3rd Lecture:
Blood: Composition, Specific Functions of each Compartment. Plasma and Serum Differences and Separation

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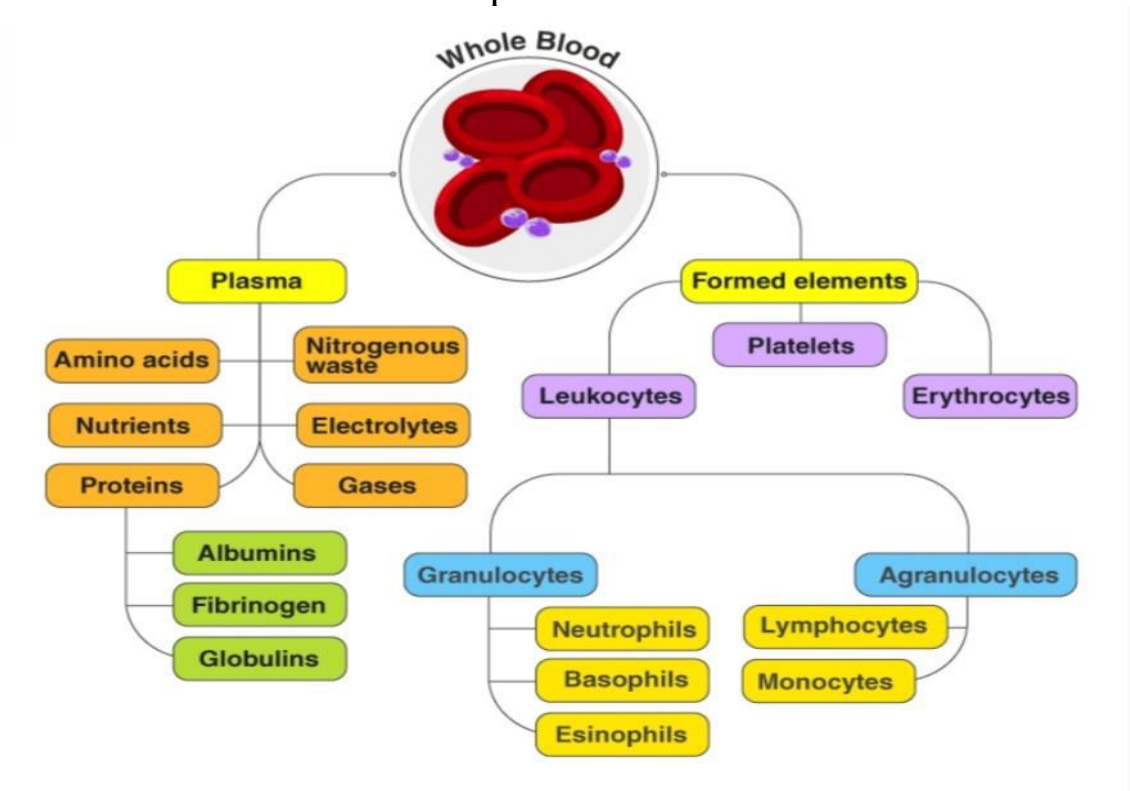
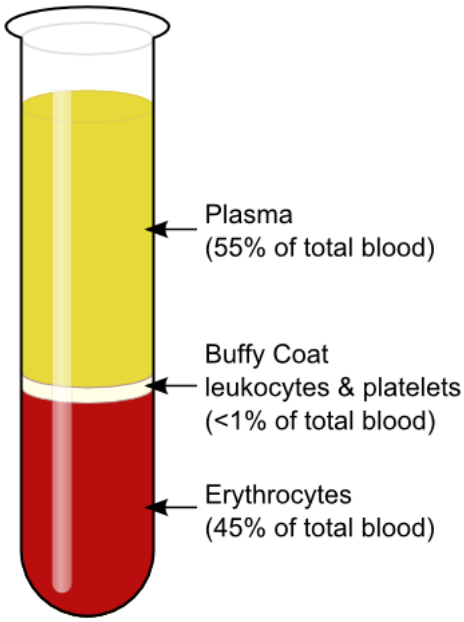
Definition of Blood: Blood is a fluid connective tissue that consists of plasma, blood cells and platelets. It circulates throughout our body delivering oxygen and nutrients to various cells and tissues. It makes up 8% of our body weight. An average adult possesses around 5-6 liters of blood.

Composition of Blood



Components of Blood

There are many cellular structures in the composition of blood. When a sample of blood is spun in a centrifuge machine, they separate into the following constituents: Plasma, buffy coat and erythrocytes. Thus blood contains RBC, WBC, platelets and plasma.



Plasma

The liquid state of blood can be contributed to plasma as it makes up ~55% of blood. It is pale yellow in colour when separated. Blood plasma consists of salts, nutrients, water and enzymes. Blood plasma also contains important proteins and other components necessary for overall health. Hence, blood plasma transfusions are given to patients with liver failure and life-threatening injuries.

Components of Blood Plasma:

Blood plasma has several protein components. Proteins in blood plasma are:

- Serum globulin
- Serum albumin
- Fibrinogen

The serum contains only globulin and albumin. Fibrinogen is absent in serum because it is converted into fibrin during blood clotting.

Functions of plasma:

Plasma, the liquid component of blood, serves several important functions in the body:
1. Transportation:
- Carries nutrients (glucose, amino acids, lipids, vitamins) to cells throughout the body
- Transports hormones from endocrine organs to their target tissues
- Moves waste products to the kidneys, liver, and lungs for excretion
- Distributes oxygen via red blood cells to organs and tissues
2- Helps regulate blood volume and pressure, maintains proper pH balance of the blood
and preserves osmotic pressure through proteins like albumin
3. Hemostasis and coagulation:
- Contains clotting factors like fibrinogen that are essential for blood clotting
4. Immune function:
- Carries antibodies and immunoglobulins that help fight infections
5. Temperature regulation:
- Helps distribute heat throughout the body, maintaining homeostasis
6. Protein reserve:
- Acts as a source of proteins for various bodily functions
7. Electrolyte balance:
- Contains and regulates levels of important electrolytes like sodium, potassium, and calcium
8. Buffering:
- Plasma proteins contribute to acid-base balance through their buffering action

Red Blood Cells (RBC):

Red blood cells consist of Hemoglobin, a protein. They are produced by the bone marrow to primarily carry oxygen to the body and carbon dioxide away from it.

White Blood Cells (WBC)

White blood cells are responsible for fighting foreign pathogens (such as bacteria, viruses, and fungi) that enter our body. They circulate throughout our body and originate from the bone marrow.

platelets

Tiny disc-shaped cells that help regulate blood flow when any part of the body is damaged, thereby aiding in fast recovery through clotting of blood.

Differences between plasma and serum

Serum and plasma are obtained from the liquid portion of the blood that is obtained when the cells are removed. However, there is striking difference between plasma and serum. Serum is the liquid that remains after the clotting of blood. Whereas, plasma is the liquid that remains when anticoagulant is added to prevent clotting.

Following are the important differences between plasma and serum:

Plasma	Serum
It is composed of serum and clotting factor.	It is the part of the blood which lacks clotting factor.
It is acquired after centrifuging blood with the anticoagulant.	It is acquired after centrifuging of coagulated blood.

Anticoagulant is required to obtain plasma from the blood sample.	Anticoagulant is not required to separate the serum from the blood sample.
Consists of 55% of the total volume of blood.	Less volume in comparison to plasma.
Comparatively easier and less time is required to separate the plasma from the blood sample.	Difficult to separate serum from the blood sample. It is a time-consuming process.
Contains fibrinogen.	Lacks fibrinogen.
Consists of 92% water with proteins, salts, lipids, and glucose.	Consists of 90% water with dissolved hormones, proteins, minerals, and carbon dioxide.
Has a long shelf life. It can be preserved up to ten years.	Has a short shelf life. It can be preserved only for a few months.

Reference

- https://byjus.com/biology/blood/
- https://byjus.com/biology/difference-between-plasma-and-serum/