Berry Polyphenols and Gut Health

Jess Reed
Health Benefits of Berry Polyphenols

• Inhibit oxidative damage to cells
• Inhibit cellular response to inflammatory agents
• Inhibit pathogenic microorganisms
  – Uropathogenic E. coli and cranberry “A-type”
  Proanthocyanidins
Health Benefits of Berry Polyphenols

- Decrease risk of disease
  - Cardiovascular
  - Cancer
  - Urinary tract infection/health
  - Dental
  - Ulcers (*H. pylori*)
  - Viral infection
  - Age related neurodegenerative diseases
Low Bioavailability of Berry Polyphenols

- Paradox in relation to health benefits
- Anthocyanins, flavonol glycosides metabolized in the gastrointestinal tract
  - Enterocyte metabolism
  - Microbial metabolism
- Tannins
  - Proanthocyanidins and ellagitannins
  - Oligomers not absorbed from digestive tract
- Blood and tissue concentrations below bioactive levels in cell culture studies
Health Benefits of Berry Polyphenols

“The way to a man's heart is through his stomach.” Fanny Fern (1811-1872)
"Anybody who believes that the way to a man's heart is through his stomach flunked geography." Robert Byrne (1930 - )
Implications

• Are effects in the gut responsible for health benefits of berry polyphenols?

• Direct effects
  – Effects of berry polyphenols on lipid oxidation, inflammation, immunity, and bacterial adherence and cell invasion in the gut

• Indirect effects
  – Immunity and gut associated lymphoid tissue
The Gastrointestinal Tract in Health and Disease

- Enterohepatic circulation
  - absorption, excretion and metabolism

- Enteric nervous system
  - “Second brain”
  - More neurons than the spinal cord

- Gut microbiota
  - Mutualism between host and microbe
  - Enteric and extra-intestinal pathogenic bacteria

- Effects on systemic immune disorders
  - Chronic inflammation in CVD, cancer and arthritis
The Gastrointestinal Tract in Health and Disease

• Gut associated lymphoid tissue (GALT)
  – largest immune tissue
  – 50% of immunity originates in the gut
  – GALT dysfunction and chronic inflammatory diseases
Tannins and Gut Associated Lymphoid Tissue

• Microbial anti-adherence
  – protection from enteric pathogens
  – E. coli, Salmonella, Listeria, Helicobacter pylori, and periodontal pathogens

• Anti-oxidant
  – Lipid oxidation in food and gut increases oxidized lipoproteins in serum
  – Causative factor in atherosclerosis and cardiovascular disease

• Anti-inflammatory
  – inflammatory bowel disease, Crohn’s disease, food allergies and colon cancer
Systemic Immune Disorders

• Chronic inflammation
  – Cardiovascular disease
  – Cancer
  – Arthritis
  – Alzheimer’s disease
  – Obesity and metabolic syndrome
  – Extra intestinal infections

• Effects of berry polyphenols in the GI tract influence the etiology of all of these diseases
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Fanny’s right because: Berry polyphenols decrease risk of (cardiovascular) disease by indirect effects mediated through the gut microbiota and gut associated lymphoid tissue.