

Effect of a high amylose starch solution on hydration and performance in trained cyclists during exercise in the heat

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Loss of body water during exercise can increase risk of heat illness and contribute to performance decrements.⁽¹⁾ Sports oral rehydration solutions (ORS) facilitate fluid absorption through coupled transport of sodium and glucose in the small intestine.⁽²⁾ The addition of high amylose maize starch (HAMS) may provide additional hydration benefit as it promotes fluid absorption when fermented to butyrate in the large intestine.⁽²⁾ This study evaluated the effects of a HAMS-ORS on hydration and performance in the heat by conducting a randomised, controlled, cross-over intervention in trained cyclists. Fifteen cyclists (VO_{2max} : 61.2 ± 8.0 mL/kg/min) consumed a HAMS-ORS or carbohydrate-matched control in a randomised order 6 hours prior to two experimental sessions. Each session involved two 60-minute cycling periods at 50% of VO_{2max} followed by a 10-minute time trial and a 90-minute recovery period in a hot environment (30°C and 48% relative humidity). Water was provided while cycling (10.7 ml/kg). During recovery, participants rested and consumed a second test solution (containing HAMS or water). Hydration was assessed via plasma volume (PV), urine specific gravity (USG), urine colour (UC), and body mass (BM) collected at specific times during each session. Performance was determined by work completed (kJ) during the time trial. A linear mixed effects model determined differences in PV, USG, UC, and BM. A paired t-test determined differences between treatments for work completed. Both treatment groups lost ~2.3% BM from baseline to post-time trial ($p < 0.001$), with similar reductions in PV (HAMS-ORS: -3.6 ± 3.2 ml/100ml; Control: -5.1 ± 5.3 ml/100ml) and increases in USG (HAMS-ORS: 0.014 ± 0.007 g/ml; Control: 0.018 ± 0.007 g/ml) and UC (HAMS-ORS: 4.3 ± 1.9 au; Control: 4.9 ± 1.6 au) (time effect, all $p < 0.05$). No treatment-by-time interactions or treatment main effects were observed for any hydration measures (all $p > 0.05$). There was no difference in work completed between treatments (HAMS-ORS: 156.3 ± 37.3 kJ; Control: 155.4 ± 42.4 kJ, $p = 0.772$). This is the first controlled laboratory study to evaluate the effect of a HAMS ORS on hydration and performance. Dehydration was induced in both treatment groups as evidenced by reductions in PV and BM, along with increases in USG and UC over time. However, HAMS-ORS was not different to Control at mitigating dehydration or improving cycling performance in the heat. As starch must be fermented by colonic bacteria in the large intestine before fluid absorption can take place, future studies should explore whether a longer time post consumption facilitates more complete digestion and associated hydration benefits. Additionally, this study was conducted in trained cyclists who may already possess finely tuned hydration responses. Greater benefit may be seen in less fit individuals, highlighting the need for further research.

References

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2. Binder H, Brown I, Ramakrishna B, *et al.* (2014) *Curr Gastroenterol Rep* **16**, 1–8.