Optimizing Gut Health: A Key to Improved Digestion and Beyond

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Presentation overview

• Introduction to the gut
  • What is it and what does it do?
  • Healthy gut and digestive process
  • Unhealthy gut and digestive disorders
    • Focus on gut microbiota

• Gut health and overall health
  • Autoimmune disease
  • Overweight and obesity
  • Emotional health
Presentation overview

- How to optimize your gut health
  - Rule out serious gastrointestinal disease
  - Elimination diets
  - Avoiding adverse food reactions
  - Healing intestinal lining
  - Fermented foods
  - Gut microbiota testing
  - Probiotics & prebiotics
  - Mindful eating
  - Stress management
What is the gut?
Healthy digestive system

- Your teeth perform "mechanical" digestion.
- Salivary glands secrete saliva to start "chemical" digestion.
- Food travels down the pharynx into the oesophagus.
- The oesophagus pushes food down.
- The stomach secretes gastric juices, and "chemically" digests food.
- Liver secretes bile to help fat digestion.
- The small intestine completes digestion.
- The large intestine absorbs water, salt, and some vitamins.
- The rectum stores faeces until it leaves the body through the anus.
Unhealthy digestive system

- Viral Hepatitis
- Bacterial Hepatitis
- Cirrhosis
- Barrett's Esophagus
- Gastritis
- Gastric Ulcer
- Pancreatitis
- Candidiasis
- Ulcerative Colitis
- Parasitic
- Crohn's Disease
- Diverticulosis
- Constipation
- Hemorrhoids
Functional bowel disorders

Irritable Bowel Syndrome

What is irritable bowel syndrome?

Irritable bowel syndrome (IBS) is a common disorder of the gut (includes the bowels). There is a problem with the function of the gut but there is no abnormality in the structure.

1 in 5

WILL SUFFER FROM IRRITABLE BOWEL SYNDROME?

Common symptoms

- Painful cramps
- Bloating
- Diarrhoea
- Constipation
- Mucus in stool

Did you know?
Women are 2-3 times more likely to suffer from irritable bowel syndrome than men
Gut Microbiota and Health
Human microbiota
Human microbiota

- **Microbiota**
  - Microorganisms on body
    - Bacteria, yeast, viruses, etc.

- **Microbiome**
  - Genes of the microorganisms

- **Bacteria**
  - Mouth (10 billion), skin (1 trillion), gut (100 trillion - 1 quadrillion!)
How do we acquire our microbiota?

How do we acquire our microbiota?

How do we acquire our microbiota?

Gut microbiota

- 100 trillion - 1 quadrillion bacteria in gut
  - 10-100 times cells in human body!
  - Weigh between 2 - 6 pounds
  - Over 1000 different species
Gut microbiota classification

- **Phylum** – broadest
  - Firmicutes
- **Genus** – more specific
  - Lactobacillus (L._____
- **Species** – more specific
  - L. acidophilus
- **Strain** – most specific
  - L. acidophilus NCFM
E. Coli... a tale of two strains

E. coli 0157:H7
- Food-borne pathogen
- Hemorrhagic diarrhea, kidney failure, death

E. coli Nissle O6:K5:H1
- In probiotic supplements
- Improves IBD, IBS, constipation, etc.
Part of microbiota - World Health Organization definition:

“Live microorganisms when administered in adequate amounts, confer beneficial health effect on the host”
Probiotic bacteria

- **Lactobacillus**
  - Common bacterial genus in gut
  - Convert lactose & sugars to lactic acid
    - Acidic environment inhibits pathogens
    - Can help people with lactose intolerance
  - Over 100 species
    - Indicated by *L. _____*
    - Some of most important: *L. acidophilus, L. casei, L. reuteri, L. brevis*
Probiotic bacteria

- *Bifidobacterium*
  - Another common bacterial genus in gut
  - Inhibit pathogenic bacteria
    - Produces acidic environment (lactic acid)
  - 29 species identified
    - Indicated by *B. _____*
    - Some of most important: *B. longum, B. breve, B. animalis*
Probiotic yeast

- **Saccharomyces**
  - Common fungal genus in gut
    - Many yeast damage gut, e.g. *Candida albicans*
  - Some species beneficial & compete with pathogens
    - Indicated by *S. _______*
      - *S. Boulardii* (Florastor) effective preventing/treating diarrhea
Another popular *Saccharomyces*...

- *Saccharomyces cerevisiae*
“Dysbiosis” - microbiota imbalance

Over 1,000 different bacterial species in gut

Most abundant bacterium in healthy gut microbiota?

*Faecalibacterium prausnitzii*
Gut microbiota and gut health

- *Faecalibacterium prausnitzii* most common bacterium in healthy adult gut microbiota
  - Up to 15% total healthy gut microbiota
  - Anti-inflammatory & makes butyrate
  - Not in many commercially-available probiotics!

- Less *Faecalibacterium prausnitzii* in IBD patients than healthy controls
  - Crohn’s disease (especially) & ulcerative colitis
Gut microbiota and gut health

- Reduced gut microbiota diversity & altered populations in many gut diseases compared to healthy adults

<table>
<thead>
<tr>
<th>Aberration</th>
<th>Most relevant observations and potential correlation</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crohn’s disease</td>
<td>Diversity decrease – reduced <em>F. prausnitzii</em></td>
<td>Kaser et al. 2010(^5); Sokol et al. 2009(^6); Willing et al. 2010(^7)</td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>Diversity decrease – reduced <em>A. muciniphila</em></td>
<td>Png et al. 2010(^8), Kaser et al. 2010(^9); Lepage et al. 2011(^10)</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>Global signatures – increased <em>Dorea</em> and <em>Ruminococcus</em></td>
<td>Salonen et al. 2010(^11); Saulnier et al. 2011(^12); Rajilić-Stojanović et al. 2011(^13)</td>
</tr>
<tr>
<td><em>Clostridium difficile</em> infection</td>
<td>Strong diversity decrease – presence of <em>C. difficile</em></td>
<td>Grehan et al. 2010(^14); Khoruts et al. 2010(^15)</td>
</tr>
</tbody>
</table>
Gut microbiota systemic effect on immune system

- Over 50% immune system activity in gut
- Many species: *Lactobacillus*, *Bifidobacterium*, *Clostridium*, etc.
- Probiotic foods prevent & reduce duration of common cold
Gut microbiota and autoimmune disease

- Gut microbiota associated with autoimmune disease

- Inflammatory Bowel Disease
  - Crohn’s disease
    - ↓ diversity
    - ↓ *F. prausnitzii*
  - Ulcerative colitis
    - ↓ diversity
    - ↓ *A. muciniphila*

*Figure 4.* Gross (top), histological (center), and endoscopic (bottom) appearance of normal colon, Crohn’s disease, and ulcerative colitis.
Gut microbiota and autoimmune disease

- Celiac disease
  - ↓ bacterial counts

- Rheumatoid arthritis
  - ↓ *Bifidobacterium*
Gut microbiota and autoimmune disease

- Allergic rhinitis
  - Altered diversity & signatures

- Type 1 diabetes
  - ↓ Butyrate producing bacteria, ↑ Bacteroidetes, ↓ Firmicutes
Gut microbiota and obesity

- Human gut microbiota influence human metabolism
Gut microbiota and obesity

- Low gut microbiota associated with obesity & weight gain
Gut microbiota and obesity

- Transplanting microbiota from obese twin - not lean twin - causes obesity in germ-free mice

Gut microbiota and obesity

Probiotic supplementation helps weight loss in humans

- *Lactobacillus gasseri* SBT2055 - 2.2 lb weight loss, decrease abdominal fat among overweight adults

- *Lactobacillus rhamnosus* CGMCC1.3724 - 3.7 lb weight loss, among obese women (not men)
Gut microbiota and emotional health

- **Enteric nervous system** in gut lining
  - “The second brain”
  - Over 100 million neurons in gut
    - Neurons – messenger cells in nervous system
    - 5 times as many neurons in gut as spinal cord!
Gut microbiota and emotional health

The Brain in Your Gut

The gut’s brain, known as the enteric nervous system, is located in sheaths of tissue lining the esophagus, stomach, small intestine and colon.

SMALL INTESTINE CROSS SECTION

Submucosal plexus
Layer contains sensory cells that communicate with the myenteric plexus and motor fibers that stimulate the secretion of fluids into the lumen.

Myenteric plexus
Layer contains the neurons responsible for regulating the enzyme output of adjacent organs.

Lumen No nerves actually enter this area, where digestion occurs. The brains in the head and gut have to monitor conditions in the lumen across the lining of the bowel.

Source: Dr. Michael D. Gershon, Columbia University

Mesentery Attaches the bowel to the body wall and contains major arteries, veins, lymphatics and external nerves.
Gut microbiota and emotional health

- Food digested in gut & microbiota produce neurotransmitters
  - Chemical messages between brain & body

- Serotonin
  - 95% serotonin produced in gut
    - *Escherichia, Bacillus, Saccharomyces*

- Dopamine
  - 50% dopamine produced in gut
    - *Bacillus, Serratia*

- Norepinephrine
  - *Streptococcus, Escherichia, Enterococcus*
Gut microbiota and emotional health

- Studies in “germ-free” animals

- Increased stress & anxiety in mice without gut microbiota
  - Regulates hypothalamic-pituitary-adrenal (HPA) axis activity
Gut microbiota and emotional health

• Studies in “germ-free” animals

• Gut microbiota impact brain development
  • Affects expression of genes involved in anxiety
Gut microbiota and emotional health

- Probiotic interventions in animals
  - Treating rats with probiotics lessened induced stress
    - *Lactobacillus farciminis*
  - Treating mice with probiotics reduced anxiety & depression
    - *Lactobacillus rhamnosus*
Probiotic interventions in humans

- Randomized controlled trial (RCT) of probiotic reduced depression
  - *Lactobacillus casei*

- RCT of probiotic reduced anxiety & depression, improved coping
  - *Lactobacillus helveticus R0052 & Bifidobacterium longum R0175*

- Milk probiotic activated brain areas affecting emotion in humans
  - *Bifidobacterium animalis, Streptococcus thermophiles, Lactobacillus bulgaricus, Lactococcus lactis*
Gut microbiota and emotional health

**Review**

**Psychobiotics: A Novel Class of Psychotropic**

Timothy G. Dinan, Catherine Stanton, and John F. Cryan

Here, we define a psychobiotic as a live organism that, when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness. As a class of probiotics, these bacteria are capable of producing and delivering neuroactive substances such as gamma-amino butyric acid and serotonin, which act on the brain-gut axis. Preclinical studies in rodents suggest that certain psychobiotics possess antidepressant or anxiolytic activity. Clinical studies using biobanks have shown that the gut microbiome can influence the development of brain and behavior. The gut microbiota can influence the development of brain and behavior. The gut microbiota can influence the development of brain and behavior.

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Key Words: Brain-gut axis, depression, microbiota, probiotics, psychobiotics, stress.

In his review of 2012, Thomas Insel, Director of the National Institute of Mental Health, referred to recent studies on the microbiota as among the most important published in the year and concluded that "Our bodies are a complex ecosystem in which human cells represent only 10% of the population. But the human mind is much more complex than the human body. In the next decade, we will see a revolution in our understanding of how our mind and body interact." There is certain an expanding volume of evidence to support the view that cognitive and emotional processes can be altered by microbes acting through the brain-gut axis. Thus, gut pathogens can influence our mental processes are recognized by all, but the fact that some bacteria may have positive mental health benefits is now emerging. The brain-gut axis provides bidirectional communication between the brain and the gut and includes the metabolically complex intestinal microbiota. In this review, we will focus on the role of the gut microbiota in the brain and the manner in which certain bacteria may be used to treat central nervous system disorders such as depression.

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There is increasing evidence that certain immune responses can be induced by feed probiotic microorganisms, which adds a further layer of complexity to the issue. We define a psychobiotic as a live organism that, when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness. Logue and Karzman (8) first proposed the use of probiotics as adjunct therapy in the management of depression. Recently, Lyte (9) argues that probiotics function mechanismcally as delivery vehicles for neuroactive compounds and these probiotics have the potential to act as psychotropic agents. It is clear that a broad range of bacteria manufacture and secrete neurochemicals. Certain strains of Lactobacillus and Bifidobacterium secrete gamma-amino butyric acid (GABA). This is the main inhibitory neurotransmitter in the brain regulating many physiological and psychological processes, with dysfunction in the system implicated in anxiety and depression (10). We have recently reported the ability of intesinally derived strains of lactobacilli and bifidobacteria to produce GABA from monooxidum glutamate (11). It has been suggested that the microbially produced GABA in the gut may have an effect on the brain-gut axis and Rodshilk (12) indicates that a subset of Lactobacillus is capable of producing acetylcholine, another essential neurotransmitter in the human brain.

Serotonin (5-HT) is a metabolite of the amino acid tryptophan and plays an important role in the regulation of a number of bodily functions including mood. It has been shown that the plasma serotonin levels of conventional animals are significantly lower than those of germ-free mice.
Gut microbiota... even more impact on health

- **Type II diabetes**
  - Signature differences

- **Colorectal cancer**
  - $\uparrow$ *fusobacteria*
Gut microbiota... even more impact on health

Many other effects of gut microbiota on health likely!
Influences on gut microbiota

Influences on gut microbiota

- **Antibiotics**
  - Long-term microbiota decrease… up to 2 years
  - Ciprofloxacin, vancomycin, metronidazole
  - Probiotics during/after antibiotics key!

- **Diet**
  - Whole, non-processed foods, fermented foods, probiotics, prebiotic fibers, minimize sugars & artificial sweeteners
Influences on gut microbiota

- Fecal transplants
  - *C. difficile* infections, IBD, Parkinson’s, etc.
  - Big area in future of medicine!
Optimize Your Gut Health
You don’t need to live with these symptoms!
See gastroenterologist if chronic symptoms

- Can rule out serious gastrointestinal conditions:
  - Colorectal cancer
  - Inflammatory Bowel Disease: Crohn’s Disease, Ulcerative Colitis
  - Small Intestine Bacterial Overgrowth (SIBO)
    - Diagnosis: Hydrogen breath test
  - Celiac disease
    - Diagnosis: Antibodies to glutenin & gliadin, tissue transglutaminase, endomysium
  - Barrett’s Esophagus
  - Peptic ulcer
  - Gallstones
  - Inflammatory conditions: Esophagitis, gastritis, pancreatitis, etc.
  - Infection: Parasites, fungal, bacterial, etc.
Elimination diets

- Eliminating problematic foods
  - Many different approaches of varying intensity
  - Gold standard treatment food allergy & sensitivity (immune-mediated) and food intolerance (non-immune mediated)
  - Try most for at least two weeks
    - “Challenge testing” - reintroducing foods after symptoms improve
  - Goal: eliminate as few foods as possible over long term!
Elimination diets

• Good all-purpose elimination diet: Institute for Functional Medicine
  • “Comprehensive Elimination Diet”
    • Rationale, include/exclude table, shopping list, recipes, etc.
    • Would also eliminate legumes (digestive challenge) & agave (high fructose)
Elimination diets

- **Strictest - Elemental Diet**
  - No solid food!
  - Liquid through IV or feeding tube under medical supervision
    - Minimal digestion required
  - Usually for severe IBD
    - Few days at a time
Elimination diets

- Specific Carbohydrate Diet
- Based on importance of gut microbiota
  - Undigested carbohydrates cause or worsen dysbiosis
- Specific carbohydrate diet eliminates:
  - Disaccharides – lactose, sucrose, maltose, isomaltose
  - Polysaccharides – starches (grains, corn, potatoes, etc.)
Elimination diets

- **Specific Carbohydrate Diet**

<table>
<thead>
<tr>
<th>Legal</th>
<th>Illegal</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat and Fish</td>
<td>Fresh or frozen; poultry, fish, beef, lamb, and shellfish</td>
<td>Processed meats such as hot dogs, cold cuts, and fast food; Most smoked meats and fish</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Most fresh or frozen vegetables, including carrots, broccoli, onions, tomato, squashes, and many others; Canned vegetables</td>
<td>Potatoes, yams, and other starchy root vegetables; Packaged vegetables with additional sugars or preservatives</td>
</tr>
<tr>
<td>Fruit</td>
<td>Fresh or frozen fruit with no added sugar, such as bananas (with ripe, speckled small brown spots), apples, pears, and others; Dried fruit with no added sugars or other preservatives/additives</td>
<td>Canned fruit with added sugars or other additives; Dried fruit with added sugars or other additives</td>
</tr>
</tbody>
</table>
Elimination diets

- **Specific Carbohydrate Diet**

<table>
<thead>
<tr>
<th>Grains</th>
<th>Grains are not included on the diet</th>
<th>Grains, including bread, rice, pasta, cereal, and products with corn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>These grains contain carbohydrates that are not properly digested by an injured intestine. Undigested, they become the primary source of energy for harmful bacteria.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dairy</th>
<th>Homemade yogurt (see page 19); Natural cheeses where the whey is removed and the remaining lactose is “cured,” such as Cheddar, Colby, Havarti, Monterey Jack, Parmesan, Swiss, and others; Dry-cured cottage cheese (also known as farmer’s cheese or hoop cheese); Butter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milk; Processed cheese, such as American cheese; Fresh cheeses, such as mozzarella and ricotta; Cheese with additives or coloring; Milk products, such as ice cream; Margarine</td>
</tr>
<tr>
<td></td>
<td>Homemade yogurt is fermented for a longer amount of time to reduce the lactose content. Check the online resources on page 211 for other allowable cheeses.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oils</th>
<th>Cooking oils, including those made with grains, such as olive, vegetable, canola, and sesame oil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooking oils with additives, such as cooking sprays</td>
</tr>
</tbody>
</table>

http://www.breakingtheviciouscycle.info/home/
Elimination diets

The Complete Low-FODMAP Diet

A Revolutionary Plan for Managing IBS and Other Digestive Disorders

Sue Shepherd, PhD and Peter Gibson, MD

Foreword by William D. Chey, MD, Professor of Medicine at the University of Michigan and Co-editor-in-Chief of the American Journal of Gastroenterology
Elimination diets

FODMAP

- Fermentable (Produce Gas)
- Oligosaccharides (Fructans and Galacto-oligosaccharides)
- Disaccharides (Lactose)
- Monosaccharide (Fructose)
- Polyols (Sorbitol and Mannitol)
### Elimination diets

<table>
<thead>
<tr>
<th>COMMON FOODS CONTAINING FODMAPs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXCESS FRUCTOSE</strong></td>
</tr>
<tr>
<td>Fruits - apples, pears, nashi, mangoes, tinned fruit in natural juice, watermelon</td>
</tr>
<tr>
<td>Sweeteners - fructose, high fructose corn syrup</td>
</tr>
<tr>
<td>Large total fructose dose - concentrated fruit sources, large serves of fruit, dried fruit, fruit juice</td>
</tr>
<tr>
<td>Honey</td>
</tr>
<tr>
<td><strong>LACTOSE</strong></td>
</tr>
<tr>
<td>Milk - cows', goats' and sheeps' milk, yoghurt, ice cream</td>
</tr>
<tr>
<td>Cheeses - soft and fresh (e.g. ricotta, cottage)</td>
</tr>
<tr>
<td><strong>FRUCTANS</strong></td>
</tr>
<tr>
<td>Vegetables - artichokes, beetroot asparagus, Brussels sprouts, cabbage, fennel, garlic, leeks, okra, onions, spring onions (white part), shallots</td>
</tr>
<tr>
<td>Cereals - wheat and rye when eaten in large amounts (e.g. bread, pasta, couscous, crackers, biscuits)</td>
</tr>
<tr>
<td>Fruits - watermelon, custard apples, persimmons</td>
</tr>
<tr>
<td><strong>GALACTANS</strong></td>
</tr>
<tr>
<td>Legumes - chickpeas, lentils, red kidney beans, baked beans</td>
</tr>
<tr>
<td><strong>POLYOLS</strong></td>
</tr>
<tr>
<td>Fruits - apples, apricots, cherries, lychees, nashi, nectarines, pears, peaches, plums, prunes, watermelon</td>
</tr>
<tr>
<td>Vegetables - avocados, mushrooms</td>
</tr>
<tr>
<td>Sweeteners - sorbitol (420), mannitol (421), xylitol (967), maltitol (965), isomalt (953)</td>
</tr>
</tbody>
</table>
Elimination diets

• Top foods to reduce/eliminate if symptomatic:
  • Gluten-containing grains
    • Wheat, barley, rye
  • Corn
  • Soy
  • Dairy (especially non-fermented)
  • Foods high in fructose
  • Eggs
  • Legumes (less problematic if sprouted)
  • Refined carbohydrates
  • Artificial sweeteners
Reduce or eliminate artificial sweeteners
Artificial sweeteners damage gut microbiota

- Aspartame
  - Other potential issues
Artificial sweeteners damage gut microbiota

- Sucralose
  - Also associated with weight gain & potential involvement in IBD
Artificial sweeteners damage gut microbiota

- Sugar alcohols
  - End in “-ol”
  - Also known to have laxative effects
  - May cause dysbiosis & lack of diversity
Honey... in moderation

- Honey contains probiotic bacteria & prebiotics
  - Preferably raw
  - *Lactobacillus* & *bifidobacter* species, oligosaccharide prebiotics
Another key elimination... acid-blocking drugs

- Acid-blocking medications
  - Proton-pump inhibitors (Prilosec, Prevacid, Nexium)
  - H₂ antagonists (Pepcid, Tagamet, Zantac)

- No long-term studies & known risks
  - Deplete Vitamin $B_{12}$
  - Increased risk of fractures: Hip, wrist, and spine
  - Worsen *H pylori* infections: Bacteria causes peptic ulcer

- Communicate discontinuation with physician
  - Be aware of Barrett’s Esophagus
  - Taper off slowly... ½ dose for a week, ¼ dose for another week, etc.
Tapering off of acid-blocking drugs

- **Deglycyrrhizinated Licorice (DGL)**
  - Licorice without glycyrrhizin (increases blood pressure)
  - Limited human clinical trials
  - Clinical practice: DGL lozenges chewed for acid indigestion

- **Aloe Vera**
  - Topical: burn relief, Internal: limited studies
    - Decreases gastrointestinal inflammation
    - 2004 *Alimentary Pharmacology and Therapeutics*
  - Drinking 100% aloe juice (gel/whole leaf) preferable
    - Whole leaf has laxative effects, gel & "inner filet" do not
Adverse food reactions
Adverse food reactions

- Food allergy
  - Immune-mediated reaction (IgE)
  - Immediate reaction often within minutes
    - Symptoms: swelling, hives, acute diarrhea, etc.
  - Test: Skin prick or IgE blood
    - Capture small portion of all adverse reactions to food!

![Diagram of allergy testing](image-url)
Food sensitivities and intolerances

- Much more common than food allergies!
- Delayed reaction... hours to days
  - Symptoms: autoimmune disease, bloating, diarrhea, acid indigestion, fatigue, etc.
- Test: Elimination diet (gold standard) & blood tests
Intestinal permeability

- Intestinal permeability, aka “leaky gut”
  - Mucous lining of small intestine too porous
    - Toxins, microorganisms, undigested food enter bloodstream
  - Can cause inflammation & autoimmune disease
Intestinal permeability

- Symptoms
  - Autoimmune diseases, IBS, adverse food reactions, etc.

- Causes
  - Poor diet, stress, alcohol, infection, antacids, NSAIDs
Intestinal permeability

- Diagnosis: Lactulose/mannitol urine test
  - Two non-metabolized sugars: lactulose (big) & mannitol (small)
    - High lactulose – intestinal permeability
    - Low mannitol – malabsorption
Healing intestinal lining

- **Homemade broth**
  - Bones from grass-fed, pasture-raised, humanely-treated animals
  - Provides amino acids that build & heal gut lining
    - Proline, glycine, glutamine, etc.: promote collagen synthesis (other benefits)
  - Contains glycosaminoglycans (GAGs)
    - Low in people with IBD
Healing intestinal lining
Healing intestinal lining
Healing intestinal lining
Healing intestinal lining

Skip the Botox... Eat Bone Broth Instead!

[Image of bone broth]

[Image of bone pieces]

[Image of gelatin can]
Healing intestinal lining

Fermented foods

- Contain probiotics… component of most traditional diets

Asian

- Miso and natto
  - Fermented beans/grains… often soy
  - *L. acidophilus* (miso) & *B. natto* (natto)

- Kimchi
  - Fermented cabbage, radishes, etc.
  - *L. kimchii*

- Kombucha
  - Fermented tea
  - *S. cerevisiae*
Fermented foods

- **European**
  - **Yogurt**
    - Fermented dairy
      - Cow, goat, sheep milk
    - People with lactose intolerance can often tolerate!
    - *L. bulgaricus* & *Streptococcus thermophilus*
  - **Kefir**
    - Fermented dairy... more probiotic species than yogurt
    - *L. rhamnosus*, *B. longum*, *S. florentinus*, etc.
  - **Sauerkraut**
    - Fermented cabbage
    - *L. plantarum*, *L. mesenteroides*, etc.
Fermented foods

- **African**
  - **Ogi**
    - Fermented grains… often corn
    - *L. brevis, L. acidophilus*, etc.

- **Currently in United States…**
  - Primarily yogurt
  - Traditional fermented foods available health food stores
    - Kefir, kimchi, kombucha, real sauerkraut (not in can), etc.
Choose fermented foods carefully
Choose fermented foods carefully

Culture Wars

How the Food Giants Turned Yogurt, a Health Food, into Junk Food

Navigating the Dairy Case to Find Quality, Safety and Nutritional Value

A Report by The Cornucopia Institute | November 2014

Choose fermented foods carefully

Type of Added Natural Sweetener – Type of natural sweetener is rated as follows: brands that add food-based sweeteners (honey or maple syrup) receive 100 points, brands that add cane sugar receive 75 points, brands that add agave receive 25 points, and brands that add corn syrup or high fructose corn syrup receive 0 points. Brands that do not add any additional sweeteners also receive 100 points. These scores are based on metabolic impact and the level of industrial refinement/processing.

Amount of Added Natural Sweetener – Brands receive 100 points for 12 grams of sugar per 6-ounce serving or less (the amount of natural sugar, primarily lactose, that is commonly found in non-fat yogurt; full fat has less sugar). For every additional gram of sugar above 12, 10 points are subtracted. Brands that include 22 or more grams of sugar per 6-ounce serving receive 0 points. (That’s more sugar than in a Twinkie (18 grams) or in 4 Oreo cookies (18 grams)!)

Added Coloring – Brands that don’t use added coloring receive 100 points. Even “natural” coloring commonly comes from industrial food processing operations typically using synthetic chemicals in their production. There is an advantage in eating pure, whole foods with the lowest number of overall added ingredients.

Added Artificial Coloring – Brands that don’t use added artificial coloring receive 100 points.

Added Flavors – Brands that don’t use added flavors receive 100 points. Even “natural” flavors commonly come from industrial food processing operations typically using synthetic chemicals in their production. There is an advantage in eating pure, whole foods with the lowest number of overall added ingredients.
Choose fermented foods carefully

Out of 116 yogurts tested... (locally available)

- **Excellent**
  - 2.) Maple Hill Creamery
  - 3.) Seven Stars Farm
  - 5.) White Mountain Organic

- **Mediocre**
  - 25.) Lifeway (organic)
  - 30.) Stonyfield
  - 50.) Fage
  - 70.) Lifeway (conventional)

- **Bad**
  - 110.) Activia
  - 113.) Yoplait
  - 115.) Dannon

Make your own fermented foods

• Make your own kefir
  • Kefir more probiotics than yogurt
    • Yogurt: 2-3 probiotic species, 100 million-80 billion CFU (colony forming units)
    • Kefir: 10+ probiotic species, >100 billion CFU (colony forming units)
    • 100 trillion CFU bacteria in gut!
Make your own fermented foods

• Make your own kefir
  • http://www.makingkefir.com/

GETTING STARTED
To begin making your own Kefir, you will need the following supplies:

- 2-3 Large Wide-Mouth Glass Jars (32 oz Mason Jars work Great!)
- Wooden Spoon (Preferably with Holes)
- Small Strainer (Ideally a plastic strainer since metals interferes with the kefir grains (stainless steel ok))
- Cheese Cloth (Or a lid... Used to cover the jar during fermentation)
- Fresh Milk (From Cow, Goat or Sheep. We prefer Goat as it is easiest for most people to digest, sometimes even those with lactose intolerances! And if you have access to Raw Milk, even better!)
- Kefir Grains (Choose a high-quality strain such as Cultures For Health)
Prebiotic fibers

- Fermentable fibers that feed probiotic bacteria
- Buckwheat excellent (gluten-free) prebiotic
- Chicory, Jerusalem artichokes ("sunchokes"), burdock root, allium vegetables (onions, leeks, garlic, etc.), asparagus, cocoa, green tea, blueberries
Resistant starch

- Starches not absorbed in small intestine... feed microbiota in colon
- Preferentially feed probiotics, improve gut lining, improve insulin sensitivity
- Sources: green(ish) bananas, cooked/cooled rice & potatoes, potato starch
Be cautious with prebiotic supplements

- Can worsen gastrointestinal symptoms in high doses
  - Inulin, fructooligosaccharides (FOS), meal replacements
  - Can worsen dysbiosis... fuel to the fire!
How to assess microbiota?

What’s Your Poo Telling You?

Josh Richman and Anish Sheth, M.D.
Illustrations by Peter Arkle
Microbiota assessment

- Stool test from integrative clinician assess gut microbiota
- Ex.) Genova CDSA 2.0
Microbiota assessment

- Other digestive measures
  - SCFAs, beta-glucuronidase, pancreatic elastase, bile acids, calprotectin, pH, etc.

### CDSA 2.0

<table>
<thead>
<tr>
<th>Patient: SAMPLE PATIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOB: March 01, 1985</td>
</tr>
<tr>
<td>Sex: M</td>
</tr>
<tr>
<td>MRN:</td>
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</table>

### Digestion/Absorption

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pancreatic Elastase 1</td>
<td>293</td>
<td>201 mg/dL</td>
</tr>
<tr>
<td>Pituitary SCFAs (Total)</td>
<td>13.0</td>
<td>0.0-5.0 nmol/g</td>
</tr>
</tbody>
</table>

*Total values equal the sum of all measurable parts.

### Gut Immunology

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eosinophil Protein X</td>
<td>3.5</td>
<td>&lt;= 7.0 mg/dL</td>
</tr>
<tr>
<td>Calprotectin</td>
<td>302</td>
<td>&lt;= 50 mg/dL</td>
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</tbody>
</table>

### Metabolic

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficial SCFAs (Total)</td>
<td>17.6</td>
<td>&lt;= 13.6 nmol/g</td>
</tr>
<tr>
<td>pCO2</td>
<td>34</td>
<td>6.1-7.9</td>
</tr>
<tr>
<td>Beta-glucuronidase</td>
<td>4.4</td>
<td>3.3-4.8 U/L</td>
</tr>
</tbody>
</table>

**Secondary Bile Acids**

- Microbiota assessment encompasses the functional activities of digestion, gastric acid production, pancreatic activity, bile production, and brush border maintenance. Absorption depends on all of the above actions, as well as a healthy gut mucosal barrier.

**Gut Immunology**

Gut immunology markers are derived from the activation and degranulation of eosinophils (EPOX) and neutrophils (calprotectin). EPOX reflects inflammation and tissue damage and can be elevated in food allergies, celiac disease, helminthic infection, and IBD. Calprotectin is inflammation specific and can elevate with infection or post-infectious IBS, NSAID enteropathy, IBD, and cancer. Children with chronic diarrhea from cows milk allergy or multiple food allergies may also have increased calprotectin. Levels greater than 120 mg/dL warrant further investigation.

**Metabolic**

Gut metabolism is representative of the bacterial milieu, primarily through the presence of commensal bacteria. Metabolic activities include: mucous production, vitamin synthesis and absorption, deconjugation of steroid hormones and bile acids, and xenobiotic and P450 detoxification.
Probiotics
Probiotics

- Most important for people who...
  - HAVE BEEN ON ANTIBIOTICS!
    - Critical to replenish flora & prevent side-effects
  - Have digestive problems
  - Have an autoimmune condition
  - Will be travelling out of the country
    - Prevent diarrheal disorders
  - Suspect deficiencies in specific probiotic species

*When choosing probiotics, you get what you pay for!*
Probiotics

- Single-species useful for specific conditions
  - *S. boulardii*, *L. GG*, etc. for diarrhea

- Core product: multiple species & SHIPPED ON ICE
  - Variety of lactobacillus & bifidobacterium... more not necessarily better
    - Highest CFU (colony forming units) or most species ≠ best quality
  - Probiotics die if exposed to high temperatures
    - Refrigeration after hot shipment (common) - not helpful
Probiotics

• Choose products that specify strain
  • Most specify genus and species
    • Best products also specify strain!
    • ex.) B. longum R0175
      • B. = genus, longum = species, R0175 = strain

• Choose products supported by research
  • Probiotic quality varies tremendously
  • Trust products supported by research
  • Company can point to studies
Probiotics

- Probiotics study for persistent gastrointestinal symptoms
- *Contact me or see flyer at Center for Integrative Medicine booth!*

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**Do You Have Gastrointestinal Problems, Distress or Discomfort?**

You may qualify for a clinical research study, if you are:

- 18 years of age or older
- Experiencing moderate discomfort from gas, indigestion, bloating and/or defecation irregularity

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Compensation up to $200.00 is available for your participation.

Please call 410-951-4102 or email contact@charmodresearch.com or [http://charmodresearch.com](http://charmodresearch.com)

Study is being conducted at Charm City Research located at St. Joseph’s Hospital, Towson, MD
Not just what you eat... how you eat it!

- Benefits of mindful eating
  - Enjoy food more, improved digestion, eat less, lose weight

“mindful eating” vs. “mindless eating”
Stress management
Stress management
Stress management – with clinician

- **Hypnosis**
  - Effective for IBD and IBS

- **Cognitive behavioral therapy**
  - Improves IBD and IBS symptoms

Seek professional with experience in gastrointestinal symptoms
Hypnosis audio improves IBS symptoms
  - Guided imagery also likely effective

Mindfulness meditation improves IBS symptoms

Inducing relaxation response improves IBD and IBS
  - ↓ inflammation and expression of genes involved in IBD & IBS
Stress management takes many forms
Create environment for stress management
Thank you! Questions?

Contact: cdadamo@som.umaryland.edu