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File: ■ Cocoa (*Theobroma cacao*, Malvaceae)
■ Flavanols
■ Aging Skin

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RE: Cocoa Flavanol Consumption Improves Facial Wrinkles and Skin Elasticity in Women with Photo-aged Facial Skin

Yoon H-S, Kim JR, Park GY, et al. Cocoa flavanol supplementation influences skin conditions of photo-aged women: a 24-week double-blind, randomized, controlled trial. *J Nutr.* 2016;146(1):46-50.

Cocoa products, derived from the dried, fermented fatty seeds of the cocoa (*Theobroma cacao*, Malvaceae) tree, reportedly have many health benefits. They are rich in polyphenolic antioxidants and flavanols such as epicatechin, catechin, and procyanidins. Clinical trials conducted for 12 weeks that investigated the effects of consuming high-flavanol cocoa products on skin photo-aging have shown conflicting results. Since finding an adequate daily dose and duration of cocoa flavanol supplementation might provide significant antioxidant photoprotection, these authors conducted a 24-week, double-blind, randomized, clinical trial to investigate whether high-flavanol cocoa supplementation would improve the moderately photo-aged facial skin of female subjects.

The subjects were healthy females aged between 40 and 86 years (mean age, 61.7 ± 13.1 years) with visible wrinkles. The study was conducted between February 2014 and March 2015 at Seoul National University Hospital in Seoul, Korea. Sixty-four subjects were randomly assigned to either the cocoa group or placebo group, with 32 subjects in each group. Of those subjects, 1 from each group did not follow the protocol and did not complete the study.

The beverage consumed daily by the cocoa group contained 4 g fat-reduced cocoa powder (Barry Callebaut Belgium N.V.; Lebbeke-Wieze, Belgium) that was processed in a manner to preserve a high amount (320 mg) of cacao bean flavanols. A nutrient-matched cocoa-flavored beverage that did not contain cocoa flavanols was consumed by the placebo group. The beverage powders were dissolved in 150-200 mL hot water.

Wrinkles were measured in the crow's feet area on the outer corner of the eye by using a Skin-Visiometer® SV 600 (Courage+Khazaka electronic GmbH; Cologne, Germany) to assess the following 5 roughness variables: skin roughness, maximum roughness,

average roughness, smoothness depth, and arithmetic average roughness. As wrinkles diminish in depth, those values decrease. A Cutometer[®] MPA580 (Courage+Khazaka electronic GmbH) was used to measure skin elasticity on the cheek in terms of gross elasticity, net elasticity, and biological elasticity. The closer the value is to 1 on the cutometer, the more elastic the skin. Using a Corneometer[®] and a Tewameter[®] (both, Courage+Khazaka electronic GmbH), the authors evaluated skin hydration on each subject's cheek.

The facial skin of each subject was evaluated at baseline and during the study at 12 and 24 weeks. Ten subjects in each group agreed to undergo ultraviolet (UV)-B irradiation. The minimal erythema dose (MED), or the minimal UV dose causing erythema on all edges of an irradiated square of skin on the buttock, was assessed at baseline and at 24 weeks in those subjects.

Adverse effects were evaluated at 12 and 24 weeks. Blood samples were drawn at baseline and at 24 weeks to measure aspartate aminotransferase, alanine transaminase, glucose, blood urea nitrogen, creatinine, and hemoglobin and hematocrit concentrations.

The authors report no significant between-group differences in visiometer measurements after 12 weeks of supplementation. After 24 weeks, however, the mean percentage changes in average roughness ($P=0.023$) and maximum roughness ($P=0.030$) were significantly lower in the cocoa group than in the placebo group. "Because visiometer values decrease as wrinkle diminish, these results suggest that the cocoa group showed improvement in wrinkle severity compared with the placebo group." Changes in the other visiometer variables were not significant at 24 weeks.

The only significant between-group difference in skin elasticity after 12 weeks was in the mean percentage change in gross elasticity of the skin, which was significantly greater in the cocoa group than in the placebo group ($P=0.020$). After 24 weeks, significant between-group differences were observed in gross elasticity ($P=0.027$), net elasticity ($P=0.027$), and biological elasticity ($P=0.032$), which were all greater for the cocoa group than for the placebo group. No significant between-group differences were seen in epidermal hydration variables after 12 or 24 weeks of supplementation.

No adverse effects were reported, and no abnormal laboratory values were observed. Body weight changes were minimal; the placebo group gained more than the cocoa group after 24 weeks ($P=0.021$). Although cocoa flavanols have been reported to have beneficial effects on obesity, in this study, the subjects' diet and physical activity were not controlled, so this finding "can only be interpreted as indirect evidence and was an unintended outcome," write the authors.

Overall adherence rates were 97.6% at 12 weeks and 98.4% at 24 weeks.

The MED of those in the placebo group undergoing UV irradiation did not change significantly during the study. In the cocoa group, however, a significantly increased MED was observed at 24 weeks ($P=0.022$). Changes in MED at 24 weeks were significantly higher in the cocoa group than in the placebo group ($P=0.035$).

Although this study showed that cocoa flavanols can improve facial wrinkles and elasticity, the effects were not as great as those reported for direct curative therapies

such as topical tretinoin, laser resurfacing, and chemical peeling. "Therefore, the main effect of cocoa flavanols on photo-aging might be preventive rather than curative," the authors state.

The authors note that their findings of changes in wrinkle severity and skin elasticity are consistent with those of previous trials.^{1,2} Conflicting results remain regarding changes in MED after cocoa flavanol consumption, possibly because of the variations in age, skin phototype, and race of subjects used in the trials.

The authors conclude that "in moderately photo-aged women, regular cocoa flavanol consumption had positive effects on facial wrinkles and elasticity," and that "regular cocoa flavanol consumption may be a good strategy for prevention of the progression of skin photo-aging."

—*Shari Henson*

References

¹Heinrich U, Neukam K, Tronnier H, Sies H, Stahl W. Long-term ingestion of high flavanol cocoa provides photoprotection against UV-induced erythema and improves skin condition in women. *J Nutr.* 2006;136(6):1565-1569.

²Mogollon JA, Boivin C, Lemieux S, Blanchet C, Claveau J, Dodin S. Chocolate flavanols and skin photoprotection: a parallel, double-blind, randomized clinical trial. *Nutr J.* 2014;13:66. doi: 10.1186/1475-2891-13-66.

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