

## **Attenuated CPK Following Carbohydrate/Protein Intervention Improves Subsequent Performance**

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Attenuated post-exercise CPK levels have been observed in athletes consuming carbohydrate/protein beverages (CHO+P) during and following endurance exercise versus those using carbohydrate-only (CHO) beverages.

### **Purpose**

The purpose of this study was to determine if cyclists who experienced large attenuations in CPK (indicating less muscle damage) following CHO+P administration performed better during subsequent exercise than those with small effects from the beverage treatment.

### **Methods**

Fourteen recreationally competitive male cyclists ( $VO_{2peak}=53.5\pm 9.5$  ml/kg/min) rode a cycle ergometer at 75% of  $VO_{2peak}$  until volitional exhaustion. This ride was designed to produce glycogen depletion and fatigue, in order to assess the effectiveness of CHO+P beverages on muscle damage and subsequent performance. Using a counter balanced, double-blind design, subjects consumed 1.8ml/kgBW of CHO or CHO+P every 15 minutes of exercise, and 10 ml/kgBW of the same beverage within 30 minutes of exercise completion. Fifteen hours later, subjects had blood samples taken to assess plasma CPK levels, and then performed a second ride to exhaustion at 85% of  $VO_{2peak}$ .

### **Results**

Post-exercise CPK levels were significantly lower ( $p<.05$ ) following the CHO+P trial compared to the CHO trial. A natural break was evident in the distribution of between-trial differences in CPK among cyclists. The majority of subjects ( $n=9$ ) experienced large attenuations in CPK during the CHO+P trial versus the CHO trial. This “attenuated response” group (AR) had a mean CPK difference (CHO+P trial minus CHO trial) of  $974.9\pm 589.7$  U/L (range= $453-2326$  U/L). The remaining five cyclists were “non-responders” (NR; mean difference= $-10.0\pm 31.6$  U/L, range= $-180-80$  U/L). To determine whether differences in post-exercise CPK responses influenced subsequent cycling endurance, performance was compared between the two groups during the second ride using a dependent t-test. The difference in time to exhaustion (CHO+P trial minus CHO trial) was significantly larger ( $p<.05$ ) in the AR group ( $16.0\pm 10.2$  min) than the NR group ( $5.3\pm 4.4$  min).

### **Conclusion**

Post-exercise muscle damage was notably attenuated by CHO+P beverage administration in the majority of cyclists. Cyclists who experienced large reductions in CPK following CHO+P treatments performed significantly better during subsequent exercise than non-responders.