Test Definition: GMCSF

Granulocyte Monocyte-Colony Stimulating Factor, Plasma

Overview

Useful For

Measuring the concentration of granulocyte macrophage-colony stimulating factor (GM-CSF) in plasma

Understanding the etiology of chronic inflammatory diseases or infections, when used in conjunction with clinical information and other laboratory testing

Research studies in which an assessment of the GM-CSF response is needed

Highlights

This test may be useful in the evaluation and management of certain autoimmune diseases, such as rheumatoid arthritis.

Measurement may also be useful in the evaluation of patients with suspected hereditary or congenital pulmonary alveolar proteinosis or in cancers in which the granulocyte monocyte-colony stimulating factor signaling pathway is implicated.

Method Name

Bead-Based Multiplex Immunoassay

NY State Available

Yes

Specimen

Specimen Type

Plasma EDTA

Ordering Guidance

If this test is ordered with CYPAN / Cytokine Panel, Plasma, this test will be canceled as duplicate and CYPAN performed as ordered.

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube: Lavender top (EDTA)
Submission Container/Tube: Plastic vial
Specimen Volume: 0.5 mL
Collection Instructions:
1. Immediately after specimen collection, place tube on wet ice.

2. Centrifuge at 4 degrees C, 1500 x g for 10 minutes.
3. Aliquot plasma into plastic vial.
4. Freeze specimen within 2 hours of collection.

Specimen Minimum Volume

0.3 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject
Heat-treated specimen	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma EDTA	Frozen	21 days	

Clinical & Interpretive

Clinical Information

Granulocyte macrophage-colony stimulating factor (GM-CSF) was initially characterized as a hematopoietic growth factor, acting on bone marrow progenitor and inducing differentiation and proliferation of myeloid cells.(1) GM-CSF gene-deficient mice, however, displayed no changes in steady state myelopoiesis. In contrast, the predominant phenotype of the GM-CSF knock-out mouse was similar to that of human pulmonary alveolar proteinosis (PAP), a condition which is characterized by an accumulation of pulmonary surfactant.(2) Subsequently, it was observed that approximately 90% of human PAP, referred to as autoimmune PAP, is associated with autoantibodies specific for GM-CSF.(3) Taken together, evidence from mice and humans point to a critical role for GM-CSF in maintenance of proper alveolar macrophage function.

GM-CSF has also been shown to play an important role in the regulation of innate and adaptive immune responses. These observations led to additional studies probing the role of this molecule in chronic inflammatory and autoimmune diseases. One of the first studies in this area demonstrated that patients with severe and moderate rheumatoid arthritis (RA) had plasma GM-CSF concentrations that were significantly elevated compared to healthy controls.(5) In addition, treatment of patients with Felty syndrome and RA with GM-CSF, which was administered in an attempt to increase neutrophil counts, led to exacerbation of the inflammatory arthritis.(6) In a recent study, elevated serum concentrations of GM-CSF were detected in patients with radiographic axial spondyloarthropathy (SpA) compared to controls, and concentrations of this cytokine correlated with disease activity score.(7)

It is now well accepted that GM-CSF plays a role in the pathology of a variety of chronic inflammatory diseases and, as

such, is a viable therapeutic target.(9) There are currently 4 monoclonal antibodies targeting the GM-CSF pathway.(8) One of the first, mavrilimumab, is specific for the alpha-chain of the GM-CSF receptor. Two phase IIb clinical trials in RA showed significant improvements in disease activity compared to placebo without any significant side effects or adverse events. Improvements were rapid (within 2 weeks) and dose dependent. The remaining 3 biologics, otilimab, namilumab, and lenzilumab, target GM-CSF directly. Several phase II clinical trials of namilumab in RA and plaque psoriasis have been completed, and a phase IIa trial in axial spondyloarthropathy is currently recruiting. Otilimab is being evaluated in 2 phase II clinical trials specifically targeting RA patients who have shown poor response to disease-modifying antirheumatic drugs or other treatments. Lenzilumab is currently being evaluated as a novel therapeutic in asthma.

Reference Values

<15.0 pg/mL

Interpretation

Elevated granulocyte macrophage-colony stimulating factor (GM-CSF) concentrations could be consistent with the presence of an inflammatory process or infection.

Cautions

Results from granulocyte macrophage-colony stimulating factor (GM-CSF) testing should not be used to establish or exclude a specific diagnosis.

GM-CSF testing should only be used in conjunction with clinical information and other laboratory testing as part of a patient's overall assessment.

Normal concentration of GM-CSF does not exclude the possibility of infection or other inflammatory condition.

GM-CSF concentrations could be affected by immunomodulatory agents.

GM-CSF is a myelopoietic growth factor with pleiotropic effects; a comprehensive cytokine evaluation, such as CYPAN / Cytokine Panel, Plasma may be more useful in overall disease assessment or pathophysiology.

Clinical Reference

1. Hamilton JA. GM-CSF in inflammation. J Exp Med. 2020;21(1):e20190945
2. Stanley E, Lieschke GJ, Grail D, et al. Granulocyte/macrophage colony-stimulating factor-deficient mice show no major perturbation of hematopoiesis but develop a characteristic pulmonary pathology. Proc Natl Acad Sci USA. 1994;91(12):5592-5596
3. Sakagami T, Uchida K, Suzuk T, et al. Human GM-CSF autoantibodies and reproduction of pulmonary alveolar proteinosis. N Eng J Med. 2009;361(27):2679-2681
4. Wicks IP, Roberts AW. Targeting GM-CSF in inflammatory diseases. Nat Rev Rheumatol. 2016;12(1);37-48
5. Fiehn C, Wermann M, Pezzutto A, Hufner M, Heilig B. Plasma GM-CSF concentrations in rheumatoid arthritis, systemic lupus erythematosus and spondyloarthropathy. Z Rheumatol. 1992;51(3);121-126
6. Hazenberg BP, Van Leeuwen MA, Van Rijswijk MH, Stern AC, Vellenga E. Correction of granulocytopenia in Felty's syndrome by granulocyte-macrophage colony-stimulating factor. Simultaneous induction of interleukin-6 and flare-up of the arthritis. Blood. 1989;74(8);2769-2770
7. Papagoras C, Tsiami S, Chrysanthopoulou A, Mitroulis I, Baraliakos X. Serum granulocyte-macrophage

colony-stimulating factor (GM-CSF) is increased in patients with active radiographic axial spondyloarthritis and persists despite anti-TNF treatment. Arthritis Res Ther. 2022;24(1):195
8. Lee KMC, Achuthan AA, Hamilton JA. GM-CSF: A promising target in inflammation and autoimmunity. Immunotargets Ther. 2020;9:225-240
9. Lazarus HM, Ragsdale CE, Gale RP, Lyman GH. Sargramostim (rhu GM-CSF) as cancer therapy (systematic review) and an immunomodulator. A drug before its time? Front Immunol. 2021;12:706186

Performance

Method Description
Analyte-specific antibodies are precoated onto color-coded magnetic microparticles. Samples are diluted 1:2 in a mixing plate. Then standards, samples, and microparticles are pipetted into wells, and the immobilized antibodies capture the analytes of interest. Unbound substances are washed away while the magnetic microparticles are immobilized. Next, a biotinylated analyte specific antibody cocktail is added to each well. Following a wash to remove any unbound biotinylated antibody, streptavidin-phycoerythrin conjugate (Streptavidin-PE), is added to each well. After removal of unbound Streptavidin-PE and resuspension of the microparticles in buffer, the plate is analyzed using a Luminex FLEXMAP 3D analyzer. A charged-coupled device camera captures an image of each well and data reduction is performed using the XPONENT software.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Wednesday

Report Available
2 to 8 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.

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Granulocyte Monocyte-Colony Stimulating Factor, Plasma

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

83520

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
GMCSF	GM-CSF, P	97054-1

Result ID	Test Result Name	Result LOINC® Value
618775	GM-CSF	97054-1