The gut microbiota in Costa Rican population and ellagitannins

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Different tools to study human gut microbiota

1. Direct assessment of gut ecology profile mainly through genomic analysis.

2. Indirect assessment through the determination of the ability of the microbiota to perform specific catalytic activities coupled with host interaction.

3. Both allowing correlation between ecology/ catalytic activities /host.
Limits of genomic analysis
Hierarchical cluster analysis of PCR-DGGE fingerprints of faecal bacteria of 26 volunteers

Observation of disimilarities between microbiota profile

How these disimilarities could be related to health issues?

How these disimilarities could be related to the ability of gut microbiota to provide host with beneficial bioactive compounds?
Food source of ellagitannins

Sanguin H6

Lambertianin C

Punicalagin (Pomegranate)

Pedunculagin
Tropical highland blackberry (*Rubus adenotrichus*): One of the most important food source of ellagittannins

**Scientific Facts**

- Fruits contain at average maturity 2 to 3 g ellagitanins/kg FW (2-3 x Pomegranate juice)
- Anthocyanin ≈1g Cyd-3 glu/kg FW
- Phenolics ≈ 5 g GAE/kg FW
- Main ellagitanins (Lambertianin-C (55%) Sanguiin H-6 (45%))
Metabolic fate of ellagitannins

- Ellagitannins
- Ellagic acid
- Urolithin D (Tetrahydrxy-urothlin)
- Urolithin A (dihydrxy-urothlin)
- Urolithin B (monohydrxy-urothlin)

- Urolithins can reach high micromolar concentrations in the colon (aglycones) and in the bloodstream (glucuronides) and in urine
Health benefits of urolithins

Multitarget action

- Anti-estrogenic activity
- Cancer cell regulation (hormono-dependent cancer prostate and breast)
- Reduce inflammation markers (reduce inflammatory bowel disease (IBD))
- Gut microbiota modulation by increasing positive bacteria
Inter-individual variability (period of urolithin excretion)

Urinary excretion of urolithin after ingestion of a single shot (250 ml) of tropical highland blackberry juice
Inter-individual variability (chemical species excreted)

On a sample of 82 individuals in Costa Rica

40% low urolithin excretors
35% High UA excretors
25% High UB/UA excretors

In Spain, only 24% of high urolithin producers
Intra-individual variability of urolithin excretion

Less intra-individual variability at different period of time => Human gut microbiota ability to metabolize urolithins appears to be quite constant over time
PLS-DA regression analysis between PCR-DGGE profiles and urolithin production status

Importance of discriminatory bands

PLS-DA Score scatter plot of 26 individuals of PCR-DGGE bands and urolithin excretory status

PLS-DA Loading plot of 26 individuals of PCR-DGGE bands and urolithin excretory status

Faecalibacterium prausnitzii

Bacteroides dorei

Parabacteroides goldsteinii

Faecalibacterium prausnitzii
Conclusion

• Gut microbiota plays a crucial role in modulating the metabolism of ellagittannins into more bioavailable and bioactive compounds with health benefits.

• Due to the high inter-individual variability of gut microbiota ability to metabolize phytochemicals we are not equal in front of the potential health benefits of functional foods.

• Finally, can we conclude that people with a microbiota able to metabolize ellagittannins into urolithin are healthier? In the same manner, people who are able to metabolize soybean dadzein, lignans from flax beans into respectively equol and enterolíngans are healthier?.

=> Perspectives for ILSI MesoAmerica : Project “Gut microbiome metabolic ability of elder people in a blue zone”
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