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File: ■ Black Chokeberry (*Aronia melanocarpa* var. *elata*)
■ Myocardial Infarction
■ Flavonoids
■ Statins

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RE: Chokeberry Flavonoids Reduce Inflammation in Medicated Patients with a History of Myocardial Infarction

Naruszewicz M, Laniewska I, Millo B, Dłużniewski M. Combination therapy of statin with flavonoids rich extract from chokeberry fruits enhanced reduction in cardiovascular risk markers in patients after myocardial infraction [sic] (MI). *Atherosclerosis.* 2007;194:e179-e184.

Oxidative stress is one of the most important causative factors in the development of atherosclerosis in all of its stages, and it may contribute to the destabilization of arterial wall plaque. Oxidative stress in the vascular wall causes the formation of oxygenated forms of low-density-lipoproteins (LDLs), which contribute to the formation of foam cells and subsequently to the development of atherosclerosis. Recent clinical trials have shown a reduction in the incidence of mortality in patients with coronary artery disease (CAD) after treatment with statins, which was related not only to an LDL-cholesterol-lowering effect but also to a reduction of less than 2 mg/l in the concentration of C-reactive protein (CRP)—an indicator of inflammation. However, such reductions in CRP are only possible with rather high doses of statins, which can have adverse health effects. It has been postulated that a moderate dose of statins in combination with natural polyphenols may provide an alternative therapeutic approach. The objective of the present study was to determine whether a reduction in oxidative stress through the consumption of flavonoids from black chokeberry (*Aronia melanocarpa* var. *elata*) fruit in combination with statins provides an additional reduction in biomarkers of cardiovascular disease risk in patients with a history of myocardial infarction.

Forty-four patients (n = 11 postmenopausal women and 33 men) with a mean age of 65 years were recruited from a cardiology clinic associated with the Medical University of Warsaw in Poland and enrolled in this double-blind, placebo-controlled, parallel trial. All patients had a history of myocardial infarction and had been taking statin drugs for at least 6 months (84% using a dose of 40 mg simvastatin/day and 16% taking 20 mg atorvastatin/day), which continued throughout this study. In addition, 77% were taking aspirin and 52% were using angiotensin I-converting enzyme (ACE) inhibitors. The subjects were randomly assigned to receive 3 capsules of either a flavonoid extract of

black chokeberry or placebo (maltodextrin) daily for 6 weeks. Each black chokeberry capsule (Aronox; Agropharm SA; Tuszyn, Poland) contained approximately 25% anthocyanins (cyanidin glycosides), 9% phenolic acids (chlorogenic and neochlorogenic acids), and 50% monomeric (epicatechin) and oligomeric procyanidins. Fasting blood samples were collected in the morning at baseline and at 6 weeks for the measurement of glucose, homocysteine, lipids (triglyceride, total cholesterol, LDL cholesterol, and high-density-lipoprotein cholesterol), and markers of oxidative stress and inflammation (interleukin-6, adiponectin, vascular adhesion molecule, intercellular adhesion molecule, high-sensitivity CRP, F_2-isoprostanes, oxidized LDL, and monocyte chemoattractant protein-1). ACE activity (measured in 10 subjects in the supplemented group and in 9 subjects in the placebo group who were not taking ACE inhibitors), arterial blood pressure, and body mass index were also measured at baseline and at 6 weeks.

Consumption of the black chokeberry extract for 6 weeks had no significant effect on lipids, homocysteine, glucose, or body mass index. Systolic and diastolic blood pressure decreased significantly ($P < 0.000$) by 11.0 and 7.2 mm Hg after 6 weeks of black chokeberry extract consumption but not after placebo. ACE activity decreased by 20-57% ($P < 0.009$) in 7 of 10 subjects from the supplemented subgroup but in none of the placebo subgroup. Compared with placebo, the black chokeberry supplement resulted in a significant decrease in F_2-isoprostanes and oxidized LDL (by 38% and 29%, respectively; $P < 0.000$ for both), in interleukin-6 by 30% ($P < 0.003$) and in CRP by 23% ($P < 0.007$), and in the adhesion molecules including vascular adhesion molecule, intercellular adhesion molecule, and monocyte chemoattractant protein-1 ($P < 0.009$, $P < 0.05$, and $P < 0.001$, respectively). Adiponectin concentrations increased significantly after black chokeberry extract consumption ($P < 0.034$).

According to the authors, the most "spectacular" findings of this study were the significant decreases in systolic and diastolic blood pressure and in CRP levels. The decrease in CRP concentrations indicates a reduction in inflammation levels. These beneficial effects were attributed to a reduction in oxidative stress resulting from the flavonoids in the black chokeberry extract, as evidenced by the observed decreases in serum isoprostanes, adhesion molecules, and oxidized LDL and the significant increase in serum adiponectin, which plays an important role in vascular wall repair. Despite some limitations of the study (e.g., relatively small sample size and short duration), the authors conclude that the findings of this study indicate "a new opportunity for using flavonoids of a high antioxidant potential for further reduction in the risk of atheromatous progression in patients with CAD treated with moderate doses of statins."

Unfortunately, this article is marred by numerous grammatical and spelling errors as exemplified in the title itself.

—Brenda Milot, ELS

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