

Partial Thromboplastin Time

INTENDED USE

VITROCELIN reagent is intended for the the determination of partial thromboplastin (aPTT) using ellagic acid as an activator.



METHOD

VITROCELIN reagent. Single, liquid, ready for use reagent.

CLINICAL SIGNIFICANCE

The arrest of bleeding depends upon primary platelet plug formed along with the formation of a stable fibrin clot. Formation of this clot involves the sequential interaction of a series of plasma proteins in a highly ordered and complex manner and also the interaction of these complexes with blood platelets and materials released from the tissues.

Activated Partial Thromboplastin Time is prolonged by a deficiency of coagulation factors of the intrinsic pathway of the human coagulation mechanism such as factor XII, XI, IX, VIII, X, V, II and Fibrinogen.

Determination of APTT helps in estimating abnormality in most of the clotting factors of the intrinsic pathway including congenital deficiency of factor VIII, IX, XI and XII and is also a sensitive procedure for generating heparin response curves for monitoring heparin therapy.

ASSAY PRINCIPLE

Cephaloplastin activates the coagulation factors of the intrinsic pathway of the coagulation mechanism in the presence of calcium ions. APTT is prolonged by a deficiency of one or more of these clotting factors of the intrinsic pathway and in the presence of coagulation inhibitors like heparin.

REAGENTS

Vitro APTT reagent is a liquid ready to use activated cephaloplastin reagent for the determination of Activated Partial Thromboplastin Time. It is a phospholipid preparation derived from rabbit brain with ellagic acid as an activator.

Each batch of the reagent undergoes rigorous quality control at various stages of manufacture for its sensitivity and performance.

REAGENT STORAGE AND STABILITY

1. Store the reagent at 2-8°C. **DO NOT FREEZE.**
2. The shelf life of the reagent is as per the expiry date mentioned on the reagent vial label. The uncontaminated reagent is stable for:

| | |
|-----------|-----------|
| 18 months | 2 – 8°C |
| 1 week | 18 – 25°C |
| 2 days | 37°C |

SPECIMEN

No special preparation of the patient is required prior to sample collection by approved techniques. Withdraw blood without undue venous stasis and without frothing into a plastic syringe fitted with a short needle of 19 to 20 SWG. The venipuncture must be a 'clean' one and, if there is any difficulty, take a new syringe and needle and try another vein. Transfer the blood into tubes, after detaching the needle from the syringe.

Mix exactly nine parts of freshly collected blood with one part of tri-sodium citrate (0.11 mol/l, 3.2%). Centrifuge immediately for 15 minutes at 3000 rpm (approximately 2000 g) and transfer the plasma into a clean test tube. **Plasma must be tested within three hours of blood collection.** For heparin determination, platelet deficient plasma should be used, hence higher centrifugation time is required.

FNP COLLECTION

Prepare a fresh normal plasma pool (FNP) of freshly collected blood from at least five normal healthy donors and process as above. Plasma must be tested within three hours of blood collection.

PROCEDURE

1. Before use, the reagent should be mixed well by gentle swirling. Do not shake.
2. Aspirate from the reagent vial enough reagent for the immediate testing requirement in a thoroughly clean and dry test tube. Bring this reagent to room temperature before prewarming at 37°C for testing purposes.
3. Separate test tubes containing Vitro APTT reagent and Vitro Calcium Chloride Solution should be brought to 37°C. (Depending on volume, approximately 5 to 10 minutes required). Do not incubate the test plasma.

4. To a 12 x 75 mm test tube, add 0.1 ml test plasma and 0.1 ml Vitro APTT. Shake tube briefly to mix the reagent and plasma; place tube at 37°C for 3 to 5 minutes.
5. Following incubation period, add forcibly 0.1 ml prewarmed calcium chloride into the plasma and Vitro APTT mixture; simultaneously start a stopwatch. Shake tube briefly to mix contents, keep at 37°C for 20 seconds.
6. Following 20 seconds incubation, remove the tube; gently tilt back and forth until a gel clot forms; stop the watch; record time.
7. Repeat steps 2-4 for a duplicate test using the same test plasma.
8. Find the average from the duplicate test values. This is the Activated Partial Thromboplastin Time (APTT of patient plasma).
9. Similarly repeat steps 2-4 twice, and record duplicate values using FNP in place of test plasma (APTT of FNP).

Calibration Curve Method (For determination of heparin concentration):

Dilute heparin (as used for treatment) with physiological saline to a concentration of 10 U/ml.

Mix 0.2 ml of 10 U/ml diluted heparin with 1.8 ml of FNP to give a heparin standard of 1 U/ml concentration.

Dilute the heparin standard as prepared above (1U/ml) with FNP as follows:

| Test tube no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Heparin standard (1 U/ml) in ml | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.1 | - |
| FNP in ml | - | 0.1 | 0.2 | 0.3 | 0.4 | 0.9 | 0.5 |
| Heparin Concentration (U/ml) | 1.0 | 0.8 | 0.6 | 0.4 | 0.2 | 0.1 | 0.0 |

1. Pipette 0.1 ml each of the seven heparin dilutions into clean test tubes.
2. Add 0.1 ml Vitro APTT reagent to each test tube.
3. Mix well and incubate each test tube at 37°C for exactly 3 minutes before testing.
4. **Forcibly** add 0.1 ml calcium chloride (prewarmed at 37°C) to each test tube, one by one and simultaneously start the stop watch.
5. Gently tilt the tube back and forth and stop the stopwatch as the first fibrin strand is visible and the gel / clot formation begins. Record the time in seconds.
6. Repeat steps 4-8 for each dilution for duplicate test, and find the average of the duplicate test values.
7. Plot the mean of the double determination in 'seconds', against each heparin concentration using Vitro APTT graph paper.



- Clotting times (APTT) of test specimens can be interpolated against the heparin concentration to determine the heparin concentration of the sample in U/ml.

CALCULATION

Manual Method

- The result may be reported directly in terms of the mean of the double determination of the APTT of the test plasma.

OR

- as a ratio R as follows:

$$R = \frac{\text{APTT of patient plasma (in seconds)}}{\text{APTT of FNP (in seconds)}}$$

Calibration Curve Method

Heparin concentration in the test sample can be directly obtained from the Vitro APTT calibration curve by interpolating the test plasma clotting time against the heparin concentration in U/ml.

EXPECTED VALUES

Normal values using Vitro APTT reagent are between 22-34 seconds at 3 minutes activation time. Between manual and Turbo densitometric instrument results a variation of 1-2 seconds may be expected. For photo optical instruments, it is recommended that each laboratory must establish their own normal range.

PERFORMANCE

Precision:

| Control | Within Run | | Between Day | |
|-------------------|------------|----------|-------------|----------|
| | Level I | Level II | Level I | Level II |
| Number of samples | 20 | 20 | 20 | 20 |
| Mean (Sec.) | 34 | 62 | 35 | 60 |
| SD (Sec.) | 0.32 | 0.46 | 1.02 | 2.65 |
| CV (%) | 0.9 | 0.7 | 2.9 | 4.4 |

Comparison with commercially available reagent (same method): 191 plasmas located between 21 sec and 59 sec were tested:
 $y = 0.8749x + 2.5946$ $r = 0.9316$

INTERFERING SUBSTANCES

- Turbidity** No interference up to 0,543 abs
Bilirubin Positive interference from 143 µmol/L
Hemoglobin No interference up to 261 µmol/L

WARNINGS & PRECAUTIONS

- Due to inter and intra laboratory variations users must establish their own normal population range as well as normal and abnormal range.
- It is recommended that controls with known factor activity should be run simultaneously with each test series routinely.
- Incorrect mixture of blood and tri-sodium citrate, insufficient pre-warming of plasma and reagent, contaminated reagents, glassware etc. are potential source of errors.
- Incorrect dilution of heparin is also a potential source of error.
- Oxalated plasma may induce prolonged clotting times.
- Clotting time of patients on anticoagulant therapy depends upon the type and dosage of anticoagulant and also the time lag between the specimen collected and the last dose.
- Abnormalities of coagulation factor VII, factor XIII and platelets are not detected by this test procedure.
- For automated equipment it is strongly recommended that the equipment manufacturer's methodology be strictly adhered to.

- In heparin monitoring time of collection of blood sample is important since the *in-vivo* half-life of heparin is approximately 1.5 hours. When it is administered intravenously it has an immediate anti-coagulant effect but its efficacy decreases rapidly with time.
- Platelet factor IV, a heparin-neutralizing factor can be released due to platelet aggregation or damage. In order to prevent this phenomenon *in-vitro* the specimen should be collected with a minimum of trauma.
- Decrease in APTT time is observed in males under estrogen therapy and oral contraceptive administration in females.

BIBLIOGRAPHY

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- Hoffmann, J.J.M.L. and Neulendijk P.N.: Thrombos. Haemosta. (Stuttgart) 39, 640 (1978).
- CRC, Handbook Series in Clinical Laboratory, Science, Section 1: Haematology, Volume III, 1980. CRC Press, Inc. Boca Raton, Florida.

SYMBOL DECLARATION

| | |
|---|------------------------------------|
|  | Manufacturer |
|  | Consult instructions for use |
|  | Batch code (Lot #) |
|  | Catalog number |
|  | Temperature limitation |
|  | In vitro diagnostic medical device |
|  | Use by |
|  | Caution. Consult instructions |
|  | Keep away from light |

ORDERING INFORMATION

| REF | SIZE |
|-------|-----------|
| 30301 | 1 X 4 ml |
| 30302 | 8 x 2 ml |
| 30303 | 5 x 3 ml |
| 30304 | 4 x 5 ml |
| 30305 | 5 X 4 ml |
| 30306 | 10 X 4 ml |

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