



Comparison of Different Resuscitation Fluids (Hydroxocobalamin vs. Whole Blood vs. Lactated Ringers) Over Time In Volume-Controlled And Uncontrolled Hemorrhage Models In Swine (*Sus scrofa*)

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Background

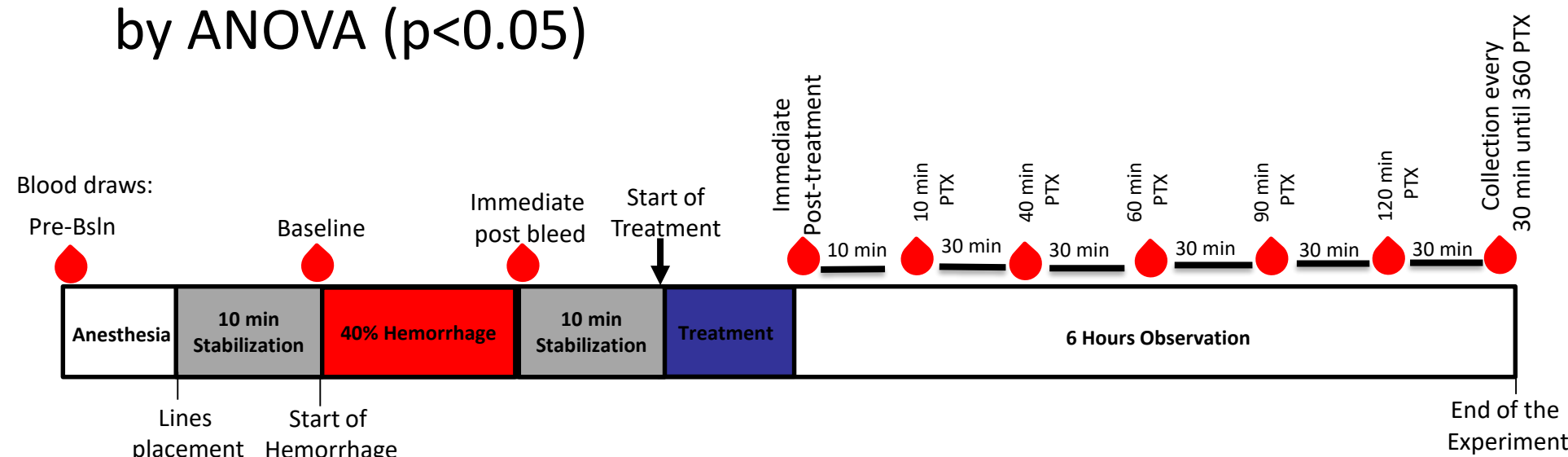
- Traumatic hemorrhage is the leading cause of preventable death in civilian and military environments
- Blood components are frequently unavailable in the prehospital setting due to increased costs and lack of resources, training and viable portable refrigeration
- Hydroxocobalamin (HOC), a synthetic form of vitamin B12, works as an antidote for cyanide toxicity and increases blood pressure via nitric oxide scavenging

Objectives

1. Evaluate whether the administration of HOC following hemorrhagic shock can improve hemodynamic parameters
2. Determine whether those effects are comparable to whole blood (WB) and lactated ringers (LR)

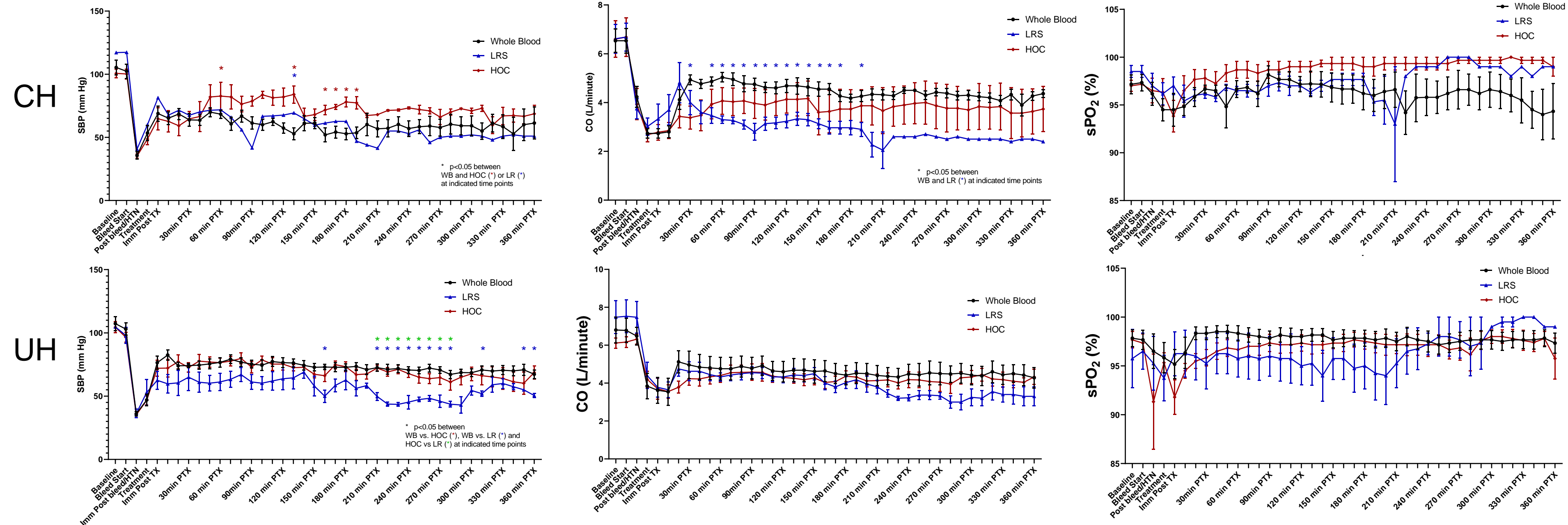
Methods

- Thirty-six swine (*Sus scrofa*) weighing 65kg – 85kg used in 40% total blood volume hemorrhage
 - 18 controlled hemorrhage (CH)
 - 18 uncontrolled hemorrhage (UH)
- Randomized treatment: 500mL WB, LR or HOC
- Animals were monitored for six hours after treatment
- Hemodynamic parameters, blood gas analysis and chemistries were collected throughout the duration of the experiment
- Data reported as \pm SEM, statistical analysis performed by ANOVA ($p < 0.05$)



Results

Hemodynamic parameters



Arterial Blood Gas analysis parameters

	Controlled Hemorrhage (CH)			Uncontrolled Hemorrhage (UH)		
Parameter	WB	LR	HOC	WB	LR	HOC
Lactate	4.9 \pm 0.4	4.3 \pm 0.6	4.2 \pm 0.2	2.1 \pm 0.1	4.9 \pm 0.4	3.9 \pm 0.2
K ⁺	5.2 \pm 0.2	4.9 \pm 0.2	5.1 \pm 0.1	4.4 \pm 0.1	5.3 \pm 0.3	4.7 \pm 0.1
O ₂	100 \pm 1.4	103 \pm 3.2	112 \pm 1.4	108 \pm 1.1	98 \pm 2.2	102 \pm 1.4
CO ₂	34 \pm 0.8	36 \pm 0.6	35 \pm 0.3	35 \pm 0.4	35 \pm 0.4	34 \pm 0.2
Ca ²⁺	1.18 \pm 0.02	1.23 \pm 0.01	1.27 \pm 0.01	1.2 \pm 0.01	1.2 \pm 0.01	1.2 \pm 0.01

- Swine averaged a blood loss of 41% \pm 0.02 for CH vs. 33% \pm 0.07 for UH
- During both uncontrolled hemorrhage (UH) and controlled hemorrhage (CH), HOC groups maintained a higher systolic blood pressure (SBP), cardiac output (CO), SPO₂ and vascular resistance (SVR) that was comparable to WB and above LR levels.

Conclusions

HOC administration resulted in improved hemodynamic parameters, and similar Ca²⁺ levels compared to LR and were equivalent to WB in both controlled and uncontrolled hemorrhage. HOC may be a viable alternative when WB is not available.

Limitations

- Animal model
- n=36

Acknowledgements

- 59th Medical Wing (MDW)
- Clinical Investigations Research Support (CIRS)