Red blood cells, also known as erythrocytes, perform many functions in the body, including:

- **Carrying oxygen**: Red blood cells transport oxygen from the lungs to the body's tissues.
- **Carrying carbon dioxide**: Red blood cells transport carbon dioxide from the body's tissues to the lungs.
- **Regulating hydrogen ion concentration**: Red blood cells act as a buffer to regulate hydrogen ion concentration.
- **Contributing to blood viscosity**: Red blood cells contribute to the thickness of blood.
- **Determining blood type**: Red blood cells carry blood type antigens on their surface, which helps determine a person's blood type.
- **Transfusing blood**: Red blood cells are the most common component of blood transfusions. They are used to treat anemia, blood loss, and blood disorders.

How red blood cells work

- Red blood cells are produced in the bone marrow.
- They have a flat disk or doughnut shape.
- They lack a nucleus, which allows them to change shape and move more easily through the body.
- They contain hemoglobin, a protein that binds to oxygen and carbon dioxide.
- They squeeze through capillaries in single file.

What are Erythrocytes?

Erythrocytes

Erythrocytes (RBCs) are the most abundant cell types in the human body. It functions in delivering oxygen from the lungs to the tissues all through the body. Oxygen transport is mediated by Haemoglobin that is abundant in RBCs.

Blood cells

Blood carried nutrients and oxygen to cells in the body. Blood cells control the bleeding process and also fight infections. They are synthesized in the bone marrow which is a constant process. Blood cells or hematocytes are cells which are produced through the process of hematopoiesis and primarily found in blood.

The main types of blood cells are – Red blood cells (Erythrocytes), White blood cells (Leukocytes), Platelets and Plasma. In the following article, we will learn about Erythrocytes, its structure and functions in detail.

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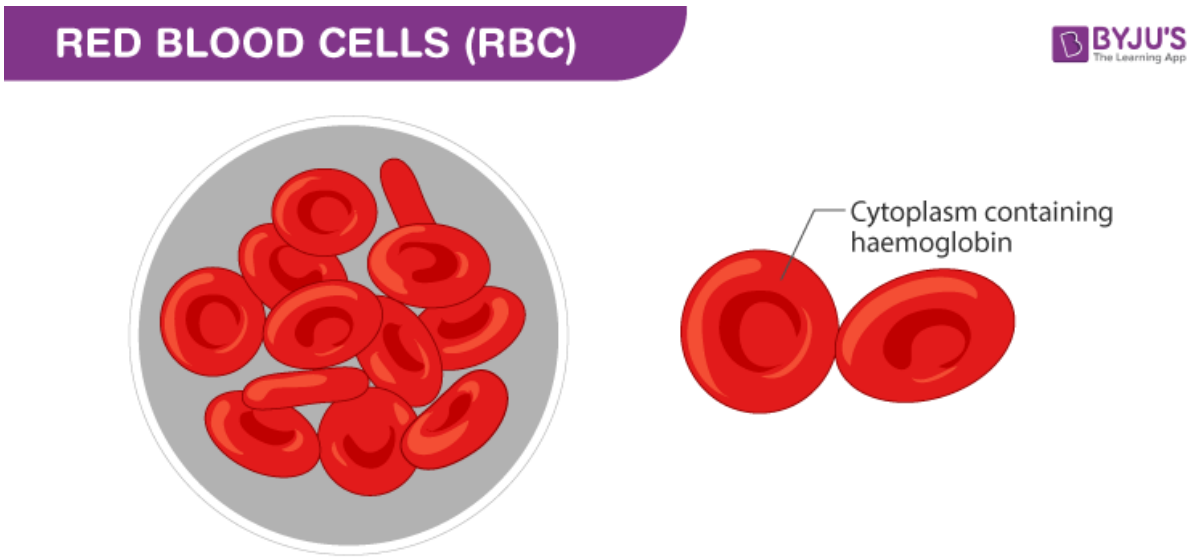
Erythrocytes Definition

Erythrocytes, also referred to as Red Blood Cells (RBCs) is a significant cellular component of blood. These cells circulate in the blood carrying oxygen from the lungs to all the tissues of the body. It is responsible for imparting blood with its characteristic colour. Mature erythrocytes in humans are rounded, small and biconcave, as though dumbbell-shaped. As the cell is flexible, it can reform to take up a bell shape when it passes through the super tiny blood vessels.

Structure of Erythrocytes

RBC Cell structure



RBCs or erythrocytes exhibit a diameter of 7-8 µm possessing an atypical structure in comparison to most other body cells of humans. The RBC structure resembles a donut, they are biconcave wherein their periphery is thicker than their central portion. Courtesy to this

feature, the total surface of the cell membrane is maximized enabling exchange of gases and their transport.

These cells are anuclear and do not have any other intracellular organelles as they are lost in erythropoiesis. There are two main structures – cytoplasm engirdled by a cell membrane.

Cytoplasm – It is filled with haemoglobin which in turn contains acidophilia causing erythrocytes to stain intense red with eosin on the samples of tissues stained with hematoxylin and eosin.

Cell membrane – This membrane is a lipid layer containing two types of membrane proteins – peripheral and integral.

The RBC membrane is a two-dimensional structure comprising a cytoskeleton and a lipid bilayer bound together. The lipid bilayer has different types of cholesterol, phospholipids, sphingolipids, and integral membrane proteins like the glycophorin.

The peripheral membrane proteins extend into the cytoplasm only, as they are found on the inner surface of the plasma membrane. The proteins are interconnected by several intracellular filaments which form a complex mesh-like cytoskeletal network through the inner cell membrane. This network is responsible for imparting strength and elasticity to RBCs enabling its even passage into the thinnest and smallest capillaries without any breakage/leakage.

Integral membrane proteins are innumerable, stretching throughout the thickness of the cell membrane. It binds haemoglobin serving as anchor points for the cytoskeletal network of RBCs. Additionally, they express antigens of ABO blood groups. Erythrocyte surface antigens are necessary for blood transfusions.

Red blood Cells – Function

What is the function of RBCs?

Basic and important functions of RBCs:

- Delivers oxygen from the lungs to the tissues all through the body
- Facilitates carbon dioxide transport
- Acts as a buffer and regulates hydrogen ion concentration
- Contributes to blood viscosity
- Carries blood group antigens and Rh factor

Erythrocytes are covered with a membrane comprising proteins and lipids. While the nucleus is absent, it contains a red iron-rich protein – haemoglobin, which binds to oxygen. Additionally, red blood cells extract carbon dioxide from your body and carry it all the way to the lungs for it to be exhaled.

Red blood cells are synthesized in the bone marrow where they are usually. Their life span is approximately 120 days after which they die. The primary role of these red cells along with its haemoglobin is to pass oxygen from gills/lungs to all tissues of the body, and then carrying carbon dioxide (a by-product of metabolism) to the lungs for its exhalation.

The oxygen-carrying pigment in invertebrates is passed free in the plasma. In vertebrates, the concentration of this pigment in the red cells is more efficient which indicates the significant development of evolution. The biconcave shape of the cells enables exchange of oxygen at a steady rate over the largest area possible. Erythrocytes help in determining the type of blood group too.

Exchange of gases:

Haemoglobin in lung capillaries associates with the inhaled oxygen to form oxyhaemoglobin imparting cells with its red color. The oxygen-rich erythrocytes then pass through the arteries until they arrive at the tissue capillaries. Here the oxygen is liberated from the haemoglobin and diffuses into the body tissues.

On the other hand, CO_2 binds to haemoglobin forming oxyhaemoglobin imparting their color. Erythrocytes rich in carbon dioxide travel to venous blood towards the heart finally moving to the lungs. The carbon dioxide in these lung capillaries is released from the capillaries in the exchange for fresh oxygen.

Also Explore: Types of Blood Cells

Life cycle of Erythrocytes

Erythrocytes' life cycle involves three stages – production, maturity and destruction. Through the erythropoiesis, which is the production of erythrocytes, a sub-process of haematopoiesis occurs in the red bone marrow. The initial stages of haematopoiesis lead to the creation of an erythroid stem cell known as Colony Forming Unit – Erythroid (CFU-E). It marks the beginning of this process driven by erythropoietin – hormone. These cells are found in erythroid islands in the bone marrow, where they multiply and differentiate towards mature RBCs. The process of differentiation gives rise to cells – erythrocytes, erythroblasts, proerythroblasts and reticulocytes.

Stages of Erythropoiesis

Stage of Erythropoiesis	Corresponding events
Proerythroblast	Initiation of the process of haemoglobin synthesis

Early normoblast	Disappearance of nucleoli
Intermediate normoblast	Stage where haemoglobin starts to appear
Late normoblast	Disappearance of nucleus
Reticulocyte	Formation of reticulum From the site of production, the cell enters capillary
RBC matures	Distinct donut shaped biconcave cell achieved Disappearance of reticulum

This was a brief on erythrocytes. Explore other topics important for NEET, at BYJU'S.

Frequently Asked Questions

Q1

What are the major types of blood cells?

The major types of blood cells are the erythrocytes (RBC), leukocytes (WBC) and thrombocytes (platelets). These three together makes up to 45% of the blood volume while the remaining 55% are composed of plasma.

Q2

What are red blood cells?

Red blood cells (RBC) or red blood corpuscles or erythrocytes are the most common type of blood cell that delivers oxygen to the vertebrate's body tissues through the blood.

Q3

What is haemoglobin?

Haemoglobin is a biomolecule that contains iron. It is present in the cytoplasm of RBC or erythrocyte. Haemoglobin can bind and transport oxygen and is also responsible for the red colour of the blood.

Q4

What is the fate of RBC?

The RBCs have a life span of 100 to 120 days. The haemoglobin becomes fragile and starts to degenerate. The RBCs are engulfed by the macrophages. The heme and globin are separated and salvaged for other uses in the body.

Q5

Write a note on erythrocytes.

Eryhtrocytes or Red blood cells (RBCs) are a type of blood cells that are synthesized in the bone marrow, found in the blood. These biconcave, anucleate cells comprise haemoglobin and are involved in transporting carbon dioxide and oxygen between the tissues and lungs. Through the process of erythropoiesis, they are synthesized in the red bone marrow. It is during this process, the stem cell derived erythroid precursors experience a chain of morphological events eventually turning into mature erythrocytes. In the bloodstream, the mature RBCs survive between 100 – 120 days.

Q6

What is the shape of erythrocytes?

Erythrocytes have the shape of a donut or a flat disk. It is round with an indent at the centre. Typically, the typical shape of RBC is a biconcave discoid. They appear dumbbell shaped. This shape of RBC enables greater area for the exchange of gases.

Q7

What maintains the shape of RBC?

A contractile protein, Spectrin maintains the flexibility and donut shaped biconcave appearance of RBC.

Q8

Describe the RBC membrane.

The membrane of RBC comprises a cytoskeleton and a lipid bilayer. Its membrane is flexible for it to squeeze through fine capillaries to deliver oxygen.

Q9

What is the function of erythrocytes? What is the role of RBC?

Erythrocytes are mainly involved in delivering oxygen to the tissues in the body. Also, RBCs transport carbon dioxide to the lungs for exhalation.

Q10

The breakdown of RBC is called?

The destruction or breakdown of red blood cells is called haemolysis or hematolysis. It is a natural process occuring when RBCs get too old. With ageing of RBC, it begins to lose some traits and functions less efficiently.