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

HerbClip™

File: ■ Cocoa (*Theobroma cacao*)
■ Green Tea (*Camellia sinensis*)
■ Insulin Resistance
■ Obesity

HC 101232-465

Date: January 31, 2013

RE: Green Tea and Cocoa Flavanols Provide Some Health Benefits in Obese Adults at Risk for Insulin Resistance

Stote KS, Clevidence BA, Novotny JA, Henderson T, Radecki SV, Baer DJ. Effect of cocoa and green tea on biomarkers of glucose regulation, oxidative stress, inflammation and hemostasis in obese adults at risk for insulin resistance. *Eur J Clin Nutr*. October 2012;66(10):1153-1159.

Insulin resistance increases an individual's chance of developing type 2 diabetes mellitus and cardiovascular diseases. Lifestyle changes, including dietary modification, may improve insulin resistance. Among the plant flavonoids associated with beneficial health effects are those found in cocoa (*Theobroma cacao*) and green tea (*Camellia sinensis*). The exploratory study reported in this article was designed to evaluate the ability of dietary cocoa flavanols to improve health indices in a group of obese adults at risk for insulin resistance. The outcome variables were those related to glucose metabolism and to biomarkers of oxidative stress, inflammation, and hemostasis, which play a prominent role in diabetes and cardiovascular diseases. Cocoa flavanols were compared with green tea flavanols for their ability to modulate those biomarkers.

The authors recruited men and women, aged 25 to 55 years, through advertisements in the Washington, D.C. metropolitan area. Risk for insulin resistance was determined by routine clinical measurements: body mass index (BMI), waist circumference (WC), fasting blood glucose concentration, blood insulin concentration, blood lipids, blood pressure, and family history of diabetes mellitus. The crossover study included five 5-day treatment periods separated by 10-day washout periods. Twenty subjects (10 men and 10 women) were randomly assigned to the treatments and completed all the treatment periods. One subject was excluded from the final analysis.

The subjects consumed 2 servings of the treatment beverage per day: 1 at breakfast and 1 at the evening meal, as part of a controlled diet. The cocoa beverage (Mars Incorporated; Hackettstown, New Jersey) provided flavanols at ~30 mg daily (control), 180 mg daily (low-flavanol), 400 mg daily (medium-flavanol), and 900 mg daily (high-flavanol). The tea used was Lipton Green Tea To Go (Unilever; Englewood Cliffs, New Jersey). The beverages were prepared from dry powders in individual packets.

During the treatment periods, subjects consumed a controlled diet: a 5-day menu cycle of typical American foods low in polyphenols. Foods in the 5-day menu cycle were analyzed for macronutrients, fatty acids, cholesterol, and dietary fiber. The subjects were weighed before breakfast Monday through Friday. The subjects completed a daily questionnaire about their general health, any prescription or over-the-counter medications used, dietary compliance, exercise performed, and questions or problems with the diet. The experimental diets provided, on average, 54% of calories from carbohydrates, 32% from fat, and 14% from protein. The diet provided 297 mg of cholesterol and 24 g of dietary fiber daily.

Blood pressure, anthropometric variables, and body composition were measured at baseline. Oral glucose tolerance tests (OGTTs) were performed on the mornings following the 5-day treatment periods.

Of the 19 subjects included in the final analysis, the OGTT results were normal in 13, and 6 were classified as having impaired glucose tolerance. Body weight did not change significantly throughout the study.

The authors report that the cocoa treatments did not significantly change the glucose, insulin, or triglyceride levels, whether measured after an overnight fast or in response to the OGTT. Values for areas under the curve (AUCs) for glucose and insulin and surrogate markers of insulin resistance (homeostasis model assessment of insulin resistance) and insulin sensitivity (quantitative insulin sensitivity check index) were not significantly affected by the cocoa treatments. When comparing the high-flavanol cocoa and green tea treatments, the authors saw no significant effects on concentrations of glucose, insulin, and triglycerides; values for AUCs for glucose and insulin; or the surrogate markers of insulin resistance and insulin sensitivity.

The authors did report that the cocoa flavanols significantly affected the biomarkers for oxidative stress and inflammation. As the cocoa flavanol dose increased, the total 8-isoprostane concentrations (P=0.02) and C-reactive protein (CRP) concentrations decreased (P=0.01). The authors noted a quadratic relationship between cocoa flavanol levels and interleukin-6 (IL-6) concentrations, "suggesting that a maximum effective dose was achieved." No significant differences were observed among the cocoa treatments on intercellular adhesion molecule-1 (ICAM-1) and fibrinogen concentrations.

Although no significant effects on total 8-isoprostane, CRP, IL-6, and ICAM-1 concentrations were reported when comparing the high-flavanol cocoa and green tea treatments, the authors did find that the green tea lowered fibrinogen concentrations by 7% (P=0.0003), compared with the high-flavanol cocoa.

In this study, the short-term consumption of flavanols from cocoa and green tea did not improve glucose metabolism in obese adults at risk for insulin resistance. However, certain markers of oxidative stress, inflammation, and hemostasis were improved. "Given that these processes likely promote diabetes, cardiovascular disease and other chronic diseases, long-term studies of flavanols are warranted particularly in at-risk populations," say the authors.

—Shari Henson

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