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Albumin

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ALBUMIN

Most of the body's total protein is a combination of **albumin** and **globulins**. Albumin, the protein present in the highest concentrations (60% of the TP), is the main **transport protein in the body for hormones, therapeutic drugs, calcium, magnesium, heme, and waste products such as bilirubin**. Albumin also significantly affects plasma oncotic pressure, which regulates the distribution of body fluid between blood vessels, tissues, and cells. Albumin is synthesized in the liver. Albumin levels are more useful as an indicator of chronic deficiency than of short-term deficiency.

Clinical significance

1- Hyperalbuminemia (Elevated Albumin in the blood) which seen in: Any condition that results in a decrease of plasma water (e.g., dehydration).

2- Hypoalbuminemia (decreased Albumin in the blood) which seen in:

a- Decreased synthesis by the liver, b- Genetic analbuminemia (related to genetic inability of the liver to synthesize albumin). c- Protein loss in

case of burn or protein-losing-enteropathy. d- Kidney disease (related to loss from damaged renal tubules.

Globulins make up the remaining 40% of proteins in the blood. The globulins are a varied group of proteins, some produced by the liver and some by the immune system. They help fight infection and transport nutrients.

Globulin = Total Protein- Albumin

The **A/G ratio is useful in the evaluation of liver and kidney disease**. The ratio is calculated using the following formula:

Albumin/(Total protein-Albumin).

*** Albumin/globulin ratio (A/G) normally found >1.0**

*** A low A/G ratio** may reflect overproduction of globulins, such as seen in multiple myeloma or autoimmune diseases, or underproduction of albumin, such as may occur with cirrhosis, or selective loss of albumin from the circulation, as may occur with kidney disease (nephrotic syndrome).

*** A high A/G ratio** suggests underproduction of immunoglobulins.

The most common method to separate the proteins is electrophoresis. There are 5 bands named:

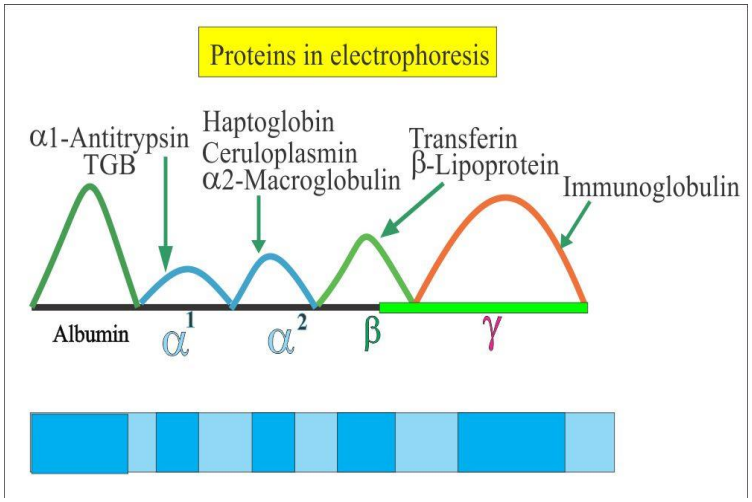

Fig.1 Serum Electrophoresis, the pattern of protein and albumin

REFERENCE VALUES

Serum, plasma

Adults	3.81 - 4.65 g/dL (38.1 - 46.5 g/L)

PRINCIPLE

The method is based on the specific binding of bromocresol green (BCG), an anionic dye, and the protein at acid pH with the resulting shift in the absorption wavelength of the complex. The intensity of the color formed is proportional to the concentration of albumin in the sample.

$$\text{BCG} + \text{Albumin} \xrightarrow{\text{pH 4.3}} \text{BCG-albumin complex}$$

PROCEDURE

1- Bring reagents and samples to room temperature.

2- Pipette into labelled tubes:

TUBES	Blank	Sample	CAL. Standard
R1.Reagent	2.0 mL	2.0 mL	2.0 mL
Sample	–	10 µL	–
CAL.Standard	–	–	10 µL

3- Mix and let the tubes stand 1 minute at room temperature.

4- Read the absorbance (A) of the samples and the standard at 630 nm against the reagent blank.

The color is stable for 30 minutes protected from light

CALCULATIONS

$$\frac{A_{Sample}}{A_{Standard}} \times C_{Standard} = \text{g/dL albumin}$$

Samples with concentrations higher than 6 g/dL should be diluted 1:2 with saline and assayed again. Multiply the results by 2. If results are to be expressed as SI units apply: g/dL x 10 = g/L.