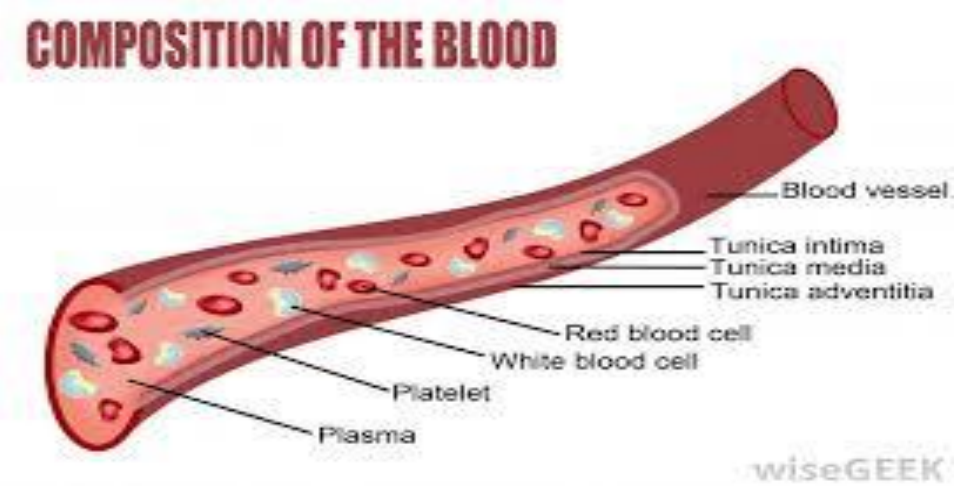
Plasma Protein

Plasma

Plasma is the clear, colorless liquid portion of blood that remains after red blood cells, white blood cells, platelets and other cellular components are removed. It is the single largest component of human blood, comprising about 55 percent, and contains water, salts, enzymes, antibodies and other proteins.



Plasma Protein

Plasma proteins are proteins found in the blood plasma, they serve many different functions, including transport of lipids, hormones, vitamins and metals in the circulatory system .

Function of plasma protein

The functions of plasma proteins include:

- Osmotic or intravascular effect of plasma protein maintains fluid as well as electrolyte balance
- Viscosity of plasma is maintained by the plasma protein
- These are the protein reserves of our body
- Performs the important function of clotting
- Responds with inflammation in case of wound or injury
- The gamma globulins act as antibodies and protect our body from infection
- Plasma protein also maintains acid base balance

Types of Plasma Protein

1- Albumin

Albumins are the most abundant of the plasma proteins, accounting for about **60 %** of all the proteins. They are manufactured by **the liver**, and are **responsible**

for transporting various substances in the blood, including drugs. They also **helps maintain water balance and contribute to osmotic pressure,** which in simple terms is the pressure exerted by water moving by osmosis in and out of cells.

Anumber of blood transport proteins are evolutionary related, including **serum albumin, alpha-fetoprotein ,vitamin D-binding protein** and **afamin.**

Serum albumin is the main protein of human blood plasma. It binds water, cations (such as Ca^{2+}, Na^{+} and K^{+}), fatty acids, hormones, bilirubin, thyroxine (T4) and pharmaceuticals , its main function is to regulate the colloidal osmotic pressure of blood.

Types of Albumin

Specific types include:

- human serum albumin
- bovine serum albumin (cattle serum albumin) or BSA, often used in medical and molecular biology labs.

Low albumin (hypoalbuminemia) may be caused by liver disease, nephrotic syndrome, burns, malabsorption, malnutrition, late pregnancy and genetic variations .

High albumin (hyperalbuminemia) is almost always caused by dehydration. In some cases of retinol (Vitamin A) deficiency, the albumin level can be elevated to high-normal values (e.g., 4.9 g/dL).

2-Globulin

The globulin proteins include **enzymes**, **protein carriers**, and **gamma globulin**, accounting for about **36 %** of all the proteins ,something the body produces to fight infection and disease. While most **plasma proteins** are made in **the liver**, **gamma globulins** are made by **lymphocytes** called plasma cells. Globulins fall into one of four groups based on their size and electrical charge: **gamma, beta, alpha-1** and **alpha-2.**

The **globulins** are a family of **globular proteins** that have higher molecular weights than albumins and are insoluble in pure water but soluble in dilute salt solutions.

Types of globulin

All globulins fall into one of the following four categories:

- **Alpha 1 globulins**
- **Alpha 2 globulins**

- **Beta globulins**
- **Gamma globulins** (one group of gamma globulins are the immunoglobulins, which are also known as "antibodies")

3-Fibrinogen

These comprise of merely **4%** of overall plasma protein and are also called as **Factor I**. Fibrinogen is synthesized in **the liver by the hepatocytes** and its only function is to **make clots** and **stop bleeding**.

Fibrinogen (***factor I***) is a **glycoprotein** ,a soluble and large that helps in the formation of blood clots that is converted by **thrombin into fibrin** during blood clot formation. In its natural form, fibrinogen can form bridges between platelets, by binding to the surface membrane proteins; however, its major function is as the precursor to fibrin.

The disorders caused by fibrinogen deficiency

Absence of fibrinogen plasma protein causes a serious disease called as ***fibrinogenemia*** .
Hypofibrigenemia is although a lower form of bleeding , it also produces medium bleeding problems. Many times the fibrinogen levels are normal but the functioning of protein is abnormal. Such a condition is called as ***Dysfibrinogenemia.*** People with such disorders never have problem clotting; rather they have been found to clot abnormally.

Impact of Abnormal Plasma Proteins

- **Low albumin** can indicate liver disease or kidney disease, which allows albumin to get into the urine, but are also explained by pregnancy (when albumin is naturally decreased), malnutrition, extensive burns or Crohn's disease. **High albumin** levels could be the result of dehydration or congestive heart failure.
- **High globulin levels** can indicate chronic infection, liver disease or rheumatoid arthritis. **Low levels** might mean acute anemia, liver dysfunction or emphysema.
- **Elevated levels of fibrinogen** seem to indicate an increased risk of stroke, one of the leading causes of death. Combined with high blood pressure, the risk is even greater. Exercise, not smoking, maintaining a healthy weight and medication seem to lower fibrinogen levels in the short term. **Lower levels of fibrinogen** indicate a form of hemophilia. This condition is inherited and affects both genders and all races.

Plasma protein binding

A drug's efficiency may be affected by the degree to which it binds to the proteins within blood plasma. The less bound a drug is, the more efficiently it

can traverse cell membranes or diffuse. Common blood proteins that drugs bind to serum albumin, lipoprotein, glycoprotein, and α, β, and γ globulins.

A drug in blood exists in two forms: ***bound*** and ***unbound***. Depending on a **specific drug's affinity for plasma protein**, a proportion of the drug may become bound to plasma proteins, with the remainder being unbound. If the protein binding is reversible, then a chemical equilibrium will exist between the bound and unbound states, such that: