P.O. Box 144345 Austin, TX 78714-4345 ▪ 512.926.4900 ▪ Fax: 512.926.2345 ▪ www.herbalgram.org

HerbClip™

▪ **Cocoa (*Theobroma cacao*)**
▪ **Phytosterols**
▪ **Cholesterol**

HC 120161-319

Date: December 29, 2006

RE: Effect of a Flavanol-rich Cocoa Snack Bar on Cholesterol Levels in Hypercholesterolemic Adults

Polagruto JA, Wang-Polagruto JF, Braun MM, Lee L, Kwik-Uribe C, Keen CL. Cocoa flavanol-enriched snack bars containing phytosterols effectively lower total and low-density lipoprotein cholesterol levels. *J Am Diet Assoc*. 2006;106(11):1804–1813.

Over the past decade, phytosterols have become of great interest because of their well-documented ability to beneficially affect cholesterol homeostasis (balanced or optimal levels). The mechanism responsible for this ability is not known for certain. However, it is known that phytosterols are poorly absorbed in humans and thus interfere with the solubility of cholesterol during the digestive process, which results in a decrease in net cholesterol absorption. Phytosterols are plant-derived compounds that can be categorized into two distinct classes: stanols and sterols. Both classes of phytosterols are found in a variety of foods and food products, such as vegetable oils, seeds, cereals, nuts, enriched margarines, orange juice, and milk. Although plant sterol-containing foods are considered safe for adults, concern exists that the consumption of phytosterols may decrease the availability of antioxidants. The objective of this study was to determine whether the ingestion of a flavanol-rich cocoa (*Theobroma cacao*) snack food containing phytosterols would decrease total and low-density-lipoprotein cholesterol levels and affect fat-soluble vitamin and carotenoid levels in hypercholesterolemic (high cholesterol) subjects.

Seventy-two hypercholesterolemic (fasting serum cholesterol level being greater than 200 mg/dL) men and women were enrolled in this randomized, double-blind, placebo-controlled, parallel-arm study, which was conducted at the University of California, Davis. The subjects were randomly assigned to consume, for 6 months, 1 of 2 snack bars twice daily within 30 minutes of a meal: a phytosterol-enriched cocoa bar (1.5 g phytosterols) or a control bar devoid of phytosterols. Both snack bars were provided by Masterfoods USA, Hackettstown, NJ.

At the beginning of the study, the subjects attended a nutrition-education seminar and were instructed to keep a 3-day dietary record at 3 time points during the study. The subjects maintained their usual diet, except that they were instructed to avoid the consumption of cocoa, chocolate, herbal and other dietary supplements, and phytosterol-containing foods. Fasting blood samples were collected twice at week 0 (baseline), once at week 3, and twice at week 6. Serum lipid, vitamin A, vitamin E, phytosterol, and carotenoid levels were measured. The bioavailability of flavanols in plasma was studied in a subset of 10 women in a separate acute study after they consumed 2 of the flavanol-rich (100 mg) phytosterol-containing snack bars.

Seventy subjects (n = 22 men and 48 women) completed the study, 35 in each of the 2 groups. None of the variables measured at baseline were significantly different between groups, and compliance was good in both groups. No significant differences in changes in energy intakes or macronutrient profiles were found between groups on the basis of the dietary records. However, subjects in the phytosterol group consumed significantly less vitamin C and fruit at week 6 than at week 0 than did the control group. Both groups reported significant decreases in β-carotene intake during the study, but no significant differences were observed between groups. Total cholesterol, low-density-lipoprotein (LDL) cholesterol, and the ratio of total to high-density-lipoprotein (HDL) cholesterol decreased significantly from baseline by 4.7% ($P = 0.02$), 6% ($P < 0.001$), and 7.4% ($P < 0.001$), respectively, at 6 weeks in the phytosterol group only; the change in these variables was also significantly different in the phytosterol group at 3 weeks. Neither HDL cholesterol nor triacylglycerols changed significantly at any time point in either study group.

No significant changes in serum vitamins A and E, lycopene, β-cryptoxanthin, lutein/zeaxanthin, or α-carotene were observed during the study in either study group. The serum α-carotene level changed significantly ($P < 0.01$) in the phytosterol group at 6 weeks. Serum campesterol and β-sitosterol levels were 1.4 times greater ($P < 0.01$) and 1.3 times greater ($P < 0.05$), respectively, in the phytosterol than in the control group at 6 weeks. No significant differences in serum stigmasterol were observed between groups at 6 weeks. Mean (±SEM) levels of plasma epicatechin in the subset of 10 subjects were 119.5 ± 24 nmol/L 2 hours after consumption and 61.1 ± 7.8 nmol/L 4 hours after consumption.

Based on the results of this trial, moderate intakes of flavanols and phytosterols from a cocoa snack bar appear to lower plasma total and LDL cholesterol levels in persons with hypercholesterolemia. The authors suggest that a healthy diet and regular exercise in conjunction with the consumption of a chocolate product that contains phytosterols "can be a safe and effective means to lower both total and LDL cholesterol levels."

—Brenda Milot, ELS

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