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File: ■ Cranberry (*Vaccinium macrocarpon*)
■ Arterial Stiffness
■ Augmentation Index

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RE: Cranberry Juice Consumption May Reduce Arterial Stiffness in Overweight Men

Ruel G, Lapointe A, Pomerleau S, et al. Evidence that cranberry juice may improve augmentation index in overweight men. *Nutr Res*. 2013;33(1):41-49.

Endothelial dysfunction, the impairment of the normal functions of the inner lining of the blood vessels, is associated with cardiovascular disease (CVD) risk factors that can lead to arterial stiffness. The augmentation index (AIx) is an index of arterial stiffness measured by peripheral pulse wave analysis. Healthy nutritional habits, including increasing the consumption of fruits and vegetables and reducing dietary fat intake, are important in helping to prevent and treat CVD through improved lipoprotein-lipid and inflammatory profiles and endothelial function. The cardioprotective potential of fruits and vegetables is due to their high content of polyphenolic compounds such as flavonoids, which play a beneficial role in protecting against inflammation and oxidative stress. Cranberries (*Vaccinium macrocarpon*) are rich in polyphenols such as phenolic acids, flavonols, anthocyanins, and proanthocyanidins. The authors conducted a short-term, placebo-controlled, double-blind, crossover study at Université Laval in Quebec, Canada to examine the effect of consuming a low-calorie cranberry juice cocktail (CJC) on the AIx and cardiometabolic profile of overweight men.

The authors recruited 35 sedentary, otherwise healthy, overweight men (mean age = 45 ± 10 years) with a body mass index (BMI) of ≥ 25 kg/m^2 and a waist circumference of ≥ 90 cm (35.4 inches). The men were nonsmokers and were not taking medications that affected lipid or insulin metabolism or blood pressure.

After a 4-week run-in period during which the subjects drank 500 mL of water daily to get used to that amount of liquid in their usual diet, they were randomly assigned to drink 500 mL daily of either a low-calorie CJC (27% juice) or placebo juice (PJ) for 4 weeks (2 boxes of 125 mL of juice in the morning and 2 in the evening). Then, after a 4-week washout period, the subjects began the other treatment for another 4 weeks.

The CJC and PJ (Ocean Spray Cranberries, Inc.; Lakeville-Middleboro, Massachusetts) had a similar taste, color, texture, and vitamin C content, but no cranberries were in the

PJ. Each daily serving of the CJC contained 500 mg of total polyphenols, 20.8 mg of anthocyanins, and 21.84 g of carbohydrates.

At baseline and after week 4, body weight, height, waist and hip circumferences, and blood pressure were measured; BMI and waist-to-hip ratio values were calculated; and fasting blood samples were drawn. The subjects also completed a food frequency questionnaire at those 2 visits.

At baseline and at 4 weeks, the resting AIx was measured by applanation tonometry, during which peripheral artery waveforms were recorded on the subjects' radial artery. Waveforms were recorded again at 5, 10, 15, and 20 minutes after the subjects inhaled 400 µg of salbutamol, which elicits the synthesis of nitric oxide (NO) and a vascular response used as a proxy measure of endothelium-dependent vasodilation. The same technique was used to measure arterial stiffness during endothelium-independent radial artery vasodilation at 3, 5, 10, 15, 20, and 30 minutes following sublingual administration of 400 µg of glyceryl trinitrate (GTN), an NO donor used to treat angina and heart failure. The cardiometabolic profile, which assesses risks associated with type 2 diabetes mellitus and CVD, was determined for each subject before and after each phase of the study.

The subjects were separated into groups made up of those with metabolic syndrome (MetS+) (n = 13) and those without metabolic syndrome (MetS-) (n = 22), using the criteria for metabolic syndrome as defined by the National Cholesterol Education Program.

At baseline, although at the high end for total fat intake and the low end for carbohydrate intake, the daily energy and nutrient intakes of the subjects fell within the nutritional recommendations for Canadian adults. The MetS+ subjects had a higher BMI, higher circulating triglycerides (TG), and lower high-density lipoprotein cholesterol (HDL-C) levels compared with the MetS- subjects.

The authors report that the salbutamol reduced the AIx by 10.8% ± 6.4% compared with resting values ($P < 0.0001$). GTN further decreased the values by 2.1% ± 6.0% compared with salbutamol ($P < 0.05$). However, these changes in the AIx responses to salbutamol and GTN did not significantly differ between subjects who consumed the CJC or PJ.

Although no significant difference was noted in the AIx changes between the subjects who consumed the CJC or PJ, a statistically significant within-group decrease was noted in the AIx ($P < 0.05$ compared with baseline) in subjects who consumed the CJC.

No significant differences were noted in other cardiometabolic variables between those subjects drinking the CJC or PJ.

Comparing the AIx values in the MetS+ and MetS- subjects, the authors report no significant differences in the responses to salbutamol and GTN after supplementation; however, they noted a significant within-group decrease in the resting AIx values in MetS- subjects who drank CJC ($P < 0.05$ compared with baseline). In those same subjects, significant increases in the AIx responses to salbutamol and GTN were observed ($P < 0.05$ compared with baseline). Although these results may seem contradictory, say the authors, earlier studies have shown that, "Vascular tone is

positively correlated with flow-mediated dilation in healthy individuals, and thus, a more relaxed (and possibly wider) artery at rest has a lower endothelium-dependent vasodilation response."

The authors previously reported that CJC supplementation was associated with reductions in circulating oxidized low-density lipoprotein (OxLDL) and adhesion molecule concentrations (inflammation and oxidative stress markers) in men.[1,2] This was not supported, however, in the present study, where no significant changes in those markers were reported after the CJC supplementation. Although the differences in the design of the studies may explain the discrepancies, say the authors, the lack of effect of the CJC on plasma OxLDL and adhesion molecule levels in the current study agrees with previous reports showing that CJC consumption for 2 weeks had no effect on oxidative stress markers[3] and that supplementing men and women with a 54% CJC for 4 weeks did not reduce cell adhesion molecule concentrations.[4]

These authors found that although CJC consumption did reduce the resting AIx in overweight men, the decrease was not significantly different from those drinking the PJ. The significant within-group decrease in the AIx following the CJC consumption, however, warrants further investigation.

—Shari Henson

References

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