Clinical Study: Effect of G3 and Other Juices on Antioxidant Network Status As Measured by Raman Spectroscopy October 2005

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Biophotonic Raman spectroscopy method was used to show the effect of Pharmanex® brand G3 and other juices on overall antioxidant network status. A total of 34 subjects (n=34) entered into this clinical study. Results confirmed that G3 significantly increases skin carotenoid score (~40%) after eight weeks of regular consumption. Furthermore, G3 increased skin-carotenoid score ~375% as compared to Tahitian Noni® and Xango™ (mangosteen) juices.

Introduction

The human body is continuously exposed to a variety of destructive oxidants including byproducts of energy metabolism, pollution, cigarette smoke and ultraviolet sunlight. To offset damage by these oxidants, the body has a number of natural antioxidant defense mechanisms. These include both intrinsic antioxidant enzymes, such as superoxide dismutase and catalase, and extrinsic antioxidant nutrients including vitamins E and C and carotenoids. However, when exposure to metabolic and environmental sources of oxidants exceeds that of the body's antioxidant defense system, a state of oxidative stress develops (Halliwell, B 1991).

There is a strong body of evidence that high intakes of fruits and vegetables rich in antioxidants have far reaching cell protective benefits, promote cardiovascular health, normal insulin metabolism, cognitive function, eye health and general overall health and well being. Science has also suggested that antioxidants and carotenoids help protect against oxidative stress (Liu, C. S. 2004). Thus, a combined diet of antioxidant-containing supplements, and fruits and vegetables, may help tip the balance away from pro-oxidants in favor of antioxidants. Carotenoids are some of the most abundant antioxidant nutrients present in fruits and vegetables. It has been theorized that carotenoids may be responsible for many of the protective effects of a diet high in fruits and vegetables in promoting cardiovascular health, eye health, and overall cell protection (During, A. 2004). In addition to providing antioxidant protection, these essential nutrients are involved in intercellular communication (Deming, 2002) and some serve as important precursors to vitamin A (Bernstein, 1998).

Recent technology, in the form of the BioPhotonic Scanner (Pharmanex), allows for the measurement of carotenoids as an indicator of overall antioxidant status in the skin, through raman spectroscopy (Svilaas, 2004). Advantages of measuring carotenoids in the skin are that it provides a good representation of systemic carotenoid status, habitual dietary fruit and vegetable intake and overall antioxidant status (Smidt, C.R., 2004). Primary carotenoids detected are: lycopene, β-carotene, α-carotene, α-cryptoxanthin, lutein, phytoene and phytofluene, with lycopene and β-carotene present in the highest amounts (Gellermann, 2002). This measurement technique is fast, painless, and cost effective, making it ideal for the assessment of antioxidant status in humans. Furthermore, carotenoid levels measured in the skin by raman spectroscopy technology have been demonstrated to be directly related to both self-reported fruit and vegetable consumption and antioxidant supplementation (Smidt, 2004).

Pharmanex provides supplements, including G3 that provide antioxidants, including carotenoids, shown to be beneficial for overall health and well-being.

Rationale

The purpose of this study was to assess antioxidant benefits, and to determine bioavailability of carotenoids, as a biomarker of overall antioxidant protection from three different branded fruit juice products.

The bioavailability of carotenoids, a biomarker of antioxidant status, was compared in 31 subjects (n=31) individuals consuming one of three different fruit juices for eight weeks (Figure 1). Bioavailability and antioxidant status was assessed using the BioPhotonic Scanner.

Figure 1: Subject Statistics

	G3 (n=11)	Noni® (n=10)	Xango™ (n=10)
Age (years)	30 ± 10	30 ± 7	35 ± 9
Height (cm)	172 ± 10	178 ± 10	179 ± 10
Weight (kg)	69 ± 15	80 ± 18	77 ± 16
BMI-Body Mass Index	23 ± 3	25 ± 5	24 ± 5
Baseline Score	24,273 ± 4,962	22,200 ± 4,685	20,492 ± 6,994
f/v intake (serv/day)	1.7 ± 1.5	2.5 ± 1.2	2.4 ±1.3

This study was conducted by Pharmanex scientists. The study authors, Carsten R. Smidt and Angela Mastaloudis, are employees of Pharmanex, a division of Nu Skin Enterprises, Inc. Pharmanex produces and distributes dietary supplement products, including g3.

Test Procedure

We measured the efficacy of three different juice mixtures in increasing skin carotenoid levels over an eight-week period as an indication of carotenoid bioavailability, as a biomarker of overall antioxidant protection.

G3 gấc superfruit blend with lipocarotenes™

G3, a Pharmanex® product, is composed of four main fruit juices from concentrate: Gac (Mormordica cochinchinensis), Cili (rosa roxburghii tratt), Siberian pineapple (Hippophae rhamnoids, also known as Sea Buckthorn), and Chinese lycium, (Lycium barbarum, also known as wolfberry). G3 is composed of food-grade ingredients commonly found in the global food supply making it a safe, well-tolerated supplement. G3 is a food-grade product that is commercially available.

Xango™ Juice (mangosteen)

Xango™ is composed of mangosteen (Garcinia mangostana) from whole fruit juice, apple fruit juice, pear fruit juice, grape fruit juice, pear fruit puree, blueberry fruit juice, raspberry fruit juice, strawberry fruit juice, cranberry fruit juice, cherry fruit juice, citric acid, natural flavor, pectin, xanthan gum and sodium benzoate. Xango™ is a food-grade product that is commercially available.

Tahitian Noni® Juice

Tahitian Noni® is composed of reconstituted Morinda citrifolia (noni fruit) juice from pure noni puree from French Polynesia, natural grape juice concentrate, natural blueberry juice concentrate, and natural flavors. Tahitian Noni® is a food-grade product that is commercially available.

Randomization Criteria:

Subjects (n = 34) meeting study criteria were randomly assigned to one of three treatment groups—Noni,® Xango™ (mangosteen), or G3. (Figure 2).

Figure 2: Subjects Per Group

G3	Xango™	Tahitian Noni®
N = 12	N = 11	N = 11

Supplementation:

Twice per day, with breakfast and with dinner, for eight weeks, subjects consumed, based on their randomization category:

1) 3 fluid ounces G3
2) 3 fluid ounces Xango™ (mangosteen)
3) 3 fluid ounces Tahitian Noni®

Carotenoids and other fat soluble nutrients are not absorbed along the same pathway as other nutrients that are present in the diet. Fat-soluble nutrients are absorbed with fat, through the lymphatic system along with other hydrophobic or "water fearing" nutrients. This alternate form of absorption assists the body in absorbing material that is near incompatible with the watery environment found in cells of the body. The fat-soluble nutrients interact with the intestinal environment the same way that oil interacts with water. The interactions of the two would make it impossible for the body to absorb a significant amount without minimizing the interaction with water in the absorption pathway. In order to minimize the interaction with water in the absorption pathway, subjects were instructed to consume the juice with meals containing a moderate amount of fat in order to ensure sufficient carotenoid absorption. In the event subjects chose to consume the juice with a fat-free meal they were instructed to consume two Optimum Omega softgels containing a total of 360 mg EPA and 240 mg DHA fish oils along with the juice in order to ensure carotenoid bioavailability. (Weber F. 1983)

Diet

Subjects were asked to maintain their typical diet for the eight weeks of the study. In order to control for the effects of diet on their BioPhotonic Scanner score, subjects were encouraged to avoid making changes to their diet, especially the addition or omission of foods high in carotenoids, including colorful fruits and vegetables such as citrus fruits, leafy green vegetables, tomatoes and tomato products as well as squash. In addition, subjects were encouraged to maintain consistent intake of beverages including, but not limited to coffee, tea, red wine and other alcohol. Subjects were provided with instructions on how to fill out the questionnaire, including food descriptions and instructions on how to best estimate portion size. Dietary questions about fruits and vegetables intake have been validated previously (Smidt, CR 2004).

Subjects were scanned one week prior to supplementation, the first day of supplementation and then every other week for the duration of the study (eight weeks). A final scan was conducted on the last day of supplementation for a total of six scans.

Results

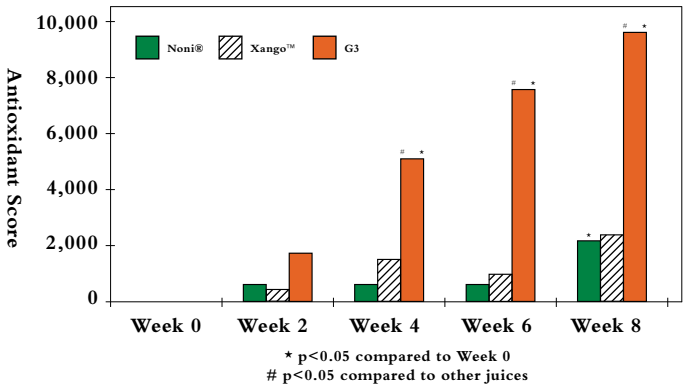
Thirty one subjects completed the study. One subject from the Tahitian Noni® group dropped out in the first week due to the taste of the juice. One subject from the Xango™ (mangosteen) group dropped after the baseline screening due to pregnancy. One subject dropped from the Xango™ group and did not give a reason.

Drinking G3 significantly increased Scanner scores within four weeks (Figure 3). Scores increased an average of 9273 ± 5081 Counts in eight weeks (Range 5,000-14,000 Counts). Furthermore, consumption of G3 led to higher Scanner scores than either Xango™ (mangosteen) or Tahitian Noni® at weeks four, six and eight.

No changes in the Noni® group were observed other than a moderate 2,400 ± 1,060 count increase at week 8 compared to the beginning of the study (Figure 3).

Consumption of Xango™ (mangosteen) had no effect on Scanner score at any time (Figure 3).

Figure 3: Change in Antioxidant Score



Discussion

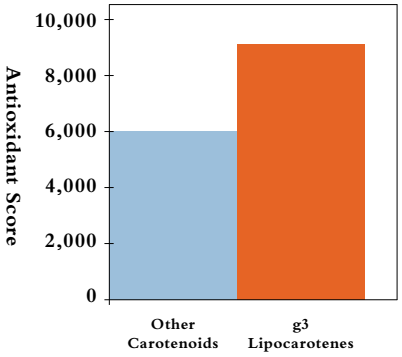
G3, consumed as recommended (three fluid oz twice a day) dramatically increased scanner scores in 10 out of 11 subjects. Average score increases were: 4818 ± 2786 (21%) after four weeks, 7455 ± 5392 (32%) after six weeks and 9273 ± 5081 Counts (40%) after eight weeks. There was no apparent plateau in the increase in Scanner scores in response to drinking G3 for eight weeks. Therefore, it may be theorized that if the study had been carried out for a longer duration, scores would have continued to increase indefinitely.

G3 increased Scanner scores 375% more than either Xango™ (mangosteen) or Noni® Juice.

Among the potent phytonutrients found in G3 are Lipocarotenes.™ A Lipocarotene™ is a matrix of beta-carotene and fatty acids that enables efficient absorption and transport of beta-carotene and other fat-soluble vitamins. Significant concentrations of long chain fatty acids (~7-10% by weight) are found in the seed membrane and pulp of the Gac fruit. This oil is also a rich source of vitamin E and essential fatty acids.

The Lipocarotene™ form of carotenoids in G3 are as much as 55% more bioavailable than those from other sources (Vuong 2002) (Figure 4)

Figure 4: Lipocarotene Carotenoids 55% more available



From this study, it can be concluded that G3 effectively increases skin-carotenoid levels, a biomarker of overall antioxidant protection.

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