Test Definition: SPISO

Prot Electrophoresis and Isotype, S

Overview

Useful For

Diagnosis of monoclonal gammopathies, when used in conjunction with locally performed serum free light chain studies (performed at client site)

Profile Information

Test ID	Reporting Name	Available Separately	Always Performed
TPE	Total Protein	Yes, (Order TP)	Yes
SPE	Protein Electrophoresis	No	Yes
MPTS	M-protein Isotype MALDI-TOF MS, S	Yes, (Order MALDO)	Yes

Reflex Tests

Test ID	Reporting Name	Available Separately	Always Performed
IMFX	Immunofixation	Yes, (Order IMFXO)	No

Testing Algorithm

This test includes total protein, serum protein electrophoresis, and heavy and light chain typing (kappa and lambda).

If a light chain is identified without a corresponding heavy chain during initial testing, immunofixation with IgD and IgE antisera will be performed at an additional charge.

The following algorithms are available in Special Instructions:

-Laboratory Approach to the Diagnosis of Amyloidosis

-Laboratory Screening Tests for Suspected Multiple Myeloma

Special Instructions

- Laboratory Approach to the Diagnosis of Amyloidosis
- Laboratory Screening Tests for Suspected Multiple Myeloma

Method Name

TPE: Biuret

SPE: Agarose Gel Electrophoresis

MPTS: Matrix-Assisted Laser Desorption/Ionization-Time of Flight Mass Spectrometry (MALDI-TOF MS)

NY State Available

Yes

Specimen

Specimen Type

Serum

Advisory Information

To monitor a patient with an established diagnosis of a monoclonal gammopathy, order MMOGA / Monoclonal Gammopathy Monitoring, Serum.

Protein electrophoresis alone is not considered an adequate screen for monoclonal gammopathies. When screening a patient or establishing a first-time diagnosis for a monoclonal gammopathy, consider ordering SMOGA / Monoclonal Gammopathy Screen, Serum instead, which includes free light chain analysis.

Specimen Required

Patient Preparation: Fasting (12 hour) preferred but not required

Container/Tube:

Preferred: Serum gel

Acceptable: Red top

Specimen Volume: 1 mL

Forms

If not ordering electronically, complete, print, and send a Renal Diagnostics Test Request (T830) with the specimen.

Specimen Minimum Volume

0.6 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	14 days	
	Frozen	14 days	
	Ambient	7 days	

Clinical and Interpretive

Clinical Information

This profile includes total protein, protein electrophoresis, and M-protein isotyping. The serum proteins can be grouped into 5 fractions by protein electrophoresis:

-Albumin, which represents almost two-thirds of the total serum protein

-Alpha-1, composed primarily of alpha-1-antitrypsin (A1AT), an alpha-1-acid glycoprotein

-Alpha-2, composed primarily of alpha-2-macroglobulin and haptoglobin

-Beta, composed primarily of transferrin and complement C3

-Gamma, composed primarily of immunoglobulins (Ig)

The concentration of these fractions and the electrophoretic pattern may be characteristic of diseases such as monoclonal gammopathies, A1AT deficiency disease, nephrotic syndrome, and inflammatory processes associated with infection, liver disease, and autoimmune diseases.

The following algorithms are available in Special Instructions:

-Laboratory Approach to the Diagnosis of Amyloidosis

-Laboratory Screening Tests for Suspected Multiple Myeloma

Reference Values

TOTAL PROTEIN

> or =1 year: 6.3-7.9 g/dL

Reference values have not been established for patients that are <12 months of age.

PROTEIN ELECTROPHORESIS

Albumin: 3.4-4.7 g/dL

Alpha-1-globulin: 0.1-0.3 g/dL

Alpha-2-globulin: 0.6-1.0 g/dL

Beta-globulin: 0.7-1.2 g/dL

Gamma-globulin: 0.6-1.6 g/dL

An interpretive comment is provided with the report.

Reference values have not been established for patients that are <16 years of age.

M-PROTEIN ISOTYPE MALDI-TOF MS, S

No monoclonal protein detected

Interpretation

Monoclonal Gammopathies:

-A characteristic monoclonal band (M-spike) is often found on serum protein electrophoresis (SPE) in the gamma globulin region and, more rarely, in the beta or alpha-2 regions. The finding of an M-spike, restricted migration, or hypogammaglobulinemic SPE pattern is suggestive of a possible monoclonal protein. Immunoaffinity purification followed by matrix-assisted laser desorption/ionization-time of flight mass spectrometry (MALDI-TOF MS) is performed to identify any immunoglobulin heavy and light chains present.

-A monoclonal IgG or IgA of greater than 3 g/dL is consistent with multiple myeloma (MM).

-A monoclonal IgG or IgA of less than 3 g/dL may be consistent with monoclonal gammopathy of undetermined significance (MGUS), primary systemic amyloidosis, early or treated myeloma, as well as a number of other monoclonal gammopathies.

-A monoclonal IgM of greater than 3 g/dL is consistent with macroglobulinemia.

-The initial identification of a serum M-spike greater than 1.5 g/dL on SPE should be followed by MPSU / Monoclonal Protein Study, 24 Hour, Urine.

-The initial identification of an IgM, IgA, or IgG M-spike greater than 4 g/dL, greater than 5 g/dL, and greater than 6 g/dL respectively, should be followed by VISCS / Viscosity, Serum.

After the initial identification of an M-spike, quantitation of the M-spike on follow-up SPE can be used to monitor the monoclonal gammopathy. However, if the monoclonal protein falls within the beta region (most commonly an IgA or an IgM) quantitative immunoglobulin levels may be more a useful tool to follow the monoclonal protein level than SPE. A decrease or increase of the M-spike that is greater than 0.5 g/dL is considered a significant change.

Patients suspected of having a monoclonal gammopathy may have normal serum SPE patterns. Approximately 11% of patients with MM have a completely normal serum SPE, with the monoclonal protein only identified by MALDI-TOF MS. Approximately 8% of MM patients have hypogammaglobulinemia without a quantifiable M-spike on SPE but identified by MALDI-TOF MS. Accordingly, a normal serum SPE does not rule out the disease and SPE should not be used to screen for the disorder. SMOGA / Monoclonal Gammopathy Screening, Serum which includes MALDI-TOF MS and serum free light chains, should be done to screen if the clinical suspicion is high.

Other Abnormal SPE Findings:

-A qualitatively normal but elevated gamma fraction (polyclonal hypergammaglobulinemia) is consistent with infection, liver disease, or autoimmune disease.

-A depressed gamma fraction (hypogammaglobulinemia) is consistent with immune deficiency and can also be associated with primary amyloidosis or nephrotic syndrome.

-A decreased albumin (<2 g/dL), increased alpha-2 fraction (>1.1 g/dL), and decreased gamma fraction (<1 g/dL) is consistent with nephritic syndrome and, when seen in an adult older than 40 years, should be followed by MPSU / Monoclonal Protein Study, 24 Hour, Urine.

-In the hereditary deficiency of a protein (eg, agammaglobulinemia, alpha-1-antitrypsin [A1AT] deficiency, hypoalbuminemia), the affected fraction is faint or absent.

-An absent alpha-1 fraction is consistent with A1AT deficiency disease and should be followed by a quantitative A1AT assay (AAT / Alpha-1-Antitrypsin, Serum).

Cautions

Very large IgG M-spikes (>4 g/dL) may saturate the protein stain. In these situations, quantitative IgG assays (IGG /

Immunoglobulin G [IgG], Serum) should be performed to accurately determine M-spike concentrations to monitor disease progression or response to therapy.

Fibrinogen will migrate as a distinct band in the beta-gamma fraction. Serum specimens from new patients with a beta-gamma band are to be treated with thrombin to ensure complete conversion of fibrinogen.

Hemolysis may augment the beta fraction.

Penicillin may split the albumin band.

Radiographic agents may produce an uninterpretable pattern.

Clinical Reference

1. Kyle RA, Katzmann JA, Lust, JA, Dispenzieri A: Clinical indications and applications of electrophoresis and immunofixation. In Manual of Clinical Laboratory Immunology. Sixth edition. Edited by NR Rose, RG Hamilton, B Derick. Washington, DC. ASM Press, 2002, pp 66-70

2. Mills JR, Kohlhagen MC, Dasari S, et al: Comprehensive Assessment of M-Proteins Using Nanobody Enrichment Coupled to MALDI-TOF Mass Spectrometry. Clin Chem. 2016;62(10):1334-1344

Performance

Method Description

Electrophoresis:

Serum proteins are separated in an electric field according to their size, shape, and electric charge. The separation is performed on agarose gels. The proteins are visualized by staining with acid blue, and the intensity of staining is quantitated by densitometry (Helen Quick Scan 2000). Multiplying by the serum total protein (Coomasie blue) converts the percentage of protein in each fraction into serum concentration.(Instruction manual: Helena SPIFE 3000;package insert: Helen SPIFE SPE Vis Gel 2001; Kyle RA, Katzmann JA, Lust JA, Dispenzieri, A: Clinical indications and applications of electrophoresis and immunofixation. In Manual of Clinical Laboratory Immunology. Sixth Edition. Edited by NR Rose, et al. Washington DC. ASM Press, 2002 p 71-91)

M-protein Isotype matrix-assisted laser desorption/ionization-time of flight mass spectrometry (MALDI-TOF MS):

M-protein isotype by MALDI-TOF MS is performed with immunoaffinity purification followed by MALDI-TOF MS analysis. For the immunoaffinity purification, patient serum is applied to 5 separate immunoaffinity resins (CaptureSelect, Life Sciences) specific to immunoglobulin G, A, M, K, and L. Unbound protein is washed away and the isolated immunoglobulins are broken down in to their reduced to separate the heavy and light chains subunits to be analyzed via MALDI-TOF mass spectrometry. The 5 separate spectra from each patient immunopurification are overlaid and investigated for an overabundance of immunoglobulin and immunoglobulin light chain.(Milani P, Murray DL, Barnidge DR, et al: The Utility of Mass-Fix to Detect and Monitor Monoclonal Proteins in the Clinic. Am J Hematol 2017;92:772-779)

Free Light Chains:

The quantitation of free light chain (FLC) by nephelometry uses FLC antisera from The Binding Site,Â and is performed on the Siemens Nephelometer II.(Bradwell AR, Carr-Smith HD, Mead GP, et al: Highly sensitive, automated immunoassay for immunoglobulin free light chains in serum and urine. Clin Chem 2001;47[4]:673-80)

PDF Report

No

Day(s) and Time(s) Test Performed

TPE, SPE, IMFX:

Monday through Friday; 1 p.m.

MPTS:

Monday through Friday; 8 a.m.

Analytic Time

2 days

Maximum Laboratory Time

3 days

Specimen Retention Time

14 days

Performing Laboratory Location

Rochester

Fees and Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact Customer Service.

Test Classification

See Individual Test IDs

CPT Code Information

84155

84165

0077U

86334 (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
SPISO	Prot Electrophoresis and Isotype, S	90991-1

Result ID	Test Result Name	Result LOINC Value
TPE	Total Protein	2885-2
602837	Albumin	2862-1
65198	M-protein Isotype MALDI-TOF MS	90990-3
602838	Alpha-1 Globulin	2865-4
602839	Alpha-2 Globulin	2868-8
602840	Beta-Globulin	2871-2
602841	Gamma-Globulin	2874-6
602842	A/G Ratio	44429-9
602843	M spike	51435-6
602844	M spike	35559-4
602836	Impression	49296-7