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: Spin down, remove plasma and spin plasma again

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

<table>
<thead>
<tr>
<th>Gross hemolysis</th>
<th>Reject</th>
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<tbody>
<tr>
<td>Gross lipemia</td>
<td>OK</td>
</tr>
<tr>
<td>Gross icterus</td>
<td>OK</td>
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Specimen Stability Information

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
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<tbody>
<tr>
<td>Plasma Na Cit</td>
<td>Frozen (preferred)</td>
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</table>
Clinical and Interpretive

Clinical Information

Prothrombin is a plasma protein with a molecular weight of 68,700. 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 prothrombin concentration in the plasma falls 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.

The 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:

- LUPPR / Lupus Anticoagulant Profile
- THRMP / Thrombophilia Profile
- BDIAL / Bleeding Diathesis Profile, Limited
- PROCT / Prolonged Clot Time Profile

The 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 (VKOR c1), responsible for converting vitamin K to its active, reduced form. By inhibiting VKOR c1, 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 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:

\[ \text{INR} = \frac{\text{Patient's PT}}{\text{mean PT of reference range}} \times \text{ISI} \]

- 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**


**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 Operatorâ€™s Manual)

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) and Time(s) Test Performed**

Monday through Sunday; Continuously

**Analytic Time**

Same day/1 day

**Maximum Laboratory Time**

Same day/1 day

**Performing Laboratory Location**

Rochester

**Fees and 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 Regional Manager. For assistance, contact Customer Service.
Test Definition: PTTP
Prothrombin Time, P

This test has been cleared or approved by the U.S. 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

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<td>PTTP</td>
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