MAYO CLINIC LABORATORIES

Test Definition: PTTP

Prothrombin Time, Plasma

Overview

Useful For

Screening assay to detect deficiencies of one or more coagulation factors (factors I, II, V, VII, X)

Screening assay to detect coagulation inhibition

Monitoring intensity of oral anticoagulant therapy when combined with INR reporting

Method Name

Coagulometric (Turbidimetric)

NY State Available

Yes

Specimen

Specimen Type

Plasma Na Cit

Specimen Required

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. For complete instructions see Coagulation Guidelines for Specimen Handling and Processing
2. Centrifuge, remove plasma, and centrifuge plasma again.
3. Aliquot plasma into plastic vial leaving 0.25 mL in the bottom of centrifuged vial.
Additional Information: Double-centrifuged specimen is critical for accurate results as platelet contamination may cause spurious results.

Specimen Minimum Volume

0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Na Cit	Frozen (preferred)	30 days	
	Ambient	24 hours	

Clinical & Interpretive

Clinical Information

Prothrombin is a plasma protein with a molecular weight of 68,700 Da. It is an unstable protein that can split easily into smaller compounds, one of which is thrombin. Prothrombin is formed continually by the liver, and it is continually being used throughout the body for blood clotting. If the liver fails to produce prothrombin, in a day or so the prothrombin concentration in the plasma falls to levels too low to provide normal blood coagulation. Vitamin K is required by the liver for normal activation of prothrombin as well as other clotting factors. Therefore, either lack of vitamin K or the presence of liver disease that prevents normal prothrombin formation can decrease the prothrombin concentration so low that a bleeding tendency results.

Prothrombin time (PT) is used as a screening test to detect a deficiency of one or more of the clotting factors of the extrinsic coagulation system (I, II, V, VII, or X) due to a hereditary or acquired deficiency, liver disease, vitamin K deficiency, or presence of inhibitors. Inhibitors include specific coagulation factor inhibitors, Lupus-like anticoagulant inhibitors (eg, antiphospholipid antibodies), and nonspecific prothrombin time inhibitors (eg, monoclonal immunoglobulins, elevated fibrin degradation products). Mixing studies with normal plasma are useful in initial evaluation of prolonged PT when the cause is unknown (eg, not attributable to known oral anticoagulation or known coagulation factor deficiency). One of the following tests may be appropriate, depending on the clinical picture:
-ALUPP / Lupus Anticoagulant Profile, Plasma
-AATHR / Thrombophilia Profile, Plasma and Whole Blood
-ALBLD / Bleeding Diathesis Profile, Limited, Plasma
-APROL / Prolonged Clot Time Profile, Plasma

PT results produced by different assays may vary significantly as there are differences in activity of the tissue factor and the instrument used to perform the test. Tissue factor is isolated from a variety of sources by assay manufacturers, and different batches may have different activity. Calculation of the international normalized ratio (INR) addresses this problem by normalizing the PT result. For this reason, INR is used to monitor oral anticoagulant therapy (warfarin or Coumadin).

Warfarin inhibits the enzyme vitamin K epoxide reductase complex 1 (VKORC1), which is responsible for converting vitamin K to its active, reduced form. By inhibiting VKORC1, warfarin decreases the available active form of vitamin K in the tissues. Thus, when warfarin is given to a patient, the amounts of active prothrombin and factors VII, IX, and X, all formed by the liver degrade and are replaced by inactive factors. Although the coagulation factors continue to be produced, they have greatly decreased coagulant activity.

Bleeding is the primary adverse reaction associated with warfarin use, and warfarin is among the top 10 drugs with the largest number of serious adverse events reported to the FDA. For these reasons, monitoring therapy closely and adjusting dose accordingly is critical.

The international sensitivity index (ISI) is an experimentally derived measurement, usually provided by the thromboplastin manufacturer, reflecting thromboplastin (and PT) sensitivity to coagulation deficiencies. More sensitive thromboplastins have a low ISI (1.0-1.2), whereas less sensitive thromboplastins have a higher ISI (eg, 2.0-3.0).
Calculation of the INR is as follows:
INR=(Patient's PT/mean PT of reference range) ISI where:
-INR=international normalized ratio
-ISI=international sensitivity index

Reference Values

PROTHROMBIN TIME:
9.4-12.5 seconds

INTERNATIONAL NORMALIZED RATIO (INR):
0.9-1.1

Standard intensity warfarin therapeutic range: 2.0-3.0
High intensity warfarin therapeutic range: 2.5-3.5

Interpretation

Prothrombin time (PT) may be prolonged due to deficiencies of factors X, VII, V, and II of the extrinsic pathway, presence of inhibitors, or oral anticoagulation therapy.

INR therapeutic ranges for orally administered drugs:
-Standard-intensity warfarin therapeutic range: 2.0 to 3.0
-High-intensity warfarin therapeutic range: 2.5 to 3.5
Note: The INR should only be used for patients on stable oral anticoagulant therapy, though it is reported for all patients despite whether they are receiving oral anticoagulants.

Cautions

Prothrombin time (PT) is not useful for detecting deficiencies of coagulation factors that have no influence on the prothrombin time test (eg, factors VIII, IX, XI, XII, XIII).

The activity of coagulation factor V (labile factor) typically may be 10% to 20% lower in frozen-thawed plasma specimens than in fresh specimens, even under optimum conditions of processing and transportation, or may be even lower if these conditions are suboptimal, and may lead to a falsely prolonged PT.

In patients receiving heparin, PT is prolonged when heparin concentrations are above 1.0 IU/mL. Internal studies demonstrate plasma from subjects not taking warfarin have shown prolongation of approximately 10% (1-2 seconds) at heparin concentrations near 1.3 IU/mL. At concentrations between 1.5 and 2.0 IU/mL, prolongation of approximately 35% (3-5 seconds) was observed.

Clinical Reference

1. Hall JE: Hemostasis and blood coagulation. In: Guyton and Hall Textbook of Medical Physiology. 14th ed. Elsevier Sanders; 2021:447-488
2. Shin J, Kayser SR: Pharmacology of Vitamin K Antagonists. Fang MC, ed. Inpatient Anticoagulation. John

Wiley-Blackwell; 2011:25-31
3. Clinical and Laboratory Standards institute (CLSI): One-stage Prothrombin Time (PT) Test and Activated Partial Thromboplastin (APTT) Test. 2nd ed. CLSI document H47-A2, CLSI; 2008

Performance

Method Description

Coagulometric (turbidimetric) clot detection is based on the principle that light passing through a medium in which fibrinogen is converted to fibrin is absorbed by the fibrin strands. Light at 671 nm is transmitted through a sample onto a photodetector, which is positioned 180 degrees to the source. Light absorption increases as fibrin clot formation progresses. Consequently, light transmittance through the sample continuously decreases and is measured by the photodetector. The corresponding electrical signal output from the photodetector changes according to the detected light. The signal output is processed via software through a series of algorithms to determine the clot point.

In the prothrombin time (PT) test, the addition of the tissue thromboplastin (RecombiPlasTin 2G reagent) to the patient plasma in the presence of calcium ions initiates the activation of the extrinsic pathway. This results ultimately in the conversion of fibrinogen to fibrin, with formation of a solid gel. The time required for clot formation is measured. The thromboplastin reagent included in the RecombiPlasTin 2G kit, after reconstitution with the RecombiPlasTin 2G Diluent, is a liposomal preparation that contains human recombinant tissue factor (RTF) relipidated in a synthetic phospholipid blend and combined with calcium chloride, buffer, and a preservative.(Package insert: HemosIL RecombiPlasTin 2G. IL ACL TOP Operator's Manual. Instrument Laboratory; R10, 03/2019)

This PT test is performed with a sensitive thromboplastin (ISI 1.0 +/- 0.05), containing phospholipid and recombinant human tissue factor.

PDF Report

No

Day(s) Performed

Monday through Sunday

Report Available

Same day/1 day

Specimen Retention Time

1 day

Performing Laboratory Location

Rochester

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 cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information

85610

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PTTP	Prothrombin Time, P	34528-0

Result ID	Test Result Name	Result LOINC® Value
PTTTP	Prothrombin Time, P	5902-2
INRTP	INR	6301-6