Concurrent Session 17: Dietary Antioxidants and Health

Biochemical parameters of anthocyanins that determine the health benefits of blackcurrants and other anthocyanin-containing fruit
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Background – Berry fruit have very high antioxidant capacities as determined by in vitro antioxidant assays such as the oxygen radical absorbance capacity (ORACFL) and the ferric reducing antioxidant power (FRAP) methods. In a selection of blackcurrant (Ribes nigrum L.) genotypes we have found that antioxidant capacities (ORACFL) vary from 71 to 194 µmol TE/g fresh weight. Anthocyanins are the main contributor to antioxidant capacity in blackcurrant and their concentrations range from 180 to 732 mg/100g FW.

Objectives - To further explore the potential of blackcurrant anthocyanins as dietary antioxidants we have used preparative HPLC to isolate the four individual anthocyanins and measured the antioxidant capacities (ORACFL and FRAP) and the ability to protect plasma proteins from peroxynitrite mediated tyrosine nitrosylation for each anthocyanin. In a previous study we found that blackcurrant anthocyanins are absorbed intact into plasma following consumption (1). Therefore we have also investigated the biochemical properties that contribute to the efficacy of the health benefits such as plasma protein binding and octanol partition coefficients.

Outcomes – We have found that the four anthocyanins vary for the parameters measured. The two cyanidin-based anthocyanins have greater (15%) antioxidant capacity than the two delphinidin-based compounds. The mean octanol partition coefficient (log p) is lower for the two rutinosides (-1.56) compared to the two glucosides (-0.71) suggesting there are differences in the ability of the anthocyanins to penetrate cell membranes. The phenolic aglycone component of anthocyanin appears to have a greater effect on protein binding than the sugar component. The percentage of anthocyanin bound to human serum albumin averaged 75% for delphinidin, 69% for cyanidin, 58% for peonidin, and 55% for malvidin.

Conclusion – These results extend our understanding about the potential health benefits of berry fruit containing high concentrations of anthocyanins. Anthocyanins are a large diverse group of compounds and these results indicate that they differ in biochemical properties that are associated with health benefits suggesting that specific compositions of anthocyanins may have increased health benefits.

Reference

Effects of partial replacement of carbohydrate with protein from lean red meat on markers of oxidative stress and inflammation: results of a randomized controlled trial
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Background – Red meat intake has been associated with increased risk of coronary heart disease and type 2 diabetes. The often coupled intake of saturated fat and processing of red meat may be at least partly responsible. Effects of iron derived from red meat to increase iron stores and initiate oxidative damage and inflammation is another possible pathway.

Objective – To determine whether an increase in unprocessed and lean red meat intake, with a concomitant reduction in carbohydrate intake, adversely influences markers of oxidative stress and inflammation.

Design – Sixty participants completed an 8 wk parallel-designed study. They were randomized to maintain their usual diet (control) or to partially replace energy from carbohydrate-rich foods with approximately 200 g/d of lean red meat (protein) in isoenergetic diets. Markers of oxidative stress and inflammation were measured at baseline and at the end of intervention.

Outcomes – Results are presented as the between group difference for protein relative to control. There was a significant decrease in urinary [-137 (-264, -9) pmol/mmol creatinine, P=0.04], but not plasma [-12 (-122, 100) pmol/L, P=0.84] F₂-isoprostane concentrations. There was a significant decrease in leucocyte [-0.51 (-0.99,-0.02) X10⁹/L, P=0.04] and lymphocyte [-0.20 (-0.36,-0.05) X10⁹/L, P=0.01] counts, a decrease in plasma high sensitivity C-reactive protein concentrations [-1.6 (-3.3, 0.0) mg/L, P=0.06] of borderline significance, but no significant effect on plasma fibrinogen concentrations [-0.08 (-0.40, 0.24), P=0.63].

Conclusion – Our results do not support the suggestion that an increase in the intake of lean red meat, partially replacing carbohydrate, increases oxidative stress or inflammation.