Medicine for Managers

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Blood

***"Come you spirits of direst cruelty! Make thick my blood."* Lady Macbeth announces her wish to be courageous and be able to commit murder. Blood is evocative of warning, fear, guilt, courage, and many other emotions. Yet it is the gentlest and most valuable of fluids. It also evokes life.**

The average adult has around ten pints (five to six litres) of blood circulating round the body in the blood vessels and, amazingly, during an average lifetime, the heart will pump about forty million gallons. It is truly the fluid of life but death would occur almost inevitably if four pints were to be lost acutely.

It has many functions including the supply of oxygen and nutrients to the body tissues, the removal of carbon dioxide and waste products and the transport of essential agents such as hormones. It forms part of the body's defence mechanism against infection, is involved in the process of repair and is also part of the homeostasis mechanism, maintaining the body's temperature and controlling the pH.

Blood is a complex mixture of components. About 60% of blood is plasma, a straw coloured liquid which is about 96% water but contains a host of other molecules including antibodies, hormones, enzymes, sugar, fat particles, salts, clotting agents and a range of other components. Plasma is sometimes confused with serum but the two are different. Essentially, when blood is spilt and a clot forms, the remaining fluid is serum. Thus serum is plasma from which the clotting factor fibrinogen has been removed during the formation of the clot.

The cellular component of blood makes up about 40% of the total volume. There are three main types of blood cell.

Red Blood Cells

Red blood cells, also called erythrocytes

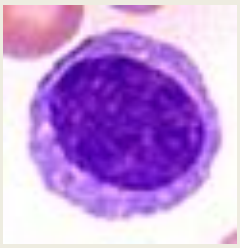
(erythro = red) constitute almost all of the cellular volume. Each cell contains haemoglobin, which is 95% of the cell and which gives it the red colour. The body manufactures about 2.4 million red cells a **second** in the bone marrow and each circulates for about 120 days before being broken down and recycled. One drop of blood contains about five million red cells. Their key function is to transport oxygen from the lungs to the tissues.

White Blood Cells

There are a number of different types of white blood cells which have different functions. White cells make up about 1% of the blood and a single drop contains about 15-25,000 white cells. They are also known as leucocytes (leuco = white).

Neutrophils. The most abundant of white

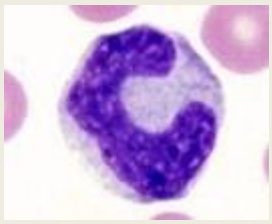
cells comprising about 50-70% of the total, they are recognised by their lobular nuclei, each having 2-5 lobes. Each cell lasts about five days. They are *phagocytes* ingesting micro-organisms and particles. There are 2.5-7.5 x 10^9/litre. The number is increased (neutrophilia) when the body is fighting



bacterial infections.

Lymphocytes. These cells form part of the immune system and are often classified as large and small. They increase in numbers when the body is under attack from viral infection. They can manufacture and release antibodies.

Monocytes. Also part of the immune

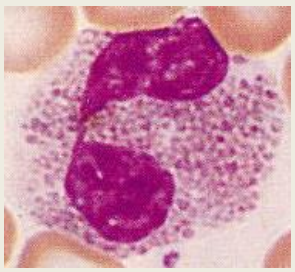


system, they are manufactured in the bone marrow and constitute 3-8% of white blood cells. They can act as phagocytes and can also produce antibodies. They are found in a variety of infective situations and where there has been tissue damage.

Basophils are the least common white

blood cells and comprise only 0.1%. They slow blood clotting and promote blood flow to tissues. Their key role is in fighting parasitic infections and in allergic reactions.

Eosinophils. These cells combat parasites



and some infections, are increased in diseases such as rheumatoid arthritis and Hodgkin's disease and are associated with allergy and asthma. They comprise 1-6% of white cells. They develop in bone marrow. They stain red with eosin, hence their name

Platelets

Platelets, also called thrombocytes, are disc

shaped fragments of cellular material which have no nucleus. They are very small, only 2-3 µm in diameter. They have a lifespan of 5-9 days. Their key role is in blood clotting, where they form form plugs in locations where there is blood vessel damage, by clumping together to stop blood leaking out of the vessels.

So that is what the blood is composed of. In a future article we shall look at the issues surrounding blood groups and blood transfusions.

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