

SUMMARY REPORT ON THE CHERRYPHARM 2008 LONDON MARATHON STUDY

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The effect of a tart cherry juice drink on markers of muscle damage, oxidative stress and inflammation after prolonged endurance exercise.

Background

Prolonged endurance exercise is associated with significant muscle damage, inflammation and oxidative stress. These factors delay recovery, interfere with normal training adaptations and impair subsequent performance. Few interventions have shown efficacy in preventing muscle damage, inflammation or oxidative stress in response to endurance exercise and no intervention has been shown to affect more than one of these three factors. A proprietary cherry juice blend (CherryPharm, Geneva, NY) has previously been shown to decrease markers of muscle damage following high intensity eccentric muscle contractions in humans and following high intensity short duration exercise in horses. The purpose of this study was to test the efficacy of this tart cherry juice drink in reducing post-exercise muscle damage, inflammation and oxidative stress following prolonged endurance exercise (Marathon race).

Methods

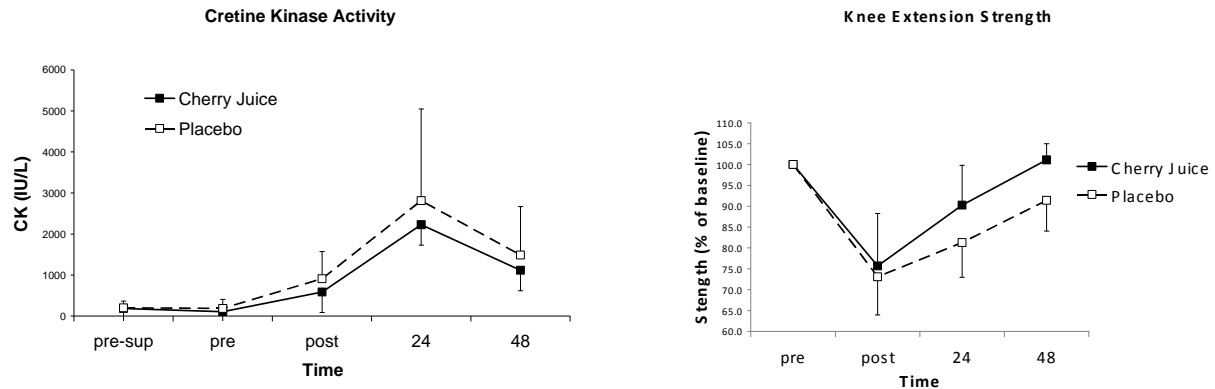
Twenty subjects (13 men, 7 women) aged 38 ± 10 yr, height 1.76 ± 0.07 m, body mass 73.0 ± 9.4 kg) were randomly assigned to take cherry juice or placebo (8 fl oz) twice a day for 5 days prior to a marathon race, on the day of the race (1 pre, 1 post) and for 2 days after the race. Blood samples were taken prior to supplementation, on the day prior to the race, immediately following the race and 1 and 2 days post race. Samples were analyzed for total antioxidant capacity (TAC), markers of muscle damage (creatinine kinase activity – CK, lactate dehydrogenase activity – LDH), inflammation (interleukin 6 – IL-6, C-reactive protein – CRP, uric acid) and oxidative stress (thiobarbituric reactive substances – TBARS, protein carbonyls). Additionally, isometric knee extension strength and muscle soreness were assessed on the evening prior to the race, immediately following the race, and 1 and 2 days post race. The effect of cherry juice was assessed using Treatment (cherry juice vs. placebo) by Time analysis of variance.

* CherryPharm provided free product for this study

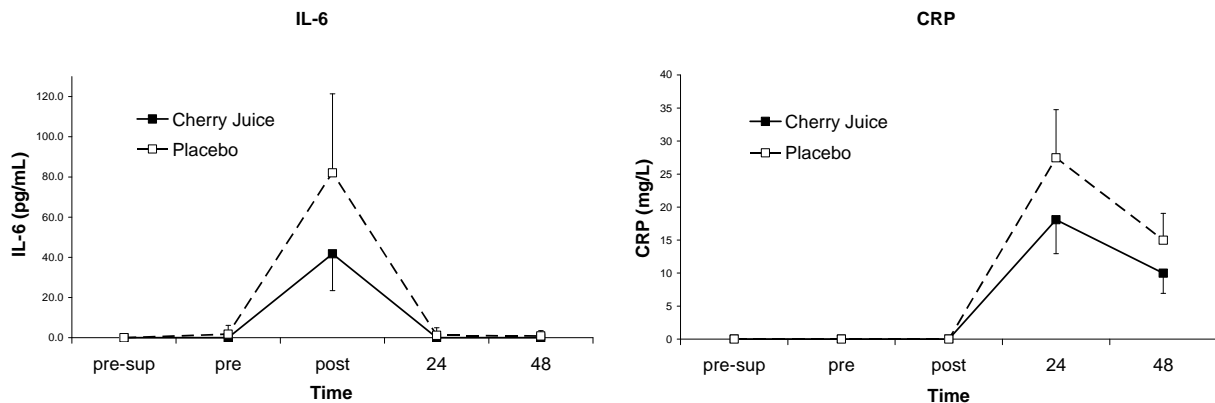
Results

Total Antioxidant Capacity (TAC): The 5-day supplementation period increased TAC by 11% in the cherry juice group with no change in the placebo group (Treatment by Time $P=0.015$). TAC was increased in both groups immediately after the race and declined on Days 1 and 2 (Time effect $P<0.01$). TAC remained 11% higher in the cherry juice group versus placebo across all time intervals (Treatment effect $P=0.019$). By Day 2 TAC had fallen below baseline in the placebo group (89% of baseline, $P=0.04$) but was not decreased in the cherry juice group (99% of baseline).

Markers of Muscle Damage: Strength loss immediately after the race was similar between groups (cherry juice 76% of baseline, placebo 73%) but the cherry juice group showed a more rapid recovery of strength (90% on Day 1, 101% on Day 2) compared with placebo (81% on Day 1, 91% on Day 2; Treatment by Time linear trend $P<0.001$). Muscle soreness (Treatment by Time $P=0.49$) and CK activity ($P=0.82$) were not different between groups. LDH results are pending.

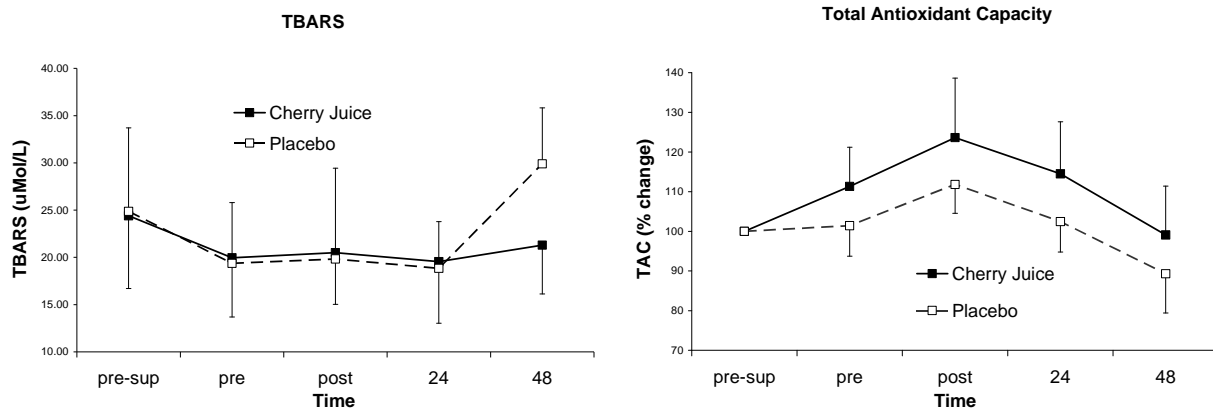


Markers of Inflammation: Post-race IL-6 elevation was 49% lower in the cherry juice group (41.8 pg/ml) versus placebo (82.1 pg/ml; Treatment by Time $P<0.0001$). CRP elevation 1 and 2 days post race was 34% lower in the cherry juice group (18 mg/dl on Day 1, 10 mg/dl on Day 2) versus placebo (27 mg/dl on Day 1, 15 mg/dl on Day 2; Treatment by Time $P<0.0001$). Uric acid results are pending.



Markers of Oxidative Stress: TBARS did not change from baseline in the cherry juice group but were elevated by 32% compared to pre-race values 2 days post race in the

placebo group (Treatment by Time $P=0.018$). Protein carbonyls were not elevated in the cherry juice or placebo group at any point after the race (Treatment by Time $P=0.27$).



Conclusions

Consumption of cherry juice prior to and after a marathon race decreased markers of muscle damage (strength), inflammation (IL-6 and CRP) and oxidative stress (TBARS). Although CK activity was unaffected by cherry juice it is notable that elevations in CK activity were positively correlated with the elevations in inflammatory markers (CK vs. CRP $P<0.0001$; CK vs. IL-6 $P<0.01$) highlighting the association between muscle damage and inflammation. The TAC and TBARS results indicated that consumption of cherry juice for 4 days prior to a Marathon race can boost antioxidant defenses and prevent post-race oxidative stress. In the placebo group oxidative stress was evident at the point when TAC fell below baseline (Day 2). TAC on Day 2 was inversely correlated with TBARS on Day 2 ($P=0.03$) highlighting the association between the antioxidant defense mechanism and prevention of oxidative stress. In conclusion, cherry juice enhanced antioxidant capacity, and accelerated recovery of strength, decreased inflammation and prevented oxidative stress in response to a marathon race.

Practical Significance

The ability to effectively recover from exercise is critical to optimizing training adaptations and enhancing performance. Prevention of muscle damage, inflammation and oxidative stress are integral to effective recovery. For example, the overtraining syndrome has been attributed to an increased inflammatory response to exercise. The authors are unaware of previous nutritional or other interventions demonstrating a combined effect on reducing muscle damage, inflammation and oxidative stress in response exercise.