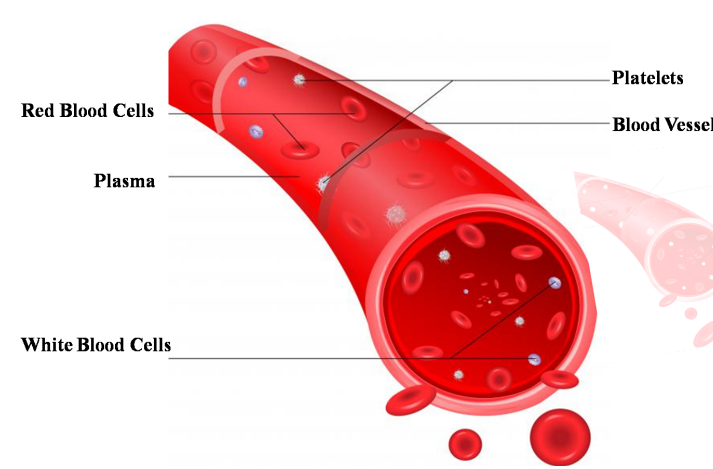


(LaMorte, 2016)



(Luke,2013)

The Pulmonary circulation carries **deoxygenated blood** to the lungs, where the carbon dioxide is unloaded and picked up oxygen which then delivers the oxygenated blood back to the heart. The Systemic circulation carries **oxygenated blood** all around the body and is then sent back to the heart to begin the cycle again (BBC, 2014).



(NicePNG, 2018)

According to the BBC (2021), the main function f the blood is to transport oxygen and nutrients to the body's cells. It is made up of four components:

- Red blood cells which transport oxygen around the body
- White blood cells that fight off infection.
- Platelets that clot together to prevent blood loss during injury.
- Plasma which is the liquid part of the blood.

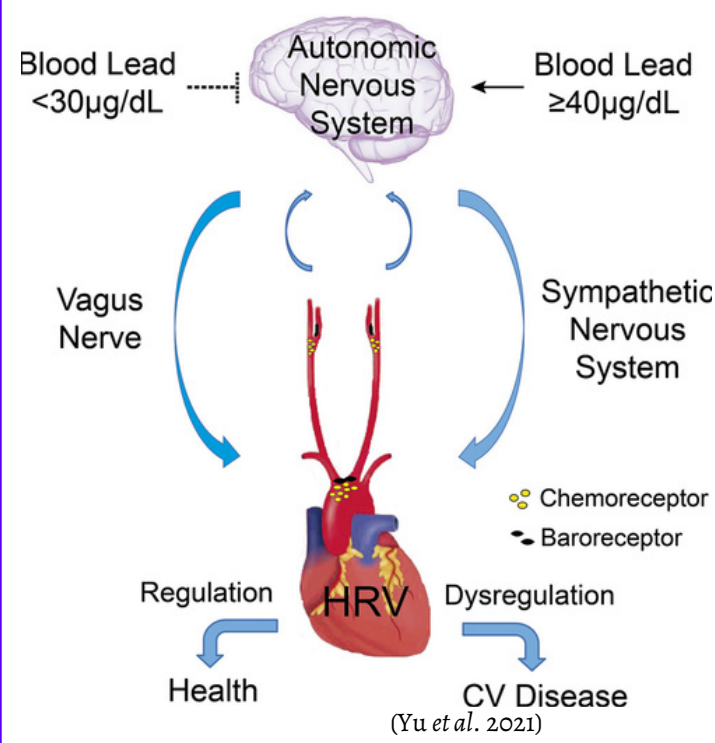
HOMEOSTASIS OF HEART

According to Waugh and Grant (2014), homeostasis is a means for the body's controls systems to maintain and detect changes in the internal environment. The heart retains homeostasis by keeping a constant body temperature, balancing the body pH, and regulating albumin levels in the blood plasma (Taylor, 2020).

Within the homeostasis system, three components perform specialised functions that allow the body to manage its internal environment. External changes that can alter the interior environment will be detected by the (1)receptor and conveyed to the (2)control centre, which will interpret the messages and deliver impulses to the (3) cardiovascular system effectors (Doherty and Foundy, 2006).

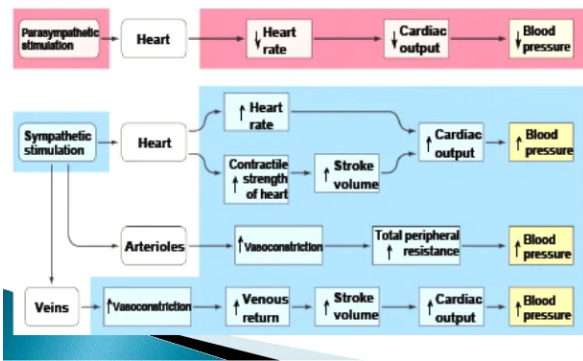
According to Laconi (2017), the cardiovascular system is essential for maintaining the homeostasis of the other bodily systems; without it, none of the different body systems can operate. The following are some instances of these systems:

- The nervous system is kept in balance by continuously supplying oxygen and glucose to the brain, spinal cord, and central nervous system.
- The kidneys and the circulatory system work together to keep blood volume and composition stable. The kidneys use blood pressure to filter waste from the body, and the system provides that.
- The skin maintains homeostasis by regulating body temperature when it falls too low and rushes warm blood to the skin's surface capillaries.



The nervous system, neurotransmitters, and hormones regulate the sinus node and play a significant role in regulating heart rate within the body. In the brain, a section called the medulla receives information from different parts of the body and decides to either activate the parasympathetic system to slow the heart rate or stimulate the sympathetic system, which increases the heart rate (Blue, 2018).

Regulation of blood pressure

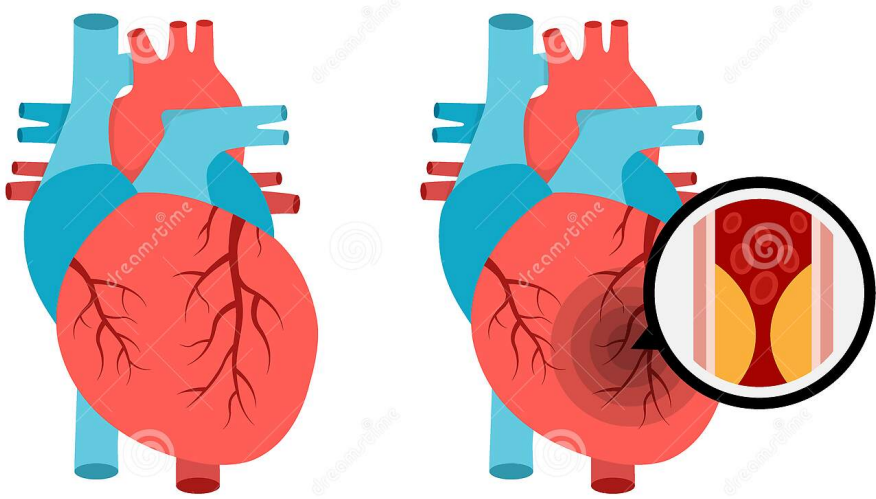


(Ababneh, 2015)

Within the human body, a series of actions can occur, raising or lowering blood pressure (BP). If the body is in a fight or flight situation, the BP will increase quickly until demands change or the increase is met. Another example is that when the body is at rest, less pressure is needed to ensure that an adequate blood supply is produced. The autonomic nervous system controls these rapid adjustments to BP through the baroreceptor reflex, which is an autonomic reflex that acts to maintain BP in the short term (Lowry *et al.* 2016)

DISORDER AND INTERVENTION

Cardiovascular disease is several disorders that affect the heart and blood vessels. This disease is the leading cause of death worldwide, and it was estimated that 17.9 million people died from this in 2019, about 32% of all global deaths. 85% of this death was due to heart attack and stroke (WHO, 2021).

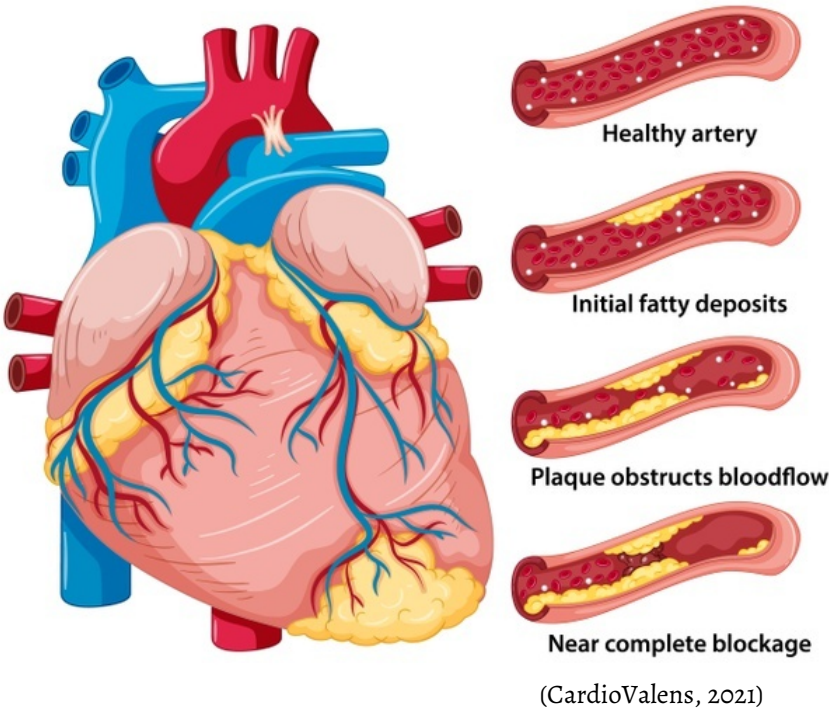


HEALTHY HEART

HEART ATTACK

(Dreamstime, 2021)

CORONARY ARTERY DISEASE



One of the disorders is Coronary Heart Disease (CHD), which affects the function and structure of the heart. It develops when the arteries in the heart cannot deliver enough oxygen-rich blood. CHD often develops when there is a build-up of a fatty substance called plaque inside the lining of the large coronary arteries (NIH, 2019).

According to Kromhout *et al.* (2002), they suggested that overtime it was known that dietary and lifestyle interventions are essential factors to prevent CHD and results from research showed that these factors can help with the reduction of risk of having CHD. The task force of the European Society of Cardiology outlines some essential guidance for a person's lifestyle: do not smoke, use alcohol in moderation if have to be used, and do moderate to vigorous walking. They also recommend limiting salt intake, keeping an energy balance, eating fatty fish at least once a week, and 400g of vegetables and fruits per day.

If a piece of the atheroma is broken off, it can cause a blood clot to occur, block the coronary artery and drive the supply of blood and oxygen to cut off from the heart muscle, known as a heart attack. The risk factor for CHD is high blood pressure, diabetes, smoking, overweight and high cholesterol (BHF, 2019).

What do your arteries look like?		
Healthy artery	Partially blocked artery	Blocked artery
— Blood flow — Low risk of heart disease	— Artery narrowed by atherosclerosis — Increased health risk	— Plaque build-up in the lining of artery — Blocked arteries can lead to stroke and heart disease

(Bengaluru, 2017)

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