Comparing Hyperhydration Resulting From The Ingestion Of Glycerol, Carbohydrate And Saline Solutions
Sharon E. Griffin, Farzaneh Ghiasvand, Ann Gibson, Julia Orri, Steve Burns and Robert A. Robergs. Center For Exercise and Applied Human Physiology, University of New Mexico, Albuquerque, NM, 87131.

Introduction: Glycerol and water ingestion can induce a significant increase in hydration (hyperhydration) compared to water or low concentration saline solutions (2,3). Results also indicate that high concentration saline solutions (60-100 mEq/L) improve hydration compared to water (4). Research is needed that compares previously recommended solutions for improving hydration so that an “optimal” regimen can be recommended.

Methods: Eight subjects completed six trials in a Latin Squares design. Pre-trial controls included no exercise (> 30 min) in the previous 24 hrs, no caffeine or other diuretics in the previous 48 hrs, the ingestion of 40 mL/kg of liquid/24 hrs for the preceding two days, and a standardized liquid breakfast the morning of the trial (2 hrs before trial). Each trial required subjects to complete a 5 hr protocol as detailed in Table 1. Statistics: A two-way ANOVA with repeated measures was used to examine differences between each of relative body weight change ([sample (kg) – baseline (kg)/baseline (kg)]x100), urine volume (mL), and plasma osmolality (mOsmol/kg). Significant differences between means were identified using Tukey’s post-hoc HSD test. Statistical significance was set at 0.05, with an estimated power >0.8 for a relative body weight mean difference of 0.39% and a SD = ±0.3%. Results: Peak hydration occurred at 2.5 hrs for trials B, C, D and E, at 1.5 hrs for trial A, and at 1.0 hrs for trial F (Figure 1). Peak hydration was similar for trials B and D, and trials A and F induced similar hydration but were less than trials B, C, and D. Trials C and E produced similar moderate hydration. At 5 hrs, trials B, C, D and E provided for a similar sustained hydration. Trials A and F produced a significant dehydration at this time compared to trials B, C, D and E. Urine volumes mirrored a reciprocal of the data for body weight change. Plasma osmolalities were no different at any time between trials A, E and F. Plasma osmolality significantly increased over time in trials B, C, and D, reaching peaks of 298±5 (3.0 Hrs, C), 300±6 (1.5 Hrs, D) and 317±11 (3.5 Hrs, B) mOsmol/kg, respectively. Discussion: Gatorade was no better than distilled water for improving hydration. Greatest hyperhydration occurred with glycerol ingestion, and there was no added benefit by ingesting a glycerol solution after an initial bolus of 1.5 g/kg. The electrolyte solution improved hydration more than water or Gatorade, but was not similar to any glycerol regimen. The ingestion of 1.5 g/kg of glycerol will improve hydration beyond that provided by equal volumes of Gatorade, an electrolyte solution, or water. References: 1. Gisolfi CV and SM Duchman. Med. Sci. Sports Exerc. 24(6):679-687, 1992. 2. Freund BJ et al. J. Appl. Physiol. 79(6):2069-2077, 1995. 3. Riedesel ML et al. J. Appl. Physiol. 63(6):2262-2268, 1987. 4. Maughan RJ et al. Eur. J. Appl. Physiol. 69:209-215, 1994