Effects of resting temperature and sodium citrate on dynamic viscoelastic coagulometry in New Zealand white rabbits.

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BACKGROUND

• European rabbits (Oryctolagus cuniculus) are useful for coagulation studies due to their size, cost, and reactions to hemorrhage and thrombotic agents.²

• Viscoelastic coagulation tests, such as dynamic viscoelastic coagulometry (DVC, Sonoclot®), have shown promise in revealing a more accurate representation of coagulation status by including cellular components absent in plasma-based tests.¹

• It is standard practice with DVC to allow citrated samples to rest for thirty-minutes at room temperature before analysis.

• A previous study indicates that hypothermic rabbits are hypocoagulable, indicating temperature dependence in DVC.³

• A previous study indicates that citrated blood is hypercoagulable relative to fresh whole blood.⁴

OBJECTIVES

• To determine if temperature during a thirty minute rest period influences the results of DVC analysis

• To determine if citrate affects the results of DVC analysis as compared to fresh whole blood

METHODS

• Blood samples were collected from eighteen New Zealand white rabbits via the jugular vein.

• Blood was partitioned into 3 groups and randomly allocated to different Sonoclot® channels in glass bead activated cuvettes (gbACT+) to be analyzed:
  • Fresh whole blood immediately analyzed in Sonoclot®
  • Blood that was anticoagulated with sodium citrate and kept at room temperature for 30 minutes before recalcification with CaCl₂ and analysis in Sonoclot®
  • Blood that was anticoagulated with sodium citrate and kept at 37°C for 30 minutes before recalcification with CaCl₂ and analysis in Sonoclot®

• Results were compared between groups using a Wilcoxon Two Sample Test.

RESULTS

Fig. 2: Activated Clotting Time (ACT) was longer in room temperature blood as compared to 37°C blood (228.22 vs. 202.00 sec., P<.015).

ACT was longer in room temperature blood as compared to fresh whole blood (228.22 vs. 91.06 sec., P<.0001).

ACT was longer in 37°C blood as compared to room temperature blood (202.00 vs. 91.06, P=.0001).

Fig. 3: Clot Rate (CR) was lower in room temperature blood as compared to 37°C blood (15.8 vs. 22.1 U/min., P=.015).

CR was higher in fresh whole blood as compared to room temperature blood (28.58 vs. 15.09 U/min., P=.041).

CR was not statistically different between fresh whole and 37°C blood (28.58 vs. 22.10 U/min., P=.447).

Fig. 4: Platelet Function (PF) did not statistically differ between room temp and 37°C blood (3.8 vs. 4.1, P=.35).

PF was lower in fresh whole blood as compared to room temperature blood (1.60 vs. 3.83, P<.0001).

PF was lower in fresh whole blood as compared to 37°C blood (1.60 vs. 4.14, P=.0001).

CONCLUSIONS

• These results indicate that rest-time temperature is a pre-analytical factor that should be considered with DVC analysis. Further studies are needed to determine ideal temperatures.

• As would be expected for a system composed of cells and enzymes that normally function at body temperature, room temperature blood was relatively hypocoagulable when compared to 37°C blood as evidenced by significantly longer ACT and lower CR.

• With regards to PF in fresh vs citrated blood, these results are harmonious with a previous study done in humans indicating that citrated blood is hypercoagulable with PF being higher in both citrated samples relative to fresh whole blood irrespective of temperature.⁵ With regards to CR, however, temperature proved to possibly be the more influential factor. The fresh whole blood had a lower CR than 37°C room temperature blood but was not statistically different from the 37°C citrated blood. Like the study in humans, ACT results were shorter in fresh blood samples, indicating that recalcification might not have been optimum.

REFERENCES


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Fig. 1: A 2 channel Sonoclot® instrument

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