ACP Max™ System: Platelet-Rich Plasma (PRP) Characterization via Cellular Analysis

Arthrex Orthobiologics

Background

The ACP Max system uses a double-spin technique to create PRP with an increased concentration of platelets. Platelets release growth factors that play a critical role in tissue healing.[1] PRP produced using the ACP Max system is depleted of red blood cells and granulocytes, including neutrophils, which are associated with inflammation.[2] Variable volumes of whole blood (WB) can be processed in the ACP Max device, which holds up to 90 mL. To assess PRP produced from the ACP Max system at different processing volumes, multiple studies were performed using WB volumes of 30 mL, 60 mL, and 90 mL.

Methods

For each of the 30 mL, 60 mL, and 90 mL processing volumes, a licensed phlebotomist collected WB from healthy donors into syringes preloaded with 4 mL, 8 mL, or 12 mL of ACD-A, respectively (Salus IRB #1082). A total of six donors were analyzed for 30 mL and 60 mL processing volumes each (n=6) and 18 donors were analyzed for 90 mL volumes (n=18). ACP Max devices were filled with corresponding processing volumes, all containing a final ACD-A concentration of 13% (v/v). A baseline complete blood cell count (CBC), with white blood cell differential, was measured using the WB/ACD-A sample from each device (Sysmex XE-5000). Devices were centrifuged and processed per the ACP Max system directions for use (Table 1). After PRP was collected from each device, product volume was recorded and each PRP sample was analyzed using CBC.

Concentrations of platelets (PLTs), white blood cells (WBCs) including neutrophils (NEs), and red blood cells (RBCs) were measured via CBC analysis. The fold change (Fold ×) of PRP cell counts, relative to baseline, was calculated using the following equation: (concentration in PRP)/(concentration in WB).

Results

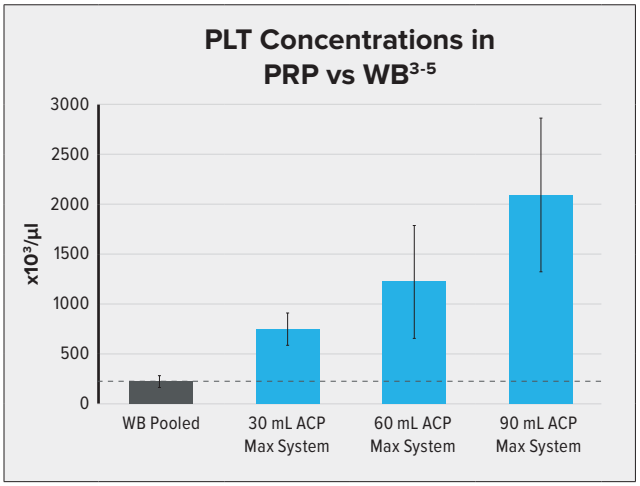
Table 1. ACP Max system processing methods for 30 mL, 60 mL, and 90 mL WB volumes

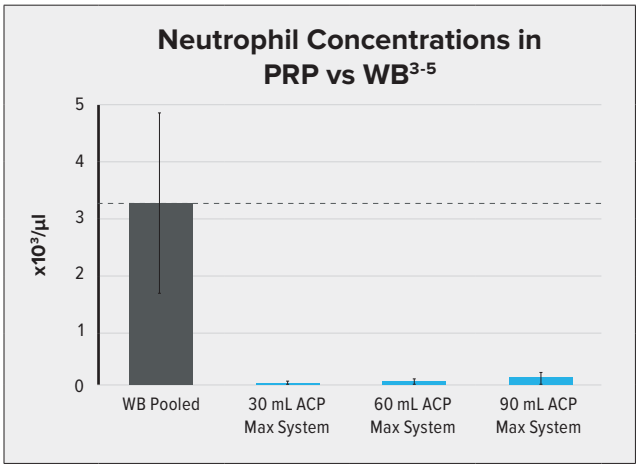
WB Processing Volume	Spin Regimes		Centrifuge
	1st spin	2nd spin	
30 mL	3200 rpm × 3 min	1500 rpm × 5 min	Hettich Rotofix 32A
60 mL	3200 rpm × 6 min		
90 mL	3200 rpm × 9 min		

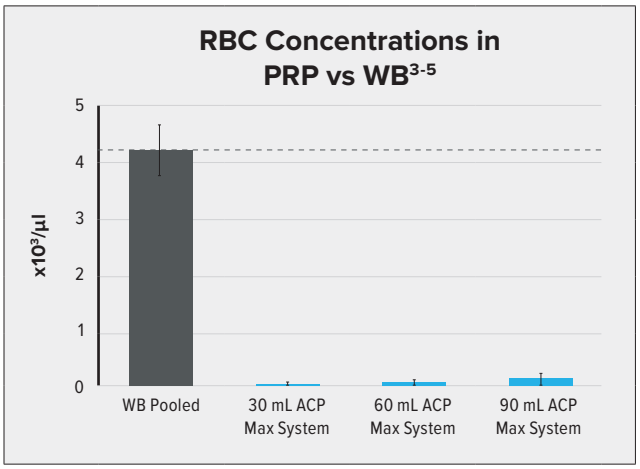
Table 2. Comparison of PLT, WBC, NE, and RBC fold change and product volumes, with standard deviation, between ACP Max system processing volumes

Sample Size	Processing Volume	Fold ×				PRP Volume (mL)
		PLT	WBC	NE	RBC	
n=6	30 mL	3.3 ± 0.3	0.1 ± 0.1	0.01 ± 0.01	0.01 ± 0.01	5.3 ± 1.3
n=6	60 mL	7.1 ± 1.9	0.5 ± 0.6	0.01 ± 0.02	0.02 ± 0.01	5.8 ± 2.1
n=18	90 mL	11.6 ± 2.6	1.0 ± 1.3	0.03 ± 0.04	0.05 ± 0.02	4.5 ± 0.8

Figure 1. Average PLT, NE, and RBC concentrations in PRP compared to WB baseline, with standard deviation, for each processing volume







Conclusion

Compiled data from multiple studies shows that the ACP Max™ system produces an average of 5 mL PRP, containing approximately 3×, 7×, and 12× platelet concentrations over baseline for 30 mL, 60 mL, and 90 mL processing volumes of WB, respectively (Table 2). These results also conclude that PRP produced from the ACP Max system is depleted of RBCs and NEs (Figure 1), resulting in a 95% to 99% reduction in RBCs and a 97% to 99% reduction of NEs, depending on processing volume. Overall, the ACP Max system can produce PRP with up to 12× concentration of platelets over baseline, while depleting inflammatory cells.

References

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