

THE CIRCULATORY SYSTEM

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The average human has 5 litres (8.8 pints) of blood.

Blood is a liquid form of connective tissue.

The blood is responsible for distributing heat around the body keeping cells at 37 degrees centigrade (98.6 F).

The blood is composed of 55% plasma and 45% blood cells.

Plasma is the liquid part of the blood which delivers to cells chemicals, gases, nutrients and removes waste products. For instance, carbon dioxide is carried to the lungs for disposal.

Plasma is formed of 90% water, 8% protein 1% organic acids and 1% salts.

The blood cells are made up of 44% Erythrocytes and 1% Leukocytes and Platelets.

Erythrocytes are red blood cells which once they have given up their oxygen appear blue. They circulate the body for a period of 120 days and then become trapped in the spleen where they are broken down.

There are around 5 million Erythrocytes per millimetre of blood in males with fewer in females.

These Erythrocytes (red blood cells) do not have a nucleus.

Leukocytes (white blood cells) are larger than red blood cells, have a nucleus and change shape. Acting as part of the body's defence system, they can slip out of capillary walls into surrounding tissues to hunt foreign invaders such as disease-causing bacteria, viruses or fungi.

There are 375,000 white blood cells in a single drop of blood.

There are several different kinds of white blood cells for instance the monocytes often referred to as phagocytes destroy foreign invaders by engulfing and digesting them in a process called phagocytosis.

Platelets are small particles of cytoplasm derived from the giant cells of the bone marrow. There are 250,000 per millilitres of blood. The granules within them are responsible for the clotting mechanism found in injured blood vessels.

Blood is circulated around the body in the vessels of arteries, veins and capillaries.

This network of blood vessels measures around 96,500 kilometres (60,000 miles).

These vessels range in size from the thickness of the thumb to a fraction of a hair's width.

The arteries form a high-pressured arterial system. The artery walls are thicker and more organised than the veins. The smooth muscular layer acts in regulating blood distribution. They can narrow or widen to adjust to the flow of blood into the capillaries and are responsive to the demands of the body.

Arteries generally carry (red) oxygenated blood away from the heart to the cell tissues. However, in the pulmonary circulation the artery carries deoxygenated blood. In the heart the oxygenated blood collects in two chambers on the left-hand side.

Arteries are either elastic or muscular. The elastic ones are closer to the heart and include the aorta and pulmonary arteries along with their major branches. They can stretch and recoil to the push and pulsation of the blood by the heart.

The muscular arteries are small and distribute blood into the tissues. They are often named according to the tissues that they supply. For instance, gastric arteries supply the stomach.

The walls of arteries and veins have three distinctive layers. The inner lining is smooth to encourage blood flow and prevent blood clotting. The middle layer is a mixture of smooth muscle and elastin fibres supported by a layer of collagen. The outermost layer is a connective tissue coating.

The veins conduct at a lower pressure to arteries and for this reason there is far less elastic or muscular tissue in their walls. They have thinner walls and larger interiors than arteries and hold most of the body's blood. To achieve this, they can stretch considerably to become a virtual reservoir of blood.

The simple squamous epithelial tissue (endothelium) forms valves at certain parts in the venous systems such as the limbs and the neck. These valves prevent the backward flow of blood and blood pooling in the lower extremities.

Veins usually carry (blue) deoxygenated blood back to the heart. In the heart deoxygenated blood collects in two chambers on the right-hand side.

In the pulmonary circulatory system deoxygenated blood is carried from the heart to the lungs (via the pulmonary artery) to be oxygenated. Once oxygenated this blood is drained from lung capillaries via (the pulmonary vein) to be circulated around the body.

Arteries and veins are connected by capillaries.

Capillaries supply the body's cells with essential chemicals, gases and nutrients in exchange for cellular waste. This exchange, between the blood and cells, is rapid and forms the microcirculation of the human body.

Capillaries are formed of simple endothelial tubes to enable diffusion and osmosis pressure for microcirculation.

The body cells are surrounded by tissue fluid called interstitial fluid. It is through this fluid that chemicals, gases, nutrients and waste products are transported.

The lymphatic system is closely connected to the circulatory system. It has two functions. One is to prevent a build-up of tissue fluid. Most of the blood which leaves the bloodstream returns except for 3-4 litres (5-7pints) which drains into the lymph system to then be returned to the circulatory system to maintain the bodily fluid balance.

The other function of the lymphatic system is to defend the human body against foreign invaders. For this reason, the lymphatic system contains lymphocytes and macrophages.