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INFLUENCE OF RED CELL REJUVENATION, BEYOND ELIMINATION OF STORAGE LESIONS WITH CELL WASHING, ON POST-RED CELL TRANSFUSION-RELATED ACUTE LUNG INJURY
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Objectives: In a swine model of transfusion-related acute lung injury (TRALI), washing old red blood cells (RBCs) ameliorates TRALI but not pulmonary hypertension or platelet dysfunction. The objectives were to assess whether rejuvenation of RBCs affords advantage beyond washing.

Methods: Thirty six pigs were quasi-randomized to sham, transfusion of 1-day-old RBCs, transfusion of 14-day-old stored RBCs (D14 Tx), transfusion of washed, 14-day-old stored RBCs, and transfusion of washed, 14-day-old stored RBCs but treated with Rejuvesol. All pigs were anaesthetized, invasively monitored, post-intervention recovered, re-evaluated at 24 h for TRALI, platelet reactivity and coagulation. Groups were analysed using ANOVA with Bonferroni adjustment. The effect sizes are reported as mean difference (MD), (95% confidence intervals (CI)).

Results: In vitro, Rejuvesol augmented red cell adenosine triphosphate, MD 2.4 (CI 0.5, 3.8) \( P<0.0001 \) and diphosphoglycerate, MD 2.9 (CI 1.8, 4.6) \( P<0.0001 \). In vivo, Rejuvesol pre-treatment mitigated the thrombocytopenic response seen with D14 Tx both post-intervention and at 24 h, MD -101 (-197, -5.5) \( P=0.031 \), and MD -117 (-229, -0.5) \( P=0.035 \) respectively. Compared to the washed D14 Tx group, a significant decrease in pulmonary vascular resistance index was seen against D14 Tx group at post-intervention with Rejuvesol treatment, MD -182 (-11.5, -354) \( P=0.030 \). Platelet aggregometry demonstrated that Rejuvesol did not have any effect on platelet activation, MD -94 (CI 168, -357) \( P=1.0 \).

Conclusions: In this translational model of TRALI, red cell rejuvenation imparts biochemical and clinical advantages beyond cell washing. Red cell rejuvenation in combination with washing of supernatant may hold the key to reducing the clinical risks of stored blood transfusion.