

## Carbohydrate-protein beverage improves muscle damage and function versus isocarbohydrate and isocaloric carbohydrate-only beverages

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**PURPOSE:** Carbohydrate-protein beverages have previously been shown to attenuate post-exercise muscle damage compared to carbohydrate-only beverages. However, it is unclear from these studies whether these benefits were the result of carbohydrate/protein consumed during or immediately after exercise. The purpose of this study was to compare the effects of a carbohydrate/protein beverage (CHO-P) consumed during exercise to isocaloric carbohydrate (HI-CHO), isocarbohydrate (LO-CHO), and a non-caloric flavored placebo (PLA) beverage on post-exercise muscle damage and muscular function. **METHODS:** Twelve male cyclists (age =  $20.8 \pm 2.4$ ;  $VO_{2peak} = 53.4 \pm 7.2 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) performed four rides to exhaustion on a cycle ergometer at 75% of  $VO_{2peak}$ . During the trials, subjects consumed 250mL of CHO-P (7.3%CHO, 1.8%P), HI-CHO (9.1%CHO), LO-CHO (7.3%CHO), or PLA every 15-minutes until cessation of exercise. Exercise sessions were performed five to ten days apart, in a randomly counterbalanced double-blind design. Baseline measures for biomarkers of muscle damage (plasma CK and Mb) and ratings of soreness were obtained prior to the first exhaustive bout. Post-exercise measures were obtained 6-9 hours (Mb), and 22-24 hours (CK and soreness) following cycling. In addition, post-exercise muscle function was assessed 22-24 hours post-exercise via the number of leg extension repetitions to fatigue with the right leg at 70% 1-RM. **RESULTS:** Post-exercise changes in CK were significantly higher ( $p < .05$ ) in HI-CHO ( $203 \pm 343 \text{ IU}$ ), LO-CHO ( $224 \pm 387 \text{ IU}$ ) and PLA ( $194 \pm 336 \text{ IU}$ ) compared to CHO-P ( $-16 \pm 83 \text{ IU}$ ). Similarly, increases in Mb were also higher ( $p < .05$ ) in the HI-CHO ( $51 \pm 70 \text{ IU}$ ), LO-CHO ( $46 \pm 79 \text{ IU}$ ) and PLA ( $135 \pm 216 \text{ IU}$ ) as compared to CHO-P ( $13 \pm 34 \text{ IU}$ ). Significantly more leg extension repetitions were completed in the muscle function test for CHO-P ( $11.3 \pm 4.1$ ) than HI-CHO ( $9.7 \pm 4.3$ ), LO-CHO ( $9.5 \pm 3.6$ ) and PLA ( $8.8 \pm 6.7$ ). Pre-exercise values for Mb and CK were not different between treatments. **CONCLUSION:** These results indicate that a carbohydrate-protein beverage consumed during exercise attenuates post-exercise muscle damage, and improves subsequent muscle functioning compared to a placebo, or carbohydrate beverages matched for either carbohydrate or total calories.

This study was supported by a grant from PacificHealth Laboratories, Inc