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File: ■ Montmorency Tart Cherries (*Prunus cerasus*, Rosaceae)
■ Exercise Recovery
■ Oxidative Stress

HC 051512-532

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RE: Montmorency Cherry Supplementation Improves Exercise Recovery in Male Cyclists

Bell PG, Walshe IH, Davison GW, Stevenson EJ, Howatson G. Recovery facilitation with Montmorency cherries following high-intensity, metabolically challenging exercise. *Appl Physiol Nutr Metab*. 2015;40(4):414-423.

Reducing oxidative stress and inflammation may accelerate the post-exercise recovery period needed for optimal athletic training and performance. The reported antioxidant and anti-inflammatory effects of Montmorency tart cherries (*Prunus cerasus*, Rosaceae) suggest these fruits could be an effective recovery supplement for athletes. The aim of this double-blind, placebo-controlled study was to assess the effects of Montmorency tart cherry supplementation on the recovery of muscle function after high-intensity and metabolically challenging exercise.

A total of 16 healthy male cyclists (age, 30 ± 8 years; height, 181.1 ± 6.7 cm; mass, 76.5 ± 9.2 kg; peak oxygen uptake [VO_{2peak}], 61.6 ± 10.4 $mL/kg^{-1}\cdot min^{-1}$) were recruited for the study. Subjects that were included in the study trained for >5 h per week over the preceding 24 months, and agreed to withdraw from other forms of exercise for the duration of the study. Subjects were excluded from the study if they were female, >45 years old, had allergies to fruits, or had any health conditions that would interfere with the study.

The test protocol required the subjects to visit 6 times (at 7:45 am) after an overnight fast. For the first visit, baseline aerobic profiles were obtained. For the second visit, the subjects became familiar with the exercise protocol 2 to 4 days later. Subjects were then stratified based on VO_{2peak} and randomly assigned to either the Montmorency tart cherry concentrate (MC) or placebo (PLA) group. After a 4-day supplement treatment, the subjects came for their third visit and participated in a high-intensity, stochastic cycling trial that lasted 109 min. The cycling trial was designed to be similar to a road cycling race. Subjects performed 66 sprints (lasting 5, 10, or 15 s) using an electromagnetically braked cycle ergometer. The sprints were divided into 9 sets, with an active recovery (ACT) period lasting 5 min between each set. Baseline aerobic measurements were repeated during the next 3 visits, which took place 24, 48, and 72 h after the third visit (post-trial).

Subjects were instructed to consume 30 mL of MC (CherryActive Ltd; Hanworth, UK) or PLA, twice per day, for 8 consecutive days (4 days pretrial; the day of the trial; and 3 days post-trial). On visits 3-6 that involved exercise, MC or PLA was consumed 15 minutes following venous blood sampling and 10 minutes prior to exercise. During this period, the subjects consumed a low-polyphenolic diet (e.g., no fruits, vegetables, tea [*Camellia sinensis*, Theaceae], coffee [*Coffea* spp., Rubiaceae], etc.). A 30-mL dose of MC contained about 90-110 Montmorency tart cherries (9.2 mg/mL of anthocyanins and 669.4 mg/mL of carbohydrates). The PLA was a mixed berry cordial (<5% fruit in concentrate form), mixed with 100 mL water and maltodextrin (equivalent carbohydrate content of MC). Food diaries were completed. Venous blood samples were obtained at baseline, 10 minutes before the trial, immediately post-trial, and 1, 3, 5, 24, 48, and 72 h post-trial for biomarkers of inflammation, oxidative stress, and muscle damage.

The decline in maximum voluntary isometric contraction (MVIC) was significantly decreased in the MC group in comparison to the PLA group, across the 72-h post-trial period (P=0.014); however, no interaction effect was found. The MVIC values never went below baseline in the MC group, whereas the PLA group had values that remained depressed. Although no group effect was found for cycling efficiency, the MC group significantly improved at 24 h compared to PLA ($VO_{2\ peak}$ was 4% lower in the MC than the PLA group; P=0.015). Delayed-onset muscle soreness (DOMS) demonstrated a significant main effect for time (P=0.005), with DOMS increasing over time in both groups. There were, however, no group or interaction effects.

In terms of inflammatory biomarkers, both interleukin (IL)-6 and high-sensitivity C-reactive protein (hsCRP) responses were significantly decreased in the MC group (vs. the PLA group) across the protocol (P<0.001 and P<0.05, respectively). Other inflammatory biomarkers (IL-8 and tumor necrosis factor-alpha [TNF-α]), an oxidative stress biomarker (lipid hydroperoxide), and a biomarker for muscle damage (creatine kinase) demonstrated main effects for time (increased over time; P<0.001), but no group or interaction effects were observed. Additionally, there were no group, time, or interaction effects observed for the inflammatory biomarker IL-1β.

Supplementation with MC prevented the decline of MVIC observed in the PLA group, which, according to the authors, indicates this fruit concentrate has protective effects on muscle function. The authors suggest these results may be due, in part, to the anti-inflammatory effects observed in the cyclists consuming MC. The authors note also that MC might impact endothelial function, which could explain the improved cycling efficiency observed at 24 hours post-trial. The lack of effect on oxidative stress is inconsistent with other studies that demonstrated that MC reduced lipid peroxidation.[1,2] All in all, future studies on MC should evaluate exercise recovery effects in different genders, ages, and athletic performances, as well as further investigate its mechanistic effects. The study was partially funded by the Cherry Marketing Institute (DeWitt, Michigan), a non-profit organization.

Note: This study was also reported in *Nutrients* with additional findings.[2]

—Laura M. Bystrom, PhD

References

[1]Howatson G, McHugh MP, Hill JA, et al. Influence of tart cherry juice on indices of recovery following

marathon running. *Scand J Med Sci Sports*. 2010;20(6):843-852.

[2]Bystrom LM. Montmorency cherry supplementation reduces oxidative stress and inflammatory markers induced by metabolically challenging exercise. *HerbClip*. October 15, 2015 (No. 051511-530). Austin, TX: American Botanical Council. Review of Montmorency cherries reduce the oxidative stress and inflammatory responses to repeated days high-intensity stochastic cycling by Bell PG, Walshe IH, Davison GW, Stevenson E, Howatson G. *Nutrients*. 2014;6(2):829-843.

The American Botanical Council has chosen not to include the original article.