Blood Microbiome: an Affinity Research Collaboration

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February, 2010
ARC theme: Microbiome and Systemic Inflammation

Human Microbiome Project: NIH

Do **humans** share a core human microbiome?

**Can changes** in the microbiome correlate with changes in human health?

**What is the technology** required to answer these questions?

http://nihroadmap.nih.gov/hmp/
Blood Microbiome

Figure 1: The Blood Microbiome construct

DIET
Fat Fiber

Oral Microbiome

GENES

INFLAMMATION

Gut Microbiome

Other body sites

Δ epithelial permeability
defective defense

BLOOD MICROBIOME

Absorbed bacteria
or bacterial components
Blood Microbiome: Creating the Model

Hypothesis:

Patients with chronic inflammatory disease will have disease-specific Blood Microbiomes evidenced by different predominant bacterial species, frequency or persistence of bacteremia, and specific effects on systemic immunity compared to healthy subjects.

Teeth cleaning followed by blood draw

Mouth → Blood

Healthy vs Disease
(FOCUS 1: T2DM & periodontal disease)
Current perspectives in Chronic Inflammatory Diseases: 
*circulating LPS* or “endotoxemia”
Surrogate markers may not be informative

- Fatty acylation and chain length determine immunological response
- Are there other relevant receptors?
- Model: Human and animal LPS responses are different

Berezow, A 2009
Detection: High throughput, direct and sensitive

Human Microbe Identification Microarray

http://mim.forsyth.org/homim.html

Ibis Biosciences

http://www.ibisbiosciences.com/index.html
Blood Microbiome ARC: Defining the Model

Figure 3: Proposed Model for characterizing the Blood Microbiome

Clinic Blood & Tissue

McDonnell, Apovian, Hasturk

Clinic Human subject clinical data

Kantarci: Checkboard Inflammatory array

Define approaches for modeling

validation

Design clinical studies/ interventions

Identify similar trends in patients

Ganley-Leal: Immunologic modeling

Define bacteria to test in model

Define approaches for modeling

Ecker/Paster: Bacterial species identification

Define approaches for modeling

Gibson/Genco: Disease modeling
Blood Microbiome: funding prospects

• Pathophysiology
  – Contribute to current knowledge of the “trigger(s)” for the persistent inflammatory response in highly prevalent chronic diseases: Type 2 diabetes, Obesity, IBD, Periodontal disease
  – Inform disease therapy (e.g. antibiotic/probiotic, receptor-based therapies)

• Translational applications:
  – Bacterial signatures that predict flares in IBD or cardiovascular risk in obesity

• Disease Prevention:
  – Modification of gut/oral microbiome to target a “healthy” blood microbiome in high-risk populations
Blood Microbiome ARC

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Thank you!
Blood Microbiome: Dynamic

30 minutes post-tooth cleaning