Factors Affecting Bioavailability of Anthocyanins

Background

Anthocyanins are water-soluble pigments that provide blue, purple and red colors to fruits and vegetables.

Purported health benefits of anthocyanin consumption include:
- improved brain health (memory, balance enhanced)
- reduced inflammation and oxidative stress
- improved gluco-regulation
- cancer protection

Research Goals

- To determine why some anthocyanins are more bioavailable than others
- To determine how amount of anthocyanin consumed relates to amount absorbed...is more better?

Research Findings

1. Acyl groups reduce anthocyanin absorption
   For purple carrots, acylation resulted in an 11 – 14 fold decrease in anthocyanin recovery in urine.
   For red cabbage, acylation resulted in a 4 fold decrease in anthocyanin recovery in urine.

2. Hydrophobic anthocyanins appear to be less efficiently absorbed
   In the Red Cabbage Study, we observed a negative correlation between HPLC elution order of anthocyanins and their recovery in urine. (Compounds of higher hydrophobicity characteristically elute later than less hydrophobic compounds.) Thus anthocyanin recovery in urine was inversely related to anthocyanin hydrophobicity. We propose that hydrophobicity is a determinant of anthocyanin bioavailability.

3. More is not always better: Comparison of amount of anthocyanin-rich food consumed to the amount of anthocyanin in urine
   - Strawberries: dose-response was linear over a range of 100 to 400 g (15 to 60 µmol anthocyanins); 2% of anthocyanin recovered in urine for each dose.
   - Red cabbage: doubling the dose size from 100 to 200 g (138 to 276 µmol anthocyanins) produced only a 20% increase in urinary anthocyanins; increasing from 100 to 300 g (138 to 415 µmol) produced only a 55% increase in urinary anthocyanins (0.04 to 0.02% for 100 and 300 g doses).
   - Purple carrots: doubling dose size from 250 to 500 g (357 to 714 µmol anthocyanins) produced no difference in amount recovered as urinary anthocyanins (0.04 and 0.02% recovered for 250 and 500 g doses).

Factors that May Influence Dose-Response

Estimated consumption in U.S. is 12-13 mg/d
- 8.7 from fruit
- 2.2 from vegetables
- 1.7 from beverages

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Citations for our anthocyanin bioavailability studies


