Comparison of Equine IRAP ProEAS™ Device, IRAP II, and Pro-Stride Using Equine-Specific ELISAs

Arthrex Research and Development

Introduction

Patients with osteoarthritis (OA) have an imbalance of cytokines in the joint, causing inflammation, joint pain, and cartilage destruction. The new Arthrex IRAP ProEAS device stimulates whole blood to produce interleukin-1 receptor antagonist (IL-1ra), an anti-inflammatory cytokine. Serum containing a high amount of IL-1ra extracted from the device can be used for treatment of OA to reduce the inflammation and damage that may otherwise occur. The Arthrex IRAP ProEAS device was tested alongside the Arthrex IRAP II device and Zimmer Biomet Pro-Stride APS device to determine which device produced a treatment with the greatest IL-1ra concentration.

Methods and Materials

Whole blood was drawn by a veterinarian at Naples Therapeutic Riding Center from 7 horses 12-23 years of age (18.3 ± 4.3 years of age). Immediately after being drawn, 50 mL of non-anticoagulated blood was injected into an IRAP ProEAS device and an IRAP II device. Devices were processed as instructed by the manufacturer by incubating for 24 hours at 37°C and centrifuging the device at 4000 rpm for 10 minutes to acquire the serum. Anticoagulated blood (13.3% ACDA) was used in the Zimmer Biomet Pro-Stride APS device. The device was processed as instructed by the manufacturer to prepare platelet-rich plasma (3200 rpm for 15 minutes). It was then concentrated (2000 rpm for 2 minutes) and the final product was collected. Volumes of all products were recorded and aliquots were frozen at -80°C until an equine IL-1ra ELISA could be performed (R&D Systems). Calculated IL-1ra concentrations were compared among devices using a repeated measure ANOVA and post-hoc Tukey test (α=0.05).

Figure 1. Average volume of fluid extracted from all devices

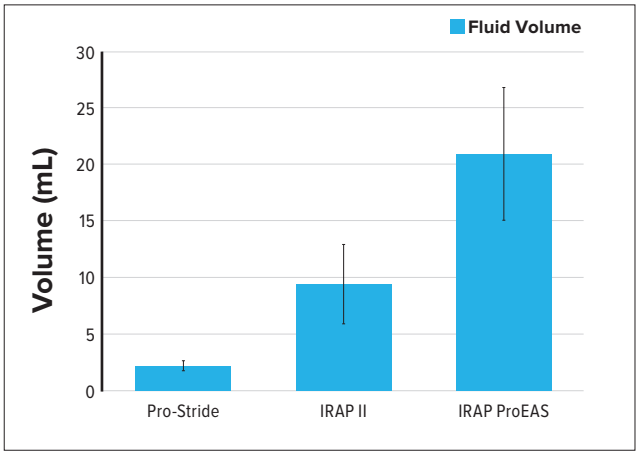


Figure 2. Average IL-1ra concentration in fluid extracted from all devices

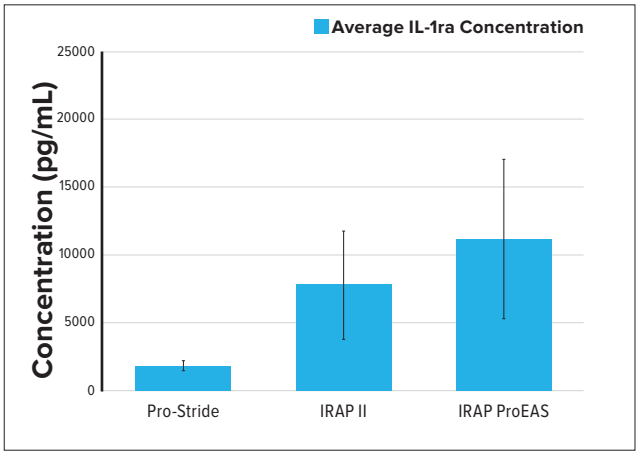
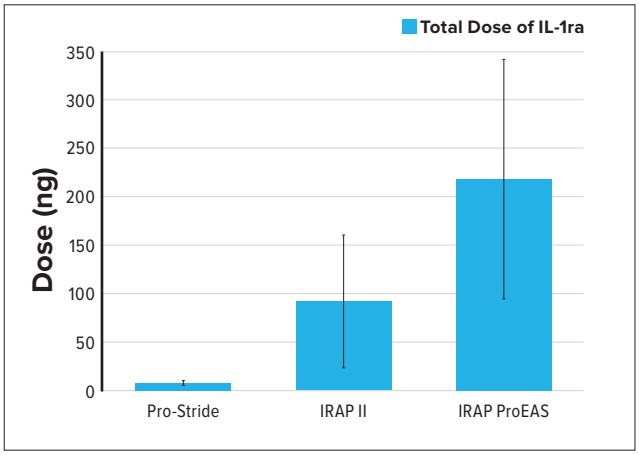


Figure 3. Total dose of IL-1ra in fluid extracted from all devices



Results

Devices produced different volumes of product ($P < .001$, Figure 1). The IRAP ProEAS device produced an average of 21.1 ± 7.0 mL of serum, which was significantly greater than the volume of treatment produced by the other devices. The IRAP II device produced 9.79 ± 4.23 ($P < .001$) and the Pro-Stride device only produced an average of 2.2 ± 0.3 mL ($P < .001$).

In addition, IL-1ra concentration varied among devices tested ($P = .007$, Figure 2). The IL-1ra concentration in the serum from the IRAP ProEAS device was significantly greater than the IL-1ra concentration of the product from the Pro-Stride device ($P = .006$) and not different from the serum from the IRAP II device ($P = .516$). The IRAP ProEAS device produced serum containing 10,900 ± 8700 pg/mL of IL-1ra, while the IRAP II device produced serum with 8200 ± 5200 ng/mL of IL-1ra and the Pro-Stride product contained 1600 ± 200 ng/mL of IL-1ra.

The total dose of IL-1ra was also evaluated and was determined by multiplying the concentration by the volume of product (Figure 3). The dose produced by the IRAP ProEAS device was significantly greater than the dose produced by the IRAP II device ($P = .01$). The dose of the IRAP ProEAS device was also significantly greater than the dose produced by the Pro-Stride device ($P = .015$).

Conclusion

In conclusion, the IRAP ProEAS device performed significantly better than the IRAP II and Pro-Stride devices, producing more output serum, a greater IL-1ra concentration, and a higher total IL-1ra dose.

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