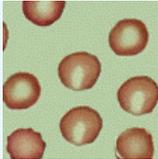


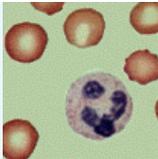
Haematology

Constituents of blood

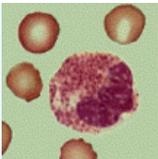
- Blood is normally composed of 45% formed elements and 55% plasma
- Plasma is the non-cellular liquid component composed of 92% water, 7% protein and 1% minerals
- The main plasma proteins: albumin (60%), globulins (alpha-1, alpha-2, beta and gamma globulins (immunoglobulins) and clotting proteins (especially fibrinogen)
- Red cells (erythrocytes): biconcave, haemoglobin loaded cells that carry oxygen and carbon dioxide
- Platelets, also known as thrombocytes, are disk-shaped, colourless enucleated bodies that are produced in the bone marrow by fragmentation of megakaryocytes. Platelets are essential for coagulation and play a vital role in the haemostatic process that prevents blood loss.



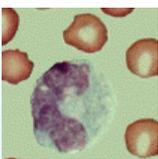
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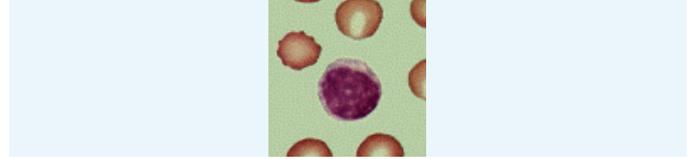
- **Immune cells:** T-cells and B-cells spend most of their time in lymphoid tissues whilst neutrophils and macrophages spend most of their time in the blood - but all migrate into tissues in response to cytokines secreted by fellow immune cells at the site of infection. The main types of immune cells are:



- **T-cells:** They recognise partially digested fragments of pathogens presented to them by infected cells, macrophages and B-cells. Upon recognition, killer T-cells will kill the cell presenting to them whereas helper T-cells will recruit and activate other immune cells. HIV attacks helper T-cells, thus preventing the body from mounting an effective immune response.



- **B-cells:** Produce antibodies that bind to pathogens, making them recognisable by neutrophils and macrophages. Several inherited diseases are due to the inability by B-cells to produce functional antibodies, making the patient susceptible to infections.



- **Neutrophils, macrophages:** Both are phagocytic cells that ingest pathogens, which they recognise either directly, because they are coated in molecules of the Complement system or because they are coated in Antibodies. The fact that they can recognise some pathogens without the need for antibodies explains why patients without antibodies manage to survive. Neutrophils are usually the first phagocytic cells to arrive and are very prominent in fighting bacterial infections. Macrophages usually arrive later to engulf pathogens but also to secrete cytokines which keep the immune system activated until all pathogens have been destroyed.
- **Eosinophils:** Attaching via C3a receptors, they are involved in fighting multicellular parasites by releasing the damaging contents of their granules.
- **Basophils:** Activated by IgE antibodies on their cell surface, they histamine and trigger an allergic response. High levels of basophils suggest myeloproliferative disorders such as Chronic Myeloid Leukaemia or Polycythaemia Rubra Vera.
- **Dendritic cells:** These cells live in the mucosal tissues and constantly ingest everything around them, presenting it to B-cells and helper T-cells in case they are recognisable as pathogens, in which case the immune system will be activated.

The blood cell lines

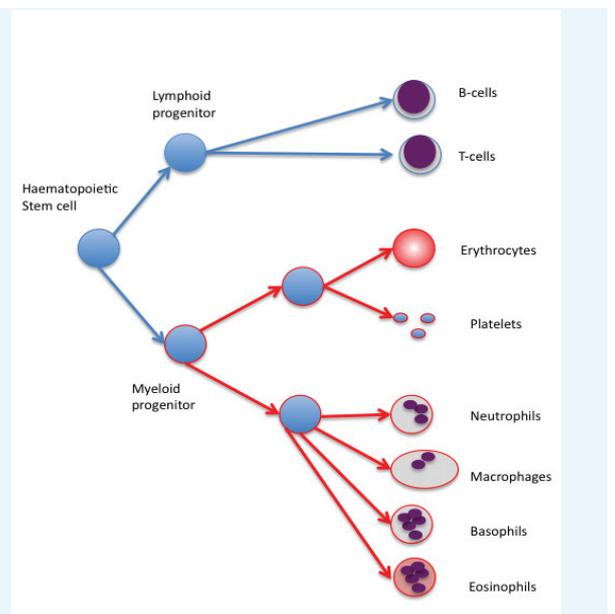


Diagram illustrating maturation of the various cell lines