Cause, Care and Dietary Treatment of SIBO

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www.siboinfo.com

WAPF Convention
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SIBO Symptoms

- **Bloating/abdominal Gas**
  - Belching, flatulence
- **Abdominal Pain, Cramps**
- **Constipation, Diarrhea, both**
- **Heartburn**
- **Nausea**
- **Leaky Gut Sx** = food sensitivities, h/a, joint pain, respiratory sx, skin sx, brain sx...
- **Malabsorption** - steatorrhea, anemia

IBS
What is SIBO?

• A condition in which abnormally large numbers of bacteria are present in the small intestine, leading to impairment of digestion and absorption

• Bacterial Colonization of the Small Intestine
  - With normal flora, not pathogenic

• Issue = location, location, location
Types of Bacteria

SIBO – COMMENSAL

Aerobic
- Lactobaccillus
- Bacterioides
- Clostridium
- Veillonella
- Fusobacterium
- Peptostreptococcus

Anaerobic
- Aeromonas
- Prevatella
- Klebsiella
- Streptococcus
- Staphylococcus
- Proteus
- Enterococcus
- E coli

NON SIBO = PATHOGENIC
- Salmonella
- Shigella
- V cholera
- E coli 0157:H7
- C jejuni

Bouhnik '99
Pyleris '12
Pimentel '14
Gastrointestinal Tract

Source: http://missinglink.ucsf.edu/lm/ids_106_lower%20gi/mainpages/smallintestine.htm
Prevalence: SIBO is Common

- IBS effects 10-20% US pop. 30–60 million
- Not all IBS is SIBO = avg. 60% IBS have SIBO
  - 6-12%, 20-38 million = SIBO (estimate)
- In comparison:
  - 1-2% = Celiac Disease
  - 1.4 mil = Inflammatory Bowel Disease
- Factoring in other Associated Diseases (40+)
  - It’s likely the # is higher
Associated Diseases & Risk Factors

Acne
Acne Rosacea
Acromegaly
Alcohol Consumption (moderate intake)
Anemia*
Atrophic Gastritis
Autism
Celiac Disease/ Tropical Sprue
Chronic Fatigue Syndrome
CLL (Chronic Lymphocytic Leukemia)
Cystic Fibrosis
Diabetes
Diverticulitis
Dyspepsia
Elderly Age
Erosive Esophagitis
Fibromyalgia
Fructose Malabsorption*
Gallstones
Gastroparesis
GERD*
H pylori Infection
Hypochlorhydria
Hypothyroid/ Hashimoto's Thyroiditis
IBD (Crohn’s, Ulcerative Colitis)
IBS*
Interstitial Cystitis
Lactose Intolerance*
Leaky Gut*
Liver Cirrhosis
Lyme
Malabsorption Syndrome
Meds: Proton Pump Inhibitors, Opiates
Muscular Dystrophy (myotonic Type 1)
NASH /NAFLD
Obesity
Pancreatitis
Parasitic Infection
Parkinson's
Prostatitis (chronic)
Radiation Enteropathy
Restless Leg Syndrome
Rheumatoid Arthritis
Scleroderma
Surgery: Post-Gastrectomy

See siboinfo.com for study links
SIBO = Underlying Cause of IBS

- 2000- Pimentel, Chow, Lin
- 84% IBS test+ SIBO
- 75% of those whose breath tests normalized after treatment, had improvement in sx’s
- SIBO = consequence of Scleroderma, blind loop

(Rees, Gastroenterology 1982)
(Soudah, N Engl J Med. 1991)
Causes (general)

Anything that allows bacteria to back up or accumulate in the Small Intestine

1. **Slowed Motility in the SI** (migrating motor complex)
   - Diseases, Opioid Drugs, Surgical/Traumatic nerve damage, Stress

2. **Obstruction of the SI**
   - Adhesions, Tumors, Strictures, Hernia, Excess Mucus...

3. **Non draining pockets/sections of SI**
   - SI Diverticulitis, Surgical Blind Loops
Common Causes of SIBO

1. Food Poisoning (Acute Gastroenteritis)
   - Travelers Diarrhea, Stomach Flu
   - IBS that develops after food poisoning = Post-Infectious IBS
   - PI-IBS is SIBO
   - Food Poisoning decreases **MOTILITY** by damaging nerve cells

2. Adhesions
   - Scar tissue bands that can occur in or outside SI
   - **OBSTRUCTS** flow by partially blocking, narrowing or constricting tube

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Adhesions

Source: http://www.drugs.com/health-guide/bowel-obstruction.html

Source: http://www.clearpassage.com/what-we-treat/bowel-obstructions/
Motility: Migrating Motor Complex
“Housecleaning Wave”

• Strongly propulsive movement that sweeps from stomach to lower small intestine every 90 min

• Occurs during fasting: between meals, overnight
  - Turns off when we eat, or drink caloric beverages
  - Wait 4-5 hours between meals to allow MMC’s

• Function: prevent bacterial overgrowth by sweeping bacteria down to large intestine

• SIBO patients have reduced MMC waves
• If # ICCs decrease below 0.12/villus, SIBO develops

http://forums.studentdoctor.net/threads/cells-responsible-for-contraction-in-stomach-intestine.1040323/
How Food Poisoning Causes SIBO


During food poisoning, pathogenic bacteria secrete Cdt toxin.

Cdt b looks like vinculin protein on ICC nerve cells. Due to mistaken identity, the immune system attacks vinculin along with the Cdt toxin & thus damages the ICC nerve cells.

The ICC damage decreases the number of MMC waves, and allows SIBO to develop.
A Simplified Sequence (Pimentel)

After Pimentel 2013
Other Causes of SIBO

1. Slowed SI Motility
   - Dz: Diabetes, Hypothyroid, Scleroderma, Lupus
   - Surgical nerve damage
   - Traumatic nerve injury (brain or abdominal, ex car accident)
   - C diff infection (Antibiotic induced diarrhea)
   - Drugs: Opiate Narcotic pain killers

2. Partial Obstruction (blockage)
   - Cancer tumors (pancreas...)
   - Crohn’s Strictures
   - Hernia, Volvulus, Intusseption...
   - Cystic Fibrosis
Relapse is Common

• SIBO will relapse until the underlying cause is treated

• For some the cause can’t be fixed
  - Scleroderma: progressive, incurable

• For some it’s unknown how to fix it
  - ICC nerve damage from food poisoning

• For some it’s not so simple
  - Adhesions: Surgical removal may create more

• Identification: PI-IBS test in development, Barium SI series to “rule out adhesions” (write on order)
SIBO Causes Problems

• The SI is not designed for a lot of bacteria
  - LI is the place for bacteria - do good things there

• But by being in the wrong location, bugs:
  1. Eat (ferment) host’s food, esp carbs
     - Carbs = favorite food, primary fuel source
  2. Damage SI physical structure and function
     - Leading to maldigestion & malabsorption
Small Intestine

- Fingers (Villi)
- Hairs (Microvilli)

Sources:
http://exerciseandmind.com/category/health-2/
http://www.siumed.edu/~dking2/erg/GI020b.htm
http://163.178.103.176/Fisiologia/general/activ_bas_3/An%20Electron%20microscopic%20view%20of%20membranes.htm
SIBO Pathophysiology #1
Location Fermentation

SI Bacterial Overgrowth

Premature Bacterial Exposure to Host Food

Bacteria Eat Host’s Food

Fermentation

Gas → GI Symptoms

Food = Growth

(O'Mahoney 2010, Cummings 1980)
Thanks For the Grub. Yum!

Source: http://www.needlework.ru/shop/UID_2106_cookie_monster_embroidery_design.html
Pardon Me!

Source: https://drawception.com/viewgame/3hPPpSbZAC/cookie-monster-grows-a-moustache/
Bacterial Gas Causes GI Sx

• Hydrogen, Methane = Bacterially produced, not made by humans

• Cause Abdominal Sx of IBS
  - Pain: Intestines sensitive to pressure, muscles contract against gas, Visceral Hypersensitivity
  - Bloating: xs gas swells intestines physically
  - Burping, Farting: excess gas exits via mouth or anus
  - Altered motility
    • Diarrhea ~ Hydrogen
    • Constipation = Methane
Methane Gas Causes Constipation
(Pimentel, Am J Physiol, 2006)

• Methane = 70% slowing of GI transit (animal)
  - Via Ca channels

• Causes constipation

• Causes gas back pressure: nausea, acid reflux, burping

• Methanobrevibacter smithii = 1° organism making methane in humans
  - Archaea, not bacteria
  - Commensal in 30%+ pop but only when its’ overgrown is there enough methane to cause constipation
SIBO Pathophysiology #2
Damage

SI Bacterial Overgrowth

Bacterial Growth
- GAS (Hydrogen, Methane)

Bacterial Actions
- Increased Inflammatory Cytokines
- Digest Brush Border
- Bile Deconjugation

Fermentation of Unabsorbed Carbohydrate

Decrease Disaccharidases
- Inhibit Carb Transporters
- Blunted Villi if Severe
- Intestinal Hyperpermeability

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SIBO Causes Carbohydrate Malabsorption

- When CHO’s bypass absorption in the Small Intestine & are left in the lumen of the SI & LI
  1. Get fermented by bacteria creating GAS
  2. CHO’s sitting in the intestine have an osmotic effect drawing water in

- GAS & water trigger symptoms
  - Bloating, constipation/diarrhea, pain, flatulence, belching, nausea, GERD...

- 1° SIBO symptoms are due to Carbohydrate Malabsorption
  - This is why all SIBO Diets target & reduce carbs
Carbohydrates=Saccharides=Sugars
Classified by Length

- Monosaccharides (glucose/fructose/galactose). Mono=1
  - glucose

- Disaccharides (sucrose/lactose). Di=2
  - glucose fructose

- Oligosaccharides (FOS/GOS/MOS). Oligo= few, 3-10
  - fructose fructose fructose fructose

- Polysaccharides (starch/fiber). Poly= many, 10++
  - glucose glucose glucose glucose glucose glucose glucose glucose glucose glucose glucose glucose
Fiber
(Slavin 2012, Murphy 2008, Guillon 2000)

• **Definition:** Indigestible to humans
  - But digestible to bacteria = Prebiotic

  1. Only bacteria make enzymes to break the bonds
     - Ex: Cellulase > cellulose
     - Ex: α-galactosidase (Beano) > GOS in beans

  2. Bonds “resist” our enzymes (ex. structurally inaccessible - enzymes can’t reach bonds)
     - Ex: Resistant starch

• **Fiber worsens SIBO by feeding bact > gas > sx**

• **Problem** = Fiber is in all plant foods
  - Grains, beans, nuts, seeds, vegetables, fruits

• **Fiber includes both long & short chains** (polysaccharides & oligosaccharides)
# Fiber (Prebiotic)

(Slavin 2012, Murphy 2008, Guillon 2000)

## Long Chain

<table>
<thead>
<tr>
<th>Soluble Fiber</th>
<th>Insoluble Fiber</th>
<th>Oligosaccharide Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectin</td>
<td>Cellulose</td>
<td>FOS - Fructoligosaccharide</td>
</tr>
<tr>
<td>Inulin</td>
<td>Hemicellulose</td>
<td>MOS – Mannoligosaccharide</td>
</tr>
<tr>
<td>Gums: guar, locust xanthum, mastic, arabic/acacia</td>
<td>Lectin</td>
<td>GOS – Galactoligosaccharide</td>
</tr>
<tr>
<td>Beta glucan</td>
<td></td>
<td>Stachyose, Raffinose</td>
</tr>
<tr>
<td>Alginate, Carrageenan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agar Agar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucomannan/Konjac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arabinogalactan</td>
<td></td>
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</tr>
</tbody>
</table>

## Short Chain

<table>
<thead>
<tr>
<th>Resistant Starch</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I physically inaccessible (cell walls)</td>
<td></td>
</tr>
<tr>
<td>II structurally inaccessible (raw &amp; amylose)</td>
<td></td>
</tr>
<tr>
<td>III cooked &amp; cooled (retrograded)</td>
<td></td>
</tr>
<tr>
<td>IV chemical modification</td>
<td></td>
</tr>
</tbody>
</table>
### Fiber (Prebiotic) Food Sources


#### Long Chain

<table>
<thead>
<tr>
<th>Soluble Fiber</th>
<th>Insoluble Fiber</th>
<th>Oligosaccharide Fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beans</td>
<td>Wheat Bran</td>
<td>FOS – Jerusalem Artichoke,</td>
</tr>
<tr>
<td>Oat Bran</td>
<td>Beans</td>
<td>Garlic, Onion, Wheat</td>
</tr>
<tr>
<td>Barley</td>
<td>Coconut</td>
<td>GOS – Beans</td>
</tr>
<tr>
<td>Citrus Fruit</td>
<td>Raspberries</td>
<td></td>
</tr>
<tr>
<td>Psyllium</td>
<td>Some Vegetables</td>
<td></td>
</tr>
<tr>
<td>Flaxseed</td>
<td>Barley</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flaxseed</td>
<td></td>
</tr>
</tbody>
</table>

#### Short Chain

- **Resistant Starch**
  1. Whole Grains, Seeds
  2. Raw Potato/Grains, Unripe Banana, Some Beans, High Amylose Rice/Corn
  3. Reheated Potato/Bread, Potato/Corn Chips, Starch Powder
  4. Created in Lab

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Key Point

In the case of SIBO, even carbs that we should be able to digest & absorb, can be malabsorbed

• Due to 1. location fermentation  2. damage
  - Starch (polysaccharide)
    Grains & Starchy Tubers
  - Lactose, Sucrose (disaccharides)
    Milk, Table sugar
  - Fructose (monosaccharide)
    Fruit, HFCS, Agave, certain varietals of Honey

• Degree to which this happens is individually based

• This is why SIBO Diets target & reduce these carbs too
2° Lactose Malabsorption is an Ex of Carbohydrate Malabsorption (Lomer 2008)

• 1° lactose malabsorption is Genetic lactase enzyme deficiency
  1. Congenital (born without lactase)
     • Rare
  2. “Lactase Non-Persistence” (loss of lactase enzyme after weaning)
     • Common

• 2° lactose mal is Acquired lactase enzyme deficiency in the Lactase Persistent (disease)
  - Ex: celiac, food poisoning, radiation, SIBO...
Lactose Malabsorption & SIBO


- SIBO is a common cause of 2° Lc Mal
  - Damage to lactase enzyme = Enzyme deficiency
  - Location Fermentation = bact eat it b4 host can

- Reversible
  - If there is no genetic lactase deficiency (lactase non-persistence) it can normalize when SIBO heals

- Constipation can be sx of Lactose Malabsorption due to methane gas
Lactose Free Dairy Foods

- Homemade 24 hr yogurt /sour cream
- Aged Cheese x 30 days+
  - Not Fresh (cheve, mozzarella, getost, feta, ricotta)
- Dry Curd Cottage Cheese
- Ghee/Butter
- Lactase enzyme treated cream in small amts
- Commercial lactose-free dairy
  - Milk, half and half, yogurt, sour cream...
  - Check for quality, pectin/gums

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How to Make 24 Hour Yogurt

• Heat milk 180°-185°, stirring occasionally
  - Use a candy thermometer – Raw = heat to 110°
• Cool milk to 100-110° in a sink of ice water
• Mix a little milk with starter in a separate bowl (packaged starter or ½ cup live yogurt to a quart milk)
• Add back to pot, mix well & pour into Yogurt maker
• Allow to ferment at 100-110° x 24-30 hours
• Transfer to fridge to cool and firm up
Lactose Free Dairy Points

- SCD advised L-F Dairy
  - Nutrition, calories, probiotics (HM Yogurt)

- My experience = 75-80% with SIBO tolerate & do better with it
  - Increase energy
  - Stabilize weight loss
  - Helps digestion (yogurt)
  - Increases food pleasure

- 20-25% can’t tolerate dairy = avoid it
Fructose Malabsorption
(Gibson 2006 & 2013, Jones 2011, Latulippe 2011, Nucera 2005)

1. Occurs with & effected by polyols & other CHOs

2. Low absorptive capacity of fructose transporter
   - Genetic: wide individual variation <5g - >50g: some absorb fructose very poorly; most tolerate 15g
   - Age: absorption increases w/age to adulthood: infants and toddlers absorb fructose very poorly

3. Overconsumption
   - 20% increase in food supply: fruit juice, corn fruits, agave syrup, high fructose corn syrup

4. Disease – rapid transit, SIBO
SIBO can cause Fructose Malabsorption
- Damage to CHO transporter Glut 5 = Transporter deficiency
- Location Fermentation = bact eat it before host can

May normalize when SIBO heals

Fructose well absorbed with glucose 1:1 ratio
- By Glut 2, a backup transporter
- Ex: Sucrose and clover/raspberry/citrus Honey
  - Not all varietals of Honey are high fructose and therefore are tolerated by fructose malabsorbers
TESTING
Key Indicators

- Antibiotics improved GI symptoms (sx)
- Prebiotics (in probiotics) worsen GI sx
- Fiber worsens constipation (and other GI sx)
- Carbs worsen GI sx (grains/veg/beans)
- GI sx start after opiate use (dt surgery)
- Chronic low ferritin with no other cause
- Gluten-free diet fails to improve Celiac pt
- Pancreas obscured by gas bubble on CT
Testing
Lactulose Breath Test (LBT)

- Tests hydrogen and methane gas produced by bacteria after a prebiotic drink of lactulose, over 2-3 hrs
- Timing reflects the location:
  - SI=1st 2 hrs, LI=3rd hr
- Performed at home with mail-in kits or in a facility with a machine (lab/hospital/office)
- Be sure methane is being tested
- See siboinfo.com for Testing Resources
TREATMENT
SIBO Treatment Protocol
Variation of the Cedars-Sinai Protocol (Pimentel 2006)
Drs Siebecker & Sandberg-Lewis (2010)

SIBO Suspected

SIBO Breath Test

Treat SIBO 4 options

Diet x 1 ½ year +

Elemental Diet x 2-3 weeks

Herbal Antibiotics x 4 weeks

Antibiotic x 10-14 days

Feel Better - 90%

Partial Improvement/ Not Better

Prevention

Diet Prokinetic
Optional: Probiotic, HCl/bitters SI healing supplements x 3 mo +

SIBO Breath Re-Test within 2 weeks

SIBO (-)
Consider other Dx

SIBO (+)
Re-Treat

Relapse

Consider other Dx

Re-Treat
Key SIBO Tx Points for Success

- Methodical approach: Proper Testing and Retesting to assess results
- Successive Treatment Rounds needed: when gas 45+
- Double Abx Therapy or high dose Allicin needed for methane/constipation cases
- Both Prokinetic and Diet for prevention
- Diet must be customized to the individual through their own trial and error over time
DIET
1. Prevention (along with prokinetic): essential

2. As a stand alone treatment
   - In cases where symptomatic relief is significant and the diet is well tolerated

3. Manage symptoms while other treatment is in progress
   - If using Abx/HAbx: treatment can take time to achieve symptomatic relief if gas is high

4. Decrease extra-intestinal symptoms & improve overall health
Benefits of Diet Beyond GI

- **Weight Loss** (not a benefit if low/under weight)
- **Stabilization of blood sugar** (high & low), stop sugar cravings
- **Decrease chronic infection and inflammation**
  - arthritis, chronic gingivitis
- **Improved immunity**
  - decreased seasonal colds/flu/allergies
- **Improved skin, mood, sleep, energy and overall well-being**
- **Removes ‘obstacles to cure’, repairs the gut, tx’s other pt complaints**
How Much Does Diet Help SIBO?
(SIBO Center 2011-1014, Ong 2010, Staudacher 2011, Gibson 2010)

• Symptoms: 60-100%, clinically
  - Remarkable

• No studies on Diet in SIBO yet

• But - studies on IBS using Low FODMAP Diet
  - Significant decrease in gas level & symptoms
  - ↓ pain, bloating, flatus, nausea, heartburn, lethargy (BM’s weren’t tracked)
  - High Fodmap Diet induces sx in IBS, Low Fodmap Diet reduces sx in IBS
SIBO Diets

Specific Carbohydrate Diet (SCD) (Haas/Gottschall)

Low FODMAP Diet (LFD) (Shepherd/Gibson)

Gut and Psychology Syndrome Diet (GAPS) (Campbell-McBride)

Cedars-Sinai Low Fermentation Diet (C-SD) (Pimentel)

SIBO Specific Diet (SSD) (Siebecker)
The Diets - Key Features

• Common to all
  - Allow Protein and Fats
  - No Lactose
  - No Sugar Alcohols (Polyols), No Sucralose
  - Manipulate carbohydrates in different ways
SCD vs LFD: Saccharides Targeted

- SCD targets polysac starch and fiber = grain, bean and starchy tuber free
  - LFD doesn’t = some grains/beans & all starchy tubers allowed

- LFD targets oligosac FOS/GOS = high FOS/GOS plant food free. But allows low FOS/GOS plant foods
  - SCD only eliminates high OS foods it knew about
    - Allows all veg (except starchy tubers), fruits, nuts
  - LFD is gluten free because gluten grains are high in FOS

- SCD targets both disac’s lactose & sucrose
  - LFD only targets lactose; Sucrose allowed

- LFD targets monosac fructose
  - SCD doesn’t
The Diets - Continued

- **Raw Food** - SCD avoids, LFD doesn’t
- **SSD** - combo SCD, LFD and my clinical input
  - Best sx relief, but most restricted
  - Only one designed specifically for active SIBO
- **GAPS** - often needs modification for SIBO
  - Onion, avocado and broth in Intro often aggravate
  - Raw cultured veg may aggravate
- **C-SD** - designed for SIBO prevention after tx
  - Targets polysac fiber = no beans or whole grains
  - Allows starchy tubers and white flour/rice/sugar
Cedars Sinai Diet and Starch

• Ouch! How could “Displacing Foods of Modern Commerce” help SIBO?
  - Low fiber
  - Clinically - it works
  - White sugar- no GI sx in many
  - White flour/rice = starch

• Starch
  - Ok for many w/SIBO: absorbs before bact eat it
  - Helps: Weight gain, Malnutrition, Carbohydrate deficiency, Food Pleasure
  - Options: White Flour/Rice, skinless White Potato
Bone Broth

• Many with SIBO don’t tolerate bone broth
  - But some do

• Contains GAGS (glycosaminoglycans) = Mucopolysaccharides
  - Polysaccharides are fermentable by bacteria
  - It’s the Cartilage, attached to bones, that has GAG’S, not the bones themselves. Try meat only or marrow-bone broth (w/out cartilage)
  - Ribs, with all their cartilage, can be a very aggravating food for SIBO

• Mucopolysaccharides famous membrane healers
  - Aloe, licorice, slippery elm, marshmallow, comfrey
Non-Mucilaginous Brush Border Healing Supplements

- **Colostrum**: 5-10g/d x 6 wks
  - Epithelial Growth Factors - close leaky gut
  - Decrease inflammation & infection
- **Zinc Carnosine**: 75-150 mg qd (cofactor for Vit A)
- **L-Glutamine**: up to 3g/d (start low) (SI cell fuel)
- **Vits A & D & Fish Oil** (can take as cod liver oil)
- **Glutathione** (or NAC precursor): label dosage
- **Turmeric, Resveratrol**: 3g/d x 1-2 wk, then label dosage long term (down regulates NF-kB inflammatory pathway)
Diet - Which One?

• Pick one and customize as needed

• Diet must be customized to the individual through their own trial & error
  - There’s no one diet that is perfect for anyone
  - There’s no test to find one’s perfect diet

• Key SIBO principle: all CHO could aggravate
  - Find which CHO by trial & error/elimination & challenge

• Diet Success = average 75%. 90% with SSD
  - Phenomenal!
Diet Problem

Attempts to reduce SIBO symptoms with dietary modifications often lead to more and more food restrictions, feelings of deprivation, loss of food pleasure, excessive weight loss and at worst, outright malnutrition.

Source: http://pilladvised.com/2010/01/the-standard-american-diet-sad/
When Diet Isn’t Enough to Tx SIBO

1. Diet isn’t giving adequate symptomatic relief
   - Diet isn’t working, even when restricted & tweaked
   - “plateaued”: helped at first but no more progress

2. Diet needs to be severely restricted to obtain adequate symptom relief, causing malnourishment &/or unhappiness
   - “5 foods”: this is no way to live

3. Diet is working but can’t go off it even a tiny bit, or get symptoms
   - Want some leeway. Unhappy with their diet.
   - SIBO is still there, just controlled by diet and they want it gone
Leaky Gut

- When cells or tight junctions between cells open up, allowing unintended items through:
  - Partially digested food particles
  - Bacteria and bacterial toxins, viruses, yeast, parasites, metabolites and acids
  - “Antigens”

- Leads to immune reactions and thus symptoms anywhere inside the body:
  - Systemic sx’s (h/a, skin, respiratory, brain, joint...)
Paracellular and Transcellular Leaky Gut

Source: http://www.nature.com/nrm/journal/v2/n4/box/nrm0401_285a_BX1.html
SIBO & Leaky Gut

(Riordan 1997, Lauritano 2010)

• SIBO causes leaky gut in half of patients
  - 50% & 55% leaky gut in SIBO
  - Not everyone with SIBO has leaky gut

• Leaky gut heals once SIBO’s gone
  - 100% & 75% healed by 1 mo after SIBO eradicated
  - With no supplement or diet intervention
    • Like our skin, intestine heals once the cause is removed
  - Unless another cause is present, or another disease prevents tissue healing
Food Reactions and SIBO

Can be due to:

1. Bacterial Fermentation
   - Digestive symptoms
     Ex: Bloating, constipation/diarrhea, abdominal pain, burping, flatulence, nausea, acid reflux

2. Leaky Small Intestine/Gut
   - Systemic symptoms
     Ex: Headache, nasal mucus, skin rash, joint pain, muscle pain, brain fog, poor memory, depression
   - Immune mediated

3. Non-SIBO generated: histamine, salicylate...
Fiber Tips for SIBO
Avoid unless individually tolerated

• Prebiotics in supplements
  - FOS/GOS/MOS, inulin, arabinogalactan...

• Supplemental fiber
  - Flax, chia, psyllium, Benefiber, Metamucil, Citrucel

• Mucilaginous herbs for leaky gut healing
  - Aloe, slippery elm, marshmallow, licorice, comfrey

• Bone-Cartilage broth
  - Marrow-bone and meat broth = OK

• Check labels for binders/thickeners
  - Carrageenan, pectin, guar gum...

• Raw vegetables/salads
Summary

1. SIBO is a colonization of SI with normal flora.
2. SIBO is common
3. Symptoms: bloating, pain, constipation/diarrhea
4. Causes: food poisoning (slow SI motility/MMC), obstruction
5. Fermentation (gas) and damage in SI create symptoms
6. SIBO can be treated and symptoms relieved
7. Relapse is common. Underlying cause must be addressed
8. SIBO can cause lactose/fructose malabsorption and leaky gut, which can reverse once SIBO’s gone
9. By reducing fermentable CHO’s, diet can significantly help sx