

Effect of a Low Carbohydrate-Moderate Protein Supplement on Endurance Performance in Female Athletes

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ABSTRACT:

Previous research has shown that consuming a carbohydrate supplement during prolonged endurance exercise improves performance compared to water or placebo. The addition of protein to traditional carbohydrate supplement has been shown to further improve performance beyond that of carbohydrate alone. However, few investigations have explored the effect of adding protein to a supplement containing a low carbohydrate concentration.

PURPOSE: To investigate if a low carbohydrate and moderate protein supplement, provided during prolonged variable intensity exercise, would improve time to exhaustion in comparison to a traditional carbohydrate supplement.

METHODS: Fourteen ($n = 14$) trained females cyclists and triathletes (30.4 ± 1.6 yrs, 2.90 ± 0.15 L·min⁻¹) cycled on two different occasions for three hours at intensities varying between 45% - 70% $\text{VO}_{2\text{max}}$. After three hours, the intensity was increased (average 72.5 % $\text{VO}_{2\text{max}}$) and held until exhaustion. Exhaustion was defined as the point at which subjects could no longer hold cadence above 60RPM. Supplements (275ml) were provided every 20 min during exercise and were composed of a 3% carbohydrate/1.2% protein mix (CHO+PRO) or a 6% carbohydrate-only (CHO). The CHO+PRO treatment contained a mixture of glucose (dextrose), maltodextrin and fructose, and whey protein isolate. The CHO treatment was composed of dextrose. CHO+PRO contained half the carbohydrate content and 30% less calories in comparison to CHO.

RESULTS: Time to exhaustion (TTE) was significantly greater with CHO+PRO in comparison to CHO (49.94 ± 7.01 vs 42.36 ± 6.21 min, respectively, $p = 0.039$).

CONCLUSIONS: The above result suggests that addition of a moderate protein to a low carbohydrate supplement enhances performance in endurance trained females above that of carbohydrate alone. Improvement in performance occurred despite a lower carbohydrate and caloric content. It is unknown whether the greater performance seen with CHO+PRO was a result of the added protein, the use of a mixture of carbohydrate sources (glucose, maltodextrin and fructose), or their combination.

FIGURE DESCRIPTIONS

FIGURE 1: Experimental protocol. Three hours of variable intensity exercise between 45-70%, followed by performance ride. Performance was measured by ride to exhaustion (TTE). Blood samples, VO_2 , RER, Heart Rate and RPE measured where noted.

FIGURE 2: Time to Exhaustion (TTE). Exhaustion measured as the point at which subject could no longer hold cycling cadence above 60 RPM. TTE was 49.94 ± 7.01 min for CHO+PRO and 42.36 ± 6.21 min for CHO. *Significantly different from CHO ($p=0.039$). Values are mean \pm SE

FIGURE 3: Glucose. Glucose was measured from blood samples taken pre exercise (PRE), time points 118min and 177min, and at exhaustion (END). Values are mean \pm SE

FIGURE 4: Lactate. Lactate was measured from blood samples taken pre exercise (PRE), time points 118min and 177min, and at exhaustion (END). Values are mean \pm SE