# Test Definition: QMPTS

Monoclonal Protein Isotype, Quantitative, Serum

## Overview

### Useful For

Aiding in the diagnosis and monitoring of monoclonal gammopathies when used in conjunction with free light chain studies

This test alone is **not** considered an adequate screen for monoclonal gammopathies.

### Testing Algorithm

Only orderable as part of a profile. For more information see QMPSS / Monoclonal Protein Study, Quantitative, Serum.

### Method Name

Only orderable as part of a profile. For more information see QMPSS / Monoclonal Protein Study, Quantitative, Serum.

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

### NY State Available

Yes

## Specimen

### Specimen Type

Serum

### Ordering Guidance

This test is only orderable as part of a profile. For more information see QMPSS / Monoclonal Protein Study, Quantitative, Serum.

### Specimen Required

Only orderable as part of a profile. For more information see QMPSS / Monoclonal Protein Study, Quantitative, Serum.

**Supplies:** Sarstedt Aliquot Tube, 5 mL (T914)
**Collection Container/Tube:**
**Preferred:** Serum gel
**Acceptable:** Red top
**Submission Container/Tube:** Plastic vial
**Specimen Volume:** 1 mL
**Collection Instructions:** Centrifuge and aliquot serum into a plastic vial.

### Reject Due To

| | |
|---|---|
| Gross hemolysis | OK |
| Gross lipemia | OK |
| Gross icterus | OK |

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Serum | Refrigerated (preferred) | 28 days | |
| | Ambient | 7 days | |
| | Frozen | 28 days | |

## Clinical & Interpretive

### Clinical Information

Monoclonal gammopathy is a general term that includes a spectrum of diagnoses including malignancies of plasma cells or B cells (eg, multiple myeloma [MM], Waldenstrom macroglobulinemia, plasmacytoma, and B-cell lymphomas and leukemias), symptomatic disorders directly related to the M-protein (eg, immunoglobulin light chain [AL] amyloidosis, light chain deposition disease, cryoglobulinemia, monoclonal gammopathy of clinical significance [MGCS], monoclonal gammopathy of renal significance [MGRS], monoclonal gammopathy of thrombotic significance [MGTS], and POEMS [polyneuropathy, organomegaly, endocrinopathy, monoclonal plasma cell disorder, skin changes] syndrome) and asymptomatic premalignant conditions (eg, monoclonal gammopathy of undetermined significance [MGUS] and smoldering MM). While the identification of the monoclonal gammopathy is a laboratory diagnosis, the specific clinical diagnosis is dependent on several other laboratory and clinical assessments.

Monoclonal proteins (M-proteins) are the marker of monoclonal gammopathies. An M-protein is defined by the presence of a monoclonal immunoglobulin that is expressed above the polyclonal background. The International Myeloma Working Group (IMWG) guidelines state that to adequately document the presence of a monoclonal protein, a serum protein electrophoresis (SPEP), serum free light chain (FLC) analysis, and serum immunofixation electrophoresis (IFE) or serum mass spectrometry, should all be used. If AL amyloidosis is suspected, a 24-hour urine monoclonal protein study should be performed when all serum testing is negative.

The Mayo Clinic MASSFIX (immunoenrichment-based matrix assisted laser desorption ionization time-of-flight mass spectrometry [MALDI-TOF-MS]) method has demonstrated to be more analytically and clinically sensitive than IFE in detecting M-proteins. MASSFIX results have also been shown to better predict patient's progression free survival time than IFE in treated MM patients. In addition, MASSFIX can detect M-proteins with glycosylated light chains which were demonstrated to be a risk factor for AL-amyloidosis, cold agglutin disease, and MGUS progression. When MALDI-TOF MS results are combined with quantitative immunoglobulin measurements, the assay can replace traditional SPEP for M-protein quantitation for common M-protein isotypes IgG, IgA, and IgM. M-proteins that consist of only light chains are best quantified using serum free light chains measurements.

If a monoclonal protein pattern is detected by the Mayo Clinic MASSFIX or serum FLC measurements, a diagnosis of a monoclonal gammopathy is established. The patient should be assessed clinically for symptomatic conditions such as multiple myeloma and the other diagnoses listed above. Once symptomatic disease is ruled out, a diagnosis of MGUS can be established. The IMWG guidelines suggests follow-up M-protein testing at 6 months for the first two years following a MGUS diagnosis. If the M-protein concentration remains stable over this period (ie, less than 0.5 g/dL increase) and the patient remains asymptomatic, testing can be reduced to once per year.

The Iceland Screens, Treats, or Prevents Multiple Myeloma (iStopMM) study involving 75,422 participants has online resources to predict the chance that a bone marrow biopsy will have greater than 10 percent plasma cells given the isotype, M-protein concentrations, free light chain ratio, and total IgG, IgA and IgM. This could be an important resource for physicians trying to decide if their patient should have a follow up bone marrow evaluation. For more information see https://istopmm.com/riskmodel/

## Reference Values

Only orderable as part of a profile. For more information see QMPSS / Monoclonal Protein Study, Quantitative, Serum.

M-protein Isotype Flag:
Negative
Interpretation:
No monoclonal protein detected.

## Interpretation

Immunoaffinity purification followed by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) is performed to identify the immunoglobulin heavy and light chains.

The assay examines the mass-to-charge distributions of immunoglobulin light chains derived from IgG, IgA, IgM, kappa, and lambda immunopurified from patient serum. Over-expressed immunoglobulins (ie, M-proteins or paraproteins) are detected as distinct peaks in the mass-to-charge distributions. Quantitation is accomplished by calculating the percentage of monoclonal protein in the charge-to-mass distribution and multiplying this by immunoglobulin concentration as measured by immunonephelometry.

## Cautions

Quantitation of IgD, IgE, free kappa, and free lambda cannot be performed by this assay. Free light chain monoclonal proteins should be quantified using FLCS / Immunoglobulin Free Light Chains, Serum. IgD and IgE should be quantified using IGD / Immunoglobulin D (IgD), Serum; or IGE / Immunoglobulin E (IgE), Serum.

## Clinical Reference

1. Rajkumar SV, Kyle RA, Therneau TM, et al. Serum free light chain ratio is an independent risk factor for progression in monoclonal gammopathy of undetermined significance. Blood. 2005;106(3):812-817
2. Katzmann JA, Dispenzieri A, Kyle RA, et al. Elimination of the need for urine studies in the screening algorithm for monoclonal gammopathies by using serum immunofixation and free light chain assays. Mayo Clin Proc. 2006;81(12):1575-1578
3. 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
4. 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

## Performance

### Method Description

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 serum is applied to 5 separate immunoaffinity resins 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 MS. The 5 separate spectra from each specimen immunopurification are overlaid and investigated for an overabundance of immunoglobulin and immunoglobulin light chain. Monoclonal protein peaks are integrated based on the modeled polyclonal background. The quantitative value is determined based on the percent area and nephelometric value of the corresponding immunoglobulin.(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

2 to 4 days

### Specimen Retention Time

14 days

### 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.

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Monoclonal Protein Isotype, Quantitative, Serum

## CPT Code Information

0077U

## LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| QMPTS | Quantitative M-protein Isotype, S | 74773-3 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 620875 | M-protein GK | 74862-4 |
| 620876 | M-protein GL | 74863-2 |
| 620877 | M-protein AK | 74864-0 |
| 620878 | M-protein AL | 74865-7 |
| 620879 | M-protein MK | 74866-5 |
| 620880 | M-protein ML | 74867-3 |
| 620881 | Glycosylation | 104267-0 |
| 620874 | Flag, M-protein Isotype | 94400-9 |
| 621012 | QMPTS Interpretation | 69048-7 |