CHAPTER- 8 CIRCULATORY SYSTEM

Good morning students
The following lesson is of Class 9 for the subject of Biology; Topic - Cellular elements of blood which is covered in Chapter 8 titled Circulatory System starting on Page no 90 of your text book titled Concise Biology - Selina Publications and is being submitted to you on 11.11.2024
This voice is of Nidhi Rana.
So dear children, please open your book at Page No 90 and pay attention as I am going to explain you the various cellular components of blood As we learnt in the last class that the cellular elements of blood are of 3 types - Erythrocytes, Leukocytes & Thrombocytes So today we will discuss these cellular elements in detail Let us first start with erythrocytes

Erythrocytes or Red Blood Cells. RBCs

Erythrocytes are minute biconcave, disc like structures having no nucleus in them. Lack of nucleus makes them flat in the centre and thick and rounded at the periphery Further these erythrocytes are very small about 7 microns in diameter For your information children 1 micron is one thousandth of a milimeter
Thus children the small size plus the biconcave shape provide a large surface area to erythrocytes which makes them very efficient in absorbing oxygen

About 3 million RBCs are destroyed each day and about 4 times of this number are formed everyday. Mammalian RBCs are devoid of certain organelles which makes them more efficient in carrying out their task of picking up and delivering oxygen The factors making them more efficient in this work are as follows -

i Loss of Nucleus - makes the RBCs biconcave, thus increasing their surface area to volume ratio for more oxygen absorption. Loss of nucleus gives RBCs the biconcave shape, because of which spaces in between the cells are increased, hence more RBCs can be accomodated in the same space Further More RBCs means more absorption of oxygen.

ii Loss of Mitochondria means the RBCs can not use oxygen for themselves for carring out cellular respiration occuring in mitochondria of cells. Thus all oxygen, absorbed by RBCs is transported and delivered to the tissues unconsumed. without any loss. Secondly lack of mitochondria means full transport of glucose in blood plasma, unused by the RBCs.

iii Loss of Endoplasmic Reticulum. enable the RBCs to be more flexible for its movement in narrow capillaries.

Now before going further, let us recapitulate quickly about the RBCs by means of a short test.

Listen to the following questions carefully and then pause the audio for 3 minutes to write their answers in your notebooks -

Q1 What is the shape of Erythrocytes ?

Q2 Name the compound formed when haemoglobin combines with carbon monoxide

Q3 Name the 3 organelles which the mammalian RBCs are devoid of.

Children you may pause the audio for 3 minutes 3 minutes break is over children First listen to the answers of the questions being asked to you

A1 Erythrocytes have biconcave shape

A2 Carboxyhaemoglobin is formed when haemoglobin combines with carbon-monoxide

A3 RBCs are devoid of -
Nucleus, Mitochondria and Endoplasmic reticulum

Now Let us continue further with the discussion of Leukocytes or White blood cells.

Leukocytes differ from erythrocytes in having a nucleus and not having haemoglobin WBCs are fewer in number than the RBCs They are larger than RBCs in size & posses the power of amoeboid movement. Children you may please see Fig 8.3 showing the WBCs producing pseudopodia with which they squeeze through the walls of the capillaries into the tissues Thus process of oozing out of the WBCs from blood capillaries by producing pseudopodia is called diapedesis

DIAPEDESIS

Children Let us take up the 'General plan of Circulation of blood through blood vessels and heart' in human body. in brief right now. Details of which we will take up later in the chapter

Now children you may all please look at the Fig 8.1 given on Page No 91 of your text book showing the diagrammatic representation of blood and lymph circulation in human body.
You may please note that since the blood is either contained in heart or blood vessels hence it is the closed circulatory system
In the Fig 8.1 please note the following points -

i) The arrows depict the direction of blood flow. Blood flows in the vessels, always in the same direction, passing repeatedly through the heart.

ii) The oxygenated blood i.e. blood containing Oxygen is carried from the heart to the body tissues and cells In the cells the oxygen is used up and CO_2 is given out, Thus the blood becomes deoxygenated This exchange of gases occurs in blood capillaries. Then the blood vessels which carry deoxygenated i.e. carbon dioxide containing blood, called the veins, carry the deoxygenated blood to heart again. This deoxygenated blood again leaves the heart and through pulmonary artery it is taken to the lungs. Lungs

take up CO_2 from blood and O_2 is added to the blood. This oxygenated blood with the help of pulmonary vein is poured back into the heart.

Children this is a general plan of circulation of blood in human body, details of which we will learn further in the chapter.

iii) Again look at fig 8.1 carefully. When the blood is flowing in the capillaries, the plasma and the white blood cells WBCs 'leak out' through their walls This fluid bathes the cells and is called the tissue fluid. Some of this tissue fluid may be reabsorbed into the blood vessels, but most of it enters into lymph vessels and is now called the lymph. Lymph vessels ultimately pour the lymph into the veins close to their entry into the heart. and again comes into circulation.

Children details of lymph and lymph vessels we will learn further in the chapter.

iv) Another point to be noted in Fig 8.1 is that the oxygenated blood is depicted in red colour while the deoxygenated blood is depicted in blue.

Now before going further in the chapter let us take a 3 min break. All of you please write down the answers to the following questions in your notebook during the 3 mins break.

Q.1 What do you mean by oxygenated and deoxygenated blood? With which colour do we depict oxygenated and deoxygenated blood?

Q2 State the composition of lymph.

You may now pause the audio for break. Welcome back children! Break is over. Firstly listen to the answers of the questions being asked to you.

A1 Oxygenated blood means - blood containing oxygen. Deoxygenated blood means - blood containing carbondioxide.
Oxygenated blood is depicted in Red colour
Deoxygenated blood is depicted in Blue colour.

A2 Lymph majorly contains - Blood plasma and White blood cells.

Now children, Let us start with the next topic that is - Properties of blood - which are as follows-

i) Blood is never stationary: It is always moving through the heart and blood vessels.

ii) Blood is bright red when taken from artery and dark red when taken from vein

iii) An average human has 5-6 litres of blood by volume in his body

iv) Blood tastes saltish

v) Blood is slightly alkaline with pH of 7.3 to 7.45

Now let us discuss the general functions of blood.

1. Blood helps to transport digested food from alimentary canal to all the body cells
2. Haemoglobin a red coloured pigment present in the blood combines with oxygen to form oxyhaemoglobin and helps to transport oxygen in the body. On reaching the cells/tissues oxyhaemoglobin breaks up to deliver oxygen to the body cells.
3. Similarly CO_2 combines with haemoglobin of blood to form Carbaminohaemoglobin and helps in transportation of CO_2 from body tissues to lungs for exhalation. CO_2 is also transported by blood plasma in the body.
4. Blood helps to transport excretory material from the body tissues to liver, kidney or skin for removal
5. Blood helps to transport hormones from glands to various organs where they are required to function.
6. Blood helps in maintaining uniform body temperature of 37°C by distributing heat.

Now there are certain 'protective' functions of blood, let us discuss them one by one.

i. During an injury or cut in body blood forms a clot. Clot prevents further loss of blood as well as prevents entry of germs into the body

2. White blood cells of the blood provide us protection from disease causing germs by killing them, thus provide us immunity.
3. Blood produces antitoxins and antibodies which also provide us protection from disease causing germs or their poisonous secretions

Now children let us discuss the composition of blood. Blood consists of -

i Plasma which is a pale yellow coloured alkaline liquid which forms 55-60% of blood The approximate percentages of its main constituents are as follows -

Water - 90-92%
Proteins - 7-8%
Inorganic salts - 1% [mainly NaCl, $NaHCO_3$]
other substances like glucose, amino acids, fibrinogen, hormones, urea, enzymes, antibodies etc. are present in traces

Blood plasma from which blood clotting protein called fibrinogen is removed is called serum. Without fibrinogen blood cannot make a clot.

ii The cellular elements of blood form 40-45% of blood. These are of 3 types -

a) Red Blood Cells or the Erythrocytes
b) White Blood Cells or the Leukocytes
c) Blood Platelets or the Thrombocytes.

Children let us conclude our discussion here now. Details of various blood cells we will take up in the next class. Students now I will give you some home assignment questions. All Students have to answer these home assignment questions in your notebooks -

Home assignment questions are as follows-

Q1 State the functions of blood in human body.

Q2. State the composition of blood.

Q3 In a coloured diagram, why do we generally show the pulmonary artery in blue and pulmonary vein in red colour as shown in Fig 8.1 ?

— THANK YOU —