

Chapter 7:

TRANSPORT IN HUMANS



Blood component: Plasma (55%), Red blood cell (44%), White blood cell and platelets (<1%)

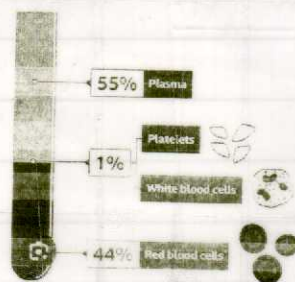
Plasma: yellowish liquid.

Function: Transport essential substance like glucose and waste material like carbon dioxide and urea.

Also transports other substances like hormones, enzymes, vitamins, plasma proteins, ions etc.

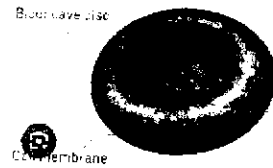
Adaptation: Plasma is a fluid, allow blood to flow

contains mostly water → Allows substances like carbon dioxide and glucose to be dissolved in it to be transported.



Function: Transport oxygen from lungs to different parts of the body.

STRUCTURE OF A RED BLOOD CELL



Adaptation: Biconcave shape to increase surface area to vol ratio to increase rate of diffusion of oxygen into and out of red blood cell.

• Contains haemoglobin to bind with oxygen.

• Lack of nucleus to carry more haemoglobin to bind with more oxygen.

White blood cell

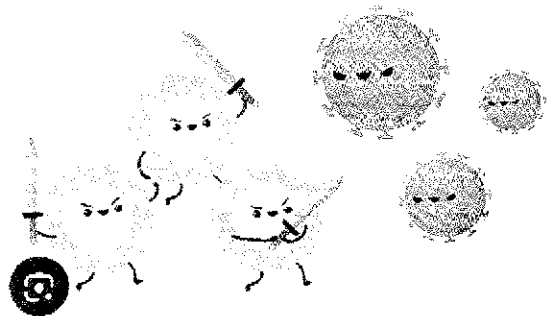
Function: protect against diseases and infections.

Adaptation

Lymphocyte: Produce antibodies that bind to toxins and neutralise them.

- may produce antibodies after organ transplant
- the organ is recognised as a foreign body
- This phenomenon is called tissue rejection.

Phagocyte: carry out phagocytosis (ingest and engulf) to break down foreign particles like bacteria and viruses.

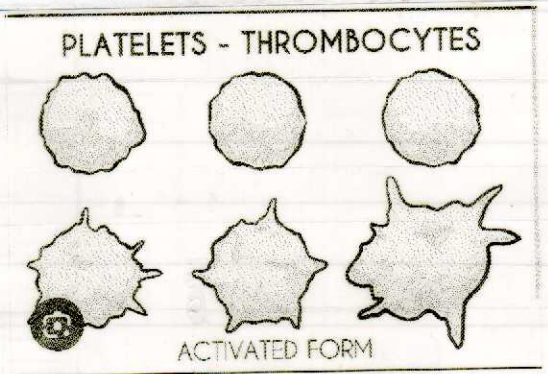


Platelets

Function: clot blood when there is an wound.

To prevent

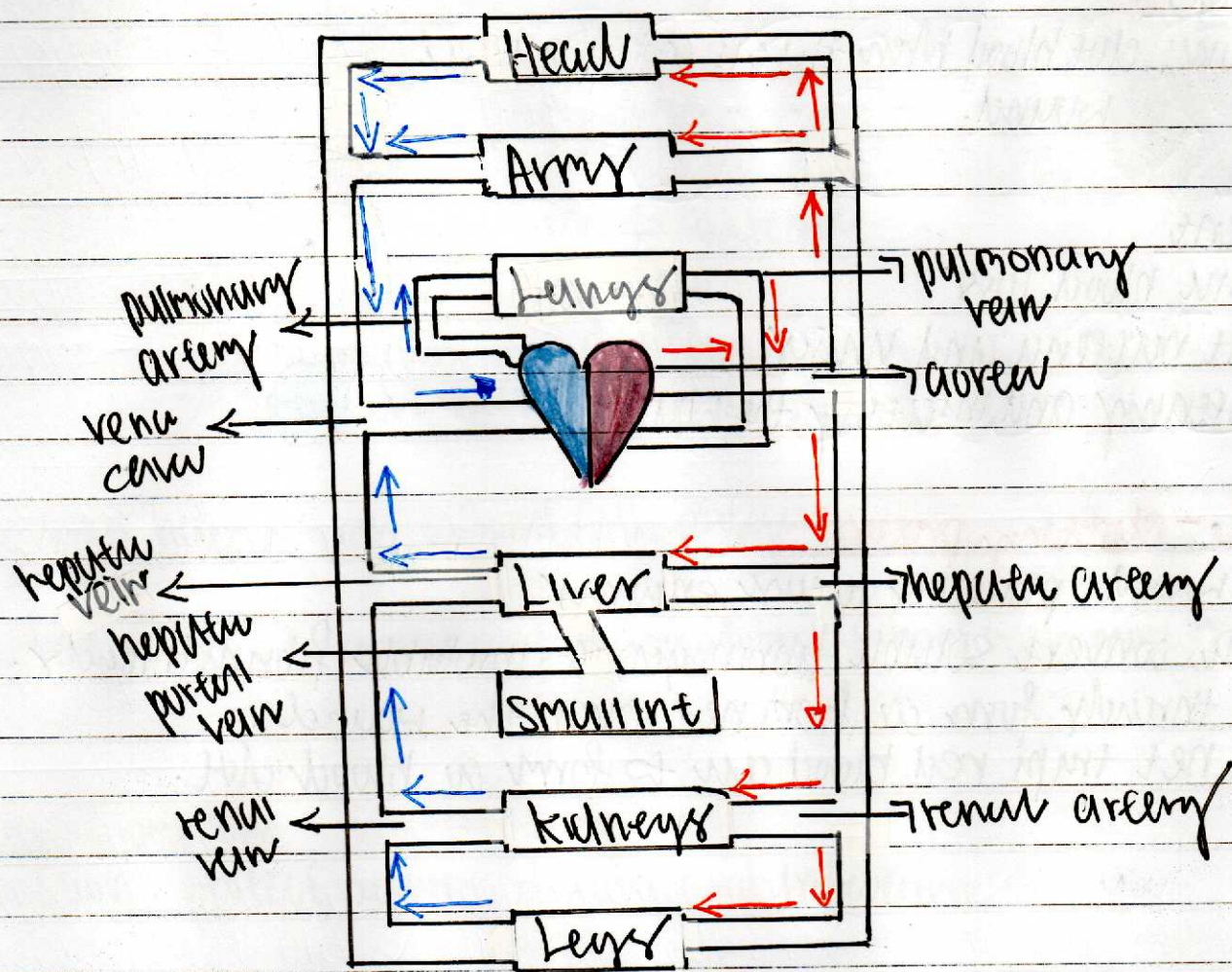
- Excessive blood loss
- Prevent bacteria and viruses from entering and infecting the wound.



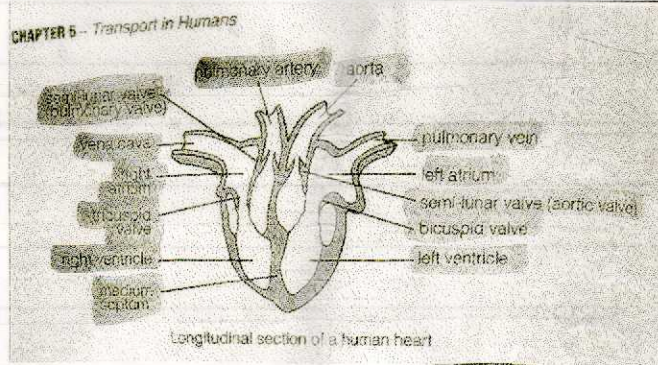
Blood - clotting process

- 1) At the wound, platelets release enzymes
- 2) Enzymes convert soluble fibrinogen into insoluble fibrin threads.
- 3) Fibrin threads form a fibrin net over the wound.
- 4) Fibrin net traps red blood cells to form a blood clot.

The Human Circulatory System



Structure and blood movement in



'Left' side

- Pulmonary artery
- Semi-lunar valve
- Vena cava
- Right atrium
- Tricuspid valve
- Right ventricle
- Median septum

'Right' side

- Aorta
- Pulmonary vein
- Left atrium
- Semi-lunar valve
- Bicuspid valve
- Left ventricle

2) There are 4 chambers in your heart: 2 atria + 2 ventricle

3) Atria has thinner wall compared to ventricle as they only pumped blood to ventricle while ventricle pumped blood to the lungs and the rest of the body.

4) Left ventricle has thicker wall compared to right ventricle as to pump blood at a higher pressure.

5) The right ventricle pumps blood at lower pressure to ensure that the rate of blood flow is lower so that there is sufficient time for gaseous exchange to take place in the lungs.

6) The median septum is a muscular wall between left and right sides of the heart to prevent oxygenated blood and deoxygenated blood from mixing together.

movement of blood in dw

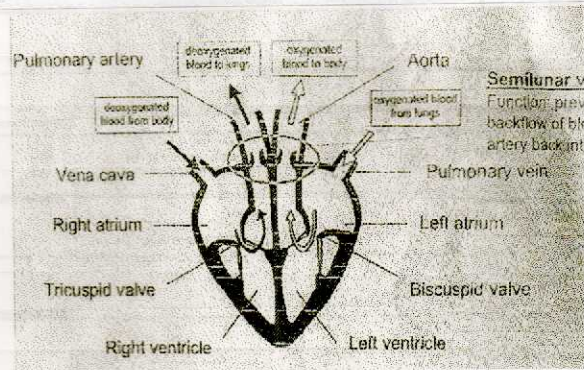


deoxygenated blood movement

Rest of the body $\rightarrow$ vena cava $\rightarrow$ right atrium $\rightarrow$ right ventricle $\rightarrow$ pulmonary artery.

Oxygenated blood movement

Lungs $\rightarrow$ pulmonary vein $\rightarrow$ left atrium $\rightarrow$ left ventricle $\rightarrow$ aorta $\rightarrow$ rest of the body.



1) Deoxygenated blood enters the right atrium through vena cava

2) When right atrium contracts, the pressure in it increases.
 $\rightarrow$ When pressure in right atrium $>$ right ventricle, tricuspid valve is forced to open and blood enters the right ventricle.

3) When right ventricle contracts, the pressure increases.
 $\rightarrow$ This caused tricuspid valve to close, preventing backflow of blood into right atrium.

4) Blood is forced out of right ventricle via pulmonary artery. The semilunar valves in pulmonary artery prevent blood from flowing back into right ventricle.

5. Blood is then transported to the lungs for gaseous exchange

6. Oxygenated blood from lungs return to left atrium via the pulmonary vein.

7. When left atrium contracts, the pressure increases. When pressure in left atrium is more than the ~~right~~ left ventricle, the bicuspid valve is forced to open.

→ Blood enters left ventricle.

8. When left ventricle contracts, the pressure in it increases.

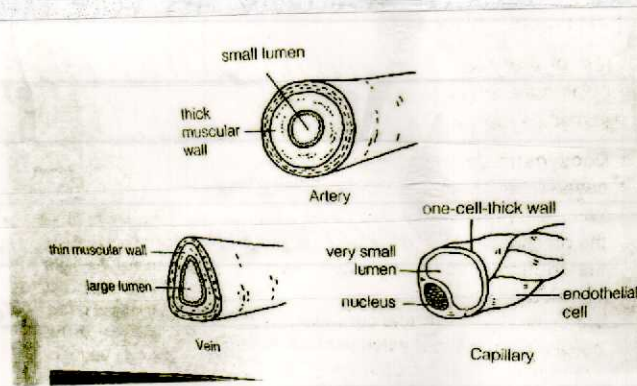
→ Forcing bicuspid valve to close

preventing back flow of blood into left atrium.

9. Blood is forced out of left ventricle via aorta. The semilunar valves in aorta prevent the back flow of blood into left ventricle.

10. Blood is then transported to ~~the~~ rest of the body and return back to the heart through veins and venae cavae.

Structure of arteries, vein and capillaries

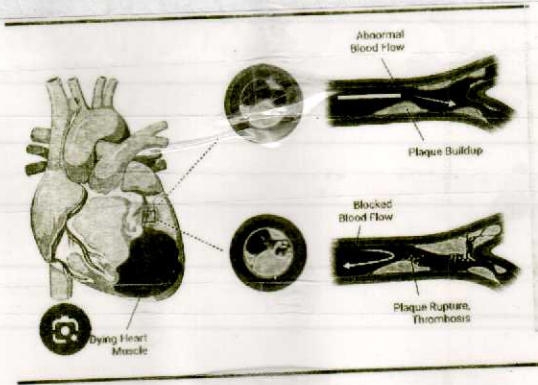


Blood vessel	main function	Adaptations
Artery	• carries blood away from the heart	• small lumen and thick elastic walls to withstand high pressure exerted by the heart
Vein	• carries blood towards the heart	• large lumen and thin walls as they carry blood of lower pressure than arteries • contains semi-lunar valves to prevent back flow of blood.
capillary	• Allows exchange for gases, nutrients and waste materials between blood and the cells	• one-cell-thick to allow gases to diffuse at a faster rate

Oxygen content in Artery: high (except for pulmonary artery)
 Oxygen content in Vein: low (except for pulmonary vein)

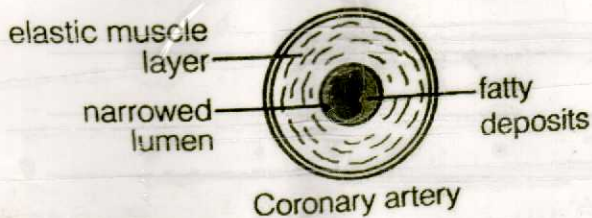
Coronary Disease

Coronary arteries: blood vessels that transport blood rich in oxygen and nutrients like glucose to heart muscles for respiration.



Lumen: the inside space of a tubular structure / an organ.

→ narrowing of the lumen of coronary arteries is caused by the building up of fatty substances on the inner walls of arteries. Can result in Coronary heart disease



→ This condition whereby fatty substances build up is called **atherosclerosis**.

Causes of coronary heart disease

- Smoking
- Diet high in saturated fat / cholesterol
- Sedentary lifestyle
- Prolonged stress
- Genetic predisposition.

Effects of Coronary Disease

1. Cholesterol and fats accumulated and deposited on the inner wall of coronary arteries forming plaque.
2. Lumen of coronary arteries become narrower and become blocked (occlusion)
3. Blood containing glucose and oxygen cannot be transported to the heart muscles.
4. Heart muscle cannot carry out respiration and release enough energy
 - Heart muscles cannot contract, causing heart attack
 - Heart muscle die.