MAYO CLINIC LABORATORIES

Test Definition: S_FX

Protein S Activity, P

Overview

Useful For

Second-order testing for diagnosis of congenital or acquired protein S deficiency for example, as an adjunct to initial testing based on results of protein S antigen assay (free protein S antigen, with or without total protein S antigen assay)
Evaluating patients with a history of venous thromboembolism

Special Instructions

- Coagulation Guidelines for Specimen Handling and Processing

Method Name

Optical Clot-Based

NY State Available

Yes

Specimen

Specimen Type

Plasma Na Cit

Specimen Required

See Coagulation Guidelines for Specimen Handling and Processing in Special Instructions.

Patient Preparation: Patient must not be receiving Coumadin.

Specimen Type: Platelet-poor plasma

Collection Container/Tube: Light-blue top (3.2% sodium citrate)

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions:

1. Centrifuge, transfer all plasma into a plastic vial, and centrifuge plasma again.
2. Aliquot plasma into a plastic vial leaving 0.25 mL in the bottom of centrifuged vial.
3. Freeze specimen immediately (no longer than 4 hours after collection) at < or =-40 degrees C, if possible.

Additional Information:

1. 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.

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

Specimen Minimum Volume

0.5 mL

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Na Cit	Frozen (preferred)	14 days	

Clinical & Interpretive

Clinical Information

Types of Heterozygous Protein S Deficiency	Type	Protein S Antigen, Free
Protein S Antigen, Total	Protein Activity	I
Decreased	Decreased	Decreased
II	Normal	Normal
Decreased	III	Decreased

Reference Values

Males: 65-160%

Females

<50 years: 50-160%

> or =50 years: 65-160%

Newborn infants have normal or near-normal free protein S antigen (> or =50%), although total protein S antigen is usually below the adult reference range. There are insufficient data concerning protein S activity in normal neonates, infants, and children; but normal or near-normal activity (> or =50%) probably is present by age 3 to 6 months.

Interpretation

In type I and type III congenital deficiency, free protein S antigen is decreased and protein S functional activity is similarly decreased. In type II congenital (dysfunctional) protein S deficiency, total and free protein S antigen levels are normal but functional activity is decreased.

Patients with acquired free protein S deficiency associated with inflammation-related increase of C4b-binding protein (C4b-BP) typically have decreased free protein S antigen (and protein S activity) and normal (or elevated) total protein S antigen. Acquired protein S deficiency is of uncertain clinical hemostatic significance and is associated with a variety of conditions.

Elevated protein S levels are of uncertain clinical significance.

Cautions

Direct acting oral anticoagulants (eg, direct thrombin inhibitors: DTI, such as dabigatran [Pradaxa], argatroban [Acova], bivalirudin [Angiomax]) and direct factor Xa inhibitors (eg, rivaroxaban [Xarelto], apixaban [Eliquis], edoxaban [Savaysa]) may cause the protein S activity to appear spuriously normal (or elevated), when protein S activity is truly decreased (or normal). Clinical correlation is suggested, and in the absence of anticoagulation therapy, consider repeating the protein S activity and antigen assay.

Coumadin therapy may result in decreased protein S activity (and free protein S antigen).

Acute or chronic inflammation can result in decreased protein S activity (and free protein S antigen).

Interpret protein S activity results with caution when any of the above patient conditions are present.

Protein S antigen assay (free protein S antigen, with concomitant or reflexive total protein S antigen assay), rather than protein S activity (functional) assay, is recommended as the initial testing approach for detecting congenital protein S deficiency, because of the greater variety of patient conditions that can interfere with the accuracy of functional testing as compared to antigen testing.
In general, it is preferable not to test for protein S deficiency during acute illness, pregnancy, or postpartum. Elective testing for protein S deficiency should be delayed for at least 30 days after cessation of warfarin therapy.

Clinical Reference

1. Borgel D, Gandrille S, Aiach M: Protein S deficiency. Thromb Haemost 1997 July;78(1):351-356
2. Faioni EM: Protein S activity. In Laboratory Techniques in Thrombosis-A Manual. Second edition. Kluwer Academic Publishers, Boston, MA, 1999, pp 153-161
3. De Stefano V, Finazzi G, Mannucci PM: Inherited thrombophilia: pathogenesis, clinical syndromes, and management. Blood 1996 May 1;87(9):3531-3544
4. Zoller B, Garcia de Frutos P, Dahlback B: Evaluation of the relationship between protein S and C4b-binding protein isoforms in hereditary protein S deficiency demonstrating type I and type III deficiencies to be phenotypic variants of the same genetic disease. Blood 1995 June 15;85(12):3524-3531
5. Grandrille S, Borgel D, Ireland H, et al: Protein S deficiency: a database of mutations. For the Plasma Coagulation Inhibitors Subcommittee of the Scientific and Standardization Committee of the International Society on Thrombosis and Haemostasis. Thromb Haemost 1997 June;77(6):1201-1214
6. Goodwin AJ, Rosendaal FR, Kottke-Marchant K, Bovill EG: A review of the technical, diagnostic, and epidemiologic considerations for protein S assays. Arch Pathol Lab Med 2002 November;126(11):1349-1366
7. Yohe S, Olson J: Thrombophilia: Assays and Interpretation. In Laboratory Hematology Practice. Edited by K Kottke-Marchant. Wiley Blackwell Publishing 2012;38:492-508

Performance

Method Description

The functional activity of free protein S is performed on the instrumentation laboratory ACL TOP. It is determined by measuring the degree of prolongation of a prothrombin time in the presence of the recombinant human tissue factor, phospholipids, calcium ions, and activated protein C. The protein S activity is correlated with the prolongation of the clotting time of protein S deficient plasma to which diluted sample has been added. The clotting time is directly proportional to the amount of functional protein S in the patientâ€™s plasma and can be quantified using a standard curve.(Package insert: HemosIL Protein S Activity. Instrumentation Laboratory Company, Bedford, MA, Rev 08/2012)

PDF Report

No

Specimen Retention Time

7 days

Performing Laboratory Location

Rochester

Fees & Codes

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

85306