The Effect of Different Sample Types on Coagulation Laboratory Tests

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Most coagulation tests require proper collection of blood into 0.109 M (3.2%) tri-sodium citrate (9:1 parts blood to anticoagulant) to prepare platelet poor plasma. It is often difficult for laboratories to recognize samples that were collected in the wrong anticoagulant, unless unusual test findings raise suspicions. We studied the impact of improper sample collections on a variety of coagulation tests.

Methods: Samples from 3 healthy volunteers were simultaneously collected into vacutainers containing 3.2% buffered sodium citrate, potassium EDTA or no anticoagulant. Samples were centrifuged by the procedure to prepare "platelet poor plasma" (<10 x 10^9platelets/L) and stored at –70°C until analyzed "blinded" in assays for coagulation parameters and calcium.

Results: The citrate plasma samples had results within reference intervals (RI) for all coagulation tests. Serum samples were not coagulable due to fibrinogen depletion, and showed normal to reduced factor V and VIII, and artifactually low levels of: factor II, antithrombin, protein C, plasminogen, alpha-2-plasmin inhibitor and invalid results in LA tests. However, serum results were within RI for protein S, activated protein C resistance, cardiolipin antibodies, plasminogen, alpha-2-plasmin inhibitor, and von Willebrand factor. EDTA plasma samples had a prolonged PT and APTT, artifactually low factor V and VIII:C with "inhibitor activity detected", however, the results for LA were negative and all other coagulation parameters were within RI, including thrombin clotting times and fibrinogen. Citrated plasma and serum had total calcium levels within RI, whereas EDTA plasma contained <0.05 mmol/L.

Conclusions: The findings of this study may help laboratories detect improperly collected samples, which can be difficult when screening tests of coagulation are not done. An improper collection should be considered when interpreting some findings, such as combined factor V and VIII deficiency. Calcium determinations may help exclude artifactual findings due to sample collection into EDTA.