**L Smart 1; C Boyd 2; M Claus 2; E Bosio 1; G Hosgood 2; A Raisis 2**

1Harry Perkins Institute of Medical Research, Centre for Clinical Research in Emergency Medicine, Perth, Australia, 2Murdoch University, Comparative Health Research Group, Murdoch, Australia

**Introduction:**
Rapid administration of crystalloid or colloid fluids may cause endothelial glycocalyx shedding, thereby increasing inflammation.

**Methods:**
Greyhounds under general anesthesia subject to hemorrhage for 60 minutes were given 20 mL kg\(^{-1}\) of either fresh whole blood (FWB), hydroxyethyl starch (HES) 130/0.4, 4% succinylated gelatin (GELO), or 80 mL kg\(^{-1}\) of isotonic crystalloid (CRYST) over 20 minutes (n=6 per group). Plasma biomarkers hyaluronan, interleukin (IL) 6, 8, 10, tumor necrosis factor-alpha, monocyte chemoattractant protein-1, keratinocyte chemokine-like (KC)) and atrial natriuretic peptide were measured at baseline, end of hemorrhage (Shock), end of fluid bolus (T20), and then 40 (T60), 100 (T120) and 160 (T180) minutes later. Cardiovascular parameters were also measured at above time points. Biomarker change from baseline (fold-change), indexed to hemoglobin, was compared between groups using mixed effects models (Bonferroni-Holm corrected P<0.05).

**Results:**
Minor differences in measures of shock between groups after fluid administration resolved by T120. CRYST showed increased fold-change in hyaluronan compared to other groups at T20 (FWB P=0.019, HES P<0.001, GELO P<0.001), T60 (FWB P<0.001) and T120 (FWB P<0.001) (Figure 1). GELO had increased fold-change in hyaluronan compared to other groups at T20 (HES P<0.001, GELO P=0.002), T60 (FWB P<0.001) and T120 (FWB P<0.001, CRYST P=0.006), as did FWB at T20 (HES P=0.008).

CRYST showed increased fold-change in IL10 compared to other groups at T20 (HES P<0.001, GELO P=0.002), T60 (HES P=0.001, GELO P=0.005), T120 (HES and GELO P<0.001) and T180 (HES and GELO P<0.001) (Figure 2), of IL8 at T60 (GELO P=0.006), and of KC at Shock (FWB P=0.002, GELO P=0.007), T20 (FWB P=0.009, GELO P=0.007), and T120 (GELO P=0.002).

**Conclusion:**
Rapid large-volume crystalloid given for hemorrhagic shock was associated with increased hyaluronan, a biomarker of endothelial glycocalyx damage, and inflammation, including increased IL10, IL8 and KC.

**Image 1:**
Figure 1. Plasma hyaluronan (geometric mean fold-change, 95% confidence interval) in dogs (n=6 per group) with hemorrhagic shock given 20 mL kg\(^{-1}\) of either fresh whole blood (FWB), hydroxyethyl starch 130/0.4 (HES), 4% succinylated gelatine (GELO) or 80 mL kg\(^{-1}\) of balanced isotonic crystalloid (CRYST). Data represents fold-change in biomarker concentration from baseline. Grey line (fold-change of 1.0) represents no change from baseline.

Image 2:

Figure 2. Plasma interleukin-10 (geometric mean fold-change, 95% confidence interval) in dogs (n=6 per group) with hemorrhagic shock given 20 mL kg\(^{-1}\) of either fresh whole blood (FWB), hydroxyethyl starch 130/0.4 (HES), 4% succinylated gelatine (GELO) or 80 mL kg\(^{-1}\) of balanced isotonic crystalloid (CRYST). Data represents fold-change in biomarker concentration from baseline. Grey line (fold-change of 1.0) represents no change from baseline.