Components of mammalian blood

SEM- II, CC- IV

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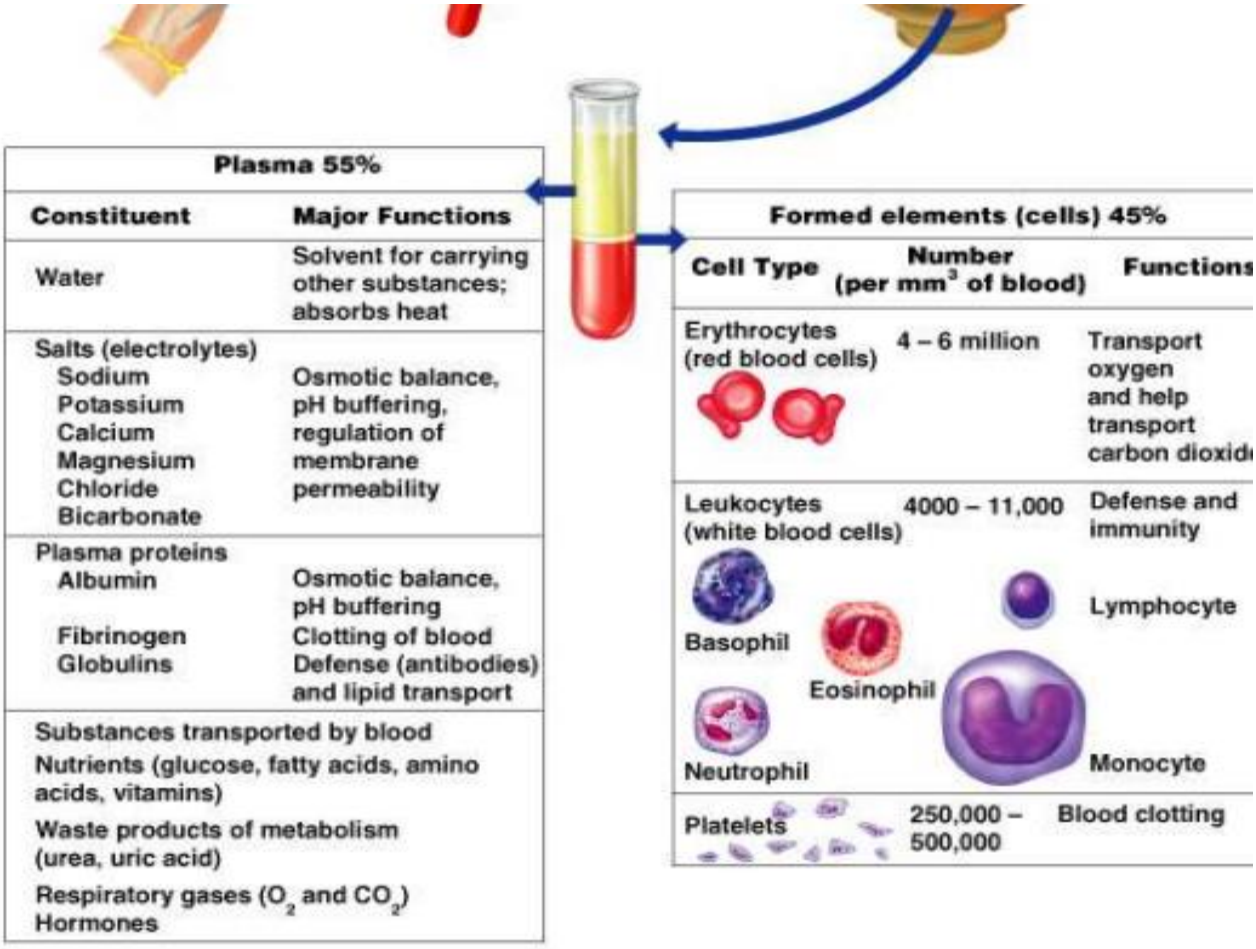
Formed Elements	Function and Description	Source
Red blood cells (erythrocytes)  4 million–6 million per mm^3 blood	Transport O_2 and help transport CO_2 7–8 μm in diameter Bright red to dark purple, biconcave disks without nuclei	Red bone marrow
White blood cells (leukocytes) 4,000–11,000 per mm^3 blood	Fight infection	Red bone marrow
Granular leukocytes		
• Basophil  20–50 per mm^3 blood	10–12 μm in diameter Spherical cells with lobed nuclei; large, irregularly shaped, deep blue granules in cytoplasm	
• Eosinophil  100–400 per mm^3 blood	10–14 μm in diameter Spherical cells with bilobed nuclei; coarse, deep red, uniformly sized granules in cytoplasm	
• Neutrophil  3,000–7,000 per mm^3 blood	10–14 μm in diameter Spherical cells with multilobed nuclei; fine, pink granules in cytoplasm	
Agranular leukocytes		
• Lymphocyte  1,500–3,000 per mm^3 blood	5–17 μm in diameter (average 9–10 μm) Spherical cells with large, round nuclei	
• Monocyte  100–700 per mm^3 blood	10–24 μm in diameter Large, spherical cells with kidney-shaped, round, or lobed nuclei	
Platelets (thrombocytes)  150,000–300,000 per mm^3 blood	Aid clotting 2–4 μm in diameter Disk-shaped cell fragments with no nuclei; purple granules in cytoplasm	Red bone marrow

Plasma	Function	Source
Water (90–92% of plasma)	Maintains blood volume; transports molecules	Absorbed from intestine
Plasma proteins (7–8% of plasma)	Maintain blood osmotic pressure and pH	Liver
Albumin	Maintains blood volume and pressure	
Globulins	Transport; fight infection	
Fibrinogen	Clotting	
Salts (less than 1% of plasma)	Maintain blood osmotic pressure and pH; aid metabolism	Absorbed from intestine
Gases		
Oxygen	Cellular respiration	Lungs
Carbon dioxide	End product of metabolism	Tissues
Nutrients	Food for cells	Absorbed from intestine
Fats Glucose Amino acids		
Nitrogenous waste	Excretion by kidneys	Liver
Urea Uric acid		
Other		
Hormones, vitamins, etc.	Aid metabolism	Varied



Rh blood group system

"Rh-" redirects here. For the Siddharta album, see Rh- (album). For the band, see The RH Factor.

The **Rh blood group system** (including the **Rh factor**) is one of thirty-five current human blood group systems. It is the second most important blood group system, after ABO. At present, the Rh blood group system consists of 50 defined blood-group antigens, among which the five antigens D, C, c, E, and e are the most important. The commonly used terms *Rh factor*, *Rh positive* and *Rh negative* refer to the *D antigen* only. Besides its role in blood transfusion, the Rh blood group system—specifically, the D antigen—is used to determine the risk of hemolytic disease of the newborn (or erythroblastosis fetalis) as prevention is the best approach to the management of this condition.

Rh derives from rhesus and the terms *rhesus blood group system*, *rhesus factor*, *rhesus positive* and *rhesus negative* are also used.

Rh factor

An individual either has, or does not have, the "*Rh factor*" on the surface of their red blood cells. This term strictly refers only to the most immunogenic D antigen of the Rh blood group system, or the Rh− blood group system. The status is usually indicated by *Rh positive* (Rh+ does have the D antigen) or *Rh negative* (Rh− does not have the D antigen) suffix to the ABO blood type. However, other antigens of this blood group system are also clinically relevant. These antigens are listed separately (*see below: Rh nomenclature*). In contrast to the ABO blood group, immunization against Rh can generally only occur through blood transfusion or placental exposure during pregnancy in women

Mechanisms of Blood Coagulation

Blood coagulation refers to the process of forming a clot to stop bleeding. Coagulation is a complicated subject and is greatly simplified here for the student's understanding.

To stop bleeding, the body relies on the interaction of three processes:
Primary hemostasis involves the first two processes.
1. Vasoconstriction. Vasoconstriction is the body's first response to injury in the vascular wall. When injury occurs, vessel walls constrict, causing reduced blood flow to the site of injury.
2. Platelet plug. Platelets aggregate to the site of the injury. They stick together acting as a "plug." Platelets also activate the process which causes a fibrin clot to form, known as secondary hemostasis.

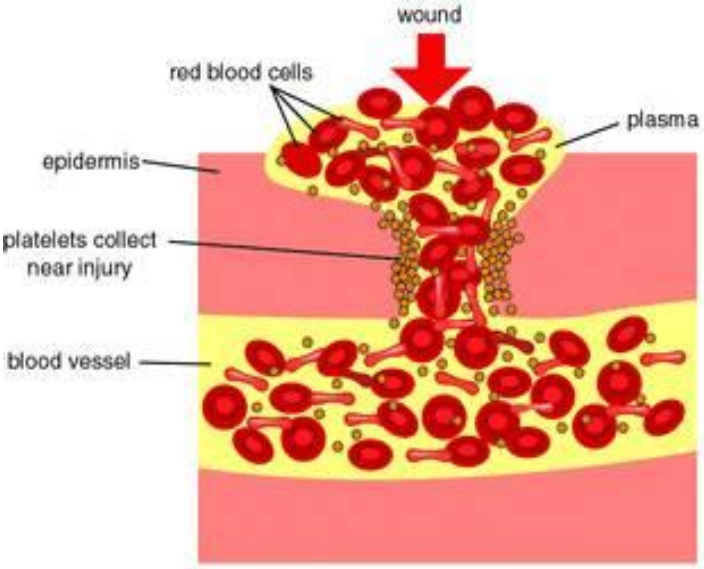
Secondary hemostasis.
3. Platelets alone are not enough to secure the damage in the vessel wall. A clot must form at the site of injury. The formation of a clot depends upon several substances called clotting factors. These factors are designated by roman numerals I through XIII. These factors activate each other in what as known as the clotting cascade. The end result of this cascade is that fibrinogen, a soluble plasma protein, is cleaved into fibrin, a nonsoluble plasma protein. The fibrin proteins stick together forming a clot.

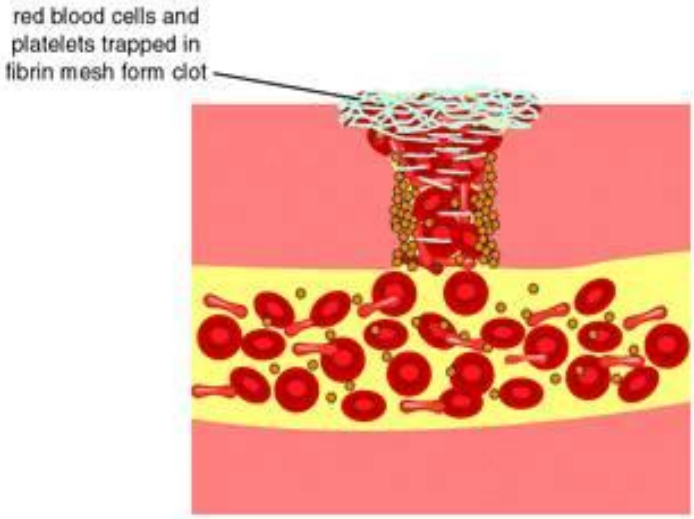
The clotting cascade occurs through two separate pathways that interact, the intrinsic and the extrinsic pathway.

Extrinsic Pathway
The extrinsic pathway is activated by external trauma that causes blood to escape from the vascular system. This pathway is quicker than the intrinsic pathway. It involves factor VII.

Intrinsic Pathway
The intrinsic pathway is activated by trauma inside the vascular system, and is activated by platelets, exposed endothelium, chemicals, or collagen. This pathway is slower than the extrinsic pathway, but more important. It involves factors XII, XI, IX, VIII.

Common Pathway
Both pathways meet and finish the pathway of clot production in what is known as the common pathway. The common pathway involves factors I, II, V, and X





injured tissues and platelets release the clotting factor **prothrombin activator** and **calcium ions**

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prothrombin activator converts the blood protein prothrombin to **thrombin**

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thrombin splits **fibrinogen** to form **fibrin**

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fibrin fibres form a mesh over wound, trapping red blood cells and platelets

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bleeding stops

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clot hardens and becomes smaller

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new cells grow to repair wound site

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enzyme **plasmin** is released to dissolve clot