NORMAL PLATELET FUNCTION IN PLATELET CONCENTRATES REQUIRES NON-PLATELET CELLS: A COMPARATIVE IN VITRO EVALUATION OF LEUCOCYTE-RICH (TYPE 1A) AND LEUCOCYTE-POOR (TYPE 3B) PLATELET CONCENTRATES

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ABSTRACT
Background: Therapeutic success of platelet-rich plasma (PRP) may vary based on the composition and preparation method. The objective of this study was to evaluate the cellular components of platelet concentrates produced by a leucocyte-rich (LR-PRP) and a leucocyte-poor PRP systems (LP-PRP).

Methods: Parameters evaluated included platelet recovery, platelet concentration, red blood cell (RBC) and white blood cell (WBC) composition, platelet growth factor release and stimulation of human tendon cell proliferation in vitro.

Results: Platelet recoveries were 52% for LP-PRP and 89% for LR-PRP. LR-PRP demonstrated greater reproducibility with a 4.2% coefficient of variation (CV) compared with 19.4% for LP-PRP (p<0.001). LR-PRP demonstrated a greater increase in platelet concentration (7.9-fold) than LP-PRP (2.2-fold; p<0.001). LP-PRP showed 5.0-fold reductions in WBCs, while LR-PRP showed a 4.0-fold increase (p<0.001). LP-PRP reduced RBCs to a haematocrit of 0.25, while LR-PRP reduced haematocrit to 11.8.

LP-PRP did not coagulate robustly on reactivation with CaCl2, and released significantly lower levels of epidermal growth factor (EGF) and transforming growth factor β1 (TGF-β1) than whole blood (p<0.03). LP-PRP also did not stimulate tendon cell proliferation greater than whole blood. In contrast, LR-PRP showed increases in each growth factor on activation with CaCl2 (p<0.01) and stimulated greater proliferation (p<0.05) compared with whole blood. Forced activation of LP-PRP with exogenous thrombin rescued the coagulation deficiency and induced greater growth factor release than comparable whole blood (p<0.03).

Conclusions: These data suggest that non-platelet cellular components in platelet concentrates are important for proper platelet function, including thrombin generation, growth factor release and clot retraction.