Influence of pistachios on performance and exercise-induced inflammation, oxidative stress, immune dysfunction, and metabolite shifts in cyclists: a randomized, crossover trial.

Abstract:

Pistachio nut ingestion (3 oz./d, two weeks) was tested for effects on exercise performance and 21-h post-exercise recovery from inflammation, oxidative stress, immune dysfunction, and metabolite shifts. Using a randomized, crossover approach, cyclists (N = 19) engaged in two 75-km time trials after 2-weeks pistachio or no pistachio supplementation, with a 2-week washout period. Subjects came to the lab in an overnight fasted state, and ingested water only or 3 oz. pistachios with water before and during exercise. Blood samples were collected 45 min pre-exercise, and immediately post-, 1.5-h post-, and 21-h post-exercise, and analyzed for plasma cytokines, C-reactive protein (CRP), F2-isoprostanes (F2-IsoP), granulocyte phagocytosis (GPHAG) and oxidative burst activity (GOBA), and shifts in metabolites. Performance time for the 75-km time trial was 4.8% slower under pistachio conditions (2.84 ± 0.11 and 2.71 ± 0.07 h, respectively, P = 0.034). Significant time effects were shown for plasma cytokines, CRP, F2-IsoP, GPHAG, and GOBA, with few group differences. Metabolomics analysis revealed 423 detectable compounds of known identity, with significant interaction effects for 19 metabolites, especially raffinose, (12Z)-9,10-Dihydr
oxyoctadec-12-enoate (9,10-DiHOME), and sucrose. Dietary intake of raffinose was 2.19 ± 0.15 and 0.35 ± 0.08 mg/d during the pistachio and no pistachio periods, and metabolomics revealed that colon raffinose and sucrose translocated to the circulation during exercise due to increased gut permeability. The post-exercise increase in plasma raffinose correlated significantly with 9,10-DiHOME and other oxidative stress metabolites. In summary, 2-weeks pistachio nut ingestion was associated with reduced 75-km cycling time trial performance and increased post-exercise plasma levels of raffinose, sucrose, and metabolites related to leukotoxic effects and oxidative stress. ClinicalTrials.gov NCT01821820.