

Almond Snacking for 8 Weeks Increases Alpha-Diversity of the Gastrointestinal Microbiome and Decreases *Bacteroides fragilis* Abundance Compared to an Isocaloric Snack in College Freshmen

Dhillon, J 2019

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Abstract:

Background: Changes in gut microbiota are associated with cardiometabolic disorders and are influenced by diet. Almonds are a rich source of fiber, unsaturated fats, and polyphenols, all nutrients that can favorably alter the gut microbiome. **Objectives:** The aim of this study was to examine the effects of 8 wk of almond snacking on the gut (fecal) microbiome diversity and abundance compared with an isocaloric snack of graham crackers in college freshmen. **Methods:** A randomized, controlled, parallel-arm, 8-wk intervention in 73 college freshmen (age: 18–19 y; 41 women and 32 men; BMI: 18–41 kg/m²) with no cardiometabolic disorders was conducted. Participants were randomly allocated to either an almond snack group (56.7 g/d; 364 kcal; n = 38) or graham cracker control group (77.5 g/d; 338 kcal/d; n = 35). Stool samples were collected at baseline and 8 wk after the intervention to assess primary microbiome outcomes, that is, gut microbiome diversity and abundance. **Results:** Almond snacking resulted in 3% greater quantitative alpha-diversity (Shannon index) and 8% greater qualitative alpha-diversity (Chao1 index) than the cracker group after the intervention ($P < 0.05$). Moreover, almond snacking for 8 wk decreased the abundance of the pathogenic bacterium *Bacteroides fragilis* by 48% (overall relative abundance, $P < 0.05$). Permutational multivariate ANOVA showed significant time effects for the unweighted UniFrac distance and Bray–Curtis beta-diversity methods ($P < 0.05$; $R^2 \leq 3.1\%$). The dietary and clinical variables that best correlated with the underlying bacterial community structure at week 8 of the intervention included dietary carbohydrate (percentage energy), dietary fiber (g), and fasting total and HDL cholesterol (model Spearman $\rho = 0.16$; $P = 0.01$). **Conclusions:** Almond snacking for 8 wk improved alpha-diversity compared with cracker snacking. Incorporating a morning snack in the dietary regimen of predominantly breakfast-skipping college freshmen improved the diversity and composition of the gut microbiome.