

## Blood components

*Blood is made of liquid (plasma) and microscopic 'cells'*

*Blood* is a mixture of liquid *plasma* and tiny *blood cells*, pumped round the body by the heart, through the blood vessels: arteries, capillaries and veins. The plasma contains nutrients and waste products, on their way to and from all parts of the body, and contains hormones and chemicals for the defence of the body, particularly those needed for blood clotting when we are injured and those which help us to destroy bacteria and viruses when we are infected.

Blood cells 'swim' in the liquid plasma.

Most of the cells are red blood cells, (*red blood corpuscles*), which carry oxygen from our lungs to all parts of the body. 'Corpuscle' is just another word for 'cell'. Literally, it means 'little body'.

*White blood cells (white blood corpuscles)* are in the blood to defend us against invasion by bacteria, viruses and other particles which get into our bodies which ought not to be there.

There are different kinds of white blood cells, each with its own role in our defence. When the body recognizes invasion by foreign bacteria, viruses or substances, white blood cells move from the blood to the place where the invasion occurred, and play their role in destroying or expelling the invader or substance. At the same time our bone marrow starts to make far more of the white blood cells than usual, so that their number in the blood increases. The kinds of white blood cell are:

- *Neutrophils (polymorphs)*, which can remove and kill bacteria and particles of foreign material. The name 'neutrophil' ('*neutro*' = *neutral*, '*phil*' = *loving*) comes from the fact that they contain granules which are neither acidic nor alkaline. The mixture of dyestuffs used to make cells easily visible under the microscope is concocted to show this, because acidic substances become

blue from the dye 'haematoxylin' and alkaline substances become red from the dye 'eosin'. The name 'polymorph' (*'poly' = many, 'morph' = shape*) comes from the fact that like almost all cells in the body they have a nucleus, but unlike other cells their nucleus can have a variety of (many) shapes, consisting of usually one to five connected lumps or 'lobes'.

- *Lymphocytes*, (*'lympho' = lymph, 'cytes' = cells*) are the cells which give our defenses the marvelous ability which they have to tell the difference between our own body and things which do not belong there. They get their name from the fact that they are the cells in body liquid called lymph, which is pumped round the body in delicate little tubes called lymph vessels, rather like wispy versions of blood vessels.

When we are immunised (either by immunization or by an infection) it is the lymphocytes which change to react more quickly in future to that infection. But the process is not perfect, and allergic disease is one of the results when our lymphocytes react in a particular way to something which comes from outside the body which does not present any threat in itself.

- *Monocytes*, (*'mono' = single, 'cytes' = cells*) have a nucleus of just one blob under the microscope, which is how they get their name, although this is not too logical, as lymphocytes also have a one-blob nucleus. Their job is a bit similar to that of neutrophils, but they belong to a group of cell types which break up foreign particles and substances for the lymphocytes, which can then handle the recognition of the small fragments.
- *Eosinophils*, (*'eosin' = the name of a red dye, 'phil' = loving*) stain red under the microscope because they are full of little packages of poisonous chemicals (toxins) and these show as microscopic granules which stain red. Eosinophils gather wherever there is a parasite infection or an allergic reaction such as allergic asthma, and then release their toxins. The toxins are very efficient at harming parasites, but unfortunately will also harm us if

released in the wrong place. So the lining of the lungs becomes damaged in asthma, and one of the most important purposes of asthma treatment is to prevent this damage.

- *Basophiles*, ('baso' = alkali, 'phil' = loving) stain blue under the microscope because they are full of little granules containing histamine which are involved in some allergic reactions. The granules are acidic and combine with the blue alkaline (basic) dye in the mixture of dyes normally used for making blood cells show clearly under the microscope.

Basophiles release the histamine when such an allergic reaction happens. *Antihistamines* are medicines which prevent histamine from having the effects which make us ill, and they work well in hay fever and most kinds of hives or 'urticaria'. Basophiles are very similar to another kind of cell, the *mast cell*, which does not live in the bloodstream but in the lungs, nose, skin, gut, heart and other organs and is important in allergy.

Both kinds of cell release histamine in allergic reactions.

Unfortunately they also release quite a lot of other things which are rather similar to histamine in their effects. But antihistamines do not work against these other substances. This means that antihistamines may not make much difference to some allergic illnesses. For example antihistamines help asthma so little that we usually do not use them for asthma. In *anaphylactic reactions (anaphylaxis)* antihistamines are utterly inadequate on their own if the reaction is at all serious.

- *Blood platelets*, ('little plates') are tiny, much smaller than all the other cells, and are vital for clotting of the blood, protecting us from bleeding dangerously from small injuries.