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File: ■ Black Chokeberry (*Aronia melanocarpa*, Rosaceae)
■ Inflammation
■ Exercise

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RE: Black Chokeberry Juice Improves Inflammation and Iron Metabolism Parameters after Intense Physical Exercise

Skarpańska-Stejnborn A, Basta P, Sadowska J, Pilaczyńska-Szcześniak Ł. Effect of supplementation with chokeberry juice on the inflammatory status and markers of iron metabolism in rowers. *J Int Soc Sports Nutr*. 2014;11(1):48. doi: 10.1186/s12970-014-0048-5.

Exercise, especially intense physical activity, has been shown to cause pro-oxidant effects, inflammation, and a decrease in serum iron. Several studies have indicated that black chokeberry (*Aronia melanocarpa*, Rosaceae) fruit extracts have anti-inflammatory effects. Yet, few studies have evaluated if flavonoid-rich foods, such as black chokeberry, produce similar effects after exercise. The aim of this placebo-controlled trial was to evaluate the effects of black chokeberry juice on pro-inflammatory cytokines, markers of iron metabolism, and total antioxidant capacity (TAC) in rowers subjected to exhaustive exercise.

This study was conducted in Poland at an Olympic Games Training Center (location undisclosed). A total of 19 male subjects from the Polish rowing team (16 heavyweight and 3 lightweight rowers) participated in the study during an 8-week training period. The intensity (based on lactic acid levels), volume (minutes/day), and type of training were recorded on a daily basis. The subjects' daily food and caloric intake were constant throughout the study period and they did not consume any medication or supplements.

Participants were divided into 2 groups; one (n=10) consumed 50 mL of black chokeberry juice (Europlant PhytoPharm Klęka S.A.; Nowe Miasto nad Wartą, Poland) 3 times a day for 8 weeks, and a placebo group (n=9) consumed a beverage identical in appearance and taste (6.6% betaine and 1% citric acid solution) for the same amount of time. The phenolic (e.g., flavonoids) content of the chokeberry juice was also evaluated.

Two assessments were given before and after supplementation, referred to as Trial I and Trial II, respectively. The training volume preceding Trial I amounted to 1,020 minutes/week (41% extensive rowing, 21% nonspecific training, and the rest was intensive rowing) and preceding Trial II, 880 minutes/week (53% extensive rowing, 18%

intensive rowing, and 11% land training). Performance trials were evaluated on the first day prior to supplementation and at the end of the training period (after supplementation) and evaluated how fast the subjects rowed a 2000 m distance. After an overnight fast, venous blood samples were obtained before the test, 1 minute after the test, and after a 24-hour recovery period. Additionally, capillary blood obtained from finger pricks was used to determine lactic acid. The inflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) were measured from the serum. Iron concentrations, hepcidin (master iron regulator), total iron-binding capacity (TIBC), unsaturated iron-binding capacity (UIBC), myoglobin, ferritin, uric acid, and TAC were also assessed from the blood samples.

Neither group differed significantly in age, years of training, body measurements, or the mean power output and run-time for the 2000-m test performed at the beginning of the study. Furthermore, no differences were found between the groups for lactic acid levels before and after supplementation. The post-exercise IL-6 levels were significantly higher than the pre-exercise levels before and after supplementation for both groups ($P<0.05$). Pre-exercise TNF-α levels were significantly lower after supplementation with black chokeberry juice ($P<0.05$). During the recovery period and after supplementation, TNF-α was also significantly lower for the group that consumed black chokeberry juice ($P<0.05$).

Post-exercise TAC was significantly lower than pre-exercise TAC for both groups before and after supplementation ($P<0.05$). During the recovery period, TAC was significantly higher in the group that consumed black chokeberry juice compared to the placebo group ($P<0.05$). Both groups had significantly higher uric acid values during the recovery period compared to post-exercise values before and after supplementation ($P<0.05$). Post-exercise hepcidin levels were significantly higher after supplementation for both groups compared to pre-exercise values ($P<0.05$). Moreover, the subjects that consumed black chokeberry juice had significantly higher iron concentrations during the recovery period ($P<0.05$). Myoglobin was significantly higher post-exercise for both groups before supplementation ($P<0.05$) and no effect was found after supplementation for either group. No significant effects were observed for ferritin, TIBC, or UIBC.

The authors conclude black chokeberry juice (50 mL 3 times a day for 8 weeks) may prevent inflammation, oxidative stress, and iron depletion after intensive physical exercise, therefore justifying chokeberry juice supplementation for athletes undergoing rigorous training. These effects are partially attributed to anthocyanins, a subcategory of flavonoids found in black chokeberry juice. As physical exercise can cause red blood cells to become more vulnerable to hemolysis (rupturing of the cell), the authors suggest future studies include data on the occurrence rate of hemolysis. Larger trials with male and female subjects are warranted to better understand how black chokeberry juice consumption impacts inflammatory cytokines, antioxidant status, and iron metabolism biomarkers after intense exercise.

—Laura M. Bystrom, PhD

Referenced article can be accessed at http://www.jissn.com/content/11/1/48.