ENVOY® 500 TOTAL PROTEIN REAGENT KIT

Product no. 55425

For *in vitro* diagnostic use

☛CAUTION : Federal Law restricts this device to sale by or on the order of a licensed healthcare practitioner (Rx ONLY)

☛INTENDED USE

Envoy® 500 Total Protein Reagent is for the quantitative *in vitro* diagnostic determination of total protein in human serum and plasma on Envoy 500 Series Analyzers. Measurements of total protein are used in the diagnosis and treatment of a variety of diseases involving the liver, kidney, or bone marrow as well as other metabolic or nutritional disorders.

It is not intended for use in Point of Care settings.

CLINICAL SIGNIFICANCE [1,2]

In human plasma, albumin accounts for 50 to 60% of total proteins ; the reminder fraction mainly contains globulins (α1, α2, β and γ). Most plasmatic proteins are synthesized by the liver, except immunoglobulins. Increase of the plasmatic volume (salt retention syndrome, intoxication with water...) or its reduction (dehydration related to vomiting, diarrhoea...) induce respectively relative hypoproteinemia and relative hyperproteinemia.

For a normal plasmatic volume, abnormal total protein rates only occur in the event of disorder affecting the concentration of albumin or immunoglobulins. Thus, severe proteinic insufficiency (malabsorption, maldigestion, dietary insufficiency), renal and hepatic diseases result in hypoproteinemia. If total protein concentration is lower than 40 g/L oedemas can be observed. Hyperproteinemia can be seen, for example, in case of hyperimmunoglobulinemia (multiple myeloma, infection).

METHODOLOGY [3]

Serum proteins form a coloured complex in the presence of copper salt in alkaline solution :
(Biuret - End point)

$$\text{Proteins} + Cu^{2+} \xrightarrow{\text{Alkaline solution}} \text{Colored complex}$$

The colour complex absorbs at 546 nm. The final absorbance at this wavelength is proportional to the concentration of total protein in the sample.

REAGENTS

COMPOSITION

Total Protein Reagent R contains 6 mmol/L Potassium iodide ; 21 mmol/L Potassium sodium tartrate ; 6 mmol/L Copper sulfate ; 490 mmol/L Sodium hydroxide.

☛WARNINGS AND PRECAUTIONS

- This reagent is for professional *in vitro* diagnostic use only.
- Total Protein Reagent is “Corrosive”.

WARNING. Causes skin and serious eye irritations. May be corrosive to metals. Harmful to aquatic life with long lasting effects.
Wear protective gloves/protective clothing/ eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/attention.
Absorb spillage to prevent material damage. Avoid release to the environment.

- For more information, Safety Data Sheet (SDS) is available on request for professional user.
- Take normal precautions and adhere to good laboratory practice.
- Use clean or single use laboratory equipment only to avoid contaminations.
- Dispose of contents in accordance with all local, state and federal regulations.

PREPARATION

Total Protein Reagent is ready for use on the Envoy 500 Analyzer as packaged.

STORAGE AND STABILITY

Store this reagent at 2 to 25 °C and protected from light. Do not freeze. Unopened reagents are stable to the expiration dates on the bottle labels. The reagent is stable for 14 days onboard the Envoy 500 Analyzer.

SPECIMENS [1,2,4]

COLLECTION AND STORAGE

Fresh unhemolyzed serum or lithium heparinized plasma is the preferred specimen. Samples must be free from haemolysis and lipemia. Do not analyze whole blood.

Collect specimens by venipuncture according to accepted clinical protocol. For best results, use only fresh specimens. Total protein in samples are stable for 7 days at 2-8 ° C , and at least 2 month at - 20 °C. For longer storage, freeze samples at -70 °C.

PROCEDURE

☛MATERIALS PROVIDED

The Envoy 500 Total Protein Reagent Kit includes the following components:

8 x 48.8 mL boats of Envoy 500 Total Protein Reagent.

MATERIALS REQUIRED BUT NOT PROVIDED

- Envoy 500 Serum Calibrator (product no. 55111).
- Envoy 500 Serum Controls (product no. 55131).
- Normal saline.
- Analyzer specific consumables
- General Laboratory Equipment.

REAGENT INSTALLATION AND USE

Program the instrument using the application parameters and programming instructions provided at the end of this Instructions For Use.

Refer to the Operator Manual for additional information on installing reagents and programming the analyzer, and running samples, calibrators and controls.

The Envoy 500 Total Protein Reagent is ready to use as packaged.

Do not remove the caps from the bottles until you are ready to install the reagent on the analyzer. Before installing, mix the reagents by gently inverting the reagent boats several times. Record the installation date on the label and insert the unit into the designated position on the reagent tray. Let the reagent equilibrate on the instrument for at least 30 minutes before use.

CALIBRATION

Calibrate the instrument after loading new reagent lot, after maintenance and whenever quality control results fall outside established limits. Under typical use conditions, calibration factors for this test are valid for 14 days. Refer to the Operator Manual for calibration procedures.

QUALITY CONTROL

Quality control requirements should be established in accordance with local, state and/or federal regulations or accreditation requirements.

Assay at least two levels of serum control daily. Serum Controls for Envoy 500 level 1 and level 2 may be used. Controls should also be assayed after performing a reagent blank, calibrating, maintaining the instrument and after loading a new reagent unit.

Controls may be assayed more frequently based on laboratory workflow and the discretion of the user.

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ELITech Clinical Systems SAS
Zone Industrielle
61500 SEES
France

For Technical questions, Please call or contact
(855) 354-8324 - www.elitechgroup.com
27 Wellington Road
Lincoln, Rhode Island 02865 - U.S.A.

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CALCULATIONS

All calculations are performed by the instrument.

To calculate the result in SI units (g/L), multiply the result in conventional units (g/dL) by 10.

LIMITATIONS

Samples must be free from haemolysis. Use only acceptable specimens as described under Collection and Storage. Do not report results outsideof the usable range shown below. Refer to the Interfering Substances section for possible sources of chemical interference.

PERFORMANCE CHARACTERISTICS

☛MEASURING RANGE

Determined according to CLSI[5] EP6-A protocol, the measuring range is from 2.20 to 12.00 g/dL (22.0 to 120.0 g/L)

☛LIMIT OF DETECTION (LOD) AND LIMIT OF QUANTIFICATION (LOQ)

Determined according to CLSI[6] EP17-A protocol, the LoD is 0.09 g/dL (0.9 g/L) and LoQ is 2.20 g/dL (22 g/L).

EXPECTED VALUES [1,2,4]

Published total protein reference ranges for adults are listed below. Use these ranges only as guides. Each laboratory should establish its own reference ranges.

Reference Range	Conventional Units	SI Units
Serum:		
Ambulatory patients	6.4 - 8.3 g/dL	64 - 83 g/L
Patients at rest	6.0 - 7.8 g/dL	60 - 78 g/L

Plasma:

Due to fibrinogen , plasma concentrations are increased from 0.2 to 0.4 g/dL (2 to 4 g/L) compared to serum concentrations.

☛PRECISION

Determined according to CLSI[7] EP5-A2 protocol.

Sample	n	mean g/dL	Within-run CV (%)	Total CV (%)
Level 1	80	4.00	1.2	2.6
Level 2	80	6.54	1.2	2.4
Level 3	80	9.09	0.9	2.2

☛METHOD COMPARISON

A comparative study has been performed between an Envoy 500 Analyzer and an FDA-approved system equipment (Biuret method) on 100 human serum samples according to CLSI[8] EP9-A2 protocol.
The sample concentrations were between 2.11 and 12.44 g/dL (21.1 and 124.4 g/L).

The parameters of the linear regressions are as follows :
Correlation coefficient: (r) = 0.996
Linear regression: y = 0.961 x + 0.05 g/dL (0.5 g/L)

☛INTERFERING SUBSTANCES

Studies have been performed to determine the level of interference from different compounds according to CLSI[9] EP7-A2 protocol and SFBC recommendations[10]. Recovery is within ± 10% of initial value of total protein concentration of 4.00, 6.50 and 9.00 g/dL.

Unconjugated Bilirubin : No significant interference up to 30.0 mg/dL (513 µmol/L).
Conjugated Bilirubin: No significant interference up to 29.5 mg/dL (504 µmol/L).
Glucose: No significant interference up to 577 mg/dL (32.03 mmol/L).
Turbidity: No significant interference up to 404 mg/dL (4.56 mmol/L) triglycerides equivalent.
Hemoglobin: No significant interference up to 50 mg/dL.
Dextran: Induces falsely high results at therapeutic concentrations.

In very rare cases, monoclonal gammopathies (multiple myeloma), in particular IgM type (Waldenstrom's macroglobulinemia) can cause unreliable results.[11]

Other compounds may interfere.[12,13]

☛REFERENCES

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3. Doumas, B.T., *et al*., Clin. Chem., (1981), **27**, 1642.
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8. *Method Comparison and Bias estimation Using Patient Samples; Approved Guideline*—Second Edition. CLSI (NCCLS) document EP9-A2 (2002), **22** (19).
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10. Vassault A., *et al.*, Ann. Biol. Clin., (1986), **44**, 686.
11. Berth, M. & Delanghe, J. *Protein precipitation as a possible important pitfall in the clinical chemistry analysis of blood samples containing monoclonal immunoglobulins: 2 case reports and a review of literature*, Acta Clin Belg., (2004), **59**, 263.
12. Young, D. S., Effects of preanalytical variables on clinical laboratory tests, 2nd Ed., AACC Press, (1997).
13. Young, D. S., Effects of drugs on clinical laboratory tests, 4th Ed., AACC Press, (1995).

☛GLOSSARY OF SYMBOLS

CONT	Contents		Manufacturer	REF	Catalog No.
LOT	Batch Code		See instruction for use		Use by
OPENED	Date opened / Installation date	IVD	*In vitro* diagnostic device		Temperature Limitation
STAB DAYS	Number of days onboard stability	R	Reagent		

☛ : Modification from previous version

ELITech Clinical Systems SAS
Zone Industrielle
61500 SEES
France

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ENVOY® 500 TOTAL PROTEIN REAGENT KIT

ELITechGroup CLINICAL SYSTEMS

APPLICATION PARAMETERS

PRIMARY PARAMETERS

Code	PRO
Bar-Code	Active
Code for Bar-Code	340
Test Methodology	Biuret
Method	End Point
Kind of Process	Linear
1st Filter	546
☛2nd Filter	700
Reaction direction	Increasing

REAGENTS

Number of reagents	1
Reagent 1 Volume µL	297
Concentrated	Inactive
Reagent 2 Volume µL	N/A
Concentrated	Inactive

SAMPLE

	Serum	Urine
Name	Total protein	NA
Sample µL	3	N/A
Pre-Dilution 1:	1	N/A
Post-Dilution 1:	1	N/A

TIMES

Sample Starter	Inactive
Delay Time	0
Reading Time	10
Reagent 1 Incubation Time	600
Reagent 2 Incubation Time	N/A

CHECK PARAMETERS

Reagent Limit (mABS)	200
Curve Acceptance (%)	100

RE-RUN SERUM

Test Limit (Conc)	12.00
☛Low Test Limit (Conc)	0.09
Initial ABS (mABS)	N/A
Final ABS (mABS)	1000
Max ABS Delta (mABS)	9999
Prozone Check	Inactive

Normal Range	Min	Max
Man	[User defined]	
Woman	[User defined]	
Child	[User defined]	

Re-run hyperactive	Inactive
Re-run pathological	Inactive

RE-RUN URINE

Test Limit (Conc)	NA
Low Test Limit (Conc)	N/A
Initial ABS (mABS)	N/A
Final ABS (mABS)	NA
Max ABS Delta (mABS)	NA
Prozone Check	Inactive

Normal Range	Min	Max
Man	N/A	
Woman	N/A	
Child	N/A	

Re-run hyperactive	Inactive
Re-run pathological	Inactive

SECONDARY PARAMETERS

1st Unit Serum	g/dL
2nd Unit Serum	Inactive
1st Unit Urine	N/A
2nd Unit Urine	Inactive
Dynamic Blank	Inactive
Needle washes	[From Settings Table]
Cuvette washes	[From Settings Table]
Special Wash	[From Settings Table]
Instrumental Factor	1.000
Shift	0.000
Reagent Blank	Every Day
Decimals	2

STANDARD PARAMETERS

Factor	[Determined by calibration]
Minimum	20
Maximum	60
Number of Samples	1
Max Var. (%)	10
Timed re-run	Inactive
N. replicates	3
Reagents ABS	[Determined by Envoy]
Pos.	[From Settings Table]
Conc.	[From calibrator labeling]
ABS	[Determined by Envoy]
% from last calibration	100

PROGRAMMING INSTRUCTIONS

Detailed instructions for programming reagent parameters are provided in the Envoy 500 Operator Manual and Envoy500 Settings Table.

If the Envoy 500 Chemistry System is not pre-programmed, a total protein code must first be added before the parameters can be entered. On the menu bar, select «Test → Test Directory.» A new window will open up listing all the codes for the tests that are installed on the instrument. Click on the «New Code» button, type «PRO» into the Code field and select «Save.»

To program the application parameters, check the box next to the code for the total protein test, and select the «Parameters» button located at the bottom of the window. To program standard information, click the «Standards» button located at the bottom of the window.

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