



Is blood volume really higher in preterm neonates?

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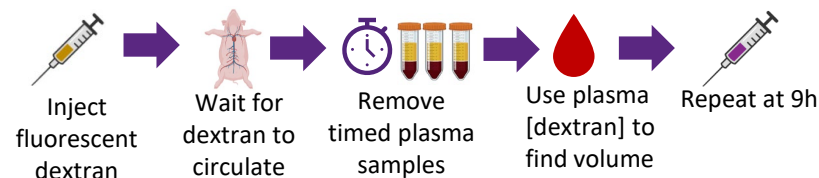
Background:

Managing cardiovascular instability in preterm infants requires an understanding of blood volume changes after birth. Clinical guidelines estimate blood volume to be higher in preterm than term infants. But recent studies report similar average volumes with high variability in preterm infants. We propose that multiple factors may be driving fluid loss from the circulation resulting in hypovolemia. Low preterm plasma protein concentrations may limit the oncotic pressure gradient across the capillary that opposes fluid loss.

Aim: Determine ① blood volume at birth in preterm and term piglets, ② how volume changes over 9 hours after birth, and ③ the relationship with plasma protein concentration.

Methods:

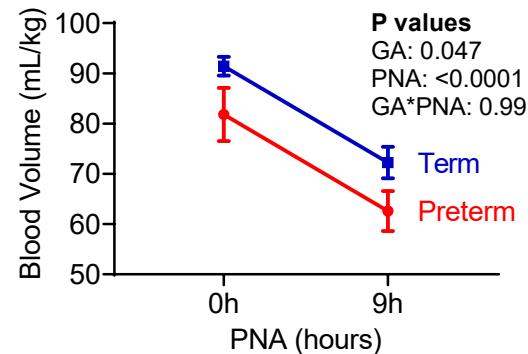
At 0h and 9h old, blood volume (new fluorescent dextran tracer method) and plasma protein concentration (iDexx pathology) were measured in preterm (97/115d) and term piglets (n=16).



Results:

- ① Blood volume per kg of body weight was significantly lower in preterm than term piglets at 0h and 9h old (Fig 1).
- ② There was a significant decrease in both preterm (25±11%) and term (19±16%) piglets by 9h old (Fig 1). Preterm piglets had highly variable blood volume at 9h old (range: 36-83 mL/kg).

Fig 1: Change in blood volume over the 9h after birth in preterm and term piglets.



- ③ Term piglets had a greater decrease in plasma protein concentration than preterm piglets over the 9h after birth (Fig 2A). Preterm plasma protein concentration at 0h was positively correlated with the % change in blood volume over the 9h after birth (Fig 2B).

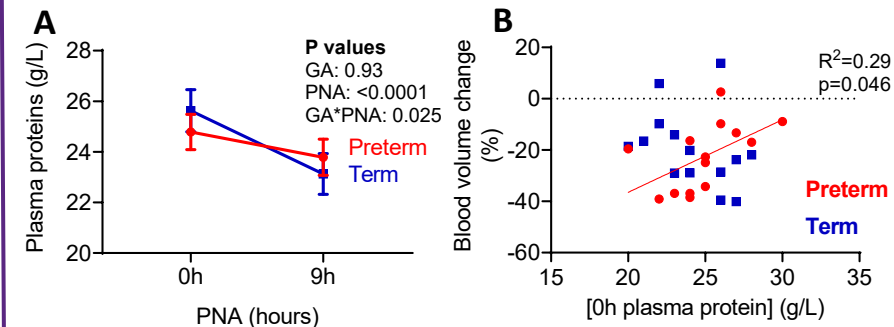


Fig 2: A) Change in plasma protein concentrations over the 9h after birth in preterm and term piglets. B) Relationship between plasma protein concentrations at birth and the change in blood volume.

Conclusion: In contrast to clinical guidelines, blood volume is lower in preterm than term piglets. There is a substantial drop in blood volume after birth regardless of gestational age. Preterm piglets with lower plasma protein concentration were more vulnerable to a low blood volume.