Effects of dose Timing on Fluid Excretion During Sodium-Aided Hyperhydration Protocols

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ABSTRACT

Co-consumption of sodium and water has been shown to be superior in promoting hyperhydration compared to consumption of an equal amount of water alone. Most sodium-aided hyperhydration studies have provided subjects with a bolus of fluid followed by a urine collection period. However the effect of providing equal amounts of fluid in a single vs. multiple doses over time on fluid retention has not been systematically studied. **PURPOSE**: To compare the effects of different dosing strategies on urine excretion levels following the consumption of consistent amounts of sodium and water. **METHODS**: Urine excretion was measured during five separate 2-hr hyperhydration protocols in 13 well hydrated male subjects (23 ± 3 yr, 176.1 ± 10.1 cm, 82.2 ± 19.4 kg) who were free from known renal, digestive, and cardiovascular disease. Each protocol began with a complete bladder void and assessment of urine specific gravity (USG). Subjects then consumed 20 mL $H_2O \cdot kg\ bm^{-1}$ and 110 mg $NaCl \cdot kg\ bm^{-1}$ in five different dosing strategies: the entire dose was consumed at the beginning of the period (1X), ½ of the dose was consumed at the beginning and ½ consumed after 60 min (2X), and 1/3 of the dose was consumed at the beginning and 1/3 was consumed after 45 and 90 min (3X), ¼ of the dose was consumed at the beginning and after 30, 60, and 90 min (4X), and 1/7 of the dose was consumed at the beginning and after 15, 30, 45, 60, 75, 90 min (7X). Protocols were administered in a randomized, crossover fashion. Total urine excretions (TUE) during the 2 hr collection periods were expressed as a percent of the H_2O consumed. USG and TUE were compared using repeated-measures ANOVA and Sidak *post hoc* analyses. **RESULTS**: USGs were 1.006 ± 0.004 (1X), 1.007 ± 0.003 (2X), 1.009 ± 0.005 (3X). 1.007 ± 0.004 (4X), and 1.007 ± 0.005 (7X) ($P = 0.37 – 1.00$) indicating that subjects were well and similarly hydrated for each trial. TUE expressed as a percentage of H_2O consumed were 75 ± 18% (1X), 69 ± 11% (2X), 52% ± 15% (3X), 59 ± 15% (4X), and 60 ± 16% (7X). Significant differences in TUE were seen between 1X and 3X ($P = 0.03$) and 2X and 3X ($P = 0.006$). No significant difference in TUE was detected between any of the other protocols ($P = 0.16 – 1.00$). **CONCLUSION**: The data suggest that hyperhydration is better achieved when water and sodium are consumed in three equal doses over 90 min when compared to consuming an equal amount of a sodium and water dose in a single bolus or in two equal doses over a 60 min period. Consuming water in four or seven equal doses over 90 min did not result in better fluid retention than consuming an equal amount of water in a single bolus or in two equal doses over a 60 min period.