Thrombinator™ System in Veterinary Use for Autologous Thrombin Production

Arthrex Research and Development

Background

Thrombin is an enzyme that plays a large role in hemostasis and wound healing through platelet activation and fibrin clot formation. Autologous thrombin serum produced using the Thrombinator system (Arthrex, Naples, FL), an FDA-cleared device, eliminates the use of ethanol and the potential immunologic response associated with allogeneic and xenogenic thrombin products. Autologous treatments have been translated into the veterinary field, making it necessary to understand how devices that produce these products work in different species.

Methods

Equine and canine whole blood (WB) was obtained from a commercial vendor (Lampire Biological Laboratories). All blood (n=3 donors/species) was anticoagulated with ACD-A and processed 24-48 hours after draw time due to shipping restrictions.

For each donor, two Arthrex ACP® double syringes were filled with 15 mL WB and centrifuged using a hard-spin regimen (3200 rpm x 10 min, Hettich Rotofix 32A) to produce platelet-poor plasma (PPP). To produce thrombin serum, 4 mL recalcified autologous fluid (WB or PPP) was added to the Thrombinator system. After a clot formed, a second 8 mL aliquot of recalcified autologous fluid was added to initiate a second clot. After 1 minute, the autologous thrombin serum was extracted from the device through a filter. Coagulation time for each thrombin product was measured using a hemostasis analyzer to determine thrombin activity (Stago STart® 4).

Results

Consistent with human findings, WB in the Thrombinator system yielded higher levels of thrombin activity in the output than respective PPP fractions. WB-derived thrombin from equine and canine had concentrations of 14.4 ± 3.8 U/mL and 7.0 ± 1.8 U/mL, and PPP-derived thrombin from equine and canine had concentrations of 4.6 ± 1.4 U/mL and 4.6 ± 1.3 U/mL, respectively (Figure 1).

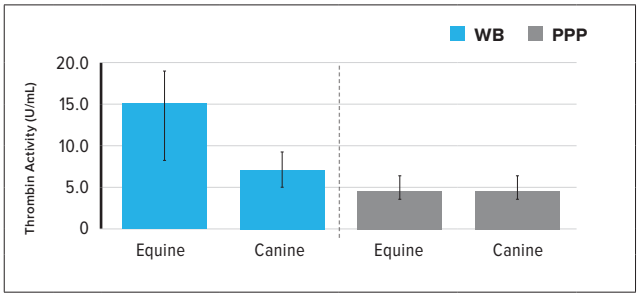

Figure 1. Comparison of thrombin activity in equine and canine for WB and PPP (n=3).

Overall procedure times were 221.0 ± 1.0 min and 14.3 ± 2.1 min when using equine and canine WB. Using PPP extended the procedure time to 32.7 ± 1.5 min and 16.0 ± 0.0 min.

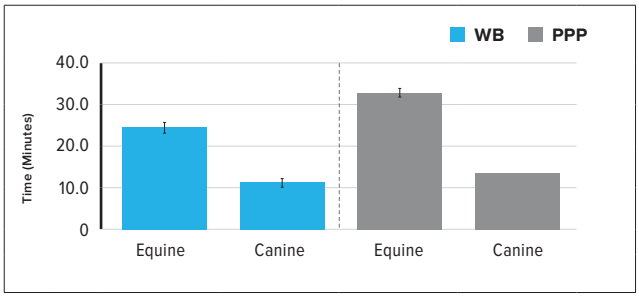

Figure 2. Comparison of procedure time in equine and canine for WB and PPP (n=3).

Canine produced higher serum volumes at 7.7 ± 1.2 and 7.8 ± 0.3 mL from WB and PPP, respectively, compared to 5.8 ± 1.0 mL and 4.5 ± 1.3 mL from equine.

Conclusion

Autologous thrombin serum can be produced from equine and canine WB and PPP in the Thrombinator system. One limitation of this study was the age of the blood samples due to shipping restrictions that may have impacted thrombin production and procedure time. Even with aged blood samples, it is concluded that autologous thrombin serum can be prepared from equine and canine species using the Thrombinator system.

Reference
Arthrex, Inc. Data on file (APT 03864). Naples; FL; 2022.

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