

Effect of Supplemental Phytonutrients on Impairment of the Flow-Mediated Brachial Artery Vasoactivity after a Single High-Fat Meal

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BACKGROUND & AIM

The aim of this study was to determine whether administration of an encapsulated fruit and vegetable juice powder concentrate rich in phytochemicals, could ameliorate the immediate adverse effect of a high-fat meal on vasodilation.

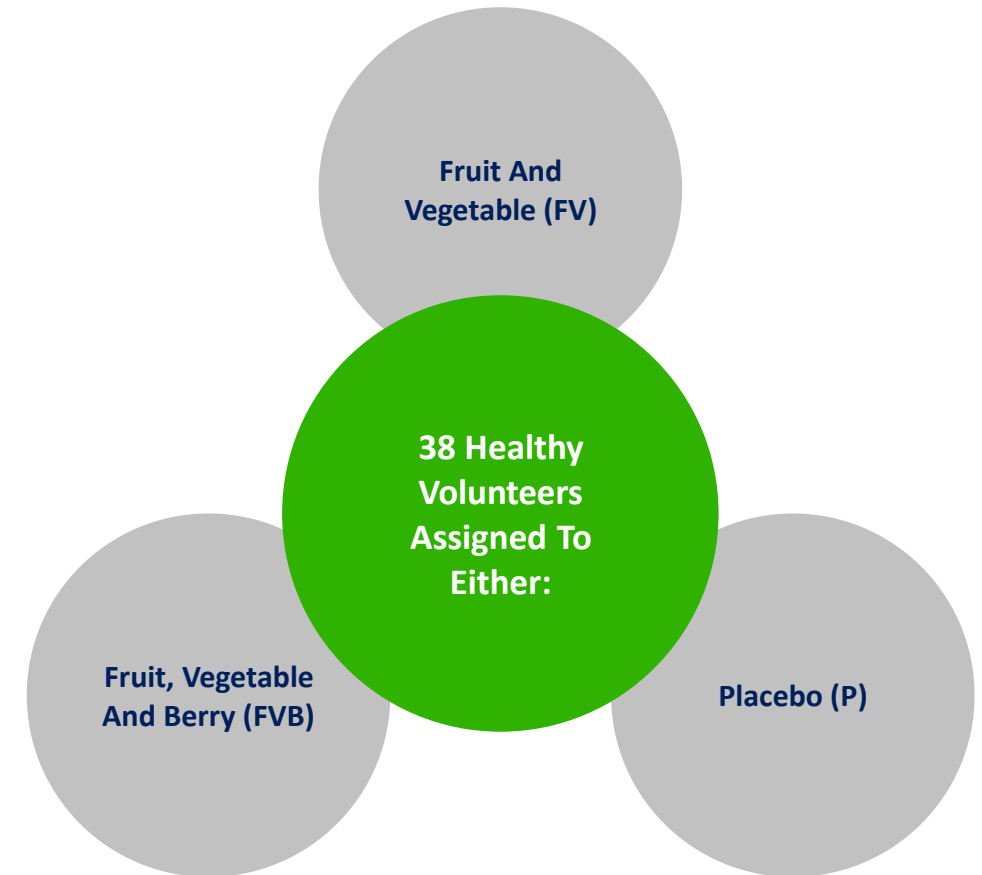
- + It has been previously established that ingestion of a high-fat meal impairs flow-mediated vasodilation of the brachial artery for at least 4hrs.
- + Antioxidant vitamins, notably C and E, can often exert a favorable effect on endothelial function.

METHODS

**Randomized, double-blind placebo-controlled trial
with 3 groups:**

- + Fruit & vegetable juice powder concentrate (Juice Plus+): 2 capsules of each/day (total capsules: 4)
- + Fruit, vegetable & berry juice powder concentrate (Juice Plus+): 2 capsules of each/day (total capsules: 6)
- + Placebo

Duration of supplementation: 28 days



METHODS

- + Endothelial function was assessed by the flow-mediated brachial artery reactivity test (BART), before and 3hrs after a high fat meal (50 grams fat) at:
 - Baseline
 - Day 21 (taking the morning dose of supplementation)
 - Day 28 (omitting the morning dose of supplementation)
- + Serum nitrate/nitrite concentrations were measured at baseline and at 4 weeks.

MAIN RESULTS

+ Measurements on day 21 and 28:

- The detrimental effect of a high-fat meal was significantly decreased in both intervention groups (compared to placebo).
- Trend for serum nitrate/nitrite levels to increase in both intervention groups.

+ Example: measurement on day 28

- Placebo group suffered 38% decrease in vasodilation after a high-fat meal
- FV group suffered 17% decrease
- FVB group experienced less than 2% drop in vasodilation

CONCLUSION:

FV and FVB significantly decreased the detrimental effect of a high-fat meal on flow mediated brachial artery vasodilation, both at 3 and 4 weeks of supplementation.

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Endothelial Function

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OBJECTIVES Our objective was to determine if long-term daily administration of phytonutrient supplements can prevent the immediate adverse impact of a high-fat meal and increase the production of nitric oxide.

BACKGROUND Ingestion of a high-fat meal impairs flow-mediated vasodilation of the brachial artery for at least 4 h; however, co-ingestion of vitamin antioxidants or a green salad has been shown to prevent this effect.

METHODS Flow-mediated brachial artery reactivity test (BART) both before and 3 h after a 900 calorie 50 g fat meal was evaluated in 38 healthy volunteers (age 36.4 ± 10.1 years). Subjects were randomized to four weeks of daily supplementation with a powdered fruit vegetable juice concentrate (Juice Plus [JP]) along with a complex supplement providing nutritional antioxidants and various herbal extracts (Vineyard [V]), JP alone, or a matching placebo. At three and four weeks, BART was repeated both before and after the high-fat meal. Serum nitrate/nitrite concentrations were measured at baseline and at four weeks.

RESULTS Four weeks of the JP-V combination blunted the detrimental effect of the high-fat meal ($-47.5 \pm 23.4\%$ at baseline vs. $-1.7 \pm 9.7\%$ at four weeks [$p < 0.05$]). Four weeks of JP alone had a similar beneficial effect ($-45.1 \pm 19.7\%$ at baseline vs. $-16.6 \pm 10.3\%$ at four weeks [$p < 0.05$]), whereas there was no substantial effect of the placebo. In the subjects treated with supplements, concentrations of serum nitrate/nitrite increased from 78 ± 39 to $114 \pm 62 \mu\text{M}$ ($p < 0.02$).

CONCLUSIONS Daily ingestion of modest amounts of a fruit/vegetable juice concentrate with or without adjunctive phytonutrient supplementation can reduce the immediate adverse impact of high-fat meals on flow-mediated vasoactivity and increase nitrate/nitrite blood concentration. (J Am Coll Cardiol 2003;41:1744-9) © 2003 by the American College of Cardiology Foundation

A high intake of fruits and vegetables has been associated with reduced risk for coronary heart disease and ischemic stroke in large prospective case-control studies (1-5). The mechanisms by which fruit and vegetable consumption achieves this benefit remain to be established. They can provide a substantial ration of dietary potassium and soluble

smooth muscle migration and hyperplasia, and maintain an anti-inflammatory endothelial phenotype that discourages the influx of activated monocytes and other inflammatory cells. To the extent that dietary antioxidants can offset the harmful impact of endothelial oxidants on NO bioactivity, they have the potential to make an important contribution to vascular health (11).

A sudden increase in the shear stress acting on arterial endothelium induces an endothelium-dependent, NO-mediated vasodilation that is susceptible to non-invasive quantitation by high-frequency ultrasound techniques (12,13). Flow-mediated vasodilation (FMV) of the brachial artery, evoked by the hyperemia that follows relief of pressure-cuff occlusion of arterial blood flow, is now commonly measured to assess the endothelium's capacity for generating bioactive NO in conduit arteries. This FMV is often impaired in patients expressing coronary risk factors associated with endothelial dysfunction, such as hypercholesterolemia, hypertension, hyperhomocysteinemia, insulin resistance, diabetes, and angina (14-24). Our group has previously demonstrated that this vasodilation is transiently impaired for up to 4 h after the ingestion of a fatty meal,

See page 1750

fiber and are typically rich in a range of antioxidant phytonutrients. Previous studies show that antioxidant vitamins—notably C and E—can often exert a favorable effect on endothelial function (6-11). In particular, they appear to help preserve the endothelium's capacity to generate bioactive nitric oxide (NO) in various pathogenic circumstances that tend to impair this activity. Nitric oxide acts to stabilize platelets, promote vasodilation, inhibit

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