

Division of Laboratory Medicine

Biochemistry

Total Protein

Pseudonyms: None

Determination of total protein is a quantitative measurement of the concentration of all proteins present in **plasma (paediatrics) or in serum (adults)**; note that this excludes clotting factors). The major proteins are albumin and the immunoglobulins (principally IgG, IgA and IgM). Many other proteins are included in the measurement but individually none contributes more than 5% of the total, and most much less.

In urine

Minimum protein should be detected unless tubular damage has been sustained in the kidneys.

General information

Collection container:

Adults – **serum** (with gel separator, 4.9mL Starstedt brown top).

Paediatrics – lithium heparin **plasma** (1.2mL Starstedt orange top tube).

Random urine (preferable early morning sample) or 24h collection in a container with no preservative

Type and volume of sample:

The tubes should be thoroughly mixed before transport to the lab. The test may be added to a profile without provision of a separate specimen provided a full tube has been received. This test is NOT included in the standard liver function profile.

Special precautions: Plasma protein concentrations increase with excessive stasis during venepuncture; blood should therefore be collected with a minimum of stasis.

Laboratory information

Method principle:

Colorimetric assay

Divalent copper reacts in alkaline solution with protein peptide bonds to form the characteristic purple-colored biuret complex.

Protein + Cu^{2+} (alkaline pH) → Cu-protein complex

The colour intensity is directly proportional to the protein concentration. It is determined by measuring the increase in absorbance at 552nm.

Biological reference ranges:

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Blood

Up to 1 month	45 - 70 g/L
1 month to 1 year	55 - 72 g/L
>1 year	60 – 80 g/L

Urine

<140 mg/24h

< 20 mg/mmol Creatinine

A positive test for proteinuria is > 30 mg/mmol creatinine.

Turnaround Time:

Urgent: 2 hours

Routine: same day

Clinical information

Clinical decision points:

Blood Total protein can be used to give an indication of total immunoglobulin concentration since $([\text{total protein}] - [\text{albumin}]) = [\text{globulins}]$ of which the major component is immunoglobulins.

Factors known to significantly affect the results:

Total protein concentration is affected by hydration status of the patient.

Levels can be up to 10% lower in recumbent patients compared to ambulatory patients.

Urine A specific test is available to investigate tubular proteinopathy (currently referred to another laboratory). Estimation of total protein should be determined when ruling out protein losing enteropathy.

Diagnosis and monitoring for proteinuria in CKD and diabetes mellitus has been superseded by quantifying albumin. If multiple myeloma is suspected, urine electrophoresis (Immunology) is the preferred investigation.

(Last updated November 2019)