

Lab.

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ISLAMIC UNIVERSITY

College of Medical Technology

Department of Medical Laboratory Techniques

Dr. Abbas F. Almulla

Ph.D. Clinical Biochemistry



Total Protein



TOTAL SERUM PROTEIN

Proteins are the most abundant compounds in serum (the rest of blood when you remove all the cells after clotting). Amino acids are the building blocks of all proteins. In turn proteins are the building blocks of all cells and body tissues. They are the basic components of enzymes, many hormones, antibodies and clotting agents. Proteins act as transport substances for hormones, vitamins, minerals, lipids and other compounds. In addition, proteins help to balance the osmotic pressure of the blood and tissue. Osmotic pressure is part of what keeps water inside a particular compartment of your body. Proteins play a major role in maintaining the delicate acid-alkaline balance of your blood. Finally, serum proteins serve as a reserve source of energy for your tissues and muscle when you are not ingesting an adequate amount.

Proteins are divided into:

1- **Fibrous** e.g. fibrinogen, troponin, collagen, and myosin.

2- **Globular** e.g. hemoglobin, enzymes, peptide hormones, and plasma proteins.

3- **Conjugated proteins** examples are lipoproteins, glycoproteins, metalloproteins.

Total serum proteins consist of:

1- Prealbumin. 2- Albumin. 3- Globulins. 4- Other proteins
included are: a- Complements. b- Fibrinogen. c – Reactive protein.

REFERENCE VALUES

Serum, plasma

Adults	6.6 - 8.7 g/dL (66 - 87 g/L)
Prematures	3.6 - 6.0 g/dL (36 - 60 g/L)
Newborns	5.3 - 8.9 g/dL (53 - 89 g/L)
Pregnancy	Concentration lowers from 69 to 61 g/L

Clinical Significance:

Hyperproteinemia (Elevated total protein): in the following conditions:

1- Chronic infection, 2- Dehydration, 3- Multiple myeloma

Hypoproteinemia (decreased total protein): in the following conditions:

1- Malnutrition and malabsorption (insufficient intake and/or digestion of

proteins).

2- Liver disease (insufficient production of proteins).

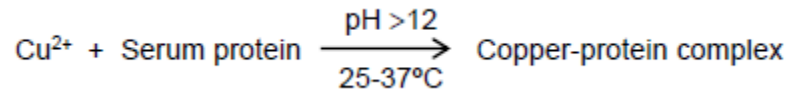
3- Diarrhea (loss of protein through the GI tract).

4- Severe burns (loss of protein through the skin).

5- Pregnancy (dilution of protein due to extra fluid held in the vascular system).

PRINCIPLE

In the biuret reaction, a chelate is formed between the Cu²⁺ ion and the peptide bonds of the proteins in alkaline solutions to form a violet colored complex whose absorbance is measured photometrically. The intensity of the color produced is proportional to the concentration of protein in the sample.



PROCEDURE

1- Pipette into labelled tubes:

TUBES	Blank	Sample	CAL. Standard
R1.Biuret	1.0 mL	1.0 mL	1.0 mL
Sample	-	20 µL	-
CAL. Standard	-	-	20 µL

2 - Mix and incubate the tubes 5 minutes at 37°C.

3- Read the absorbance (A) of the samples and the standard at 540 nm against the reagent blank.

The color is stable for at least 1 hour.

CALCULATIONS

$$\frac{A \text{ Sample}}{A \text{ Standard}} \times C \text{ Standard} = \text{g/dL total protein}$$

Samples with concentrations higher than 12 g/dL should be diluted 1:2 with saline and assayed again. Multiply the results by 2.

Notes:

1- Avoid prolonged application of a tourniquet. This will lead to hemoconcentration and give a false rise in values.

2- Drugs like anabolic steroids, androgens, dextran, growth hormone, progesterone, and insulin increase the protein level.
