The Gut Microbiome
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Gut Microbiome

- The gut contains many naturally occurring microbes

- They are important for many functions:
  - Digestion
  - Metabolism
  - Produce vitamins (B, B12, K)
  - Protective barrier
  - Immune system function
Gut Microbiome Dysbiosis

- Obesity
- Metabolic Syndrome
- Nonalcoholic Steatohepatitis (NASH)
- Inflammatory Bowel Diseases
- Irritable Bowel Syndrome
- Type 1 Diabetes
- Autism
- Allergies
- Asthma
- Celiac Disease
Probiotics are **live** organisms that when administered in adequate amounts confer a health benefit on the host.

- Scientific definition, but not a legal one.
- Not all products on the market actually meet the criteria to be considered a probiotic.
Probiotics

- Minimum criteria to be considered a probiotic for human consumption:
  - Purified strain of the candidate microbe (usually bacterium or yeast)
  - Identified strain level using biochemical and genetic techniques
  - Shown in human studies to improve health
  - Safe for target consumers
Probiotics

- Most probiotic bacteria are chosen from ones that normally exist in the human intestines.
- Once purified, and grown, they are added to products:
  - As a culture concentrate added to foods at medium levels (not much growth opportunity)
  - Injected into a milk-based food or dietary supplement (allowed to grow to high levels)
  - As concentrated, dried cells for dietary supplements (powders, capsules, or tablets – various dosages)
Probiotics

- Strains with FDA Generally Recognized as Safe (GRAS) status include:
  - *Bifidobacterium longum* BB536, for use as a food ingredient and in infant formula
  - *Lactobacillus casei* subsp. *Rhamnusus* GG, for use in infant formula
  - *Lactobacillus reuteri* DSM 17938, for use in food
  - *Bifidobacterium lactis* Bb12+ *Streptococcus thermophilus* Th4, for use in infant formula
  - *Lactobacillus rhamnusus* HN001, for use in infant formula
  - *Bifidobacterium animalis* ssp. *Lactis* Bf-6, for use as a food ingredient
Suggested Benefits

- Allergies
  - In Finland, *Lactobacillus rhamnosus GG* was given to pregnant moms, 2-4 weeks before delivery, and their newborn infants, for up to 6 months.
  - 50% reduced rate of atopic eczema
Suggested Benefits

- Brain function
  - One study administered *Lactobacillus helveticus* R0052 and *Bifidobacterium longum* R0175 to healthy volunteers for 30 days
    - Reduced depression, anger-hostility
  - Other studies: improved sleep in elderly, improved mood scores, and decreased anxiety in patients with chronic fatigue syndrome
Suggested Benefits

- **Cancer**
  - Theoretically, carcinogens, can be ingested or created by metabolic activity of GI microbes, so some probiotic cultures *might* decrease exposure by:
    - Detoxifying ingested carcinogens
    - Altering intestinal environment to combat carcinogen producing/ingesting microbes
    - Produce products that improve apoptosis (programmed cell death)
    - Produce compounds that inhibit tumor cell growth
    - Stimulate immune system for better defense
Suggested Benefits

- Cancer Continued...
  - Researchers testing the consumption of probiotic cultures such as fermented milks, probiotic bacteria, or extracts of bacteria have found:
    - Reduced incidence of chemically induced tumors in rats
    - Reduction in fecal enzymes believed to play a role in colon cancer
    - Weakened mutagenic activity of substances
    - Prevention of DNA damage in colonic cells
    - Enhanced immune system function
Suggested Benefits

- **Diarrhea**
  - *May* be improved with certain probiotics
  - Children with acute diarrhea
  - Antibiotic induced diarrhea – may prevent, but not treat
  - Traveler’s diarrhea – may prevent
Suggested Benefits

- Hypertension (High Blood Pressure)
  - Studies of animals and mildly hypertensive adults using three different types of *Lactobacilli* have been associated with decreasing blood pressure by 10-20 mmHg
Suggested Benefits

- Irritable Bowel Syndrome (IBS)
  - Many symptoms including abdominal pain, cramps, gas, bloating, diarrhea, and constipation.
  - Some symptom relief in only a few controlled studies
    - Primarily relief from diarrhea, abdominal pain, or bloating
Suggested Benefits

- Inflammatory Bowel Disease (IBD)
  - Crohn’s Disease or Ulcerative Colitis
  - Some studies have shown extended remission period after high levels of certain probiotic strains, but not all studies have shown benefits.
Suggested Benefits

- Immune System Modulation
  - Some studies have shown that yogurt or lactic acid bacteria may enhance immunoreactive cells and other immune factors
    - Macrophages
    - Lymphocytes
    - Cytokines
    - Immunoglobulins
    - Interferon
Suggested Benefits

- Obesity & Diabetes
  - Some studies have shown that *Lactobacillus gasseri* was able to decrease fat mass and Body Mass Index (BMI) in diabetic patients
  - Another study showed that probiotics may also preserve insulin sensitivity.
## Sources: Got Yogurt?

<table>
<thead>
<tr>
<th>Indication</th>
<th>Example Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant diarrhea</td>
<td>DanActive or Danimals Yogurt Culturelle (capsule)</td>
</tr>
<tr>
<td>IBD (pouchitis)</td>
<td>VSL#3 (powder)</td>
</tr>
<tr>
<td>Atopic dermatitis (i.e. eczema)</td>
<td>Culturelle (capsule) Danimals Yogurt</td>
</tr>
<tr>
<td>Immune Support</td>
<td>DanActive Good Start Natural Cultures (infant formula)</td>
</tr>
<tr>
<td>IBS</td>
<td>Align (capsules)</td>
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</tbody>
</table>
Prebiotics

- Food ingredients that promote the growth or activity of a limited number of bacterial species for the benefit of host health.

- Essentially, prebiotics are food for bacteria that are considered beneficial for health.

- Prebiotics have been studied extensively in vitro and in vivo to confirm fermentation characteristics which should extend those of regular nutrition.
Sources: Fructans

- Naturally occurring oligosaccharides and fructooligosaccharides found in foods like onions, bananas, wheat, artichokes, garlic, and other whole foods.
- May also be extracted from chicory
Sources: Resistant Starch

- 20g/day is considered minimum healthy dose; associated with fiber content
- Found in raw potatoes, unripe bananas, other starchy foods that have been cooked and cooled.
- On food labels they may be listed as “corn starch,” “starch,” or “maltodextrin.”
Sources: Medical Use

- Used in enteral nutrition products to help normalize and maintain bowel function, colon integrity, and build colonization resistance in hospital settings.
- May be used for antibiotic associated diarrhea and other irritable bowel conditions as part of formulated nutrition therapy.
Other Sources:

<table>
<thead>
<tr>
<th>Company/Product</th>
<th>Claim</th>
</tr>
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<tbody>
<tr>
<td>Various Horizon Organic – various products</td>
<td>Calcium absorption, immune benefits, improved digestion</td>
</tr>
<tr>
<td>Stonyfield Farms – various products</td>
<td>Calcium absorption</td>
</tr>
<tr>
<td>Lifeway Foods - Kefir</td>
<td>Bifidogenesis, calcium absorption</td>
</tr>
<tr>
<td>Abbott - Ensure Fiber</td>
<td>Fiber, digestive health</td>
</tr>
<tr>
<td>Clif Bar, Inc. – Clif, Luna Bars</td>
<td>Fiber</td>
</tr>
<tr>
<td>Abbott – ZonePerfect Shakes</td>
<td>Fiber</td>
</tr>
<tr>
<td>Skinny Cow – Low-fat ice cream sandwiches</td>
<td>Fiber</td>
</tr>
</tbody>
</table>
## Sources: Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Format</th>
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<tbody>
<tr>
<td>Kal Nutra Flora FOS</td>
<td>Powder</td>
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<tr>
<td>Solaray NutraFlora FOS</td>
<td>Capsule</td>
</tr>
<tr>
<td>FiberChoice</td>
<td>Chewable tablet/drops</td>
</tr>
<tr>
<td>SmartFiberStixx</td>
<td>Powder</td>
</tr>
<tr>
<td>Miracle Fiber</td>
<td>Powder</td>
</tr>
<tr>
<td>NutraFlora FOS</td>
<td>Powder</td>
</tr>
<tr>
<td>Durk Pearson &amp; Sandy Shaw’s Glycemic Control Resistance Starch</td>
<td>Powder</td>
</tr>
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Benefits

- Supports the growth of health supporting bacteria in the colon
- Work well with probiotics
Conclusion

- Research is still emerging and causal relationships between pre/probiotic use and health benefits in humans must continue to be validated.
- It is safe to consume naturally occurring pre/probiotics in the diet to help promote the same health benefits.
- Eat more yogurt, fruits, vegetables, and whole grains!
Questions?
Thank you
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References


