Higher dietary anthocyanin and flavonol intakes are associated with anti-inflammatory effects in a population of US adults[1]

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ABSTRACT

Background: Although growing evidence from trials and population-based studies has supported a protective role for flavonoids in relation to risk of certain chronic diseases, the underlying mechanisms remain unclear. Several previous studies focused on individual inflammatory biomarkers, but because of the limited specificity of any individual marker, an assessment of a combination of biomarkers may be more informative.

Objective: We used an inflammation score (IS) that integrated 12 individual inflammatory biomarkers for the examination of associations with intakes of different flavonoid classes.

Design: The study was a cross-sectional analysis of 2375 Framingham Heart Study Offspring Cohort participants. Intakes of total flavonoids and their classes (anthocyanins, flavonols, flavanones, flavan-3-ols, polymers, and flavones) were calculated from validated food-frequency questionnaires. ~~Individual inflammatory~~ biomarkers were ranked, standardized, and summed to derive an overall IS and subgroup scores of functionally related biomarkers.

Results: In multivariate analyses, an inverse association between higher anthocyanin and flavonol intakes and IS was observed with a mean ± SE difference between quintile categories 5 and 1 of −1.48 ± 0.32 (P-trend ≤ 0.001) and −0.72 ± 0.33 (P-trend = 0.01), respectively. Results remained significant after additional adjustment for physical activity and vitamin C and fruit and vegetable intakes. Higher anthocyanin intake was inversely associated with all biomarker subgroups, whereas higher flavonol intake was associated only with lower cytokine and oxidative stress biomarker concentrations. In food-based analyses, higher intakes of apples and pears, red wine, and strawberries were associated with a lower IS with differences between quintiles 5 and 1 of −1.02 ± 0.43 (P = 0.006), −1.73 ± 0.39 (P < 0.001), and −0.44 ± 0.88 (P = 0.02), respectively. Although intakes of other classes were not associated with a reduction in overall IS, higher intakes of flavan-3-ols and their polymers were associated with a significant reduction in oxidative stress biomarkers.

Conclusion: These findings provide evidence to suggest that an anti-inflammatory effect may be a key component underlying the reduction in risk of certain chronic diseases associated with higher intakes of anthocyanins and flavonols. The Framingham Offspring Study was registered at clinicaltrials.gov as NCT00005121 (Framingham Heart Study). *Am J Clin Nutr* 2015;102:172–81.

Keywords: anthocyanins, dietary intake, flavonoids, flavonols, inflammation

INTRODUCTION

Evidence from population-based studies and randomized controlled trials has supported a protective role for several dietary flavonoids in relation to a number of age-related chronic conditions including cardiovascular disease, diabetes, some cancers, Parkinson disease, and cognitive decline (1–8). One shared mechanism for these conditions is low-grade systemic chronic inflammation or metaflammation. A wealth of data from experimental, clinical, and epidemiologic research links inflammation and the biological networks integral to the inflammatory response to their pathophysiology (9–11). Many dietary factors influence various aspects of inflammation (11), and emerging data support the potential for several flavonoids to reduce a predisposition to chronic inflammation with particular interest in the anthocyanin, flavonol, and flavan-3-ol subclasses. Specifically, these bioactive compounds and their metabolites decrease inflammatory mediator production through effects on endogenous cell signaling pathways, gene expression, and gut microbiota and by exerting anti-inflammatory and neuroprotective effects (12–15). Inflammation plays a key role in a range of different diseases and conditions, and although resulting clinical signs and symptoms are different, many of the processes, cells, and molecules

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