

### Blueberries Improve Endothelial Function in Postmenopausal Women With Above-Normal Blood Pressure via Reductions in Oxidative Stress

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**Objectives:** Research suggests blueberries and their (poly)phenols may improve endothelial dysfunction, a major risk factor for cardiovascular disease (CVD). The objective of this study was to investigate the impact of consuming 22 g/day for 12 weeks of freeze-dried highbush blueberry powder on endothelial function and other measures of cardiovascular health, oxidative stress, and circulating (poly)phenol metabolites in postmenopausal women with above-normal blood pressure.

**Methods:** We performed a randomized, double-blind, placebo-controlled, parallel-arm trial in estrogen-deficient postmenopausal women aged 45–65 years with elevated blood pressure or stage 1-HTN. Endothelial function was assessed as brachial artery flow-mediated dilation (FMD) and normalized to individual shear rate

area under the curve (FMD/SR<sub>AUC</sub>) to control for inter-individual variability in reactive hyperemia-induced shear stress. To assess whether improvements in FMD were mediated by reduced oxidative stress, FMD was assessed before and after intravenous infusion of a supra-physiologic dose of ascorbic acid. Blood pressure, arterial stiffness, and plasma (poly)phenol metabolites were also assessed.

**Results:** A total of 43 women completed the trial ( $n = 32$  for endothelial function). Compliance in the Blueberry and Placebo groups were 93% and 91%, respectively. Mean total plasma (poly)phenol metabolite concentrations were increased at 4 (250,053 nmol/L,  $P < 0.05$ ) and 8 (303,053 nmol/L,  $P < 0.05$ ) weeks in the Blueberry group compared to baseline (125,798 nmol/L) with a strong trend at 12 weeks (227,971 nmol/L,  $P < 0.05$ ), and no changes in Placebo. Blood pressure and arterial stiffness were unchanged with both treatments. At 12 weeks, FMD/SR<sub>AUC</sub> was increased by 96% from baseline ( $P < 0.05$ ) in the Blueberry group but unchanged in Placebo, and changes in FMD/SR<sub>AUC</sub> from baseline to 12 weeks were higher ( $P < 0.05$ ) than Placebo. The response in FMD/SR<sub>AUC</sub> to ascorbic acid infusion was lower ( $P < 0.05$ ) at 12 weeks compared to baseline in the Blueberry group but not Placebo.

**Conclusions:** These findings suggest blueberries improve endothelial function, and is mediated, in part, by reduced oxidative stress in postmenopausal women with above-normal blood pressure, a high-risk population for developing CVD.

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