

The Logan Study: Hypertension and Phytonutrient-Rich Fruit and Vegetable Supplementation

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"Please test your servants for 10 days. Give us nothing but vegetables to eat and water to drink. ... At the end of 10 days they looked healthier and better nourished than the young men who ate the royal food."

- *From the Old Testament (Daniel 1:12,15)*

High Blood Pressure: The Silent Killer

High blood pressure, the third-leading cause of disability, has reached epidemic status globally.^{1,2} To quote the American Heart Association, high blood pressure is a "silent killer [that] directly increases the risk of coronary heart disease and stroke."³ Indeed, high blood pressure might be causing 50 percent of all strokes and heart attacks!⁴

Dietary Approaches to Stop Hypertension

In 2004, a study published in the *Journal of the American Dietary Association* announced, "The Dietary Approaches to Stop Hypertension (DASH) diet substantially lowers blood pressure and reduces blood lipid levels. When compared with the control diet, the DASH diet is higher in flavonols, flavanones, flavan-3-ols, beta-carotene, beta-cryptoxanthin, lycopene, lutein, zeaxanthin and phytosterols. It, therefore, is possible that the health benefits of the DASH diet are partially attributable to the phytochemicals and might extend beyond cardiovascular disease risk reduction."

The DASH study had established that a diet emphasizing fruits, vegetables, whole grains, poultry, fish and low-fat dairy products can reduce systolic blood pressure by an average of 5.5 mm Hg and diastolic blood pressure by 3 mm Hg.⁵

It generally had been thought that the effectiveness of the DASH diet was related to the high fiber, magnesium, potassium, folic acid and vitamin C content in this fruit- and vegetable-rich diet. Recent studies further suggest it might be the plethora of phytonutrients in plant foods that deserve a larger portion of the credit. For example, researchers in Israel found that a daily dose of tomato extract, standardized for 10 percent lycopene content, helped lower blood pressure in 31 men and women with moderately elevated blood pressure.⁶

The nitrates found in many vegetables also might help lower blood pressure and keep blood vessels healthy. According to a December 2006 study, results of which were reported in *The New England Journal of Medicine*, nitric oxide, generated by nitric oxide synthase, is a key regulator of vascular integrity. Each study participant took a daily dose of nitrate supplement equivalent to the amount normally found in 150 grams to 250 grams of a nitrate-rich vegetable, such as spinach, lettuce or beetroot. Researchers found that the average diastolic blood pressure was 3.7 mm Hg lower after three days of nitrate supplementation. This finding is similar to that found in healthy participants of the DASH trials.⁷

In an editorial commentary on a peer-reviewed paper on the prevention of high blood pressure and nutraceuticals, Dr. Brent M. Egan, professor of pharmacology and medicine at the Medical University of South Carolina, wrote:

"In the summary and conclusions, which promises to become a classic reference source, no fewer than 20 naturally-occurring foods and specific compounds have angiotensin-converting enzyme inhibitor (ACEI) activity. Some of these substances appear to have ACEI activity comparable to that of commercially marketed pharmaceutical products. Moreover, 11 naturally-occurring substances are noted to have calcium channel blocker activity, 11 diuretic activity and 11 enhance nitric oxide. Nine naturally-occurring compounds have angiotensin receptor-blocking properties, 16 direct vasodilator properties, and 14 improve insulin sensitivity. This summary provides a foundation for a rational, 'stepped-care' or multi-dimensional nutritional and nutraceutical approach to the primary and secondary prevention of cardiovascular disease."

Dr. Egan further notes, "To his credit, Dr. Houston repeatedly and correctly points out that the evidence for benefit is much stronger when multiple foods and nutraceuticals are considered together rather than as isolated components."^{8,9}

The Logan Chiropractic College Study

The Logan research study was designed to study the effects of a green phytonutrient-rich fruit and vegetable powder mix on cardiovascular health, including blood pressure, in 40 subjects, half of whom were controls. This green fruit and vegetable powder consisted of micro algae (spirulina, chlorella, *Dunaliella salina*), barley grass juice powder, multiple fruit and vegetable powders of all the colors, lecithin, acerola cherry, fermented cabbage, milk thistle, plant enzymes, quinoa sprout, lemon peel, oat beta-glucan, soluble rice bran, concentrated extracts of green and white tea, resveratrol, lutein, zeaxanthin, lycopene, cinnamon, raspberry, iso quercetin-rutin 50/50 and aloe vera. The product was formulated with a liposomal nanotechnology to enhance the bioavailability of the lipophilic phytonutrients and naturally flavored to enhance compliance.

One serving of a 12 gram scoop, mixed in 6-8 ounces of water, supplied 50 calories, 1.5 g fat, 24 mg NA, 152 mg K, 8 g carbohydrates, less than 1 g of fiber, and 2 g of protein, providing 50 percent RDV of vitamin A as beta-carotene and 50 percent vitamin C from acerola cherry. All other measured vitamins and minerals were under 4 percent RDV per 12 g serving. The product had an oxygen radical absorbance capacity (ORAC) of 583 per gram, or 6,996 ORAC units per serving. Subjects were given two scoops a day.

After taking the supplement for 90 days, both the systolic and diastolic blood pressure decreased significantly. On average, the systolic blood pressure decreased 12.4 mm Hg (140.4±17.7 mm Hg to 128±14.2 mm Hg) and the diastolic blood pressure decreased 7.1 mm Hg (90.2±7.7 mm Hg to 83.1±7.4 mm Hg). No significant blood pressure decrease was observed in the control group. It was observed that taking the green phytonutrient-rich fruit and vegetable drink for 90 days significantly reduced blood pressure, both systolic and diastolic.

Conclusion

This study strongly supports the hypothesis that the phytonutrients in fruits and vegetables are the major factors in the proven efficacy of the DASH diet in reducing blood pressure, rather than the DASH diet's high levels of fiber, magnesium, potassium, folic acid and vitamin C. The study showed significant decreases in both systolic pressure (225 percent greater) and diastolic blood pressure (237 percent greater) compared to the DASH diet results reported by the JADA.¹¹ While the green fruit and vegetable powder tested replicates much of the phytonutrition density one might ingest while following the DASH diet, it does not supply nutrition levels comparable to the DASH diet for nutrients such as fiber, potassium, magnesium, folic acid, vitamin A or vitamin C.¹²

The study also reinforces the hypothesis that the benefit is much stronger when the phytonutrition of multiple fruits and vegetables are considered together, rather than when consumed as isolated nutrients. It should be noted that the size of the study was small and further testing on a larger base is warranted to confirm results.

Although a healthy diet rich in fruits and vegetables has no peer in overall benefits, compliance hurdles in strict dietary regimes is a familiar obstacle to all clinicians. Therefore, green phytonutrient-rich fruit and vegetable powders similar in formula and dosage to the one in the Logan study may indeed be worthy of further clinical investigation in practice.

References

1. Ezzati M, Lopez AD, Rodgers A, Vander Hoorn S, Murray CJ. Selected major risk factors and global and regional burden of disease. *Lancet*, 2002;360:1347-60.
2. He J, Whelton PK. Epidemiology and prevention of hypertension. *Med Clin North Am*, 1997;81:1077-97.
3. Whelton PK. Epidemiology of hypertension. *Lancet*, 1994;344:101-6.
4. Casas JP. Homocysteine and stroke: evidence on a causal link from Mendelian randomization. *Lancet*, 2005;365(9455):224-32.
5. Most MM. Estimated phytochemical content of the dietary approaches to stop hypertension (DASH) diet is higher than in the control study diet. *J Am Diet Assoc*, Nov. 2004;104(11):1725-7.
6. Engelhard YN, Gazer B, Paran E. Natural antioxidants from tomato extract reduce blood pressure in patients with grade-1 hypertension: a double-blind, placebo-controlled pilot study. *Am Heart J*, Jan. 2006;151(1):100.
7. Larsen F. Effects of dietary nitrate on blood pressure in healthy volunteers. *The New England Journal of Medicine*, Dec. 2006;355:2792-93.
8. Houston MC. Editorial Commentary on Egan BM. The role of vascular biology, nutrition and nutraceuticals in the prevention and treatment of hypertension." *JANA*, April 2002; Supplement No. 1.
9. Egan BM. The role of vascular biology, nutrition and nutraceuticals in the prevention and treatment of hypertension. *JANA*, April 2002; Supplement No. 1.

10. Zhang J, Oxino G. "The Effect of Fruit and Vegetable Powder Mix on Blood Pressure and Heart Rate Variability." Poster and abstract presentation. Association of Chiropractic Colleges Convention, March 2007, St Louis, Mo.
11. Most MM, *op cit*.
12. *Journal of Agriculture and Food Chemistry*, 2004; 52(12).

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