“The Microbiome Approach: It Takes Guts to be Healthy”

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Hippocrates, 460-370 B.C.

“When looking for solutions, don’t see what everyone sees. See what everyone else chooses NOT to see” – Dr. Patch Adams
“FOOD” is INFORMATION!

Increasing Interest

The gut microbiome has emerged as a major influence in the health status of individuals.
Intestinal Microbiome

• Trillions of microorganisms
• 6,000 + bacterial species
• 4 - 6 # of body weight.
Maternal Microbiota

- Studies: Mothers’ microbial communities change profoundly during pregnancy to support newborn.

![Diagram showing factors influencing mother and child gut microbiota]

Inoculation

- Occurs during birth.
- Bacteria present in the mother’s birth canal.
- Undergoes a myriad of changes throughout a lifetime.
Breast Fed (BF) vs. Formula Fed (FF)

- BF babies: higher abundance and a more diverse microbiota community than formula fed
- Early gut microbiota consists of bacteria that can metabolize lactose.

The Microbiome

- Colonized bacteria reside not only in the gut, but also - nasal and oral cavity, birth canal, skin, etc.
- Let’s shake hands everyone! Use your left hand.
What no one else “sees”…

• Brain/Gut both develop from same tissue.
• One part: Enteric Nervous System (ENS) the other: Central Nervous System (CNS).
• The brain-gut axis: bi-directional communication system between the (ENS) and (CNS).
• It’s more than a GUT feeling…

Brain-Gut Connection

• Studies show: gut microbiome can have a significant influence on psychosis, mood, and behavior. Via communication along the gut-brain axis and the HPA axis
• Research: indicate exposure to stressful events influences the composition of the microbiome. Creating both short- and long-term effects
Dysbiosis (Dysbacteriosis)

• Research suggests “dysbiosis” in gut bacteria can induce depression and anxiety (bottom-up signaling).

Dysbiosis (alcohol, antibx, diet)

• Dysbiosis (GI): Been implicated in cardiovascular disease, fungal/bacterial overload, IBS/colitis, and obesity.
• Dysbiosis: implicated in diabetes and (Cardio) Metabolic Syndrome
Metabolic Syndrome

• A lifestyle disorder.

• **Defined:** elevated fasting glucose, high blood pressure, dyslipidemia, or polycystic ovarian syndrome (PCOS), with obesity being a significant risk factor for its development.

• Metabolic syndrome increases the risk of developing type II diabetes and cardiovascular complications.

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**MetS prevalence**

1 in 3

Number of adults with metabolic syndrome

Source: American College of Preventive Medicine

2009
Can Normal Weight “Skinny” People Develop Pre-Diabetes (metabolic syndrome)?

1 in 4 Skinny People have Pre-Diabetes and are “Metabolically Obese”


Metabolic Endotoxemia

• Occurs when the level of endotoxins in the blood increases 2-3 x the normal amount.
Endotoxemia (LPS/ZONULIN)

- Cell walls of bacteria contain compounds (toxins) that leak into the bloodstream (when the gut lining is compromised), resulting in systemic overload.
- Can result in insulin resistance, mood disorders, muscle pain, and fatty liver.

Leaky Gut

- Systemic overload = increased intestinal permeability.
- Caused by disrupted intestinal tight junctions, creating “leaky gut” (loss of gut barrier integrity).
- Bacterial toxins leak beyond the mucosal barrier.
- Continues to weaken tight junctions.
“Are we beginning to see what none chooses to see?” Non-Alcoholic Fatty Liver Disease (NAFLD)

- NAFLD ranges from 17% – 33% population.
- **Obese about 75%**
- NAFLD can progress from normal, to fatty liver, to liver cirrhosis.
- Many studies: animals/ humans found a relationship between the gut microbiota and NAFLD

Gut Microbiota and Fecal Transplants

- Academic Medical Centre in Amsterdam (Netherlands)
- Working with obese patients found that insulin response time almost doubled in just six weeks’ after gut microbiota fecal transplants from lean donors
Shifting Gut Bacteria

- *Harvard Univ.:* showed that diet and gastric bypass operations encourage shifts in gut microbiota by decreasing Firmicutes (sugar loving) and increasing Bacteroidetes (plant loving).

- **Shifting gut bacteria with diet** to an abundance of beneficial bacteria can show the **same** results when compared to invasive surgery.

Nori Genes

- Gut’s microbiota from birth to adulthood, **we are what we eat.**

- Japanese gut microbiota has special seaweed-associated marine bacteria not found in Caucasians. **We are what we absorb.**

- “Nori genes” evolved with individual’s feeding habit. **We are what our microbes eat!**
The 3 R’s and Fish Tank Analogy

Reset, Repair, and Replenish
Reset (remove)

• 1\textsuperscript{st} R - \textit{eliminate} things from body that negatively affect our health/biome.

• Environmental chemicals, pollutants, accumulated waste material in the colon, an overabundance of food, beverages that promote inflammatory processes, and the \textit{wrong kind} of gut bacteria.

Repair

• 2\textsuperscript{nd} R - provide nutritional support for healing/regeneration of the gut.

• Supplying body with vitamins, minerals, antioxidants, essential fatty acids, amino’s (L-glutamine), and of course, plants.

• \textit{Plants, fiber, fermentation!}
Plant Based Diets

• Diets primarily plant-based (vs. animal based) have a greater diversity for helpful bacteria. Phytotherapy.
• Diets high in protein/plant-based/fermentation are associated with an abundance of supportive bacteria.

Repair Tight Junctions

• Amino acid “L-glutamine” is the major fuel source for intestinal cells - crucial for intestinal health.
• Legumes (protein/pulses): a rich source of glutamine to aid in the integrity of the gut to develop tight junctions/reduce intestinal permeability.
Fiber Rich Diet (Pre-biotic or post)

- Ability to robustly affect the composition of the gut microflora.
- **Fiber rich diets have been shown to increase healthy bacteria, improve gut barrier, increase insulin sensitivity and balance lipid profiles.**
  - i.e. Inulin (chicory root) - J. Artichoke.
- **Microbes ferment** (digest what you can’t) fiber = Butyrate (SCFA).

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**Speaking of fermentation (Fish Food)!**

- **Organic Apple Cider Vinegar (ACV).** Best at night. (Arizona State Univ. 2015 study showed helps lower blood glucose levels in a.m.)
- **Sauerkraut, Kimchi, Beet Kvass, Miso paste, Kombucha, tubers** (Taro, Yucca, Sweet Potatoes). Non “pasteurized”.
- **Kefir** (“plain” - if dairy tolerant) 7 X longer effect than yogurt for gut health (Univ. Wisconsin Madison 2016).
- **Ask this when making a fish food choice...”is this a plant, does it contain fiber, and/or is it fermented?”** As long as meets one of these criteria or more, good choice!
- **(Are we seeing why plant based protein shakes make sense?)**
“FOOD” is INFORMATION!

Prebiotics (fish food cont.)

• Prebiotics: non-digestible fibers that are fermented in the GI tract by bacteria such as F.O.S., guar gum, lactulose, and *inulin*.

• **Inulin - type prebiotics enhance the growth of probiotics** (Bifidobacteria and Lactobacillus) species in the gut and exert beneficial effects.
Inulin (Chicory root)

- Studies: Inulin has shown improvement in glucose metabolism, reductions in weight gain and fat mass accumulation, and improvements in metabolic endotoxemia.

<table>
<thead>
<tr>
<th>Food</th>
<th>Fructooligosaccharide (FOS) (g/100g)</th>
<th>Inulin (g/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicory Root</td>
<td>22.9</td>
<td>41.6</td>
</tr>
<tr>
<td>Jerusalem Artichoke</td>
<td>13.5</td>
<td>18</td>
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<tr>
<td>Dandelion greens (raw)</td>
<td>10.8</td>
<td>13.5</td>
</tr>
<tr>
<td>Dandelion greens (cooked)</td>
<td>7.3</td>
<td>9.1</td>
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<tr>
<td>Garlic (raw)</td>
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<td>12.5</td>
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<tr>
<td>Leeks (raw)</td>
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<td>6.5</td>
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<tr>
<td>Onion (raw)</td>
<td>4.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Onion (cooked)</td>
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<td>3.0</td>
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<tr>
<td>Asparagus (raw)</td>
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<td>Asparagus (boiled)</td>
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</tr>
<tr>
<td>Artichoke</td>
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<td>4.4</td>
</tr>
<tr>
<td>Wheat (flour, baked)</td>
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<td>2.4</td>
</tr>
<tr>
<td>Rye (flour, baked)</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Banana</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Barley (cooked)</td>
<td>0.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Table adapted from Moshfegh et al. (1999).

Replenish

- **3rd R** - Restore a healthy balance of beneficial bacteria (fish) to the gut by re-inoculating with desirable GI flora. What is important in supplementation is quality and safety of strains, NOT COUNTS! *(I.P.A. International Probiotics association)*

- Obtain a desirable balance and keep working at an optimal level.
Beneficial Probiotic Supplements

• Help maintain beneficial microbial community by increasing beneficial population.

• Helps inhibit invasion of pathogens (through an increase in the amount of mucus secretion and in reducing gut permeability).

• Bifidobacteria demonstrated in several studies to improve the gut barrier function and reduce intestinal endotoxin levels.

Cardio Metabolic Disorders

• Cholesterol lowering potential of probiotics has been widely studied.

• Fermented vegetables and prebiotic containing foods shown to reduce blood pressure, heart rate, and cholesterol, while inducing weight loss and decreasing toxin-producing bacteria.
Choose wisely, see what no one else sees.
In conclusion

• “See what everyone else chooses NOT to see”.
• Hippocrates was right! Choice matters/make smart DECISIONS.
• 1-3 people you know, are already in metabolic disorder.
• Apply 3 “R”s. Reset, Repair, Replenish.
• May your fish tank be as beautiful as it can be!
• Thank and you and enjoy the convention!