MAYO CLINIC LABORATORIES

Test Definition: PCAG

Protein C Antigen, Plasma

Overview

Useful For

Differentiating congenital type I protein C deficiency from type II deficiency

Evaluating the significance of decreased functional protein C, especially when decreased protein C activity might be congenital rather than acquired (eg, due to oral anticoagulant effect, vitamin K deficiency, liver disease, or intravascular coagulation and fibrinolysis/disseminated intravascular coagulation)

This test is **not useful** for predicting a thrombotic event.

Special Instructions

- Coagulation Guidelines for Specimen Handling and Processing

Method Name

Enzyme-Linked Immunosorbent Assay (ELISA)

NY State Available

Yes

Specimen

Specimen Type

Plasma Na Cit

Ordering Guidance

Coagulation testing is highly complex, often requiring the performance of multiple assays and correlation with clinical information. For that reason, consider ordering AATHR / Thrombophilia Profile, Plasma and Whole Blood.

Testing of protein C functional activity (CFX / Protein C Activity, Plasma) is recommended for initial laboratory evaluation of patients suspected of having congenital protein C deficiency (personal or family history of thrombotic diathesis).

Necessary Information

If the patient is being treated with warfarin, this should be noted as warfarin will lower protein C.

Specimen Required

Specimen Type: Platelet-poor plasma
Patient Preparation:
Fasting: 8 hours, preferred but not required
Collection Container/Tube: Light-blue top (3.2% sodium citrate)
Submission Container/Tube: 13-mm x 75-mm, 5-mL, plastic vial (polypropylene preferred)

Specimen Volume: 1 mL Plasma
Specimen Stability Information: Frozen 2 years
Collection Instructions:
1. For complete instructions, see Coagulation Guidelines for Specimen Handling and Processing.
2. Centrifuge, transfer all plasma into a plastic vial, and centrifuge plasma again.
3. Aliquot plasma into a plastic vial leaving 0.25 mL in the bottom of centrifuged vial.
4. Immediately freeze plasma (no longer than 4 hours after collection) at -20 degrees C or ideally, at -40 degrees C or below.
Additional Information:
1. A double-centrifuged specimen is critical for accurate results as platelet contamination may cause spurious results.
2. Each coagulation assay requested should have its own vial.

Forms
If not ordering electronically, complete, print, and send a Coagulation Test Request (T753) with the specimen.

Specimen Minimum Volume
Plasma: 0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Na Cit	Frozen		

Clinical & Interpretive

Clinical Information
Protein C is a vitamin K-dependent anticoagulant proenzyme. It is synthesized in the liver and circulates in the plasma. The biological half-life of plasma protein C is approximately 6 to 10 hours, similar to the relatively short half-life of coagulation factor VII.

Protein C is activated by thrombin, in the presence of an endothelial cell cofactor (thrombomodulin), to form the active enzyme, activated protein C (APC). APC functions as an anticoagulant by proteolytically inactivating the activated forms of coagulation factors V and VIII (factors Va and VIIIa). APC also enhances fibrinolysis by inactivating plasminogen activator inhibitor type 1 (PAI-1).

Expression of the anticoagulant activity of APC is enhanced by a cofactor, protein S, another vitamin K-dependent plasma protein.

Congenital homozygous protein C deficiency results in severe thrombotic diathesis, evident in the neonatal period and resembling purpura fulminans.

Congenital heterozygous protein C deficiency may predispose the patient to thrombotic events, primarily venous thromboembolism. Arterial thrombosis (stroke, myocardial infarction, etc) may occur. Some individuals with hereditary heterozygous protein C deficiency may have no personal or family history of thrombosis and may or may not be at increased risk.

The 2 types of hereditary heterozygous protein C deficiencies that are recognized are:
-Type I (concordantly decreased protein C function and antigen)
-Type II (decreased protein C function with normal antigen)

Acquired deficiency of protein C may occur in association with:
-Vitamin K deficiency
-Oral anticoagulation with warfarin compounds
-Liver disease
-Intravascular coagulation and fibrinolysis/disseminated intravascular coagulation

Reference Values

Adults: 72%-160%
Normal, full-term newborn infants or healthy premature infants may have decreased levels of protein C antigen (15%-50%), which may not reach adult levels until later in childhood or early adolescence.*
*See Pediatric Hemostasis References section in Coagulation Guidelines for Specimen Handling and Processing.

Interpretation

Values less than 70% to 75% may represent a congenital deficiency state, if acquired deficiencies can be excluded.

Protein C antigen and activities generally are undetectable in individuals with severe, homozygous protein C deficiency.

Acquired protein C deficiency is of uncertain clinical hemostatic significance.

The clinical significance of increased protein C is unknown.

Cautions

No significant cautionary statements

Clinical Reference

1. Mannucci PM, Owen WG. Basic and clinical aspects of proteins C and S. In: Bloom AL, Thomas DP, eds. Haemostasis and Thrombosis. 2nd ed. Edinburgh, Churchill Livingstone; 1987:452-464
2. Marlar RA, Mastovich S. Hereditary protein C deficiency: a review of the genetics, clinical presentation, diagnosis and treatment. Blood Coagul Fibrinolysis. 1990;1(3):319-330
3. Marlar RA, Montgomery RR, Broekmans AW. Diagnosis and treatment of homozygous protein C deficiency. Report of the Working Party on Homozygous Protein C Deficiency of the Subcommittee on Protein C and Protein S, International Committee on Thrombosis and Haemeostasis. J Pediatr. 1989;114(4 Pt 1):528-534
4. Miletrich J, Sherman L, Broze G Jr. Absence of thrombosis in subjects with heterozygous protein C deficiency. N Engl J Med. 1987;317(16):991-996

5. Cooper PC, Pavlova A, Moore GW, Hickey KP, Marlar RA. Recommendations for clinical laboratory testing for protein C deficiency, for the subcommittee on plasma coagulation inhibitors of the ISTH. J Thromb Haemost. 2020;18(2):271-277

Performance

Method Description
Protein C antigen is quantitated by enzyme-linked immunoassay using monospecific antibody. The assay is performed using the REAADS PCAg kit on a Janus G3 integrated system, which includes a BioTek microplate reader.(Package insert: REAADS Protein C Antigen Test Kit. Corgenix, Inc; 09/2023)

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
3 to 7 days

Specimen Retention Time
7 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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 has been modified from the manufacturer's instructions. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
85302

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value

PCAG	Protein C Ag, P	27820-0

Result ID	Test Result Name	Result LOINC® Value
9127	Protein C Ag, P	27820-0