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File: ■ Chia (*Salvia hispanica*) Seed
■ Cardiovascular Disease
■ Overweight/Obesity

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RE: Milled Chia Seed Consumption Increases Plasma ALA and EPA Levels

Nieman DC, Gillitt N, Jin F, et al. Chia seed supplementation and disease risk factors in overweight women: a metabolomics investigation. *J Altern Complement Med*. 2012;18(7):700-708.

The essential fatty acid, α-linolenic acid (ALA), present in various seeds, nuts, and vegetables, can be metabolically converted to long-chain *n*-3 polyunsaturated fatty acids (*n*-3 PUFAs), including eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA), and docosahexaenoic acid (DHA).[1,2] EPA and DHA consumption through fish and fish oil supplements reduces certain disease risk factors. Results of animal studies support the use of *n*-3 PUFA supplements to help control chronic inflammation and disease risk factors, but the limited data from human studies are conflicting. Among the botanical sources of *n*-3 PUFAs is chia (*Salvia hispanica*) seed. An earlier study conducted by the lead author and associates reported that daily ingestion of 50 g of whole chia seed for 12 weeks increased plasma ALA but not EPA levels, with no change in body mass, inflammation, or disease risk factors.[3] The purpose of the randomized, double-blind, placebo-controlled community trial reported here was to compare the effects of milled and whole chia seed on plasma ALA and EPA levels and the potential effects on traditional biomarkers of cardiovascular disease.

Subjects were recruited through local advertising and included 24 overweight (body mass index [BMI]=25-59.9 kg/m^2) and 38 obese (BMI≥30 kg/m^2), otherwise healthy, nonsmoking, postmenopausal women aged 49 to 75 years. The subjects agreed to maintain their normal diets and physical activity during the study, not to try to lose weight, and to avoid flax (*Linum usitatissimum*) seed, flaxseed oil, and fish oil, and to keep fish consumption to no more than 1 serving per week.

Subjects ingested chia seed or placebo supplements daily for 10 weeks. The chia seed and placebo supplements were prepared by Dole Packaged Foods, LLC (Westlake Village, California). Whole poppy (*Papaver somniferum*) seed was used as the placebo. The subjects used a single 25 g packet daily, ingesting the supplement throughout the day in fruit juice or other beverages, in yogurt, on salads and cooked vegetables, or on breakfast cereal.

Body composition, blood pressure, augmentation index (for cardiovascular risk), and blood samples were taken from all subjects before and after the study after an overnight fast. Plasma ALA, EPA, DPA, and DHA levels were analyzed, as well as concentrations of 9 inflammatory cytokines (interleukin-6 [IL-6], tumor necrosis factor-α, granulocyte-macrophage colony-stimulating factor, interferon-γ, IL-1β, IL-2, IL-8, IL-10, and IL-12p70). High-sensitivity C-reactive protein (hs-CRP) was also measured as a marker for inflammation. Diet records and questionnaires determined potential adverse effects and adherence to the study regimen.

Six subjects from the placebo group dropped out because of difficulty consuming the placebo, citing unpleasant mouthfeel and seeds lodging between the teeth. Fifty-six subjects remained in the whole chia seed (n=16), milled chia seed (n=14), and placebo (n=26) groups. The subjects who completed the study consumed all of the chia seed and placebo supplied to them. Of the 56 subjects, 35 did not know what supplement they were ingesting (chia seed or poppy seed); of those who believed they knew which seed they were consuming, 14 subjects guessed correctly, and 7 guessed incorrectly.

Food records completed by the subjects before the study and at 5 and 10 weeks revealed similar macronutrient and micronutrient intake among the groups throughout the study. Symptoms for digestive health, hunger, energy level, illness, pain, stress, focus/concentration, and overall wellbeing as assessed before the study and at 5- and 10-week symptom logs did not differ significantly between chia seed and placebo groups.

Plasma ALA increased 58.4% (interaction effect, P=0.002) and EPA increased 38.6% (P=0.016) in the milled chia seed group compared with nonsignificant changes in the other 2 groups. Increases were noted in plasma DPA (21.1%) and DHA (16.5%) in the milled chia seed group, but the changes were not significant compared with placebo.

Body mass and composition remained stable during the 10 weeks and did not differ among the groups. The pattern of change over time was similar among the groups for serum glucose, cholesterol, hs-CRP, systolic blood pressure, augmentation index, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, serum triglycerides, diastolic blood pressure, and all components in the comprehensive diagnostic chemistry panel. The pattern of change over time for the 9 plasma cytokines measured did not differ among the groups.

The authors used metabolomics to measure small molecules or metabolites present in biological samples to elucidate the effect of a particular stimulus on metabolic pathways. Gas chromatography-mass spectrometry was used particularly to measure metabolic profiles in pre- and post-supplementation serum samples in combination with commercial metabolite libraries and an internal library of about 600 internal standards for compound annotation.[4] The authors hypothesized that "global and targeted metabolomics profiling would capture subtle perturbations in metabolites associated with inflammation and disease risk factors from chia seed ALA intake." Results showed that the global metabolic difference scores for each group were nonsignificant, and fold-changes for 28 targeted metabolites associated with inflammation and disease risk factors did not differ among the groups.

In this trial, ingestion of 25 mg of milled, but not whole, chia seeds daily for 10 weeks resulted in a significant increase in plasma ALA and EPA levels compared with placebo; however, no group differences were reported for inflammation and disease risk factors.

According to the authors, these data combined with those from their previous publication[3] do not support the short-term strategy of having postmenopausal, overweight women use whole or milled chia supplements (25-50 g daily) high in ALA to help lower chronic inflammation or improve blood pressure, vascular function, and blood lipid profiles. "These findings, however, should not discourage individuals from using chia seed and other ALA-rich foods," write the authors, noting that those foods are rich in nutrients, and that high, chronic ALA intake has been associated with multiple health benefits.

—Shari Henson

References

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