BLOOD PROTEINS

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INTRODUCTION

- Blood proteins, they are also termed as Plasma proteins, are proteins which was present in blood plasma.
- Plasma proteins are:

1. SERUM ALBUMIN
2. SERUM GLOBULIN
3. FIBRINOGEN

- Serum contains only albumin and globulin.
- Fibrinogen is absent in serum because, it is converted into fibrin during blood clotting.
- Because of this, the albumin and globulin are usually called serum albumin and serum globulin.

1. SERUM ALBUMIN

- It accounts for 55% of total blood proteins.
- It was a major contributor to maintaining the oncotic pressure of plasma.
- It play an important role in transport of lipid and steroid hormones as a carrier.

2. SERUM GLOBULIN

- It consist 38% of total blood proteins.
- It contributes in many important function's in body such as transportation of ions and hormones.
- They play an important role in defence system of body.

3. FIBRINOGEN

- It comprises 7% of total blood proteins.
- Conversion of fibrinogen to insoluble fibrin is essential for blood clotting.

ALBUMIN/GLOBULIN RATIO

- Ratio between plasma level of albumin and globulin is called albumin/globulin (A/G) ratio.
- It is an important indicator of some diseases involving liver or kidney.
- Normal A/G ratio is 2 : 1.

PROPERTIES OF PLASMA PROTEINS

1. Molecular weight

- Albumin : 69,000
- Globulin : 1,56,000
- Fibrinogen : 4,00,000

Thus, the molecular weight of fibrinogen is greater than that of other two proteins

2. Specific gravity

- Specific gravity of the plasma proteins is 1.026.

3. Normal values

Normal values of the plasma proteins are:

- Total proteins : 7.3 g/dL (6.4 to 8.3 g/dL)
- Serum albumin : 4.7 g/dL
- Serum globulin : 2.3 g/dL
- Fibrinogen : 0.3 g/dL

ORIGIN OF PLASMA PROTEINS

- All kind of plasma proteins are synthesized in liver except for the gamma globulins.
- On the basis of origin all plasma proteins are divided into two groups.

1. IN EMBRYO

- In embryonic stage, the plasma proteins are synthesized by the mesenchyme cells.
- The albumin is synthesized first and other proteins are synthesized later.

2. IN ADULTS

- In adults, the plasma proteins are synthesized mainly from reticuloendothelial cells of liver.
- The plasma proteins are synthesized also from spleen, bone marrow, disintegrating blood cells and general tissue cells.
- Gamma globulin is synthesized from B lymphocytes.

FUNCTIONS OF PLASMA PROTEINS

- Plasma proteins are very essential for the body.
- Following are the functions of plasma proteins:

1. ROLE IN COAGULATION OF BLOOD

- Fibrinogen is essential for the coagulation of blood

2. ROLE IN DEFENSE MECHANISM OF BODY

- Gamma globulins play an important role in the defense mechanism of the body by acting as antibodies (immune substances).
- These proteins are also called immunoglobulins.
- Antibodies react with antigens of various microorganisms, which cause diseases like diphtheria, typhoid, streptococcal infections, mumps, influenza, measles, hepatitis, polio myelitis etc.

3. ROLE IN TRANSPORT MECHANISM

- Plasma proteins are essential for the transport of various substances in the blood.
- Albumin, alpha globulin and beta globulin are responsible for the transport of the hormones, enzymes, etc.
- The alpha and beta globulins play an important role in the transport of metals in the blood.

4. ROLE IN MAINTENANCE OF OSMOTIC PRESSURE IN BLOOD

- The plasma proteins cannot pass through the capillary membrane easily and remain in the blood except most of the substances are exchanged between the blood and the tissues.
- In the blood, these proteins exert the colloidal osmotic (oncotic) pressure. The pressure exerted by the plasma proteins is about 25 mm Hg.
- The sequence of plasma proteins in exertion of osmotic pressure are:

Albumin < Globulin < Fibrinogen

5. ROLE IN REGULATION OF ACID-BASE BALANCE

- Plasma proteins, particularly the albumin, play an important role in regulating the acid-base balance in the blood.
- This is because of the virtue of their buffering action.
- The Plasma proteins are responsible for 15% of the buffering capacity of blood.

6. ROLE IN VISCOSITY OF BLOOD

- Plasma proteins provide viscosity to the blood, which is important to maintain the blood pressure.
- Albumin provides maximum viscosity than the other plasma proteins.

7. ROLE IN ERYTHROCYTE SEDIMENTATION RATE

- Erythrocyte sedimentation rate (ESR) is the rate at which the erythrocytes settle down.
- Globulin and fibrinogen accelerate the tendency of rouleaux formation by the red blood cells.
- Rouleaux formation is responsible for ESR, which is an important diagnostic and prognostic tool for diseases like Tuberculosis, All types of anemia except sickle cell anemia, Malignant tumors, Rheumatoid arthritis, Rheumatic fever.

8. ROLE IN SUSPENSION STABILITY OF RED BLOOD CELLS

- During circulation, the red blood cells remain suspended uniformly in the blood.
- This property of the red blood cells is called the suspension stability.
- Globulin and fibrinogen help in the suspension stability of the red blood cells.

9. ROLE AS RESERVE PROTEINS

- During fasting, inadequate food intake or inadequate protein intake, the plasma proteins are utilized by the body tissues as the last source of energy.
- Plasma proteins are split into amino acids by the tissue macrophages.
- Amino acids are taken back by blood and distributed throughout the body to form cellular protein molecules.
- Because of this action, the plasma proteins are called the reserve proteins of body.