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Dark Chocolate May Improve Insulin Sensitivity/Resistance and Blood Pressure

Laurie Barclay, MD

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March 11, 2005 — Dark chocolate improves insulin sensitivity and resistance and decreases blood pressure, whereas white chocolate does not, according to the results of a randomized study published in the March issue of the *American Journal of Clinical Nutrition*.

"Numerous studies indicate that flavanols may exert significant vascular protection because of their antioxidant properties and increased nitric oxide bioavailability," write Davide Grassi, from the University of L'Aquila in Italy, and colleagues. "In turn, nitric oxide bioavailability deeply influences insulin-stimulated glucose uptake and vascular tone. Thus, flavanols may also exert positive metabolic and pressor effects."

After a seven-day cocoa-free run-in phase, 15 healthy participants were randomized to receive either dark chocolate bars or white chocolate bars for 15 days, followed by another seven-day cocoa-free washout phase and then crossover to the other chocolate. The dark chocolate bars weighed 100 g and contained approximately 500 mg polyphenols; the white chocolate bars weighed 90 g and presumably contained no polyphenols. At the end of each period, oral glucose tolerance tests were performed to calculate the homeostasis model assessment of insulin resistance (HOMA-IR) and the quantitative insulin sensitivity check index (QUICKI).

Mean HOMA-IR was 0.94 ± 0.42 after dark chocolate ingestion and 1.72 ± 0.62 after white chocolate ingestion ($P < .001$). Mean QUICKI was 0.398 ± 0.039 vs 0.356 ± 0.023 , respectively ($P = .001$). Systolic blood pressure was lower after dark than after white chocolate ingestion (107.5 ± 8.6 vs 113.9 ± 8.4 mm Hg; $P < .05$).

Study limitations include inability to determine if positive changes in insulin sensitivity induced by dark chocolate were due to increased NO availability, and inability to completely exclude the contribution of other substances present in dark but not in white chocolate bars to the positive effects noted.

"Dark, but not white, chocolate decreases blood pressure and improves insulin sensitivity in healthy persons," the authors write. "These findings indicate that dark chocolate may exert a protective action on the vascular endothelium also by improving insulin sensitivity. Obviously, large scale trials are needed to confirm these protective actions of dark chocolate or other flavanol-containing foods in populations affected by insulin-resistant conditions such as essential hypertension and obesity."

The Italian Ministero della Università e della Ricerca Scientifica supported this study. The authors report no conflict of interest.

In an accompanying editorial, Cesar G. Fraga, from the University of California, Davis, and the University of Buenos Aires, Argentina, cites the large body of epidemiologic evidence suggesting that diets rich in fruit and vegetables may attenuate or delay the onset of cardiovascular and other chronic diseases.

"The interpretation that flavanols and procyanidins contained in the dark chocolate used in this study may be associated with the observed health effects is tempting but remains speculative," Dr. Fraga writes. "The identification of healthy foods and the understanding of how food components influence normal physiology will help to improve the health of the population.... Further studies in larger groups and in diabetic and hypertensive individuals are needed to confirm the healthy effects of chocolate, cocoa, and flavanols."

Dr. Fraga reports no conflict of interest.

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Reviewed by Gary D. Vagin, MD

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