MAYO CLINIC LABORATORIES

Test Definition: RMPU

Monoclonal Protein Studies, Random, Urine

Overview

Useful For

Identifying monoclonal gammopathies using random urine specimens

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
MPTRU	M-protein Mass-Fix, Random, U	No	Yes
RPEU	Protein Electrophoresis, Random, U	No	Yes
RPTU2	Protein/Creatinine Ratio, Random, U	Yes, (RPTU1)	Yes

Special Instructions

- Amyloidosis (Familial) Test Algorithm
- Multiple Myeloma: Laboratory Screening

Method Name

MPTRU: Matrix-Assisted Laser Desorption/Ionization-Time of Flight Mass Spectrometry (MALDI-TOF MS)
RPEU: Agarose Gel Electrophoresis
RPTU2: Turbidimetry/Enzymatic Colorimetric Assay

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

The use of a random urine specimen is sufficient for identifying the presence or absence of monoclonal proteins, but a 24-hour specimen is preferred for quantitating and monitoring the abnormality. See SMPU / Monoclonal Protein Studies, 24 Hour, Urine.

Shipping Instructions

Send refrigerated.

Specimen Required

Supplies: Urine Container, 60 mL (T313)
Submission Container/Tube: Plastic, 60-mL urine bottle
Specimen Volume: 50 mL
Collection Instructions:
1. Collect a random urine specimen.
2. Aliquot between 30 mL and 50 mL of urine into a plastic, 60-mL urine bottle and refrigerate.

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

Specimen Minimum Volume
30 mL

Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Refrigerated (preferred)	14 days	
	Ambient	24 hours	
	Frozen	5 days	

Clinical & Interpretive

Clinical Information
Urine proteins can be grouped into 5 fractions by protein electrophoresis:
-Albumin
-Alpha-1
-Alpha-2
-Beta-globulin
-Gamma globulin
One or more quantifiable monoclonal proteins may be present and reported as M spike.

The urine total protein concentration, the electrophoretic pattern, and the presence of a monoclonal immunoglobulin light chain may be characteristic of monoclonal gammopathies such as multiple myeloma, primary systemic amyloidosis, and light-chain deposition disease.

The following algorithms are available:
-Amyloidosis: Laboratory Approach to Diagnosis
-Multiple Myeloma: Laboratory Screening

Reference Values
CREATININE:

> or =18 years old: 16-326 mg/dL
Reference values have not been established for patients younger than 18 years.

PROTEIN/CREATINE RATIO:
> or =18 years: <0.18 mg/mg creatinine
Reference values have not been established for patients younger than 18 years.

ELECTROPHORESIS, PROTEIN:
The following fractions, if present, will be reported as mg/dL:
Albumin
Alpha-1 globulin
Alpha-2 globulin
Beta globulin
Gamma globulin
No reference values apply to random urines.

MASSFIX M-PROTEIN ISOTYPE:
M-protein Isotype MS:
No monoclonal protein detected

Flag M-protein Isotype MS:
Negative

Interpretation

The presence of a monoclonal immunoglobulin light chain in the urine is seen in multiple myeloma, macroglobulinemia, primary systemic amyloidosis and light-chain deposition disease, monoclonal gammopathy of undetermined significance, and idiopathic Bence-Jones proteinuria. The presence of a monoclonal light chain can produce renal insufficiency, may be deposited as amyloid fibrils, may damage the proximal tubes producing Fanconi syndrome, or light chains may deposit in the glomerulus and cause light-chain deposition disease.

Heavy-chain fragments as well as light chains may be seen in the urine of patients with multiple myeloma or amyloidosis.

Cautions

Monoclonal gammopathies are rarely seen in patients younger than 30 years.

Hemolysis may cause a discrete band on protein electrophoresis, which will be negative on isotyping.

Penicillin may split the albumin band.

Radiographic agents may produce an uninterpretable pattern.

Clinical Reference

1. Abraham RS, Barnidge DR. Protein analysis in the clinical immunology laboratory. In: Detrick B, Hamilton RG, Schmitz JL, eds. Molecular and Clinical Laboratory Immunology. 8th ed. Wiley; 2016:chap 4
2. Sykes E, Posey Y. Immunochemical characterization of immunoglobulins in serum, urine, and cerebrospinal fluid. In:

Detrick B, Hamilton RG, Schmitz JL, eds. Molecular and Clinical Laboratory Immunology. 8th ed. Wiley; 2016:chap 9

Performance

Method Description

Protein:
The sample is preincubated in an alkaline solution containing EDTA, which denatures the protein and eliminates interference from magnesium ions. Benzethonium chloride is then added, producing turbidity.(Package insert: Total Protein Urine/CSF. Roche Diagnostics; V13.0, 11/2018)

Creatinine:
The enzymatic method is based on the determination of sarcosine from creatinine with the aid of creatininase, creatinase, and sarcosine oxidase. The liberated hydrogen peroxide is measured via a modified Trinder reaction using a colorimetric indicator. Optimization of the buffer system and the colorimetric indicator enables the creatinine concentration to be quantified both precisely and specifically.(Package insert: Creatinine plus v2. Roche Diagnostics; V15.0, 03/2019)

Electrophoresis:
Urine proteins are separated in an electric field according to their size, shape, and electric charge (Helena SPIFE Touch). 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 (Helena Quick Scan Touch). Multiplying by the urine protein concentration converts the percentage of protein in each fraction into urine concentration.(Instruction manual: SPIFE Touch. Helena Laboratories, Corp; 11/2016; package insert: SPIFE Touch SPE Pro 277. Helena Laboratories, Corp; 06/2018; Keren DF, Humphrey RL. Clinical indications and applications for serum and urine protein electrophoresis and immunofixation. In: Detrick B, Hamilton RG, Schmitz JL, eds. Molecular and Clinical Laboratory Immunology. 8th ed. Wiley; 2016:chap 8)

Mayo Clinic MASSFIX:
The Mayo Clinic MASSFIX M-protein isotype by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) is performed with immunoaffinity purification followed by MALDI-TOF MS analysis. For the immunoaffinity purification, patient sample 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 to separate the heavy and light chains subunits to be analyzed via MALDI-TOF MS. 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(8):772-779. doi:10.1002/ajh.24772)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

4 to 6 days

Specimen Retention Time

See Individual Test IDs

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

Fees & 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 account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

84156
82570
84166
0077U

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
RMPU	M-protein Studies, Random, U	101909-0

Result ID	Test Result Name	Result LOINC® Value
33044	A/G Ratio	44293-9
33045	M spike	40661-1
33046	M spike	40661-1
33047	Impression	49299-1
607975	Albumin	6942-7
607976	Alpha-1 globulin	9734-5
607977	Alpha-2 globulin	38190-5
607978	Beta globulin	9744-4
607979	Gamma globulin	9745-1
617119	M-protein Isotype MS, Random, U	In Process
617120	Flag M-protein Isotype MS, Random, U	No LOINC Needed
CRTR1	Creatinine, Random, U	2161-8
PCRT1	Protein/Creatinine Ratio	2890-2

PTCN1	Protein, Total, Random, U	2888-6