The Gut Microbiome: Contributions to Variation in Response to Diet and Impact on Health

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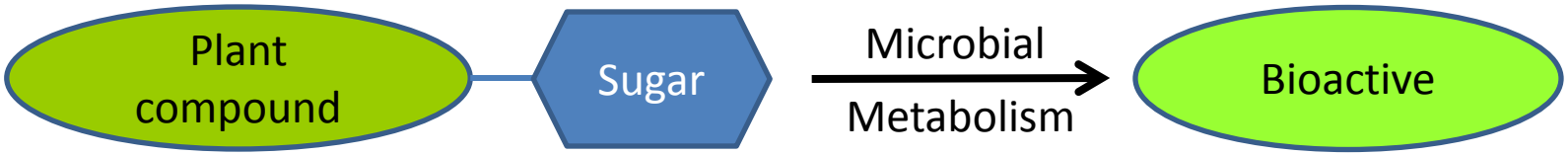
Human Gut Microbiome

- Collective genomes of the gut microbial community.
- ~ 10-100 trillion microorganisms in GI tract (10 times more than human cells in the body).
- ~500-800 species.
- 100 x more genes than human genome.
- Important symbiosis between human host and microorganisms.

How does the gut microbiome affect diet?

- Alters exposure to nutrients and bioactives
- Generates new compounds, which:
  - Serve as energy source
  - Regulate metabolism
  - Regulate immune system
  - Alter inflammation and oxidative stress

Microbial Metabolism of Plant-Food Bioactives



Cruciferous vegetables

- Glucosinolates → isothiocyanates
- Fecal bacterial glucoraphanin degradation higher in high-ITC excreters.

Li *et al.*, *Br J Nutr*, 2011

Soy food isoflavones

- Daidzein → equol and ODMA
- Obese adults more likely to be ODMA-nonproducer phenotype.

Frankenfeld *et al.*, *Eur J Clin Nutr*, 2014

High-fiber foods

- Plant lignans → enterolactone & enterodiol
- Gut bacterial composition in high ENL excreters is different than low ENL excreters.

Hullar et al, *Cancer Epidemiol Biomarkers Prev*, 2015

Where else is this taking us?

Characterize gut microbial-diet metabolism phenotypes

- *Identify associations between gut microbiome and gut microbial metabolism of plant-food bioactives*

Improve understanding of effects of bioactives on cancer risk

- *Using observational and intervention studies*
- *Stratification by microbiome differences or phenotypes*

Personalized/precision nutrition for disease prevention

- *Subgroups who may benefit more or be harmed by particular bioactives*