Individualized, Microbiome-based Nutrition: Tapping the Potential for Disease Prevention

October 10, 2017
What Will Healthcare Look Like in 2050?

- Personalized
- New Paradigms
- Prevention
- Patient-centered
- Disease Interception
- Technology
- Cure
Janssen’s vision for a world without disease

Clinical manifestation
No clinical manifestation

Prevention
Disease-specific approaches to warding off onset of disease initiation

Interception
Arrest disease as it develops before clinical manifestations

Cure
Eliminate disease and reverse damage to restore full health

Disease Elimination
Microbiome-based products are well suited to this mission

**Closer to root cause** of disease than other products going after human targets

**Has more beneficial safety profile**

**Leveraging for prevention** may be key differentiator
Many ways to pursue the microbiome across spectrum of health and disease

Microbiome Solutions for Prevention, Interception, Treatment, Maintenance

- MB PROFILING
- DISEASE SPECIFIC SCREENS/DIAGNOSTICS
- PERSONALIZED NUTRITION PRESCRIPTIONS
- MEDICAL FOODS
- CONSUMER PRODUCTS THAT MANAGE SYMPTOMS
- MB THERAPEUTIC COCKTAILS
- NEXT-GEN PREBIOTIC SUPPLEMENTS

• Patient: Prevention
• Pharma: Evidence-based
• Payer: Effective & affordable
We should consider all perspectives

Key Perspectives

PATIENT

Prevention

PHARMA

Evidence-based

PAYER

Effective & Affordable
Consider the microbiome as an organ that contributes to health and illness

**MOLECULAR MIMICRY**
Microbes mimicking host signaling via metabolites, hormones & peptides

**CATABOLIC RATE**
Influences an individual’s response to glucose

**MUCOSAL INTEGRITY**
Creates a healthy and tight gut epithelial

**COLONIZATION PROTECTION**
The microbiome is an organ that **impacts** health in many ways

**MOLECULAR IMBALANCE**
Creates disproportionate levels of metabolites, hormones & peptides

**CATABOLIC SPIKE**
Raises and individual’s glucose levels

**UNHEALTHY GUT**
Creates pathways in intestinal cells, leading to inflammation and pathogen overgrowth

**INFECTION**

We lose that battle as the body resists the change and metabolism wins.
Targeting the microbiome brings the focus closer to the root cause of disease compared to traditionally developed drugs.

**Adapted from:** Rethinking Diet to Aid Human–Microbe Symbiosis. Derrien, Muriel et al. Trends in Microbiology, Volume 25, Issue 2, 100 - 112
We have been losing our microbiome diversity due to dietary changes.

Microbiota diversity

Hunter/Gatherer

Agriculture

Industrial Food

Processed Sanitized Food

Dietary Change

Species reintroduction

The microbiome can and should leverage ‘in-human discovery’ insights

How to move from correlation to causation?
FMT is the leading approach to ‘In-human discovery,’ accelerating and de-risking translation

**SUCCESSES IN ALTERING PHENOTYPES IN HUMANS USING FECAL MICROBIAL TRANSPLANT (FMT)**

- Multiple sclerosis
- Chronic fatigue syndrome
- Autism
- Non-alcoholic fatty liver disease
- Obesity
- Atherosclerosis
- Idiopathic thrombocytic purpura
- Insulin resistance/type 2 diabetes mellitus
- C. Difficile infection
- Irritable bowel syndrome
- Inflammatory bowel disease

Green: beneficial effect FMT in RCT
Blue: beneficial effect FMT in case series
Black: association between gut microbiota and disease from experimental/observational studies

Smits, Nieuwdorp et al Gastroenterology 2013; 1:8
Dietary intervention studies are providing a fast track to actionable insight

Choose the foods that are right for you!

Discover the right foods for you, by measuring your genetics, microbes, and personal glucose response to food

JOIN STUDY

Eran Elinav, M.D. Ph.D

Prof. Eran Segal, Ph.D
People have widely different glucose responses to the same food

Source: Lihi Siegel, DayTwo
Glucose responses can even be opposite from one person to the other

Source: Lihi Siegel, DayTwo
People have widely different glucose responses to the same food

Meal carbohydrate composition is not a good generalizable predictor of blood glucose response

A personalized microbiome-based algorithm is a much better predictor of blood glucose response

Personalized microbiome-based diets can impact post-prandial glucose response

26 participants

**Profiling Week**

- 'Good' Diet
- 'Bad' Diet

Week 1

Week 2

Gut microbiome
Profiling tests
Continuous glucose

Blood Glucose

Glucose rise (mg/dl)

7 Days

P<10^-6
FEB. 2, 2017

DayTwo, Janssen R&D, Weizmann Institute taking first-in-class personalized nutrition platform into the clinic to evaluate potential to intercept metabolic disorders
The future holds potential for a digital therapeutic

1. “I need to make a change”

2. Enroll online and pay

3. Provide microbiome data (i.e. Stool Sample)
   Full Shotgun, 16S, Metabolomics

4. Attend connection meeting

5. Log lifestyle data

6. Receive personalized report

7A. Makes daily diet decisions

7B. Continuously consult personalized recommendations
Diverse landscape of personalized nutrition offerings

**Genetic-based insights**
- Smart DNA, simplified Genetics, Pathway Genomics, FitnessGenes, Vitagene, DNAFIT, Orig3n, GB Healthwatch, nutriFENEus

**Blood-based insights**
- Habit, WelnessFX, Ixcela, Viome

**Building habits/behavior change**
- Noom, Omada Health, 8fit

**Microbiome-based insights**
- DayTwo, Biome, MapMyGut, Viome

**Comprehensive programs**
- Arivale, Freeletics, Human Longevity

**Disease-specific coaching**
- mySugr, Everyday Health

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**Supplements**

**Diet**

**Exercise** (w/ or w/o coaching)

**Other personalized solutions**
Existing kits that promise health advise based on your existing microbiome

Gut **metagenome** analysis is used to recommend a personalized diet that lowers blood glucose response.

Monthly gut **metatranscriptome** analysis and blood-based metabolic intelligence is used to recommend a personalized diet and pre- and pro- biotics that promise to improve health.

Gut 16S analysis provides detailed and accurate information to help consumers understand their gut health.

Gut 16S analysis available exclusively through accredited health professionals.
Beyond nutrition, Altering the microbiome toward health benefits

Cocktail
- Caelus Health
- Whole Biome
- Symflor

GMO
- TargEDys

Prebiotics
- LNC Therapeutics
- GnuBiotics
- Microbiome Therapeutics
JHMI: External innovation approach brings expertise to partners

JHMI is dedicated to translating microbiome science into meaningful interventions
### Applying demonstrated expertise to critical challenges facing the field

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<tr>
<th>REGULATION</th>
<th>Manufacturing</th>
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<tr>
<td><strong>Challenge</strong></td>
<td>Establishing manufacturing capabilities for ‘next-gen products’</td>
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<td><strong>JHMI Approach</strong></td>
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<td>Multidisciplinary – Align across areas of expertise yield a tailored path for each opportunity</td>
<td>Entrepreneurial – A lack of manufacturing options led JHMI to manufacture microbes in-house</td>
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<td>Collaborative – Janssen is taking a leadership role with trade organizations to address issue of concerns</td>
<td>Multidisciplinary – Apply existing expertise in manufacturing biologics, small molecules and vaccines</td>
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<td>Informed – Apply lessons learned from other pioneering science (cell therapy, vaccines)</td>
<td>Internally Collaborative – Align across internal Janssen stakeholders to apply decades of manufacturing experience</td>
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JHMI: A “One Stop Shop” for Access to 5+ Years of Experience Across Janssen/J&J

Microbiome Experience Across Therapeutic Areas:
- Type 2 Diabetes
- Obesity
- Oncology
- Dermatology
- IBD
- Infectious Diseases
- Gut Health
- Metabolic Disorders
- Gestational Diabetes

Legacy of Pioneering New Approaches
- Janssen Prevention Center
- Janssen Disease Interception Accelerator

Demonstrated Success In
- DISCOVERY
- DEVELOPMENT
- COMMERCIALIZATION
Thank You

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