

The blood is a key element in the process of the body maintaining homeostasis. Homeostasis is the the body's internal environment being kept at a certain and continuous level. In order for the body to maintain homeostasis, internal conditions such as blood sugar levels and body temperature need to be carefully controlled. Blood plays a major factor in these functions. (BBC, 2020).

The blood is made up of 3 separate layers, this becomes apparent to the naked eye when a test tube of blood is centrifuged (spun), or left standing for a period of time. The layers split according to density.

The bottom layer is made up of Red blood cells (RBC's or erythrocytes) and makes up 45% of the bloods volume. However this can differ depending on the sex of a person (Get Body Smart, 2020). Red blood cells have a disk like structure with an indentation in the middle of the top and the bottom. This is called a biconcave structure. The structure of this cell means a larger surface area is available, allowing more oxygen and carbon dioxide molecules to be transported per individual blood cell. This particular cell does not contain a nucleus and is covered in a membrane consisting of lipids and proteins (The Editors of Encyclopaedia Britannica, 2020a). Haemoglobin, which is a protein, is found in vast amounts in the red blood cells (Bailey, 2019) and is rich in iron, giving blood its red colour (The Editors of Encyclopaedia Britannica, 2020). Thanks to the large surface area of a red blood cell, it allows oxygen and carbon dioxide to be easily diffused in the process of gaseous exchange.

The next layer is the smallest layer and only makes up 1% of the total Blood volume. This layer is made up of white blood cells (Leukocytes) and platelets (thrombocytes). Leukocytes play a key role in the bodies defence and immunity functionality. Their structure consists of a nucleus and is able to reproduce RNA (Ribonucleic Acid) meaning they are able to synthesise protein (The Editors of Encyclopaedia Britannica, 2020b). whilst platelets join forces with proteins in the plasma to bring blood loss to

a holt (Visible Body, 2020). White blood cells exist in five variations and are split into 2 separate groups depending on their appearance under a microscope. These two groups are the Granulocytes and the Agranulocytes. Granulocytes are made up of Neutrophil, eosinophils and basophils and are 'mediators of the inflammatory response' (Schwartz, R. 2020). When under a microscope they all have grains present in their cytoplasm. The function of Granulocytes is their involvement in innate immunity and the production of an immune response, which is not necessarily specific to a particular pathogen (Panawala, L. 2017). Agranulocytes are made up of monocytes, macrophages and lymphocytes. These cells do not have grains present in their cytoplasm (Khan Academy, 2020a). Agranulocytes main function surrounds more specific pathogens, by producing an immune response, creating a more adaptive immunity (Panawala, L. 2017). Diabetes.co.uk (2019) suggests that, Granulocytes have gained their name due to having granules of enzymes presents. These granules digest invading microbes and can therefore ingest foreign cells such as bacteria, viruses and parasites. Each cell is responsible for their own job roll, for example, Neutrophil cells are the most common occurring cell and can absorb up to five to twenty bacteria in its life-span. Eosinophils are responsible for the allergic reactions and the infiltration of multicellular parasites such as worms. Basophils are also responsible for the body's reaction to an allergic reaction and will release histamine, this triggers inflammation and heparin which is a natural occurring anti-coagulant. The functions of the Agranulocytes can also be broken down as follows. According to Diabetes.co.uk (2019) monocytes can be split into two types of cells, Dendritic cells and Macrophages. Dendritic cells are 'antigen-presenting cells' that are able to identify potential, harmful antigens, that need to be disintegrated by lymphocytes and Macrophages are similar to Neutrophils accept they are larger and live longer. They are also able to act as antigen presenting cells (Diabetes.co.uk, 2019). Lymphocytes are contributing cells to the regulation of the body's immune system. These can also be split into two groups, B Lymphocytes (B cells) and T Lymphocytes (T cells). The roll of a B cell according to Diabetes.co.uk (2019) is to

release proteins in the shape of a 'Y', known as antibodies. These then connect to infected cells or microbes in the body. Once the antibodies has connected with the infected cell it can either neutralise it or flag it up to the T cells, so they can then attack it. The T cells have 4 variations depending on the job in hand. Helper T cells are responsible for releasing a protein called cytokines. This helps to direct further responding White Blood cells to the infection site. Cytotoxic T cells are known as the natural killer T cells and are able to kill viruses by releasing molecules and other antigens. Memory T cells are the bodies memory cells and can help with the identification of a similar infection in the future and remind the body how to deal with it. Lastly is the Regulatory T cells, these are responsible for regulating T cells to ensure the prevention of T cells attacking the bodies own cells (diabetes.co.uk, 2019).

Thrombocytes, commonly known as Platelets, can be identified as 'non nucleated' and 'colourless' (The Editors of Encyclopaedia Britannica, 2008). Thrombocytes main function is to prevent and control active bleeding in the body. If the surface of a blood vessel is injured (the endothelial surface), a mass of platelets and fibrin molecules (Fibrinogen; a tough protein found in plasma), bind themselves to the injured surface and each other to form a blood clot or thrombus to slow down and ultimately stop the bleeding if possible (Schwartz, R. 2020). The process of a blood clot forming is called coagulation. Serotonin, epinephrine, histamine and thromboxane are a few of the chemicals that are stored and transported Within platelets. Once released these chemicals contributes to the clot formation process after triggering local blood vessel constriction (The Editors of Encyclopaedia Britannica 2008) . If an individual has dysfunctional platelets, this can lead to prolonged bleeding, ineffective clotting of the blood and an increased chance of haemorrhaging (The Editors of Encyclopaedia Britannica, 2017).

The last layer of the blood is called the plasma. This is a straw coloured liquid making up 55% of the bloods volume. 90% of this liquid is made up of water, while the remaining 10% is a mixture of ions, proteins, nutrients and some waste products

(Khan Academy, 2020a). The balance of this mixture all contributes to to the body maintaining homeostasis. Homeostasis is the bodies habit of resisting change to maintain an almost constant and balanced internal environment (Khan Academy, 2020b). One way plasma works to maintain homeostasis is by regulating the bodies temperature by releasing and absorbing heat as needed (Nall, 2018). Plasma also has the job of excretion. This means transporting waste product of the body to areas such as the kidneys and liver (Nall, 2018). Through other components in plasma, such as, proteins and immunoglobulins more key functions of plasma, are also carried out. The two key proteins in plasma are Albumin and Fibrinogen. Albumin helps to maintain osmotic pressure between the blood vessels and tissues by keeping fluids within the blood vessels. If osmotic pressure is not maintained, an individual may find themselves suffering with Oedema. Oedema is swelling as a result of excess fluid(The Editors of the Encyclopaedia Britannica, 2018). Low albumin levels can result in swelling in hands, feet and abdomen (Nall, 2018). The second protein is known as Fibrinogen and plays a key roll in the reduction of active bleeding and the blood-clotting process (Nall, 2018).

Another important component within plasma are immunoglobulins. These are produced by the immune system when an antigen is detected. Immunoglobulins will attach themselves to antigens to remove them from the body. Antigens are foreign substances to the body. Once attached to the antigen it will attempt to neutralise the substance or it will attract other killing microbes such as Macrophages (The Editors of Encyclopaedia Britannica, 2020c) therefore, immunoglobulins are also game players in the fight against infection.

To conclude, all cells in the blood have key functions that work alongside each other to ensure homeostasis of the body is maintained. If an individual was to have a dysfunctional cell, this would have a knock on effect to the body's equilibrium.

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