GENETRACK Diagnostics

Total Protein, Albumin, and Globulin

PROTEINS IN BLOOD

Proteins are important building blocks of all cells and tissues. They form the structural part of most organs, regulate body functions (enzymes and hormones), and are essential for body growth, development, and health. The majority of total protein in blood is from two major classes – albumin and globulin. Albumin prevents fluid from leaking out of blood vessels and transports hormones, vitamins, and other substances around the body. Globulins are important components of the immune system. More than 500 other proteins and enzymes also contribute to a very small proportion of total protein (1).

The **Alinity c Total Protein** assay measures the total protein present in a blood sample. The **Alinity c Albumin BCP** assay measures the albumin level in a blood sample. The globulin level is determined by subtracting the albumin value from the total protein value.

TOTAL PROTEIN

The normal ranges for total protein levels in serum are 6.8–8.2 g/dL (6–19 years), 6.5–8.3 g/dL (20–29 years), and 6.5–7.8 g/dL (30–79 years) (2). Plasma levels are generally 0.3 – 0.5 g/dL higher than serum levels due to the presence of fibrinogen (3).

Elevated total protein levels (hyperproteinemia) can occur in cases of severe dehydration, some types of cancer (e.g. multiple myeloma), and chronic inflammation or infection (e.g. HIV and hepatitis B or C). Some drugs may also lead to hyperproteinemia, including anabolic steroids, androgens, growth hormone, insulin, and progesterone (4).

Reduced total protein levels (hypoproteinemia) can suggest a liver or kidney disorder, other disorders which affect protein digestion or absorption, or congestive heart failure which can increase the volume of plasma (thereby diluting the blood). Extensive bleeding, severe burns, malnutrition, and estrogens can also result in hypoproteinemia (1).

ALBUMIN

Albumin makes up more than half of the total protein in serum. It is essential for providing colloid osmotic pressure to regulate the passage of liquid through the capillaries. Albumin binds fatty acids to keep soluble in the plasma, and also aids in the transport of bilirubin, hormones, metals, vitamins, and drugs. It is synthesized in the liver, with increased synthesis after the consumption of protein-containing foods (5).

Thyroid hormone, corticosteroids, growth hormone, and insulin can increase albumin synthesis. Fasting, protein-deficient diets, liver disease, and intestinal malabsorption syndromes can cause a decrease in albumin synthesis. Accelerated losses of albumin can also occur due to nephrotic syndrome and severe burns because skin is an extra storage pool for albumin (1).

GLOBULIN

The globulin fraction of the total protein includes carrier proteins, enzymes, complement, and immunoglobulins. Increased immunoglobulins are the usual cause of elevated globulin, but other protein increases can also occur in certain pathologic states. Malnutrition, immune deficiency, and kidney disease can reduce globulin levels due to protein loss through the kidney (1).

Additional testing is usually required to determine which globulin fraction is affected in individuals with increased or decreased globulin levels. Decreases in the α1 fraction occur in individuals with congenital α1 antitrypsin deficiency, while increases are associated with acute inflammatory disorders. Increases in the α2 fraction are due to nephrotic syndrome, stress, infection, and acute inflammation, while a decrease can occur after a hemolytic reaction. Transferrin is the major β globulin, and is elevated in individuals with severe iron deficiency. Polyclonal increases in the γ region occur in chronic infections, connective tissue diseases, and liver disease. Monoclonal increases in the γ region suggest multiple myeloma, lymphoma, primary amyloidosis, or monoclonal gammopathy. Decreases in the γ region may occur in congenital immune deficiency syndromes, nephrotic syndrome, chronic lymphocytic leukemia, and corticosteroid treatment (1).

TEST PROCEDURE

Correct specimen collection and handling is required for optimal assay performance.

This test requires a blood sample from a finger prick. All supplies for sample collection are provided in this kit. First wash and dry hands. Warm hands aid in blood collection. Clean the finger prick site with the alcohol swab and allow to air dry. Use the provided lancet to puncture the skin in one quick, continuous and deliberate stroke. Wipe away the first drop of blood (as it may be contaminated with tissue fluid or skin debris). Massage finger to increase blood flow at the puncture site and hold in a position that gravity facilitates the collection of blood on the fingertip. Transfer the blood to the blood collection card or blood collection tube (microtainer).

Avoid squeezing or 'milking' the finger excessively. If blood flow stops, perform a second skin puncture on another finger if more blood is required.

Dispose of all sharps safely and return sample to the laboratory in the provided prepaid return shipping envelope.

Upon receipt at the laboratory, the blood sample is analyzed by the fully automated Alinity c Total Protein and Alinity c Albumin BCP assays on the Alinity ci series analyzer. The Total Protein assay measures total protein levels by the biuret methodology, where polypeptides with at least two peptide bonds react with the biuret reagent. The Albumin BCP assay measures albumin levels using colorimetric methodology, where bromcresol purple specifically binds to albumin to produce a coloured complex. Globulin level is determined by subtracting the albumin value from the total protein value.

TEST INTERPRETATION

These assays will provide accurate total protein, albumin and globulin levels for the tested blood specimen. Additional testing may be required to determine the cause of abnormal protein, albumin and globulin levels.

DISCLAIMERS/LIMITATIONS

Some drugs may affect total protein, albumin, and globulin levels, including anabolic steroids, androgens, growth hormone, insulin, and progesterone. Other factors that can influence results include fasting, and infections.

These results should be interpreted in conjunction with other laboratory and clinical information.

Additional testing is recommended if total protein, albumin and globulin levels are inconsistent with clinical evidence.

Correct specimen collection and handling is required for optimal assay performance.

REFERENCES

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