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

HerbClip™

File: ■ Chocolate (*Theobroma cacao*)
■ Polyphenols
■ Obesity

HC 011013-400

Date: May 14, 2010

RE: Dark Chocolate Consumption Improves Fasting Glucose Levels and Blood Pressure in Overweight and Obese Persons

Almoosawi S, Fyfe L, Ho C, Al-Dujaili E. The effect of polyphenol-rich dark chocolate on fasting capillary whole blood glucose, total cholesterol, blood pressure and glucocorticoids in healthy overweight and obese subjects. *Br J Nutr.* 2010 Mar;103(6):842-50.

Obesity has been shown to be associated with elevated blood pressure (BP) and insulin resistance, and epidemiological studies have shown an association between high polyphenol intakes and a reduced risk of oxidative stress-related diseases such as diabetes, hypertension, and cardiovascular disease (CVD). In particular, the consumption of cocoa or dark chocolate (DC) (*Theobroma cacao*) has been shown to improve endothelial function, insulin sensitivity, and BP in obese persons. One underlying factor linked to these CVD risk factors is the abnormal metabolism of cortisol, and postprandial hypercortisolism has been associated with abdominal obesity, increased urinary cortisone-to-cortisol ratio, and insulin resistance. The objective of the present study was to evaluate and compare the effect of DC consumption containing two different amounts of polyphenols on fasting capillary whole blood glucose levels, total cholesterol, BP, and urinary cortisol levels in healthy obese persons.

Fourteen obese (body mass index average: 27.7 kg/m^2), but otherwise, healthy men (n = 8) and women (n = 6) aged 21-50 years were enrolled in this uncontrolled, randomized crossover study, which was conducted at Queen Margaret University (Musselburgh, United Kingdom). The subjects served as their own controls and were randomly assigned to consume 20 g DC daily (Acticoa™ chocolate; Barry Callebaut; Lebbeke, Belgium) containing either 500 or 1000 mg polyphenols for 2 weeks. After a 1-week washout period, the subjects were crossed over to the alternate treatment. The subjects were advised to consume the chocolate throughout the day, so as to achieve a high steady state level, and to maintain their usual diet but to refrain from consuming polyphenol-rich foods. Before and after the intervention, fasting capillary whole blood samples were collected for the measurement of glucose and total cholesterol 12 hours after the last intake of chocolate; 24-hour urine samples were collected for the measurement of magnesium, sodium, potassium, and cortisol levels; anthropometric

measures (body mass index and waist and hip circumferences) were made; and systolic and diastolic BP were measured. Fasting glucose (FG) and systolic and diastolic BP were measured weekly. The subjects were requested to complete a 3-day diet and physical activity diary.

A mixed between-within subjects analysis of variance showed a significant decrease in capillary blood glucose levels ($P = 0.002$), systolic BP ($P < 0.0001$), and diastolic BP ($P < 0.0001$) after the consumption of DC. However, no significant differences in FG or in BP were observed between the 500- and 1000-mg polyphenol interventions, which indicated that both doses of polyphenols had similar efficacy. No significant changes in any of the anthropometric measures, in total cholesterol, or in urinary cortisol-to-cortisone ratio, magnesium, potassium, sodium, or free cortisol were observed after either of the polyphenol interventions. Urinary free cortisone levels trended toward a reduction after both the 500- and 1000-mg polyphenol interventions; however, the change did not reach statistical significance. Energy expenditure and intakes of energy, macronutrients, and minerals did not change significantly throughout the intervention.

The results indicate that the consumption of polyphenol-rich DC decreases FG levels and BP in obese adults. These results coincide with previous findings that intakes of polyphenol-rich DC improved insulin resistance and sensitivity, FG levels, and BP in healthy,[1] hypertensive,[2] glucose-intolerant,[3] and obese[4] persons. The authors suggest that the main mechanism by which DC polyphenols improve glucose and BP is via the nitric oxide pathway. Furthermore, it was shown that DC containing 500 mg polyphenols was as effective at decreasing FG and BP as was DC containing 1000 mg polyphenols with similar nutrient contents, and these effects appeared to be independent of cortisol metabolism. However, only 1 of the 14 subjects was abdominally obese, the condition most associated with enhanced cortisol metabolism. Finding the minimum polyphenol dose for maximum benefits will help to reduce bitterness and increase palatability. The authors conclude that "the present study confirms previous reports of improved FG levels and BP following DC consumption" and that additional studies are needed "to identify the optimal dose of polyphenols required to improve glucose metabolism and to examine additional parameters that could be influenced by polyphenols."

—Brenda Milot, ELS

References

[1]Grassi D, Lippi C, Necozione S, et al. Short-term administration of dark chocolate is followed by a significant increase in insulin sensitivity and a decrease in blood pressure in healthy persons. *Am J Clin Nutr.* 2005;81:611-614.

[2]Grassi D, Necozione S, Lippi C, et al. Cocoa reduces blood pressure and insulin resistance and improves endothelium-dependent vasodilation in hypertensives. *Hypertension.* 2005;46:398-405.

[3]Grassi D, Desideri G, Necozione S, et al. Blood pressure is reduced and insulin sensitivity increased in glucose-intolerant, hypertensive subjects after 15 days of consuming high-polyphenol dark chocolate. *J Nutr.* 2008;138:1671-1676.

[4]Davison K, Coates AM, Buckley JD, et al. Effect of cocoa flavanols and exercise on cardiometabolic risk factors in overweight and obese subjects. *Int J Obes (Lond).* 2008;32:1289-1296.

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