

The Blood

The average human body contains about 4 to 5 litres of blood. As a liquid connective tissue, it transports many substances through the body and helps to maintain **homeostasis** of nutrients, wastes, and gases. The blood is made up of red blood cells, white blood cells, **platelets**, and liquid plasma.

- *Red Blood Cells:* Red blood cells, also known as **erythrocytes**, are by far the most common type of blood cell and make up about 45% of blood volume. Erythrocytes are produced inside of red bone marrow from stem cells at the astonishing rate of about 2 million cells every second. The shape of erythrocytes is biconcave—disks with a concave curve on both sides of the disk so that the centre of an erythrocyte is its thinnest part. The unique shape of erythrocytes gives these cells a high surface area to volume ratio and allows them to fold to fit into thin **capillaries**. Immature erythrocytes have a nucleus that is ejected from the cell when it reaches maturity to provide it with its unique shape and flexibility. The lack of a **nucleus** means that red blood cells contain no DNA and are not able to repair themselves once damaged.

Erythrocytes transport oxygen in the blood through the red pigment **haemoglobin**. Haemoglobin contains iron and proteins joined to greatly increase the oxygen carrying capacity of erythrocytes. The high surface area to volume ratio of erythrocytes allows oxygen to be easily transferred into the cell in the lungs and out of the cell in the capillaries of the systemic tissues.

- *White Blood Cells:* White blood cells, also known as **leukocytes**, make up a very small percentage of the total number of cells in the bloodstream, but have important functions in the body's immune system. There are two major classes of white blood cells: granular leukocytes and agranular leukocytes.

1. *Granular Leukocytes:* The three types of granular leukocytes are **neutrophils**, **eosinophils**, and **basophils**. Each type of granular leukocyte is classified by the presence of chemical-filled vesicles in their cytoplasm that give them their function. Neutrophils contain digestive enzymes that neutralize bacteria that invade the body. Eosinophils contain digestive enzymes specialized for digesting viruses that have been bound to by antibodies in the blood. Basophils release histamine to intensify allergic reactions and help protect the body from parasites.

2. *Agranular Leukocytes:* The two major classes of agranular leukocytes are **lymphocytes** and **monocytes**. Lymphocytes include T cells and natural killer cells that fight off viral infections and B cells that produce antibodies against infections by **pathogens**. Monocytes develop into cells called **macrophages** that engulf and ingest pathogens and the dead cells from wounds or infections.

- *Platelets :* Also known as **thrombocytes**, platelets are small cell fragments responsible for the **clotting** of blood and the formation of **scabs**. Platelets form in the red bone marrow from large megakaryocyte cells that periodically rupture and release thousands of pieces of membrane that become the platelets. Platelets do not contain a nucleus and only survive in the body for up to a week before macrophages capture and digest them.

- Plasma*: Plasma is the non-cellular or liquid portion of the blood that makes up about 55% of the blood's volume. Plasma is a mixture of water, proteins, and **dissolved** substances. Around 90% of plasma is made of water, although the exact percentage varies depending upon the hydration levels of the individual. The proteins within plasma include **antibodies** and **albumins**. Antibodies are part of the immune system and bind to antigens on the surface of pathogens that infect the body. Albumins help maintain the body's osmotic balance by providing an isotonic solution for the cells of the body. Many different substances can be found dissolved in the plasma, including glucose, oxygen, carbon dioxide, electrolytes, nutrients, and cellular waste products. The plasma functions as a transportation medium for these substances as they move throughout the body.

Source: <http://www.innerbody.com/image/cardov.html>

Task 1. Read the text and answer the following questions?

1. What is blood made up of?
2. Where are erythrocytes produced?
3. What enables erythrocytes to enter thin capillaries?
4. What is the main function of erythrocytes?
5. What increases their capacity to transport oxygen?
6. How are granular leukocytes classified?
7. What are the functions of granular leukocytes?
8. What are the classes of agranular leukocytes?
9. What are their functions?
10. Where are platelets formed?
11. What are platelets responsible for?
12. What does plasma consist of?
13. What are antibodies and albumins within plasma responsible for?
14. What substances can we find in the plasma?

Task 2. Match the words from the text in bold with their Polish equivalents.

1. homeostasis	A. rozpuszczony
2. platelets	B. krwinki białe
3. erythrocytes	C. krzepnięcie
4. capillary	D. leukocyty zasadochłonne
5. nucleus	E. homeostaza
6. haemoglobin	F. krwinki czerwone
7. leukocytes	G. limfocyty
8. neutrophils	H. jądro

9. eosinophils	I. płytki krwi
10. basophils	J. trombocyty
11. lymphocytes	K. strup
12. monocytes	L. przeciwciała
13. pathogens	M. albumina
14. thrombocytes	N. czynnik chorobotwórczy
15. clotting	O. włośniczka
16. scab	P. neutrofile
17. dissolved	Q. granulocyty eozynochłonne
18. antibodies	U. makrofag
19. albumin	V. monocyty
20. macrophage	W. hemoglobina

Task 3. Using the words below complete the gaps in the definitions.

capillary, clotting, leukocyte, pathogen, haemoglobin, erythrocyte, homeostasis

1. _____ -a colourless blood corpuscle whose aim is to protect the body against microorganisms causing disease.
2. _____ - a disease producing-agent or microorganism.
3. _____ - a corpuscle, a biconcave disk which contains haemoglobin and transports oxygen.
4. _____ - one of the minute vessels connecting the arterioles and venules.
5. _____ - a tendency to stability in the normal physiological states of the organism.
6. _____ - coagulation.
7. _____ - the oxygen-carrying pigment of erythrocytes, formed by developing erythrocytes in the bone marrow.

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