Start with the Gut: Support the Microbiome and Digestion
Derek Strong DC, ACN

Digestive Concerns on the Rise

• 60 to 70 million American each year have digestive concerns including:
  • Heartburn, acid reflux, GERD (gastro esophageal reflux disorder), IBS (irritable bowel syndrome), IBD (inflammatory bowel disease), indigestion constipation, diarrhea, abdominal pain, others ¹

• These concerns can be from complex to minor.

• Costing the healthcare system and individuals
  • close to $135.9 billion in expenses.²

Burden of GI Conditions (USA vs Global)

Prevalence of IBS: ~20% in US


Prevalence of IBD: 1.3% for US adults


Prevalence of GERD: ~15% in US

The modern diet influences GI inflammation - susceptibility to infection, allergy, and autoimmunity

Studies have shown elevations of inflammatory cytokines (TNF-α, IL-1β, IL-6) associate with poor gut health.

Certain Dietary Stimuli have the potential for inducing or mitigating GI inflammation in humans.

Dietary omega-3 fatty acids from fish oils, and plant based phytonutrients have displayed evidence to help positively control gut specific inflammation.

An ideal GI state is characterized by effective digestion and absorption of food, normal and stable intestinal microbes, effective immune status, a functioning GI barrier system, and an overall status of well-being.
Features and GI Environment

Upper GI
- Breakdown of food: carbohydrates, protein and fat
- Acidic pH from HCl in stomach (1.5-3.5) sterilization
- Enzymes (pepsin, amylase)
- Hormones (secretin, gastrin)
- Bile production in liver, gallbladder storage and release into small intestine

Lower GI
- Neutral pH = 4.0-6.0
- Enzymes
- Hormones (CCK, GIP, Motilin, Somatostatin)
- Selective permeability
- Absorption of nutrients
- Houses trillions of microbes
- Local microbial effects

Early Digestion – Saliva

Proper digestion and absorption starts in the mouth, where mastication breaks apart food making it available for digestion. Saliva plays a key functional role in supporting mastication and beginning the digestion of food. Saliva also plays a protective role.1,2

The Acidic Environment – Stomach

- Begins the process of protein digestion
- Hydrolysis of protein
- Breaks down foreign microbes
- Increases absorption of minerals

Supporting Proper Gastric Acidity

- Betaine HCl
- Digestive enzymes with acid pH range
- Bitters
- Vinegar
- Gentian root
- Stress management
Enzymes: Macronutrient Breakdown

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Lipids</th>
<th>Protein</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase</td>
<td>Lipase</td>
<td>Pepsin</td>
<td>Betaine HCl (Stomach acidification)</td>
</tr>
<tr>
<td>a-galactosidase</td>
<td></td>
<td>Peptidase</td>
<td></td>
</tr>
<tr>
<td>b-galactosidase</td>
<td></td>
<td>Protease</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endoprotease</td>
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</tr>
</tbody>
</table>

Digestive Enzyme Support

**Types of Digestive Enzyme**

- Exocrine function releases enzymes
- Lipases: break down fats
- Proteases: break down proteins (Bromelain, papain, proteolytic enzymes)
- Amylases: break down carbohydrates (Amylase, glucoamylase, alpha galactosidase, phytase, lactase, cellulase, hemicellulose)

**Enzyme Product Sources**

- Pancreatin
- Aspergillus-derived enzymes
- Food-derived enzymes

**Digestive Aids / Enzymes**

- Figs
- Pancreatin
- Pineapple
- Papaya
- Amylase
- Cellulase
- Lipase
- Pepsin
- Black Cumin seed
- Betaine HCl
- Mint
- Fennel
- Ginger
- Bovine Bile Salts
- What is bile?
Made up of bile salts, lecithin, cholesterol, and bilirubin - biosynthesized in a healthy liver and stored in the gallbladder. Humans secrete 700mL of bile daily.

- What happens to bile once released?
Most bile is reabsorbed in the ilium, a small amount make it to the colon where a some is absorbed, a few bacteria from the Firmicutes, Bacteroidetes, and Actinobacteria phyla can metabolize bile, and the rest is excreted in the stool.

- What is bile for?
Critical for digestion and absorption of fats and fat-soluble vitamins in the small intestine. Used for the removal of cholesterol, xenobiotics (drugs and heavy metals), metabolic wastes, and excess hormones. Also important for inhibition of the growth of bacteria and protection against certain bacteria in the small intestine.

- What is bile for?
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- Do we control bile synthesis?
Synthesis is controlled tightly in healthy individuals by a feedback system that assures only the amount of bile needed is made. Microbial interaction also plays a role.

- Problems with poor bile circulation?
Too little bile leads to malabsorption of dietary fats and fat soluble vitamins, as well greater susceptibility to unwanted bacteria to growth. Cholagogues are substances that stimulate bile release.

- Problems with excess bile?
May cause diarrhea via one or more mechanisms: altering water and sodium transport; increasing lower gastrointestinal motility; damaging the mucosa; inducing mucus secretion; or stimulating defecation. Bile binders can help with this. Excess bile can negatively impact commensal microbiota.

Features and GI Environment

Upper GI
- Breakdown of food: carbohydrates, protein and fat
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- Absorption of nutrients
- Houses trillions of microbes
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The composition of the bacteria in the gut varies by location

<table>
<thead>
<tr>
<th>Location</th>
<th>Epithelial Surface</th>
<th>Mucus Layer</th>
<th>Intestinal Lumen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duodenum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jejunum</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ileum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colon</td>
<td></td>
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</tbody>
</table>


The human GI tract is home to trillions of microbes — their collective genetics are known as the “microbiome.” The Microbial Barrier is the combination of “good” and potentially “bad” microbes that inhabit this environment. Foods that feed good bacteria are called Prebiotics.


Microbial Layer in the GI Barrier

<table>
<thead>
<tr>
<th>Phylum</th>
<th>Class</th>
<th>Order</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
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</thead>
<tbody>
<tr>
<td>Actinobacteria</td>
<td>Actinobacteria</td>
<td>Bifidobacteriales</td>
<td>Bifidobacteriaceae</td>
<td>Bifidobacterium</td>
<td>Bifidobacterium longum</td>
</tr>
<tr>
<td>Firmicutes</td>
<td>Clostridia</td>
<td>Clostridiales</td>
<td>Clostridiaceae</td>
<td>Faecalibacterium</td>
<td>Faecalibacterium prausnitzii</td>
</tr>
<tr>
<td>Bacteroidetes</td>
<td>Bacteroides</td>
<td>Bacteroidales</td>
<td>Bacteroidaceae</td>
<td>Bacteroides</td>
<td>Bacteroides vulgatus</td>
</tr>
<tr>
<td>Proteobacteria</td>
<td>Gamma proteobacteria</td>
<td>Enterobacteriales</td>
<td>Enterobacteriaceae</td>
<td>Escherichia</td>
<td>Escherichia coli</td>
</tr>
<tr>
<td>Fusobacteria</td>
<td>Fusobacteria</td>
<td>Fusobacteriales</td>
<td>Fusobacteriaceae</td>
<td>Fusobacterium</td>
<td>Fusobacterium nucleatum</td>
</tr>
<tr>
<td>Bacteroidetes</td>
<td>Bacteroides</td>
<td>Bacteroidales</td>
<td>Bacteroidaceae</td>
<td>Bacteroides</td>
<td>Bacteroides vulgatus</td>
</tr>
<tr>
<td>Verrucomicrobia</td>
<td>Verrucomicrobiae</td>
<td>Akkermansiaceae</td>
<td>Akkermansia</td>
<td>Akkermansia muciniphila</td>
<td></td>
</tr>
</tbody>
</table>
The Microbiome is developed from birth where different influences change the development of the microbial populations over the course of an individual's lifecycle.

Factors that Impact the Microbiome
- Diet
- Pharmaceuticals
- Stress
- Exercise
- Metabolic and Psychological
- Geographic
- Lifecycle stages
- Infant Feeding Method
- Birthing Process

Fungi are detectable in all sections of the GI tract of about 70% of healthy adults. At least 267 distinct fungal taxa have been reported from analysis of the human gut.

Environmental and commensal fungi are in constant contact with the host providing myriads of fungal antigens with which to interact.

During homeostatic conditions commensal fungi are kept at the mucosal surfaces and the skin, while environmental fungi are either killed or tolerated upon contact with the host.

Under aberrant conditions when mucosal and immune barriers are compromised, fungi invade tissues leading to dissemination, inflammation and disease.

Fungal dysbiosis is in GI conditions is characterized by a lack of Saccharomyces cerevisiae and an increased proportion of Candida albicans.
“Good” and “Bad” Microbes?

- **Commensals**: Permanent residents that provide much needed bacterial diversity
- **Symbionts**: Commensal microbes living in the GI that have evolved to perform beneficial functions
- **Pathobionts**: Resident microbes that can cause disruptions under certain conditions
- **Serious Disruptors**: Environmentally acquired microbes that are opportunistic colonizers capable of rapid GI disruption


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Microbial Balance

**Homeostasis**
- A healthy microbiota
- High diversity in species and function
- Ability to resist change under physiological stress

**Dysbiosis**
- Expansion of pathobionts
- Lower species diversity
- Fewer beneficial microbes


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Western-style diet is associated with dysbiosis

Effects of special diets on gut microbiota

<table>
<thead>
<tr>
<th>Diet</th>
<th>Food Constituents</th>
<th>Total Bacteria</th>
<th>Bifidobacteria</th>
<th>Lactobacilli</th>
<th>Prevotella</th>
<th>Eubacteria</th>
<th>Roseburia</th>
<th>Bacteriodes</th>
<th>Enterobacteria</th>
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<tbody>
<tr>
<td>Western</td>
<td>High animal fat / protein / processed food / sugar</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Mediterranean</td>
<td>High fiber / antioxidants / UFA low red meat</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Gluten-free</td>
<td>No gluten</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
<td></td>
</tr>
</tbody>
</table>

*UFA* unsaturated fatty acids


GI function - Bristol Stool Scale – abnormal stool patterns associated to specific microbiota


**Increased:** Oscillospira, Campylobacter, Turibacteri

**Decreased:** *Bacteroides*, *Roseburia* and *Coprococcus*

**Increased:** Fusobacterium
Identifying Ongoing Dysbiosis – Pre-Existing Conditions

Liver-specific
- ↑ Gammaproteobacteria
- ↓ Erysipelotrichia

Cardiovascular
- ↓ Bacteroides
- ↑ Ruminococcus

Glucose Management
- ↓ Bifidobacteria

Lower GI
- ↓ Bacteroides
- ↓ Bifidobacteria
- ↑ Enterobacteriaceae
- ↓ F. prausnitzii

Weight Management
- ↓ Bacteroidetes:Firmicutes

Prescriptions that modify the microbiome
- Proton Pump Inhibitors
- Antibiotics
- Inhaler-Anticholinergic
- SSRI
- Paracetamol
- Opioids

Antibiotics Modify Gut Environment – Increase Susceptibility to Environmental Influence

• Antibiotics negatively alter gut microbiota\(^1\).
  • This affects metabolic byproducts\(^1\).
• Antibiotics alter intestinal integrity
  • Barrier function\(^1\).
  • Immune responses\(^1\).
• Butyrate producing bacteria and butyrate appear protective during antibiotic exposure followed by *C. difficile* challenge\(^1,2\).
  • Enhanced clearance/recovery of bacterial overgrowth\(^1\).
  • Protective intestinal integrity\(^1\).
• Butyrate and other Short Chain fatty acids keeps pH low\(^2\).

The Chemical Barrier is made up of Mucin that coats the outside of GI cells protecting them from damage


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Chemical Makeup of Mucin


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The Physical Barrier consists of tightly connected epithelial cells stitched together by tight junction proteins.


The GI Tract is the largest Immune Organ in the body.

A healthy GI barrier functions by selectively allowing nutrients through and keeping larger food particles and pathogenic bacteria, yeast, and parasites out.

In a leaky gut the tight junctions are loosened so undigested food particles and pathogens can get through and activate the immune system causing inflammation and food sensitivities.

Unhealthy diet, excessive antibiotic use and stress may impact permeability

Intestinal hyperpermeability often known as “Leaky Gut” has been associated with health conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>% Increased Intestinal Permeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoimmune Condition</td>
<td></td>
</tr>
<tr>
<td>Dermatitis herpetiformis</td>
<td>87.5</td>
</tr>
<tr>
<td>Ulcerative Colitis</td>
<td>10.5-42.9</td>
</tr>
<tr>
<td>Crohn’s Disease</td>
<td>36</td>
</tr>
<tr>
<td>Systemic sclerosis</td>
<td>34.3</td>
</tr>
<tr>
<td>Type 1 Diabetes</td>
<td>30</td>
</tr>
<tr>
<td>Liver Related Conditions</td>
<td></td>
</tr>
<tr>
<td>Primary biliary cirrhosis</td>
<td>25</td>
</tr>
<tr>
<td>Chronic liver disease with type 2 diabetes</td>
<td>65</td>
</tr>
<tr>
<td>Liver Cirrhosis</td>
<td>35</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>15-35</td>
</tr>
<tr>
<td>Non-alcoholic fatty liver disease</td>
<td>31</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
</tr>
<tr>
<td>Chronic liver disease with type 2 diabetes</td>
<td>65</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>37.5</td>
</tr>
<tr>
<td>Type 1 diabetes</td>
<td>30</td>
</tr>
<tr>
<td>Neurological</td>
<td></td>
</tr>
<tr>
<td>Autism</td>
<td>36.7</td>
</tr>
<tr>
<td>Digestive</td>
<td></td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>35.6</td>
</tr>
</tbody>
</table>

Gut Permeability and Dysbiotic microbiota contributes to depletion of the whole GI barrier


Gaps in tight junctions and damage to epithelial cells, allow bacteria to translocate to areas even commensals become problems.

Depleted Diversity and Symbionts, colonization of problematic species

Depleted Chemical Barrier Secretions

Immune system responds to constant threats

Recent research supporting a role for the microbiota in maintaining normal brain function offers the intriguing possibility that the therapeutic targeting of the gut microbiome might be a viable strategy in supporting CNS health.

Gut Health And The Brain

Gut Health And The Brain

Recent research supporting a role for the microbiota in maintaining normal brain function offers the intriguing possibility that the therapeutic targeting of the gut microbiome might be a viable strategy in supporting CNS health.
Supporting your GI with “biotics”

- **Probiotics**: Live microorganisms that confer a health benefit on the host when administered in adequate amounts.
- **Prebiotics**: Dietary substances that nurture specific changes in the composition and/or activity of the gastrointestinal microbiota (favoring beneficial bacteria), thus conferring benefit(s) upon host health.
- **Synbiotics**: Products that contain both probiotics and prebiotics.
- **Phytobiotics**: Non-essential plant phytonutrients that are capable of modifying the GI environment.
- **Postbiotics**: Non-viable bacterial products or metabolite byproducts from probiotic microorganisms that have biologic activity in the host.
- **Psychobiotics**: Live organisms that, when ingested in adequate amounts, produce a cognitive health benefit in the host.
- **Parabiotics**: Inactivated microbial cells which, when administered in sufficient amounts, deliver health benefits to patients.

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**Biological Effects – Probiotic**

1. Competition for nutrients and prebiotics
2. Bioconversions
3. Production of growth substrates (vitamins)
4. Direct antagonism (bacteriocins, quorum sensing)
5. Competitive exclusion
6. Barrier function
7. Reduction of inflammation, enhancing immunity

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Most probiotic organisms when supplemented do not colonize the GI tract.

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**Probiotics function through a variety of mechanisms**

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Probiotic Effects Range from Common to Rare Depending on Strain

Rare
- Strain-Specific Effects
  - Neurological Effects
  - Immunological Effects
  - Endocrinological Effects
  - Production of Specific Bioactives

Frequent
- Species-level effects
  - Vitamin Synthesis
  - Bile salt metabolism
  - Enzymatic activity
  - Neutralization of damaging compounds
  - Gut barrier reinforcement
  - Bile Salt metabolism
  - Enzymatic activity

Widespread
- Among Most Probiotics
  - Colonization resistance
  - Normalization of perturbed microbes
  - Postbiotic production of SCFA
  - pH modification benefits
  - Regulation of intestinal transit
  - Increase turnover of enterocytes
  - Competitive exclusion

Probiotic
- Fermented foods with live microbes
- Lactobacillus acidophilus
- Saccharomyces cerevisiae var. boulardii
- Lactobacillus paracasei
- Lactobacillus casei 431
- Bifidobacterium BB12
- Saccharomyces cerevisiae
- Bifidobacterium longum

Diets with High Fiber Help Support a Healthy GI Environment

- Production of short chain fatty acids, particularly butyrate, is associated with colon health ¹.
- Adequate fiber provides substrates for bacterial fermentation to predominate bacteria that produce SCFAs and preserves a functioning mucus layer ¹.
- Resistant starch is better than other fiber sources for driving production of Butyrate ².

Different Substances in the GI Tract Modify the Microbial Populations in Different Ways

![Diagram showing substances that affect the microbiome]

<table>
<thead>
<tr>
<th>Prebiotic</th>
<th>Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inulin</td>
<td>Okra</td>
</tr>
<tr>
<td>Galactooligosaccharide</td>
<td>Collinsonia Root</td>
</tr>
<tr>
<td>2′FL</td>
<td>Beets</td>
</tr>
</tbody>
</table>

**Prebiotic**
- Inulin
- Galactooligosaccharide
- 2′FL

**Fiber**
- Okra
- Collinsonia Root
- Beets
- Carrots
- Oats
- Maitake mushroom
- Buckwheat
- Sweet Potato
- Apple Pectin
- Psyllium Husk
- Inulin

• Butyrate is both a marker for intestinal health and an important bioactive.
• Primary energy source for colon cells
• Anti-inflammatory.
• Helps with tight junction maintenance.
• Regulates colonic luminal pH.
• Enhances certain mineral absorption.
• Induces satiety hormone secretion.
• Alters gut microbiota.

Postbiotics: Butyrate Production Benefits Lower GI and Whole Body Health

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Phytochemicals from Plants Interact with the GI Microbiota

Plant derived phenolic compounds bypass much of human digestive mechanisms and allow them to reach the lower GI where they interact with microbes.

Certain phenolics have shown the ability to drive the growth of microbes that elicit beneficial biological effects such as Lactobacilli, Bifidobacteria, Akkermansia muciniphila, and Faecalibacterium prausnitzii.

Phytochemicals from Plants Interact with the GI Microbiota

Plant Metabolites that have Shown Positive Impact on Intestinal Barrier Integrity and Dietary Sources of Metabolites

Positive: Shape the microbiota, inhibit the production of deleterious endotoxins, positively modulate the production of beneficial short chain fatty acids (SCFA), inhibiting the activity of hydrolytic enzymes, e.g., pancreatic lipase, amylase, mitigating intestinal permeabilization, and the associated paracellular transport of endotoxins that can initiate local/systemic inflammation, modulating the secretion of gut hormones by enteric endocrine cells (EEC).

Sources: Grapes, Beet, Swiss Chard, Peavine, Green Tea, Peavine, Buckwheat, Peavine, Red Clover, Alfalfa, Peavine.

References:
Plant Metabolites Impact GI Microbiota

Plant Phytobiotic compounds are capable of modifying the microbial populations by both increasing and decreasing bacterial populations

<table>
<thead>
<tr>
<th>Phytobiotic</th>
<th>Uva Ursi</th>
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<tbody>
<tr>
<td>Black Walnut Hull</td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td></td>
</tr>
<tr>
<td>Berberine</td>
<td></td>
</tr>
<tr>
<td>Oregno</td>
<td></td>
</tr>
<tr>
<td>Green Tea</td>
<td></td>
</tr>
<tr>
<td>Turmeric</td>
<td></td>
</tr>
<tr>
<td>Grape seed</td>
<td></td>
</tr>
<tr>
<td>Buckwheat</td>
<td></td>
</tr>
<tr>
<td>Slippery Elm Bark</td>
<td></td>
</tr>
<tr>
<td>Glucosinolates (Broccoli, Brussels Sprouts, Kale, Radish)</td>
<td></td>
</tr>
<tr>
<td>Citrus Extract</td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
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</tr>
</tbody>
</table>


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Nutritional Approach for Microbial Dysbiosis

**Weed**

Phytobiotic Sources
- Berberine
- Wormwood
- Black Walnut
- Green Tea Extract
- Red Wine Extract
- Citrus Fruit Extract
- Oregano
- Goldenseal
- Uva ursi
- Garlic

**Seed**

Fermented Foods
- Targeted Microbes Strains
  - Lactobacillus acidophilus
  - Bifidobacterium breve
  - Bifidobacterium longum
  - Saccharomyces cerevisiae var. boulardii

**Feed**

Healthy Base Diet
- Diverse Fiber for a Diverse GI
- Avoid Any Trigger Foods
- Prebiotics
  - Inulin
- Resistant starch
- Galactooligosaccharide
- Slippery Elm Bark
- Targeted Prebiotic
- Human Milk Oligosaccharide (2’FL)
Presentation Objectives

• Identify the importance of addressing gut health

• Examine two cases using functional & lab testing

• Show how digestion can affect overall health and well being

• Show how lab tests can be used to develop treatment
Prevalence of GERD

• Prior estimates reported that up to 40% of the U.S. general population had symptoms of GERD

• As of 2014 estimates suggest that more than 50% of the U.S. general population sampled reported heartburn, higher than previous studies

• G.I. specific patients suffer from GERD at the same rate
Lower Esophageal Sphincter & Stomach

- Lower Esophageal Sphincter
  - Operates by pressure to allow food to enter
  - Shuts during digestion

- Stomach
  - Digests proteins & absorb divalent cations
    - Calcium, magnesium, iron, zinc
  - Acid in stomach kills foreign microbial organisms

Hiatal Hernia increases risk

“The excess reflux in GERD patients with hiatus hernia compared with those without is caused by malfunction of the gastroesophageal barrier during low LES pressure, swallow-associated normal LES relaxations, deep inspiration, and straining.”


https://step1.medbullets.com/gastrointestinal/110087/hiatal-hernias
Obesity increases the risk

“A commonly suggested pathogenetic pathway is the increased abdominal pressure which relaxes the lower esophageal sphincter, thus exposing the esophageal mucosal to gastric content. Apart from the mechanical pressure, visceral fat is metabolically active and it has been strongly associated with serum levels of adipo-cytokines including interleukin-6 and tumor necrosis factor α, which may play a role in GERD or consequent carcinogenesis. ”


Stress increases risk

- Stress increases the levels of adrenal hormones
  - Epinephrine and Cortisol
- Epinephrine leads to LES spasm
- Sympathetic innervation to the stomach decreases stomach acid
What Leads to Increased Stomach Acid?

- The H2 histamine receptor increases the proton pump
- Hypothesis: food and spices that produce histamine can lead to increase acid

Western Medicine For GERD

- Antacids such as:
  - Proton pump inhibitors
  - H2 Histamine Blockers
  - TUMS
- Creates Drug Induced Nutrient Depletion
<table>
<thead>
<tr>
<th>Medication</th>
<th>Nutrient(s) depleted</th>
<th>Effect of the loss of this nutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antacids:</td>
<td></td>
<td>• Muscle loss</td>
</tr>
<tr>
<td>Proton pump inhibitors</td>
<td></td>
<td>• Osteoporosis, tooth decay, increased cardiovascular risk</td>
</tr>
<tr>
<td>H2 histamine blockers</td>
<td></td>
<td>• Anemia, lack of energy</td>
</tr>
<tr>
<td>TUMS</td>
<td>Protein</td>
<td>• Muscle loss</td>
</tr>
<tr>
<td></td>
<td>Calcium</td>
<td>• Osteoporosis, tooth decay, increased cardiovascular risk</td>
</tr>
<tr>
<td></td>
<td>Iron</td>
<td>• Anemia, lack of energy</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
<td>• Poor wound healing, trouble breathing, poor digestion</td>
</tr>
<tr>
<td></td>
<td>Folic acid</td>
<td>• Elevated homocysteine levels</td>
</tr>
<tr>
<td></td>
<td>B12</td>
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</tbody>
</table>

**Medication-induced osteoporosis: screening and treatment strategies**

Keshav Panday, Amita Gona and Mary Beth Humphrey

**Abstract:** Drug-induced osteoporosis is a significant health problem and many physicians are unaware that many commonly prescribed medications contribute to significant bone loss and fractures. In addition to glucocorticoids, proton pump inhibitors, selective serotonin receptor inhibitors, thiazolidinediones, anticonvulsants, medroxyprogesterone acetate, aromatase inhibitors, androgen deprivation therapy, heparin, calcineurin inhibitors, and some chemotherapies have deleterious effects on bone health. Furthermore, many patients are treated with combinations of these medications, possibly compounding the harmful effects of these drugs. Increasing physician awareness of these side effects will allow for monitoring of bone health and therapeutic interventions to prevent or treat drug-induced osteoporosis.
Another problem of H2 histamine blockers

• Some compounds inhibit the Cytochrome P450 system which can then INCREASE the pharmacological action of drugs and other toxins.

• Example: Ranitidine (Zantac)

Alternative Treatment

“There is a battle going on between those who are trying to promote better nutrition, and the food manufacturers who insist on making products worse so that they can be sold for less.”

—Dr. Royal Lee

Change Diet
Add supplementation
Clinical Case

• Referred by Medical doctor
• Long history of intestinal upset
• Unable to do her normal activities of daily living

Female Patient, 27 yoa

• Chief complaints:
  • Diarrhea
  • Constipation
  • Constant bloating
  • Allergies

• Western Clinical Diagnoses
  • Allergies
  • ADHD
  • GERD
Female Patient, Cont.

- Initial Medications:
  - Adderall (ADHD)
  - Zyrtec (allergies)
  - Nexium (GERD)

- Functional Tests
  - Riddler’s points (right enzyme, left HCL)
  - Standard Process Systems Survey

Results before Intervention

Standard Process System Survey

**GROUP SIX (Stomach)**

98 – 3 Loss of taste for meat  
99 – 3 Lower bowel gas several hours after eating  
100 – 0 Burning stomach sensations, eating relieves  
101 – 3 Coated tongue  
102 – 3 Pass large amounts of foul-smelling gas  
103 – 3 Indigestion 1/2 - 1 hour after eating  
104 – 3 Mucous colitis or “irritable bowel”  
105 – 3 Gas shortly after eating  
106 – 3 Stomach “bloating” eating; may be up to 3-4 hours after eating

Score: 24
Diet and Medication Intervention

- Eliminated dairy, gluten, and decrease sugar
- Increased water (at least 64 oz) away from meals
- Work with MD to safely reduce medications as symptoms abate

Supplement Intervention

- Ammonium and calcium chloride for system acidifier for allergies
- Digestive enzymes and betaine HCL, allow for proper digestion
- Liver support to assist in toxin removal
- Omega 3 for inflammation and brain support


3 mo. Treatment

Riddler’s points no longer tender to the touch

No bloating noted

Allergies almost non-existent

Focus slightly improved

Survey Results - 3 mo Treatment

Standard Process System Survey

GROUP SIX (Stomach)

<table>
<thead>
<tr>
<th>Score</th>
<th>Symptom Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>98</td>
<td>Loss of taste for meat</td>
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</table>

Score: 1
Decrease of 23 points
MD eliminated all GERD and allergy medication

**Chief complaints:**
- Daily gas & intestinal discomfort
- Alternating diarrhea and constipation
- PTSD and racing heart
- Chronic pain and inflammation

**Additional history:**
- Injured by roadside bomb in Afghanistan
- Anxiety has continued to worsen even with medication
Male Patient, Cont.

• On more medications than he can list…
• History of heart disease in his family
• Gets light headed a lot
• Has always been strong and fit but now energy continues to worsen
• Seems like he can eat less and less variety without stomach upset
• Very physically demanding job and lifestyle
• He feels like his life and health are spiraling out of control.
• He wants to be around to take care of his 7 year old daughter

Clinical Tests and Blood Tests

• Riddler’s points both tender to touch
• X-rays of lumbar reveal multilevel disc height loss

• Ordered blood tests
• C-reactive protein
• Homocysteine
• Lipoprotein (a)
Blood tests results

- C-reactive protein  6.4  Control is less than 0.9
- Homocysteine  11 Control is less than 9
- Lipoprotein (a)  108 Control is less than 29

Diet & Supplement Intervention

- Eliminating offending foods including dairy, gluten, and processed foods and sugar
- Focused on clean meats and veggies
- Worked to reduce pain with Chiropractic and exercise
- Introduced supplements:
  - Digestive enzymes with hydrochloride betaine and berberine
  - Proteolytic enzymes on an empty stomach
  - Liver support supplements to assist in toxin removal
  - Buckwheat supplement to promote vascular repair
  - B complex vitamins to support cardiovascular health, mood, and energy
Patient Response after 1 month

• Bloating and gas pain has significantly reduced
• Only a couple bouts of diarrhea since starting supplements. They both happened when he ate something he should not have.
• Started feeling a tremendous increase in energy after about a week of taking supplements
• He is sleeping better and does not seem to get irritated as easily
• Reports that if his heart is racing and he feels anxious, he takes a few more B vitamins and he calms down within minutes
• Pain has reduced by about 25% in his back
• Passed several large, what appear to be tape worms in his stool as well as slime

Other Considerations

• Have not reordered blood test results. I will generally wait about 6 months to see the needle move on Lipoprotein (a)
• Continue to work on cleaning up the diet (He is stubborn)
• With report of passing tape worms, will add supplements to help assist the bodies ability to digest and remove pathogens
• Oregano
• Worm wood
• Additional drainage support
Final Thoughts

• Gut health impacts everything

• Don’t undervalue simple clinical tests

• Blood tests can be very useful to determine treatment for a patient and can be used as an educational tool

• There are many options to improve gut health – pick one & build from there

• You can make incredible changes in peoples lives with nutrition