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Resuscitation Science Symposium

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Abstract 292: Surviving 60% Blood Loss Using 7.5% NaCl With Adenosine, Lidocaine and Magnesium (ALM) in the Rat Model of Battlefield Hemorrhagic Shock

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Soldiers with catastrophic blood loss often die on the battlefield before they can be evacuated. In an effort to translate the protective effects of AdenocaineTM (adenosine, lidocaine and Mg²⁺) (ALM) from cardiac surgery to resuscitation science, we examined the early hypotensive resuscitative effects of 7.5% NaCl with ALM following near lethal blood loss of 60% in the rat model.

Methods: Male Sprague–Dawley rats (250–350g, n=32) were anesthetized and randomly assigned to one of four groups: 1) Untreated, 2) 7.5% NaCl, 3) 7.5% NaCl/6% Dextran–70 (RescueFlow[®]), 4) 7.5% NaCl/ALM. Shock was induced by removing ~60% blood (volume controlled) over 50 min and maintaining the MAP between 30 to 40 mmHg. Animals were left in shock at 34°C for an additional 30 min. Total shock time was ~80 min. 0.3 ml bolus was injected into the femoral vein and hemodynamics monitored for 60 min (Phase 1). Shed blood was replaced and function monitored for another 60 min (Phase 2). Lead II ECG, arterial pressures, MAP, heart rate (HR) and rate–pressure product (RPP) were monitored.

Results: Mortality (%) for Untreated, 7.5% NaCl, 7.5% NaCl/6% Dextran–70, and 7.5% NaCl ALM groups were 100%, 75%, 87.5% and 0% respectively. Times to death after bolus injection were 9±3, 19±4 and 45±12 min respectively. The MAP of survivors at the end of Phase 1 was 24±3 (n=2), 26±0.1 (n=3) and 40±2 mmHg (P<0.05) (n=8) respectively. After blood was returned, the MAP at 60 min for the three treatment groups was 67±5 (n=2), 47 (n=1) and 69±5 mmHg (n=8) respectively. All rats, except the 7.5% NaCl ALM group, were profoundly proarrhythmic; Dextran doubled the arrhythmias compared with 7.5% NaCl alone. No severe arrhythmias occurred in ALM group in Phase 1 or 2, and 60 min after return of shed blood HR, MAP and RPP were 96%, 75% and 83% of their pre–shock values.

Conclusions: Ultra–small (<1 ml/kg) IV bolus of 7.5% NaCl with ALM led to 100% survival with no arrhythmias in Phase 1 following 60% blood loss. Compared to untreated animals, 7.5% NaCl and the Dextran group delayed time to death by a factor of 2 and 5 respectively. Only one rat receiving 7.5% NaCl/6% Dextran–70 survived and it was profoundly proarrhythmic. Further work is required to test if 7.5% NaCl ALM, with its low cube/high resuscitation capability, has field applications.

Author Disclosures: **H.L. Letson:** None. **G.P. Dobson:** Ownership Interest; Significant; Equity position in Hibernation Therapeutics. Consultant/Advisory Board; Significant; Consultant for Hibernation Therapeutics. Other; Significant; Sole inventor on nine (9) patents on AdenocaineTM.

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