Dietary Modulation of the Microbiome

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Disclosure of Financial Relationships

- I do not have any relevant financial relationships with any commercial interests.

- Off Label Usage
  - None

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Learning Objectives

- Understand the role of food and the microbiome
- The attendee will be able to more easily discern which dietary plan may provide the best therapeutic outcome for a specific client.
- Utilize root cause issues to determine recommendations
- Gain practical skills and tools to utilize in a clinical setting.

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Diet and Microbiome

"Diet has the most powerful influence on gut microbial communities in healthy human subjects."

About 75% of the food in the Western diet is of limited or no benefit to the microbiota in the lower gut. Most of it, comprised specifically of refined carbohydrates, is already absorbed in the upper part of the GI tract, and what eventually reaches the large intestine is of limited value, as it contains only small amounts of the minerals, vitamins and other nutrients necessary for maintenance of the microbiota.

Bengmark S. "Nutrition of the Critically Ill: a 21st-Cent perspective" *Nutrients* **2013**, *5*, 162-207

Health effects of dietary risks in 195 countries, 1990–2017:

a systematic analysis for the Global Burden of Disease Study 2017

- 11 million deaths and 255 million disability-adjusted life-years were attributable to dietary risk factors.
- In 2017, consumption of nearly all healthy foods and nutrients was **suboptimal.**

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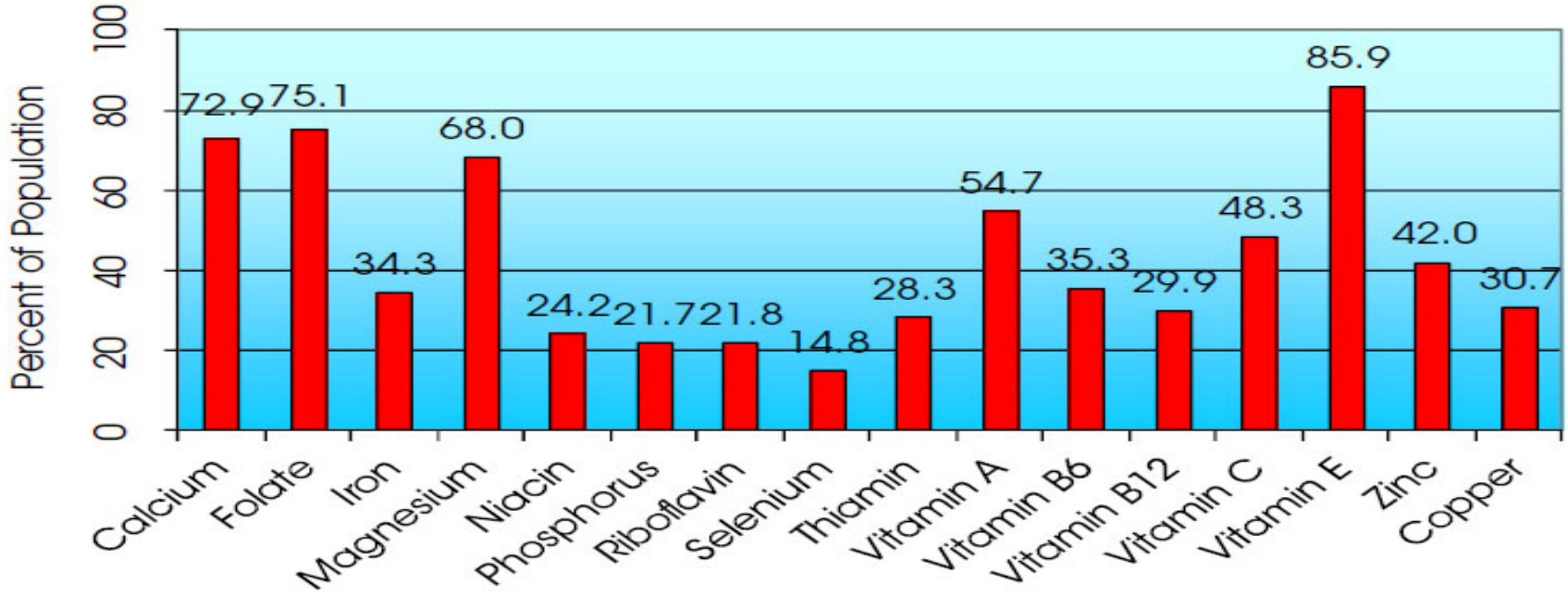
GBD 2017 Diet Collaborators. Health effects of dietary risks in 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2019 May 11;393(10184):1958-1972. doi: 10.1016/S0140-6736(19)30041-8.

Percent of U.S. Population NOT Meeting the Dietary Reference Intake (DRI) for Specific Nutrients



http://www.ba.ars.usda.gov/cnrg/services/cnmapfr.html Aug 10, 200

Nova Food Classification System

1. Raw and minimally processed foods: apples, vegetables, milk, eggs, meats

2. Processed culinary ingredients: butter, lard, salt, oils, honey, sugar, spices, herbs

3. Processed Foods: cheese, canned fish and meats, applesauce, canned vegetables and beans, canned fruit, simply processed meats such as ham, smoked fish, bacon. Typically only 2-3 ingredients.

4. Ultraprocessed Foods: carbonated soft drinks; sweet, fatty or salty packaged snacks; candies (confectionery); mass produced packaged breads and buns, cookies (biscuits), pastries, cakes and cake mixes; margarine and other spreads; sweetened breakfast 'cereals' and fruit yoghurt and 'energy' drinks; pre-prepared meat, cheese, pasta and pizza dishes; poultry and fish 'nuggets' and 'sticks'; sausages, burgers, hot dogs and other reconstituted meat products; powdered and packaged 'instant' soups, noodles and desserts; baby formula. Often contain flavorings, preservatives, emulsifiers, etc.

The Healthfulness of the US Packaged Food and Beverage Supply

- 236 packaged food manufacturers and 46 soft drink companies with more than 0.1% US market share
- Represents more than 80% of food and drinks sold in US and 230,156 barcoded products
- NOVA System used to code by level of food processing
- **70.9% of products were ultra-processed**

Baldridge AS, Huffman MD, Taylor F, et al. The Healthfulness of the US Packaged Food and Beverage Supply: A Cross-Sectional Study. Nutrients. 2019;11(8):1704. Published 2019 Jul 24. doi:10.3390/nu11081704

Ultra Processed: Effects on Health

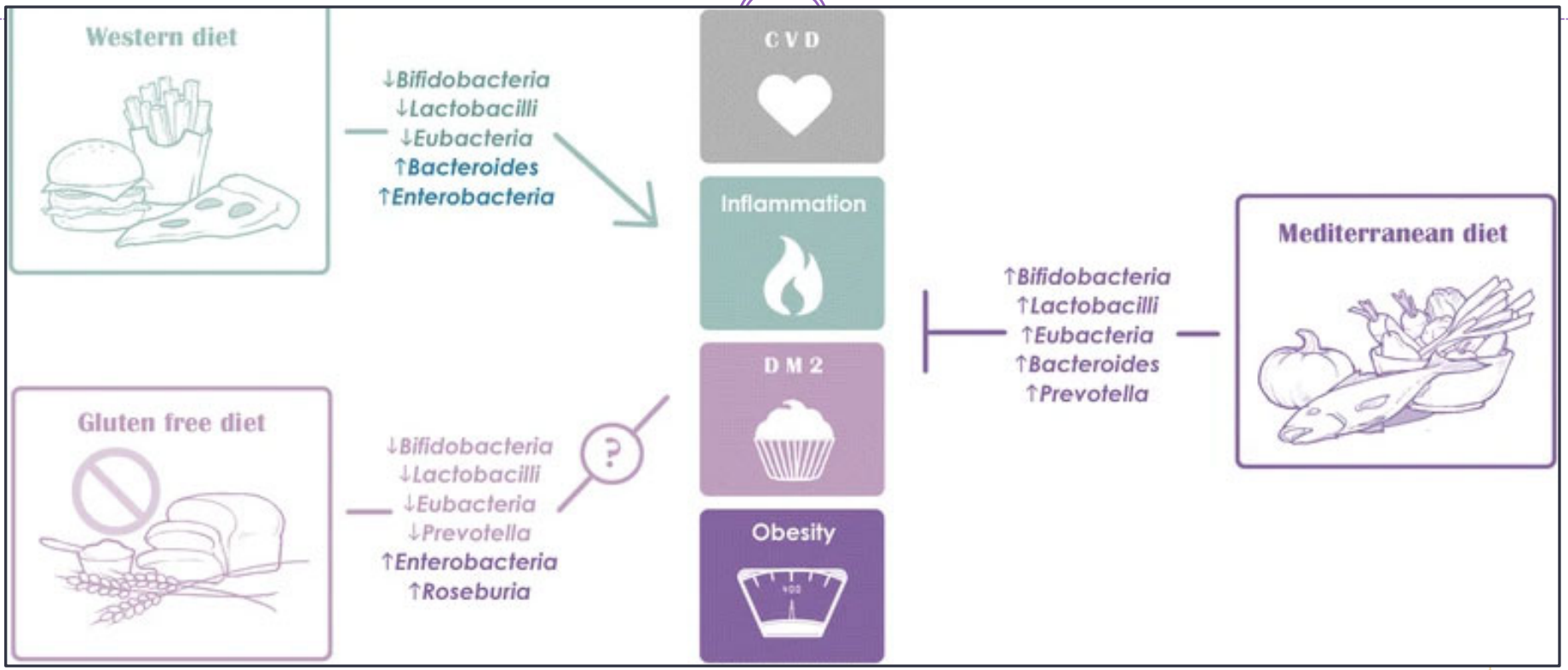
- 4 servings daily compared to 2 servings daily = 62% increased risk of mortality
- Each additional serving (over 4) associated with > 18% mortality
- 10% increase in ultra-processed foods = 12% > cardiovascular disease,13% heart disease, & 11% cerebrovascular disease

Bernard Srour, Léopold K Fezeu, Emmanuelle Kesse-Guyot, Benjamin Allès, Caroline Méjean, Roland M Andrianasolo, Eloi Chazelas, Mélanie Deschasaux, Serge Hercberg, Pilar Galan, Carlos A Monteiro, Chantal Julia, Mathilde Touvier. Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study (NutriNet-Santé). BMJ, 2019; l1451 DOI: 10.1136/bmj.l1451

Anaïs Rico-Campà, Miguel A Martínez-González, Ismael Alvarez-Alvarez, Raquel de Deus Mendonça, Carmen de la Fuente-Arrillaga, Clara Gómez-Donoso, Maira Bes-Rastrollo. Association between consumption of ultra-processed foods and all cause mortality: SUN prospective cohort study. BMJ, 2019; l1949 DOI: 10.1136/bmj.l1949

Mark A Lawrence, Phillip I Baker. Ultra-processed food and adverse health outcomes. BMJ, 2019; l2289 DOI: 10.1136/bmj.l2289ovascular disease

Diet and the Microbiome



Singh, R.K., Chang, H., Yan, D. et al. Influence of diet on the gut microbiome and implications for human health. J Transl Med 15, 73 (2017). https://doi.org/10.1186/s12967-017-1175-y

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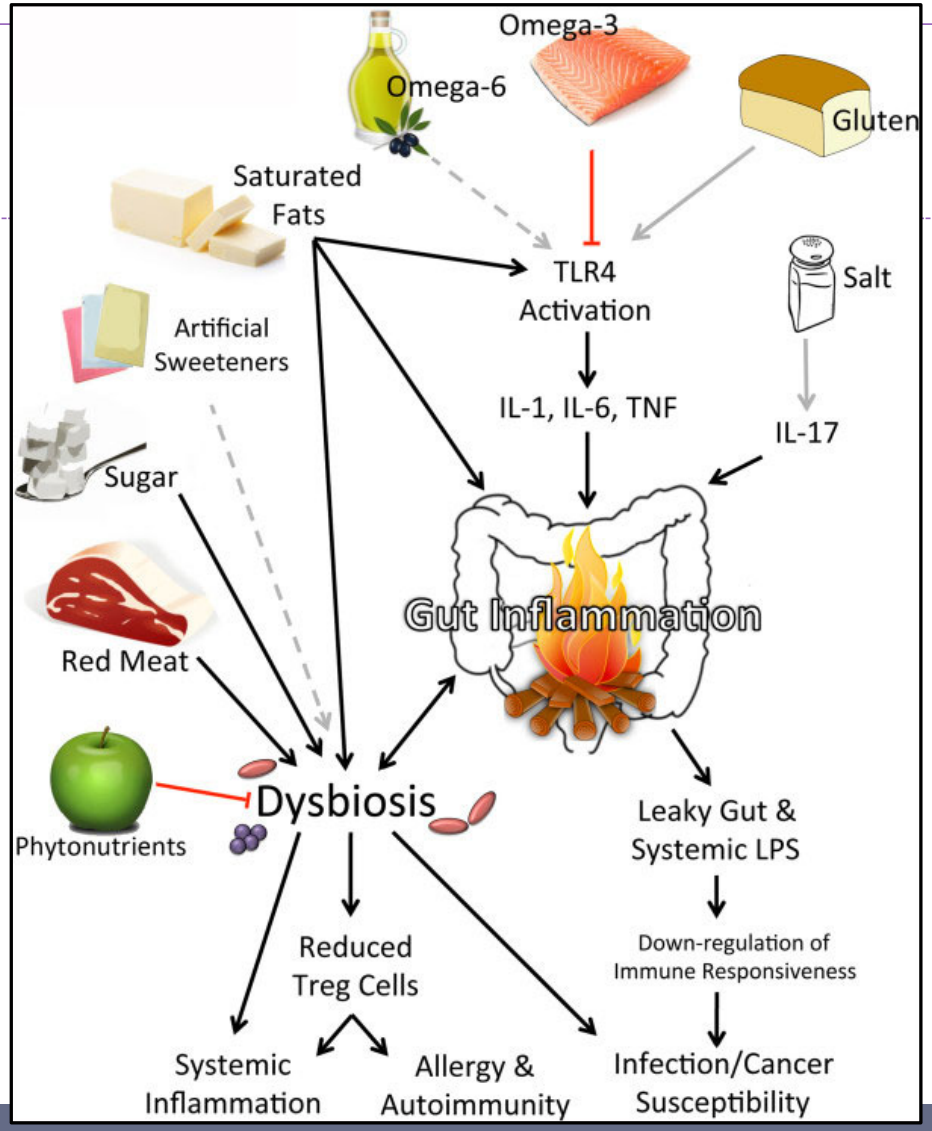
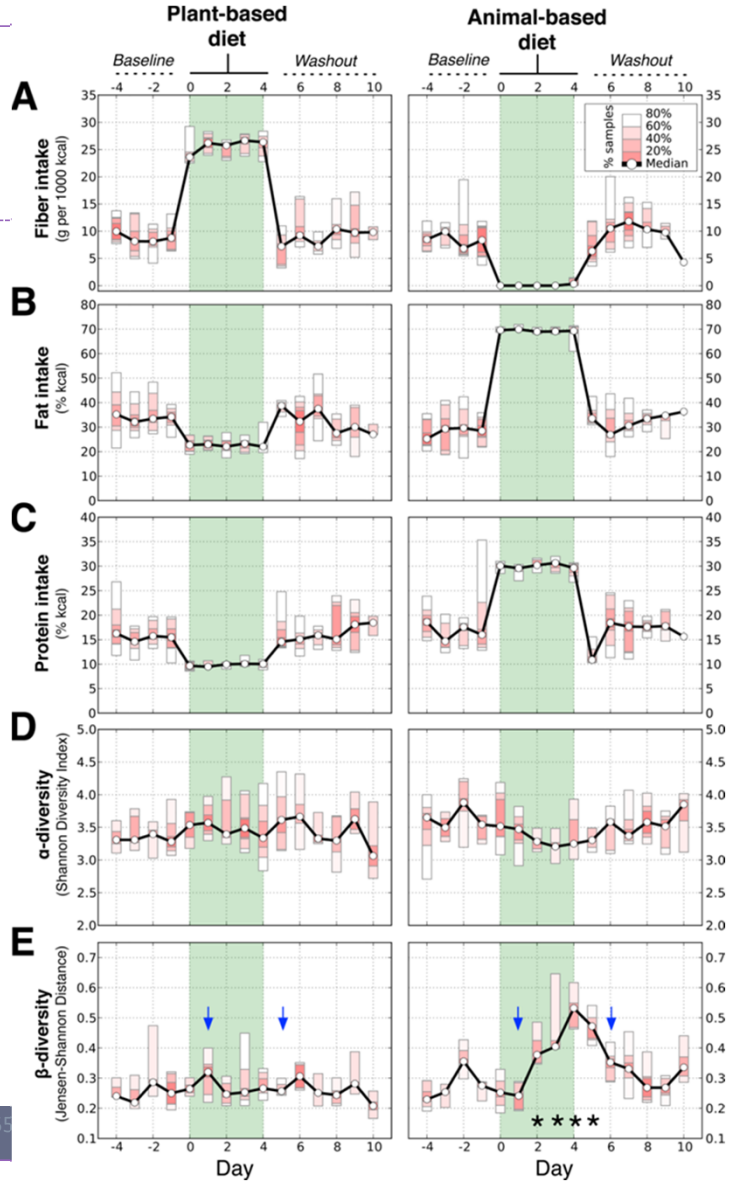


Myles IA. Fast food fever: reviewing the impacts of the Western diet on immunity. *Nutrition Journal*. 2014;13:61. doi:10.1186/1475-2891-13-61.

Modulating the Microbiome with Food

Diet rapidly and reproducibly alters the human gut microbiome

- 9 Volunteers placed on **two extreme diets x 5 days**:
  - Meat, egg and cheese then switched to grains, vegetables and legumes
- **Within 1-2 days, saw major alterations in microbiome** measured by 16S rRNA sequencing
- Microbial activity **mirrored differences between herbivorous and carnivorous mammals**, reflecting trade-offs between carbohydrate and protein fermentation.



David LA, Maurice CF, Carmody RN, et al. Diet rapidly and reproducibly alters the human gut microbiome. Nature. 2014;505(7484):55

Dietary Components that Affect Microbiome

- Plant Foods
- Protein
- Polyunsaturated Fatty Acids and CLA (proposed)
- Carbohydrates
  - Soluble Fiber/Resistant Starch (Microbiota accessible carbohydrate = MACS)
  - Sugars
- Prebiotics
- Polyphenols
- Cultured and Fermented Foods
- Artificial Sweeteners

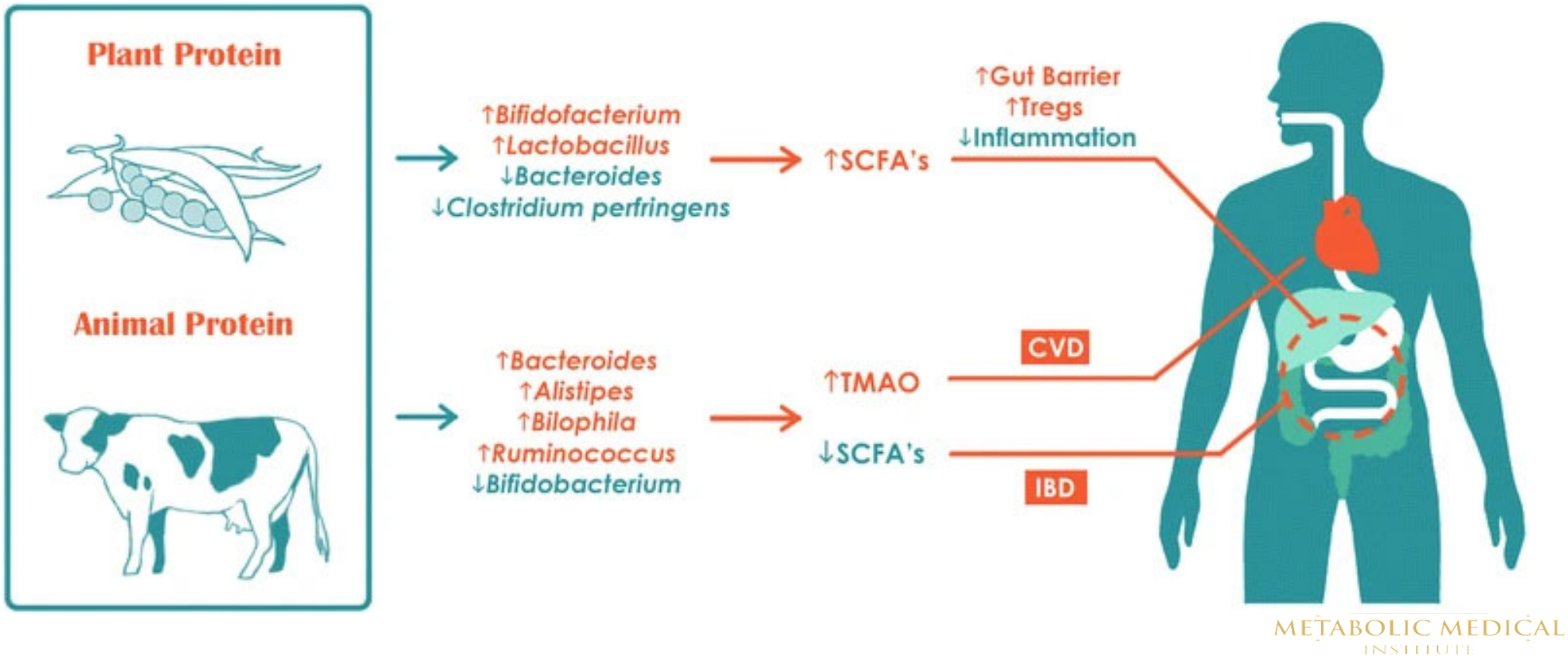
"**Increased consumption of fruits and vegetable** and thus higher fibre consumption before the intervention seemed to be **associated with high bacterial richness.**

This finding…supports a recently reported link between long-term dietary habits and the structure of the gut microbiota and suggests that a permanent change of microbiota may be achieved by appropriate diet."

Cotillard A, Kennedy SP, Kong LC, et al. Dietary intervention impact on gut microbial gene richness. *Nature*. 2013;500(7464):585-588.

Dietary intervention impact on gut microbial gene richness

Protein Sources and the Human Microbiome



Singh, R.K., Chang, H., Yan, D. et al. Influence of diet on the gut microbiome and implications for human health. J Transl Med 15, 73 (2017). https://doi.org/10.1186/s12967-017-1175-y

Artificial Sweeteners (NAS) & the Gut Microbiome

- Saccharine, sucralose (Splenda), Aspartame (NutraSweet)
- Germ-Free Mice-fed artificial sweetener, water with glucose, water with sucrose.
- Normal glucose curves sweetened water
- > glucose intolerance with NAS, highest saccharine
- Changed gut microbiome
- 7 Healthy people: 1 week, days 2-7 max FDA saccharine dose: 4/7 poor glycemic response.
- Changes in microbiome in 4 who had changes in glycemic response, but not in 3 who had no change in glycemic response

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Suez J, Korem T, Zeevi D, et al. Artificial sweeteners induce glucose intolerance by altering the gut microbiota. *Nature*. 2014;514(7521):181-186. doi:10.1038/nature13793

Where is someone on the health continuum?

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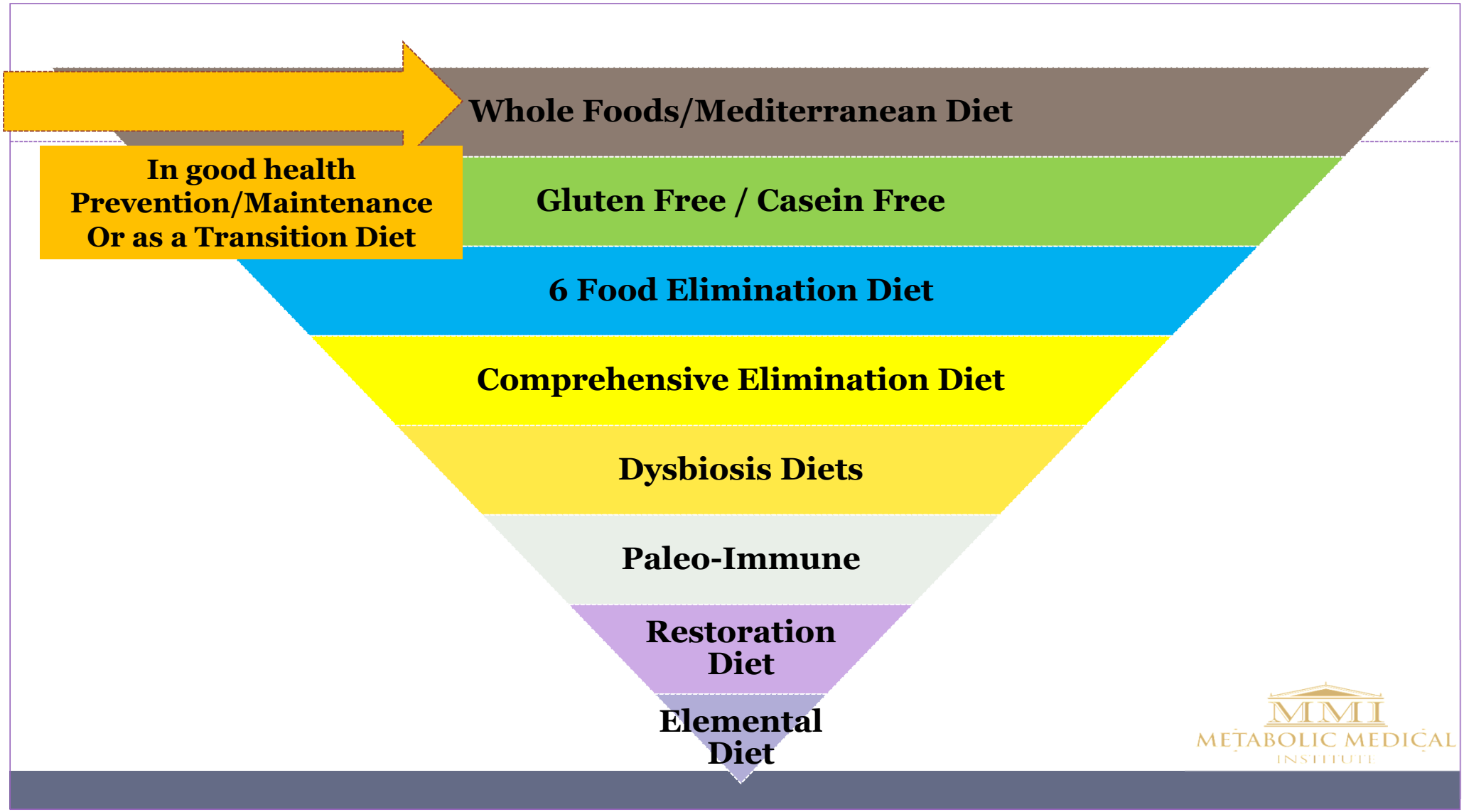
In good health
Prevention/Maintenance
Or as a Transition Diet
Whole Foods/Mediterranean Diet
Gluten Free / Casein Free
6 Food Elimination Diet
Comprehensive Elimination Diet
Dysbiosis Diets
Paleo-Immune
Restoration Diet
Elemental Diet
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Mediterranean Diet Benefits:

- PREDIMED:
  - benefits significant in men, not women
  - olive oil (1 liter a week) and nuts (30 grams daily)
  - Cardiovascular disease: no change in cardiac events
  - Stroke 39% decrease (PREDIMED)
  - Memory and cognition
  - NO change in mortality rates
  - < in Breast Cancer rates in women
- Hypertension
- Dyslipidemia
- Type 2 diabetes/ Insulin Sensitivity, Inflammation
- POLYPHENOLS: in olive oil, nuts, vegetables, fruits, culinary herbs, spices

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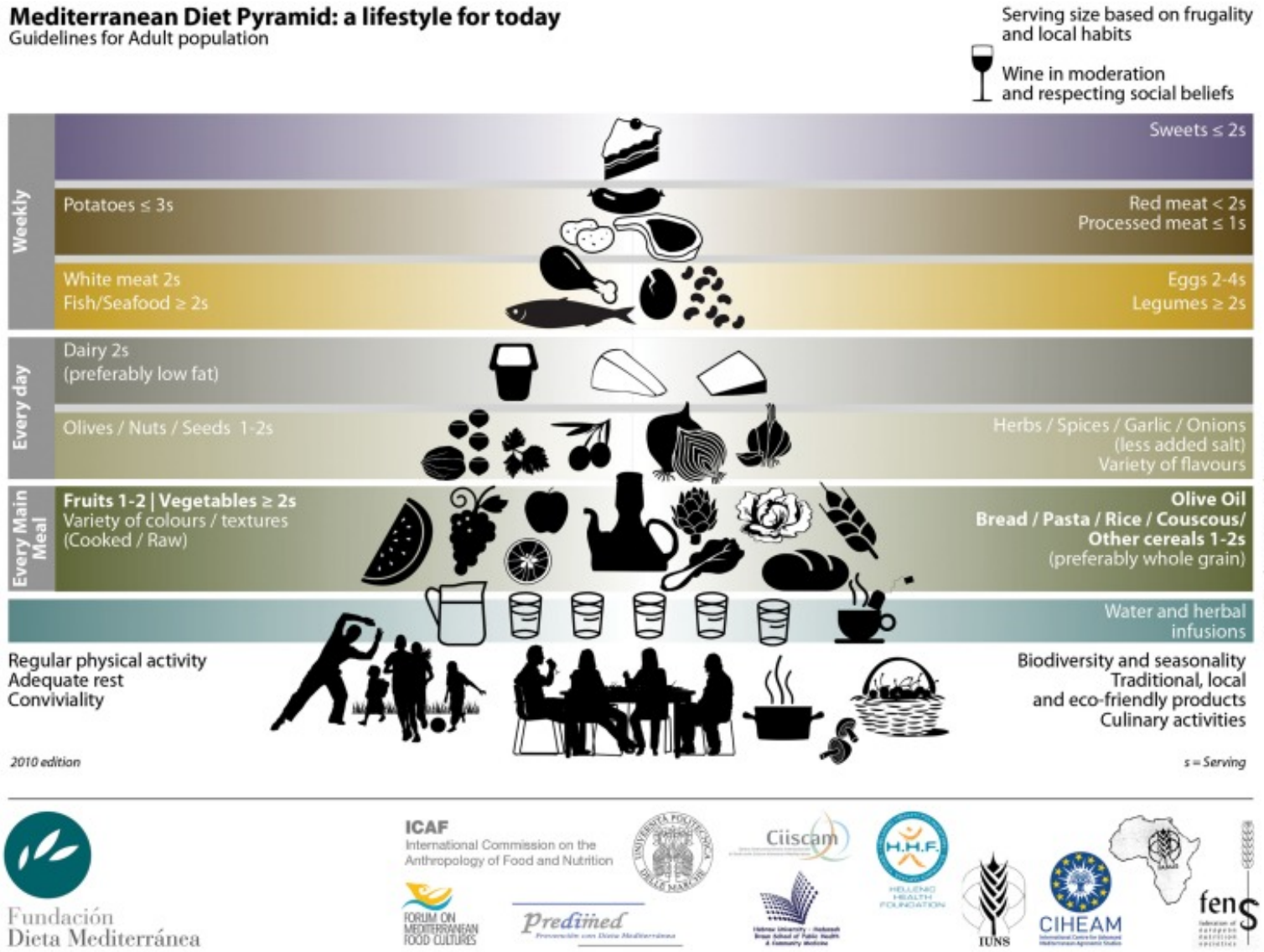

Fundación Dieta Mediterránea

ICAF
International Commission on the Anthropology of Food and Nutrition

FORUM ON MEDITERRANEAN FOOD CULTURES

Predimed

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H.H.F. HELLENIC HEALTH FOUNDATION

IUNS

CIHEAM

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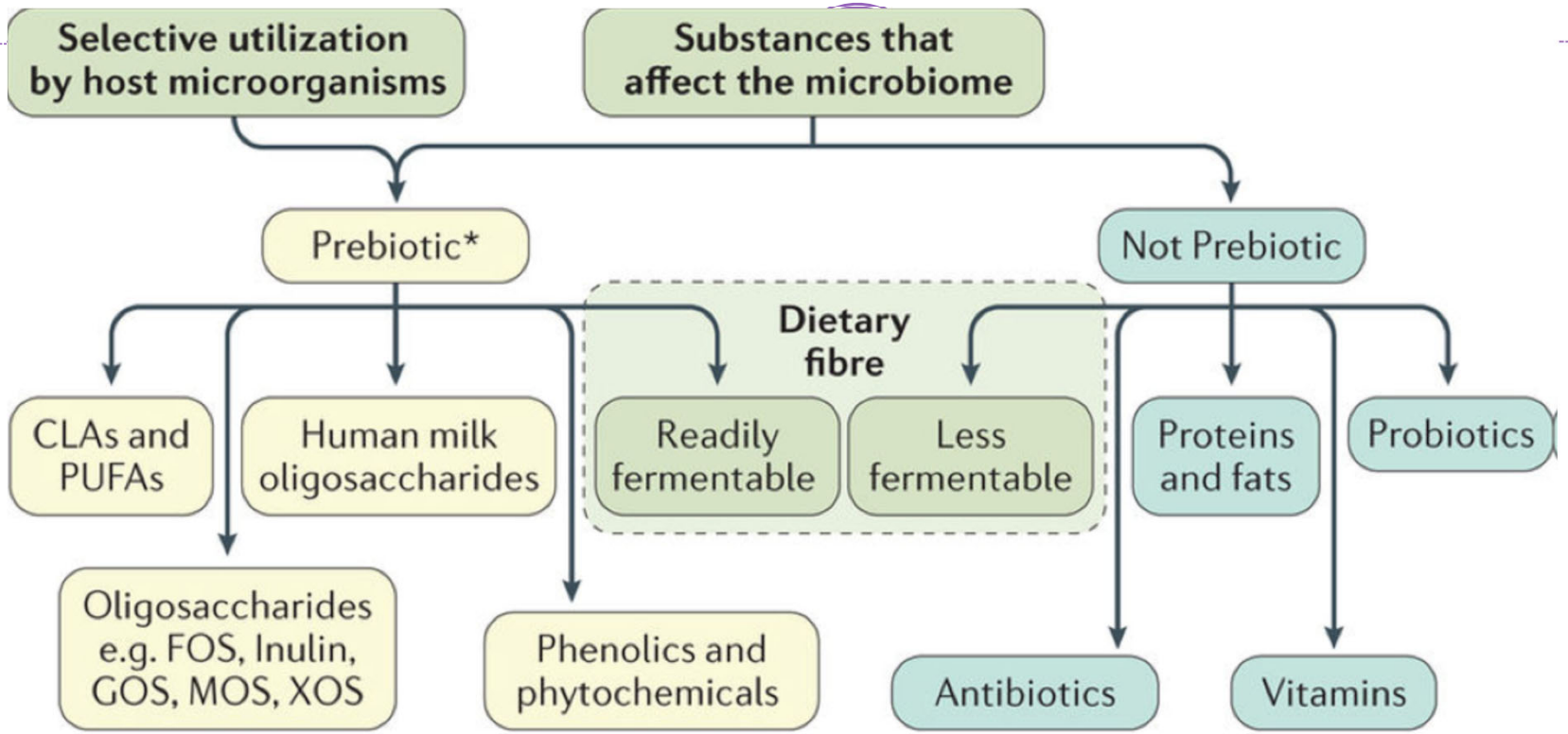
Prebiotic Definition

A prebiotic is a substrate that is selectively utilized by host microorganisms conferring a health benefit.

Gibson, G. R., Hutkins, R., Sanders, M. E., Prescott, S. L., Reimer, R. A., Salminen, S. J., . . .Reid, G. (2017). Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. *Nature Reviews | Gastroenterology & Hepatology*. doi:doi:10.1038/nrgastro.2017.75



Nature Reviews | Gastroenterology & Hepatology

June 14, 2017 (G. R. Gibson et al., 2017

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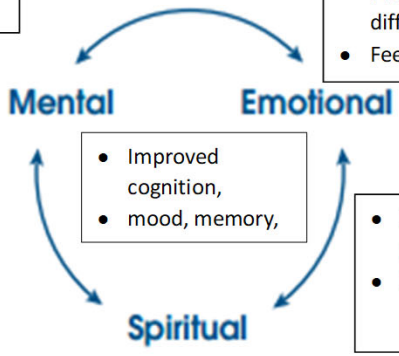
Research on Prebiotics and How they affect Human Physiology

Assimilation

- Enhance bioavailability and absorption of minerals
- Increase SCFA production

Defense & Repair

- Reduced inflammation systemically and IBD
- Increased antioxidant activity
- Reduces risk and duration of bacterial and viral infection
- Protection from microbial toxins such as Clostridia difficile
- Feeds and modulates commensal and probiotic



- Improved cognition,
- mood, memory,

Structural Integrity

- Improves hydration
- Enhances bone health: > minerals to bone and bone density in high risk individuals
- Reduction in infant eczema
- May prevent and restore increased intestinal permeability

Energy

- Metabolism: Small but significant weight loss in people with obesity; increased adiponectin
- Increased satiety

Communication

- Changes in genomic expression
- Diabetes and Metabolic Syndrome; Regulates insulin and glucose, lowered HvA1c, lipids, increase in serum glutathione
- Improved vagal nerve function
- Stimulates production of neuro-chemicals such as BDNF
- Enhanced brain function: neural, endocrine & immune

Transport

Cardiovascular protection: helps normalize LDL cholesterol and serum triglycerides; decreased C-Reactive Protein levels; reduction in blood pressure

Biotransformation & Elimination

- Chronic Kidney Disease: lowered levels of p-cresyl and indoxyl sulfate; Arabic gum effective in delaying dialysis in people with end-stage kidney disease
- Improve Laxation: relieve constipation, improve motility, increase fecal bulk

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SCFA Production in Colon

Starch

+

Non-starch Polysaccharides

Bacterial Enzymes

SCFA

Butyric

Acetic

Propionic

FUNCTIONS OF SHORT-CHAIN FATTY ACIDS

BUTYRATE	PROPIONATE	ACETATE
Main fuel and repair substance for the colonocytes **Benefits are largely in the colon; some systemic** **70% of energy, maintenance, and repair of colonocytes** < pH of the colon = < bile solubility, > mineral absorption, < ammonia absorption, < pathogenic growth, improves absorption of water and sodium Effects gene expression of epithelial cells Protects against colon cancer and colitis Supports barrier function with mucin, antimicrobial peptides and tight junction proteins Anti-inflammatory/Immune supportive Histone deacetylation (HDAC) G-protein coupled receptor activator Promotes neurotrophic factors: BDNF, GDNF, and NGF *In animal models* reduces neurological disease: Parkinson's, reduced stroke damage, improves learning and memory	**Moves through the portal vein and taken up by the liver** Contributes a small amount as energy source for colonocytes < pH of colon = < bile solubility, > mineral absorption, < ammonia absorption, < pathogenic growth Anti-inflammatory/Immune effects Protective for colon cancer Promotes satiety Helps normalize serum cholesterol Decreases fatty liver Improves insulin sensitivity	**Moves through the portal vein for metabolism throughout body tissues and organs, especially muscle and brain** Contributes a small amount as energy source for colonocytes < pH of colon = < bile solubility, > mineral absorption, < ammonia absorption, < pathogenic growth Anti-inflammatory Improves blood flow and oxygen uptake in the colon Can be utilized by bacteria as a co-substrate to synthesize butyrate Substrate for cholesterol and fatty acid synthesis in the liver Energy source for muscle and brain

Adapted from: Rivière A, Selak M, Lantin D, Leroy F, De Vuyst L. *Front Microbiol*.2016;7:979.. doi:10.3389/fmicb.2016.00979 & Bourassa MW (2016) Neurosci. Letter doi/10.1016/j.neulet.2016.02.009

Enhancing Butyrate & other SCFA

Eat more prebiotic rich foods

Balance gut microbes:

- Eat fermented and cultured food
- Take probiotic supplements

Testing SCFA

- Comprehensive Stool testing
- Organic acid testing

<table>
<tr><th rowspan="2">HEALTH BENEFITS OF INSOLUBLE FIBER</th><th colspan="3">SOLUBLE FIBER HEALTH BENEFITS</th></tr>
<tr><th>HEALTH BENEFITS OF SOLUBLE FIBER</th><th>HEALTH BENEFITS OF PREBIOTICS</th><th>HEALTH BENEFITS OF RESISTANT STARCH</th></tr>
<tr><td colspan="4">• Substrate for short-chained fatty acids (SCFA); butyrate, acetate, propionate
• Regulates peristalsis and bowel regularity
• Regulates glucose
• Lowers glycemic load in meals
• Keeps you feeling full which may help with weight loss
• Lowers cancer risk</td></tr>
<tr><td rowspan="2">• Improve IBS
• May prevent hemorrhoids
• May reduce risk of diverticulosis</td><td colspan="3">• Are prebiotic: feeds & protects the microbiome
• Lowers elevated cholesterol & triglycerides</td></tr>
<tr><td>• Regulates pH balance in the intestines
• Binds bile acids
• Regulates phase 1 and 2 liver detoxification</td><td>• Reduces inflammation
• Regulates insulin & lowers hemoglobin A1c
• Enhances hydration
• Builds bone
• Cancer protective
• Modest increase in weight loss
• May prevent and restore increased intestinal permeability
• Increases serum glutathione levels
• Enhanced brain function
• Enhances immunity
• Reduces toxins in people with chronic kidney disease</td><td>• Reduces inflammation
• Substrate for short-chained fatty acids (SCFA)
• Modest increase in weight loss
• Improved bowel function</td></tr>
</table>

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Dietary Fibers

Total Dietary Daily Fiber = soluble + insoluble: (USDA)

- Men up to age 50: 38 gms /after 50: 30 gms.
- Women up to age 50: 25 gms/after 50: 21 gms.

Soluble Fiber:

Prebiotic fiber: (International Scientific Association for Probiotics and Prebiotics)

- Average Daily intake: 2-8 gm daily USA
- Recommended Daily intake: 5g-20g daily

Resistant starch: (CSIRO)

- 20g daily
- **https://www.csiro.au/en/Research/BF/Areas/Nutrition-and-health/Nutrition-and-gut-health/Resistant-starch?ref=/CSIRO/Website/Research/Health/Healthier-foods/Resistant-starch**

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Fiber Enriched Diet in Non-Erosive GERD

- 36 patients consuming a low fiber diet (< 20 grams daily)
- Given 5 grams of psyllium three times daily for 10 days
- Heartburn at beginning in 93.3%, end: 40%
- Incidence of GERD episodes per week: 67.9 at beginning, 42.4 end
- Maximal reflux time decreased from 10.6 minutes to 3.7 minutes

Conclusion: ”Fiber-enriched diet led to a significant increase of minimal lower esophageal sphincter resting pressure, a decrease of number of gastroesophageal refluxes, and a decrease of heartburn frequency per week in NERD.”

Morozov S, Isakov V, Konovalova M. Fiber-enriched diet helps to control symptoms and improves esophageal motility in patients with non-erosive gastroesophageal reflux disease. World J Gastroenterol. 2018;24(21):2291-2299. doi:10.3748/wjg.v24.i21.2291

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Fermented Foods

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Fermentation of Food

- Food more digestible
- Add familiar probiotic & commensal microbes & bacteriophages; typically contain 1 million micoorganisms per gram
- Produces bioactive peptides such as CLA, bacteriocins
- Polyphenols into active state
- > vitamins, enzyme activity & amino acid production
- Enhance mineral absorption
- Antioxidant, antifungal, anti-inflammatory
- Breakdown of phytates, tannins, oxalic acid
- Extends shelf life/food preservation
- Improves health: diabetes, atherosclerosis
- Improves food security

Sanlier, N., Gokcen BB, & Sezgin AC. Health Benefits of Fermented Foods. *Crit. Rev. Food Sci and Nutr*. 2019. 59(3):506-527. https://doi.org/10.1080/10408398.2017.1383355; Marco, M.L.; Heeney, D.; Binda, S.; Cifelli, C.J.; Cotter, P.D.; Foligné, B.; Gänzle, M.; Kort, R.; Pasin, G.; Pihlanto, A.; et al. Health benefits of fermented foods: Microbiota and beyond. *Curr. Opin. Biotechnol.* **2017**, *44*, 94–102; Dimidi, E. Cox, S. R., Rossi, M., Whelan, K. "Fermented Foods: Definitions and Characteristics, Impact on the Gut Microbiota and Effects on GI Health and Disease. *Nutrients* **2019**, *11*(8), 1806

Kefir Therapeutic Effects

- Antimicrobial
- Supports GI Immune Health
- Protects against cancer
- Increases *Lactobacilli, Lactococcus, Bifidobacteria* in the gut.
- Improves lactose digestion
- Reduces flatulence severity; not frequency, abdominal pain nor diarrhea compared to milk.
- RCT combining Triple Therapy, with kefir or milk for *H. pylori*. (500 mL/day kefir compared with 25 mL/day milk); Eradication better than in controls; lowered diarrhea, nausea and abdominal pain in kefir group.
- Crohn's disease: increases serum hemoglobin levels and *Lactobacill* in stool
- Improved serum cholesterol

Historical use:

- Gastrointestinal
- Hypertension
- Allergies
- Ischemic heart disease

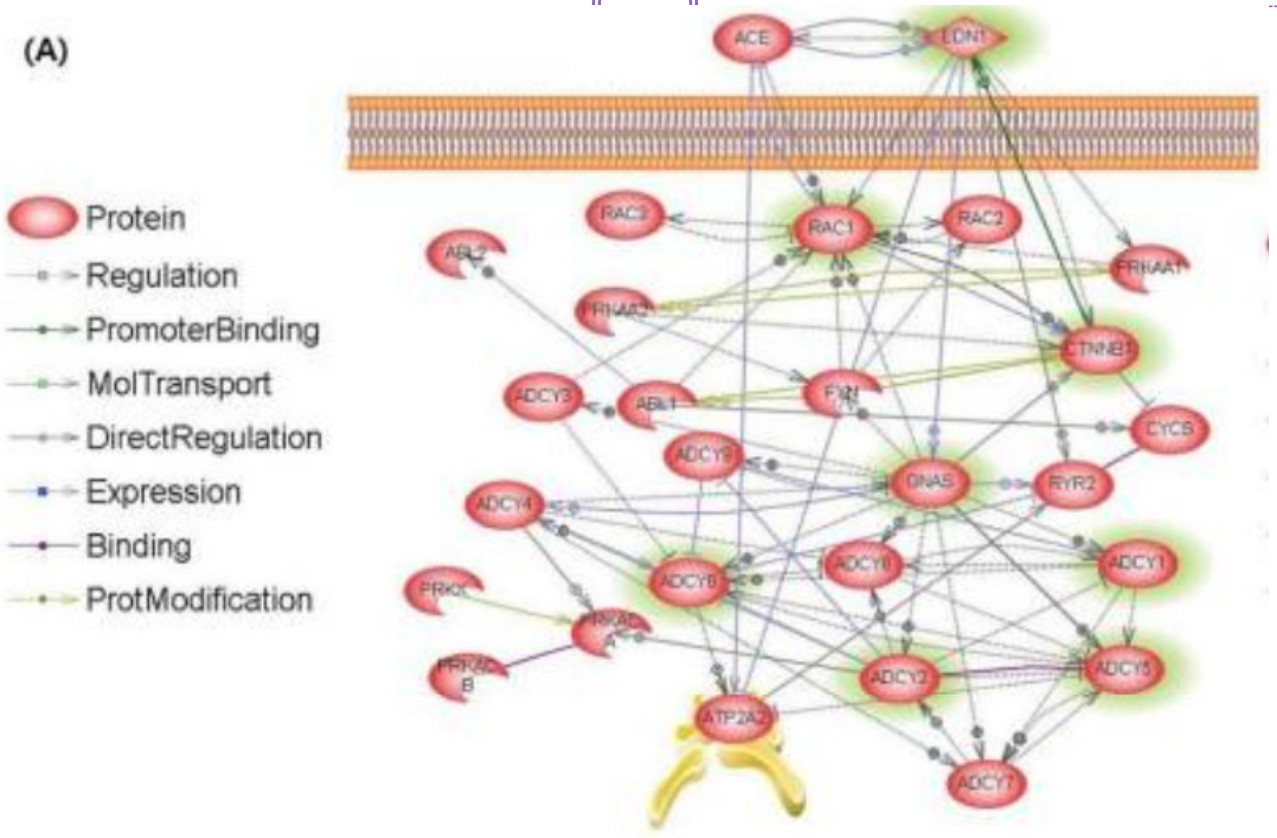
Sharifi M, Moridnia A, Mortazavi D, Salehi M, Bagheri M, Sheikhi A. Kefir: a powerful probiotics with anticancer properties. Med Oncol. 2017 Sep 27;34(11):183. doi: 10.1007/s12032-017-1044-9.
de Oliveira Leite AM, Miguel MA, Peixoto RS, Rosado AS, Silva JT, Paschoalin VM. Microbiological, technological and therapeutic properties of kefir: a natural probiotic beverage. Braz J Microbiol. 2013 Oct 30;44(2):341-9. doi: 10.1590/S1517-83822013000200001. Rosa DD 2017 *Nutr Res Reviews* 30(1): 82-96; Dimidi, E. Cox, S. R., Rossi, M., Whelan, K.
"Fermented Foods: Definitions and Characteristics, Impact on the Gut Microbiota and Effects on GI Health and Disease. *Nutrients* **2019**, *11*(8), 1806; https://doi.org/10.3390/nu11081806

Kimchi Health Effects

- Anti-cancer
- Anti-obesity
- Anti-constipation
- > Colorectal health
- Probiotic properties
- Cholesterol reduction
- Fibrolytic effect
- Antioxidant and anti-aging properties
- Brain health promotion
- Immune promotion
- Skin health promotion

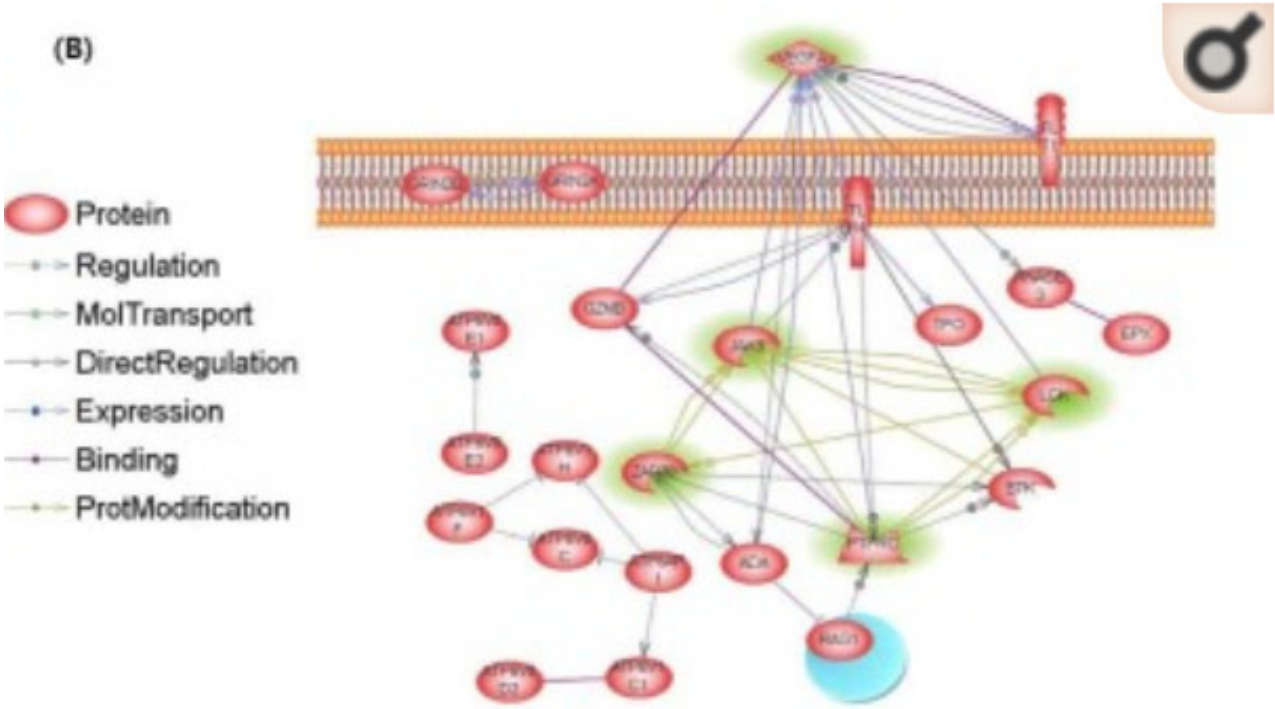
Park, K.Y., et al., Health benefits of kimchi (Korean fermented vegetables) as a probiotic food. J Med Food, 2014. 17(1): p. 6-20.
Patra JK, Das G, Paramithiotis S, Shin HS. Kimchi and Other Widely Consumed Traditional Fermented Foods of Korea: A Review.Front Microbiol. 2016 Sep 28;7:1493.

Kimchi and Genomic Regulation: CVD



Shin GH, Kang BC, Jang DJ. Metabolic Pathways Associated with Kimchi, a Traditional Korean Food, Based on In Silico Modeling of Published Data. Genomics Inform. 2016;14(4):222–229. doi:10.5808/GI.2016.14.4.222

Kimchi and Genomic Regulation: Immune Regulation



Shin GH, Kang BC, Jang DJ. Metabolic Pathways Associated with Kimchi, a Traditional Korean Food, Based on In Silico Modeling of Published Data. Genomics Inform. 2016;14(4):222–229. doi:10.5808/GI.2016.14.4.222

Honey: LAB Symbionts

- 13 unique strains of *Lactobacilli* and *Bifidobacterium* in fresh honey
- They exist in biofilms
- 1 billion CFU/gm
- 40 LABs in bee's stomachs
- Active against MRSA, *Pseudomonas aeruginosa*, and vancomycin-resistant *Enterococcus*
- Long known as antimicrobial, and anti-inflammatory in wounds

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Olofsson TC, Butler È, Markowicz P, Lindholm C, Larsson L, Vásquez A. Lactic acid bacterial symbionts in honeybees - an unknown key to honey's antimicrobial and therapeutic activities. International Wound Journal. September 2014:n/a–n/a. doi:10.1111/iwj.12345.

Probiotic Rich Foods

- Yogurt/Kefir
- Miso
- Natto
- Tempeh
- Sauerkraut
- Kim chee
- Raw pickles
- Fermented anything
- Root and ginger beers
- Olives

- Pulke
- Kombucha
- Fermented vegetables
- Buttermilk
- Raw whey
- Raw vinegars
- Fermented sausages
- Sourdough
- Essene bread
- Beer
- Wine

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FOOD & THE DIGIN MODEL
What is this person's priority?

- **D**igestion/Absorption
- **I**ntestinal Permeability
- **G**ut Microbiota/Dysbiosis
- **I**nflammation/Immune
- **N**ervous System

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Main GI Therapeutic Dietary Plans

Digestion/Absorption: Enzyme Insufficiencies

- Lactose intolerance
- Fructose Intolerance, Sucrose Intolerance

Microbiome: Dysbiosis Diets: Restrict Prebiotics and Carbohydrates

- FODMAP
- Specific Carbohydrate Diet
- Gut & Psychology Syndrome Diet
- Anti-Fungal Diets

Immune/Inflammation/Increased Permeability: Food Allergy and Sensitivity: Low-Antigenic Diet

- Gluten Free/Casein Free/Egg Free
- Comprehensive Elimination Diet
- Celiac Disease: Gluten Free
- Rotation Diet
- Low Histamine Diet
- Renew / Paleo Immune

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Diets currently best matched for Current Research & Specific Diagnoses

IBS = FODMAP Diet

IBD= Specific Carbohydrate Diet, Elemental Diet, Parenteral Nutrition with Elimination Diet, Paleo Immune in UC

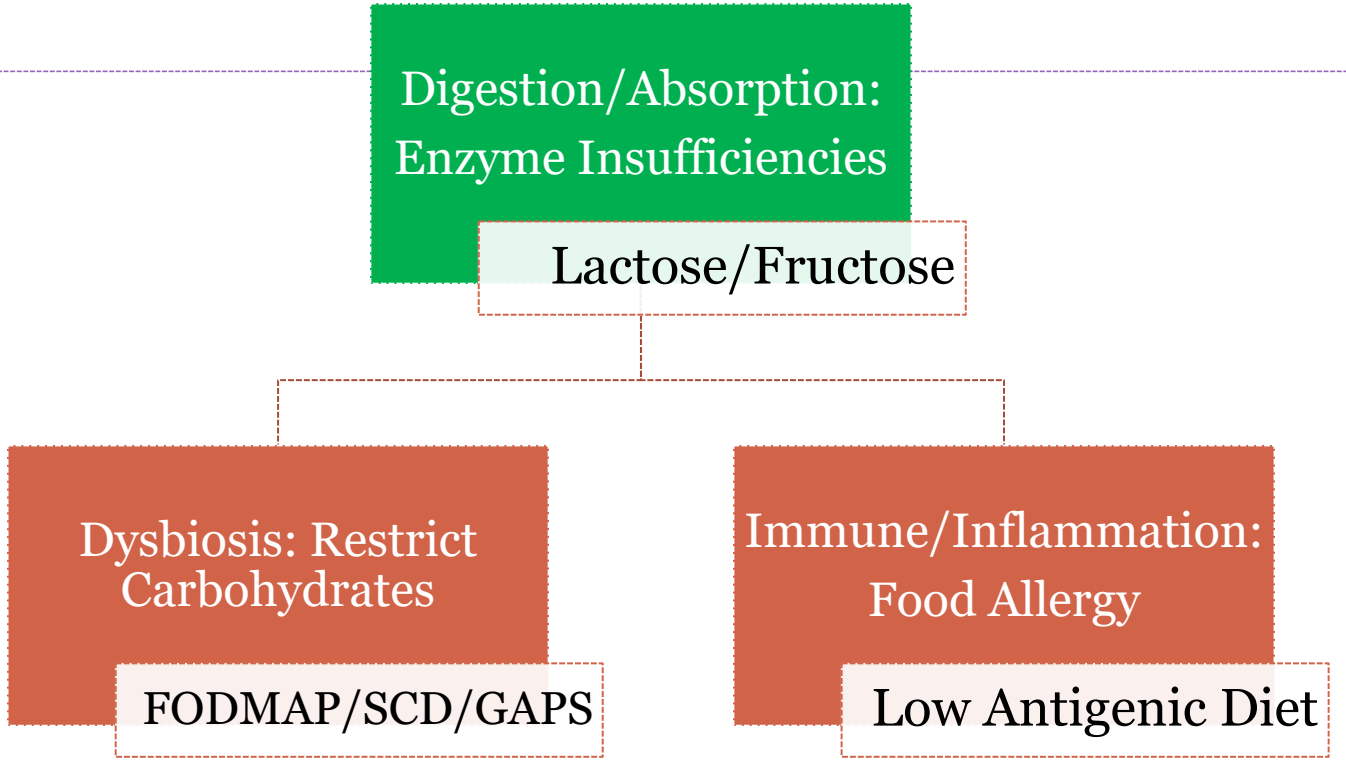
Celiac Disease = Eliminate Gluten, consider Elim Diet.

Eosinophilic esophagitis or gastritis = 6-Food Elimination Diet

Fungal Overgrowth= Anti-Fungal Diet

(limited research)

Auto-immune = Paleo Immune, Elimination Diet



Exocrine Pancreatic Insufficiency

Symptoms:
Diarrhea
Feeling full
Gas
Bloating
Stomach pain
Foul-smelling, oily stools that float
Undigested food in stool
Weight loss

History of Pancreatic Issues
Chronic pancreatitis
Pancreatic cancer
Pancreatic surgery
Diabetes (type I or type IIIC)
Cystic fibrosis
Schachman-Diamond Syndrome

Does your Medical history of the following:
Celiac disease
Crohn's disease
Exocrine pancreatic insufficiency (EPI)
Gastrointestinal surgery
Irritable bowel syndrome - diarrhea (IBS-D)
Malabsorption
Small intestinal bacterial overgrowth (SIBO)
Ulcerative colitis

Testing:
Stool testing: Pancreatic Elastase(fecal elastase 1) levels less than 200 mcg/gm
Rule out celiac disease
Rule out pancreatitis

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WebMD/Exocrine Pancreatic Insufficiency; clinical experience; & www.identifyepi.com

Enzyme Insufficiencies

- Exocrine Pancreatic Insufficiency
- Lactose Intolerance
- Fructose Intolerance
- Sucrose Intolerance

Incidence of Lactose Malabsorption

- 68% of the global population has lactose malabsorption
- 36% of US population has lactose malabsorption
- Some people have lactose malabsorption, yet are asymptomatic
- Less likely if from European ancestry
- More likely if African American, American Indian, Asian American, or of Hispanic or Latin descent

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https://www.niddk.nih.gov/health-information/digestive-diseases/lactose-intolerance/definition-facts

Fructose Malabsorption

- Hereditary fructose intolerance: affects 1 in 20,000-30,000 people. Genetic.
- **Up to 1/3 of us not very tolerant of fructose**
- **Americans: 38.9 pounds per year in 2017 (+ 60.2 pounds of sucrose)**
- **More common in women** than men
- 83% of people with fructose malabsorption have IBS Dx
  - Looks just like IBS:
    - Constipation
    - Diarrhea
    - Abdominal spasms
    - Flatulence
    - Nausea

Ebert K, Witt H. Fructose malabsorption. Molecular and Cellular Pediatrics. 2016;3:10. doi:10.1186/s40348-016-0035-9.
Beyer PL, Caviar EM, McCallum RW. J Am Diet Assoc. 2005 Oct;105(10):1559-66.
Szilagyi A et al. Dig Dis Sci. 2007 Nov;52(11):2999-3004.
USDA Food Tables: Consumption of Sweeteners 2018.

Fructose Malabsorption (FM) & Lactose Malabsorption (LM) in GI Disorders

- **Crohn's Dx:** 61% FM, 42% LM, 29% both
- **Ulcerative Colitis:** 40% LM
- **Celiac Disease:** 10% LM

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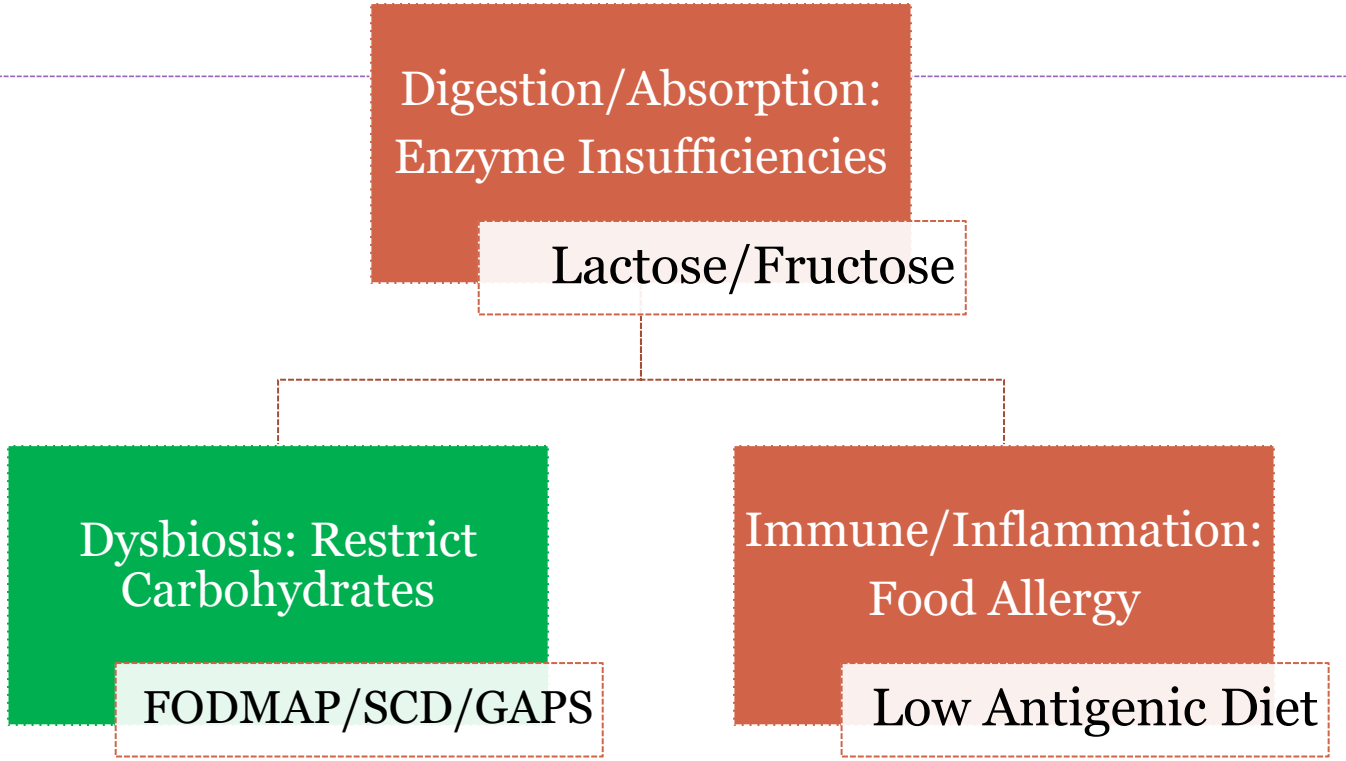
Barrett JS, Irving PM, Shepherd SJ, Muir JG, Gibson PR. Comparison of the prevalence of fructose and lactose malabsorption across chronic intestinal disorders. Aliment Pharmacol Ther. 2009 Jul 1;30(2):165-74. doi: 10.1111/j.1365-2036.2009.04018.x.



Low FODMAP Diet

FODMAPs = PREBIOTICS

- **Fermentable**
- **Oligosaccharides** (fructans, and galactooligo-saccharides)
- **Disaccharides** (lactose)
- **Monosaccharides** (fructose)
- **Polyols** (Sugar Alcohols: sorbitol, mannitol, malitol, xylitol, polydestrose, isomalt)

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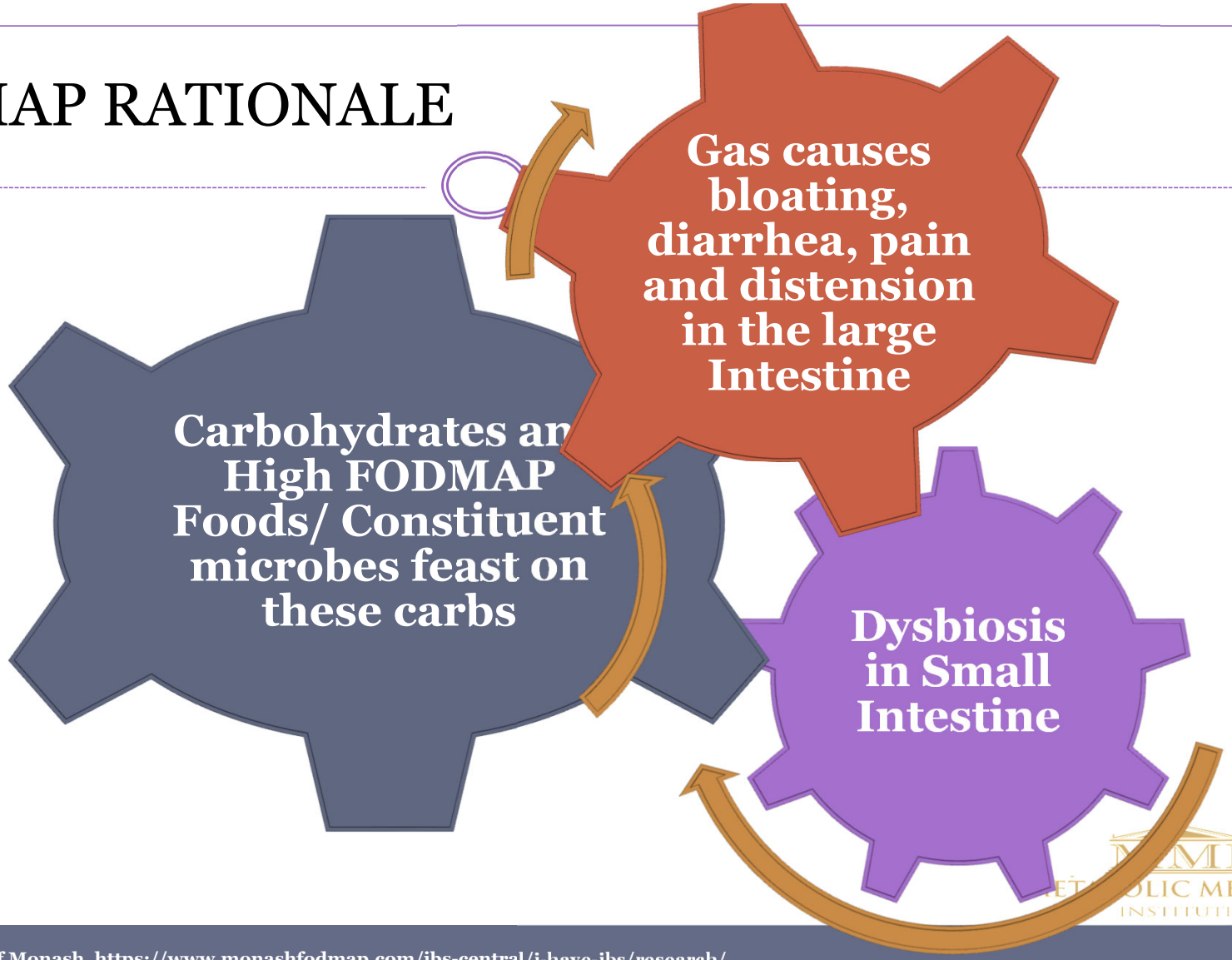
FODMAP RATIONALE



Adapted from: University of Monash. https://www.monashfodmap.com/ibs-central/i-have-ibs/research/

Who Benefits from a low FODMAP diet?

- Symptoms that may respond to the FODMAP approach include **Functional Gut Disorders such as IBS, gas, bloating, pain, and diarrhea.**
- **Helpful in 50% of IBD patients in remission who have abdominal symptoms**
- Often used **when someone suspects a problem with wheat/gluten but a gluten-free diet doesn't help** as much as we would want (they are still eating FODMAPs and having symptoms).

Wang XJ, Camilleri M. Personalized medicine in functional gastrointestinal disorders: Understanding pathogenesis to increase diagnostic and treatment efficacy. World J Gastroenterol. 2019 Mar 14;25(10):1185-1196. doi: 10.3748/wjg.v25.i10.1185. Gibson, P.R. Use of the low-FODMAP diet in inflammatory bowel disease. J. Gastroenterol. Hepatol. 2017, 32 (Suppl. 1), 40–42
Gibson PR. Use of the low-FODMAP diet in inflammatory bowel disease. *J Gastroenterol Hepatol.* 2017;32 Suppl 1:40-42. doi:10.1111/jgh.13695; Skodje GI, Sarna VK, Minelle IH, et al. Fructan, Rather Than Gluten, Induces Symptoms in Patients With Self-Reported Non-Celiac Gluten Sensitivity. *Gastroenterology*. 2018;154(3):529-539.e2. doi:10.1053/j.gastro.2017.10.040

Low-FODMAP Foods by Category: Consume

Fruits	Vegetables	Grains	Seeds	Dairy Products	Others
1 serving of Fruit – banana, blueberry, boysenberry, cantaloupe, cranberry, durian, grape, grapefruit, honeydew melon, kiwifruit, lemon, lime, mandarin, orange, passionfruit, pineapple, pawpaw, prickly pear, raspberry, rhubarb, rockmelon, star anise, strawberry, tangelo *1 serving: ¼ cup berries/grapes, 1 banana, etc. *If these fruits are dried, eat in small quantities.	**Vegetables –** avocado (<1/4), alfalfa, bamboo shoots, bean shoots, bok choy, carrot, celery, chives, choko, choy sum, cucumber, endive, ginger, green beans, lettuce, olives, parsnip, potatoes, pumpkin, radish, red bell pepper, rocket, silver beet, spinach, spring onion (green part only), summer squash (yellow), swede, sweet potato (<1/2 cup), taro, tomato, turnip, yam, zucchini	**Cereals –** gluten-free bread or cereal products **Bread (100% spelt bread), oats, polenta, rice, buckwheat, corn**	**Seeds –** chia seeds, flaxseeds, pumpkin seeds, sesame seeds, sunflower seeds	**Milk –** lactose-free milk, oat milk*, rice milk, soy milk* *look for additives **Cheeses –** hard cheeses, brie, camembert, swiss cheese, parmesan, cheddar, edam, gouda, romano, American, Blue cheese, naturally aged cheeses, cream cheese **Yoghurt –** lactose-free varieties **Ice-cream substitutes –** gelati, sorbet **Low-lactose foods –** butter, heavy cream, sour cream	**Sweetener –** sugar (*sucrose), glucose, artificial sweeteners not ending in –ol, stevia *moderate amount only **Honey Substitutes –** golden syrup*, maple syrup*, molasses, treacle *small amounts only **Other –** Garlic-infused oil
	Herbs – basil, chili, coriander, ginger, lemongrass, marjarom, mint, oregano, parsley, rosemary, thyme	**Other –** arrowroot, millet, psyllium, quinoa, sorghum, tapioca (often found in “gluten” free products)			

High FODMAPs by Category: Avoid

Excess fructose	Lactose	Fructans	Galactans	Polyols
Fruit – apple, boysenberries, cherries, figs, mango, nashi, pear, tinned fruit in natural juice, watermelon	**Milk –** milk from cows, goats or sheep, custard, ice-cream, yogurt *Most people will tolerate small amounts – 4 grams daily.	**Vegetables –** artichokes, asparagus, beetroot, broccoli, Brussels sprouts, cabbage, eggplant, fennel, garlic, jicama, leek, okra, onion (all), shallots, soybeans, spring onion	**Legumes –** baked beans, chickpeas, kidney beans, lentils, soybeans **Nuts/Seeds –** cashews, pistachios	**Fruit –** apple, apricot, avocado, blackberry, cherry, lychee, nashi, nectarine, peach, pear, plum, prune, watermelon
Vegetables – asparagus, artichokes, snap peas				**Vegetables –** cauliflower, green bell pepper, mushroom, sweet corn, snow peas
Sweeteners - fructose, high fructose corn syrup, agave, honey, corn syrup, frusiana (fruit sugar)		**Cereals –** barley, wheat and rye, in large amounts (bread, crackers, cookies, couscous, pasta)		
Large Total Fructose dose – concentrated fruit sources, large servings of fruit, dried fruit, fruit juice, 100% fruit juice jams, fruit juice concentrates	**Cheeses –** soft unripened cheeses (cottage cheese, mascarpone, ricotta)	**Fruit –** custard apple, persimmon, watermelon, currants, dates, dried figs, grapefruit, nectarine, persimmon, plums, prunes, white peaches		**Sweeteners –** sorbitol (420), mannitol (421), isomalt (953), maltitol (965), xylitol (967), polydextrose
		Others – tea (chamomile, fennel & oolong), pistachios, cashews, chicory, dandelion, inulin, agave, legumes, foods fortified with FOS, carob > 2 tsp, lentils > ½ cup canned, chickpeas > ¼ cup canned		

2019-2020 Updates on the Low-FODMAP Diet

- A meta-analysis found that a Low-FODMAP diet significantly improves IBS symptoms and QOL of patients in 6 randomized controlled trials.[1]
- Low-FODMAP diet has been found to improve the following symptoms: abdominal pain, bloating, diarrhea, nausea, and constipation.[1,2]
- British Dietetic Association recommends the Low-FODMAP diet as a second line intervention for IBS.[1,3]

1. Ooi SL, Correa D, Pak SC. Probiotics, prebiotics, and low FODMAP diet for irritable bowel syndrome - What is the current evidence?. *Complement Ther Med*. 2019;43:73-80. doi:10.1016/j.ctim.2019.01.010
2. Bellini M, Tonarelli S, Nagy AG, et al. Low FODMAP Diet: Evidence, Doubts, and Hopes. *Nutrients*. 2020;12(1):148. Published 2020 Jan 4. doi:10.3390/nu12010148
3. McKenzie YA, Bowyer RK, Leach H, et al. British Dietetic Association systematic review and evidence-based practice guidelines for the dietary management of irritable bowel syndrome in adults (2016 update). J Hum Nutr Diet. 2016;29(5):549-575. doi:10.1111/jhn.12385
4. Su H, Li YT, Heitkemper MM, Zia J. Effects of Low-FODMAPS Diet on Irritable Bowel Syndrome Symptoms and Gut Microbiome. *Gastroenterol Nurs*. 2019;42(2):150-158. doi:10.1097/SGA.0000000000000428

FODMAPs alter symptoms and the metabolome of patients with IBS

What are the new findings?

- Metabolic profiling of urine showed **diets caused significant separation of metabolome.**
- There was an **eightfold reduction in urinary histamine** in the low FODMAP group.
- **Low FODMAP diet increased *Actinobacteria* richness and diversity** and high FODMAP diet decreased the relative abundance of bacteria involved in gas consumption, likely contributing to symptoms.
- Changes in gut microbiota may play a role in symptom generation in a subset of patients with IBS; however, a low FODMAP diet might induce potential 'unhealthy' changes at the microbial level but requires long-term studies.

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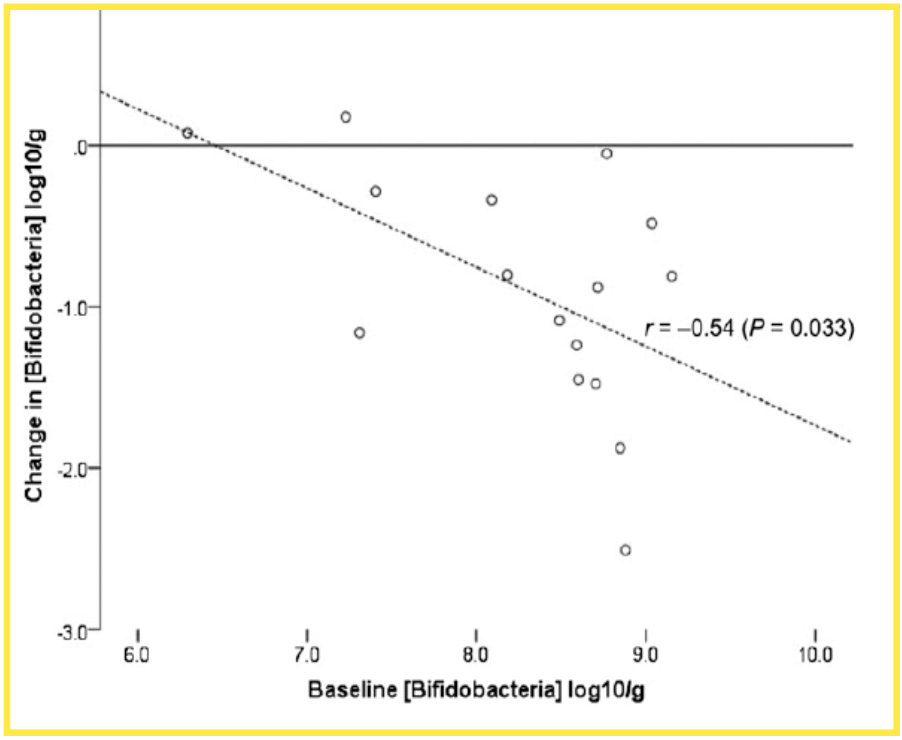
McIntosh K, Reed DE, Schneider T, Dang F, Keshteli AH, De Palma G, Madsen K, Bercik P, Vanner S. FODMAPs alter symptoms and the metabolome of patients with IBS: a randomised controlled trial. Gut. 2017 Jul;66(7):1241-1251. doi: 10.1136/gutjnl-2015-311339.

FODMAP DIET and decreases in *Bifidobacterium*



Baseline fecal bifidobacteria concentration in IBS patients compared with change in bifidobacteria concentration after 4 wks of fermentable CHO restriction

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Staudacher HM et al. Fermentable carbohydrate restriction reduces luminal bifidobacteria and gastrointestinal symptoms in patients with irritable bowel syndrome. J Nutr. 2012 Aug;142(8):1510-8. doi: 10.3945/jn.112.159285.

Low FODMAP Approach Needs and Comparisons

- **The need for monitoring by an expert dietitian or nutritionist[1]**
  - High level of dietary restriction
  - To prevent potential nutritional deficiencies: fiber, calcium, iron, zinc, folate, B and D vitamins, and natural antioxidants
  - Could foster disordered eating; recommend frequent monitoring
- **The potential lack of advantage over alternative dietary, pharmacological and psychological interventions for IBS**
  - People improve IBS symptoms with just a gluten-free diet or even traditional dietary advice
  - No significant difference in low-FODMAP compared with gut directed hypnotherapy, yoga therapy or acupuncture
- **Low-FODMAP vs. Probiotic:**
  - Similar severity scores were observed in patients treated in 3 groups: Low-FODMAP diet, Rifaximin for 10 days followed by *B. longum* W11/Prebiotic and B1, B2, B6, B12, or MegaSporeBiotic probiotic treatment.[2]

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References: Low-FODMAP Approach Needs and Comparisons

1. Bellini M, Tonarelli S, Nagy AG, et al. Low FODMAP Diet: Evidence, Doubts, and Hopes. *Nutrients*. 2020;12(1):148. Published 2020 Jan 4. doi:10.3390/nu12010148
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4. Chumpitazi BP et al. Randomised Clinical Trial: Gut Microbiome Biomarkers are Associated with Clinical Response to a Low FODMAP Diet in Children with Irritable Bowel Syndrome. Alimentary pharmacology & therapeutics. 2015;42(4):418-427. doi:10.1111/apt.13286.
5. De Giorgio R, Volta U, Gibson PR . Sensitivity to wheat, gluten and FODMAPs in IBS: facts or fiction? Gut 2016;65:169-178.
6. Catassi G, Lionetti E, Gatti, S., Catassi C. Low FODMAP Diet: Many Question Marks for a Catchy Acronym. *Nutrients*. 2017 Mar 16;9(3). pii: E292. doi: 10.3390/nu9030292.
7. Rej A, Aziz I, Tornblom H, Sanders DS, Simrén M. The role of diet in irritable bowel syndrome: implications for dietary advice. J Intern Med. 2019 Aug 29. doi: 10.1111/joim.12966.
8. Halmos, E. P. (2013). Role of FODMAP content in enteral nutrition-associated diarrhea. J Gastroenterol Hepatol, (4), 25-8. doi:10.1111/jgh.12272.
9. Halmos, E. P. (2014). Diets that differ in their FODMAP content alter the colonic luminal microenvironment. Gut. doi:10.1136/gutjnl-2014-307264.
10. Hill P, Muir JG, Gibson PR. Controversies and Recent Developments of the Low-FODMAP Diet. Gastroenterol Hepatol (N Y). 2017;13(1):36-45.
11. McIntosh K.,et al. (2016). FODMAPs alter symptoms and the metabolome of patients with IBS: a randomised controlled trial. Gut 2016;0:1–11. doi:10.1136/gutjnl-2015-311339.
12. Peters, S.L.; Yao, C.K.; Philpott, H.; Yelland, G.W.; Muir, J.G.; Gibson, P.R. Randomised clinical trial: The efficacy of gut-directed hypnotherapy is similar to that of the low FODMAP diet for the treatment of irritable bowel syndrome. Aliment. Pharmacol. Ther. 2016, 44, 447–459
13. Schumann D, Langhorst J, Dobos G, Cramer H. Randomised clinical trial: yoga vs a low-FODMAP diet in patients with irritable bowel syndrome. Aliment Pharmacol Ther. 2018;47(2):203-211. doi:10.1111/apt.14400

Phases of low FODMAP Diet

1. **Elimination:** 4-6 weeks of eliminating all FODMAPs; symptoms should diminish during this time.
2. **Reintroduction:** Continue FODMAP diet. FODMAPs are reintroduced one sub-group at a time for 6-8 weeks with close monitoring for symptoms to re-emerge.
3. **Personalized Maintenance:** Begin normalizing diet and avoid only the high FODMAP foods that triggered symptoms

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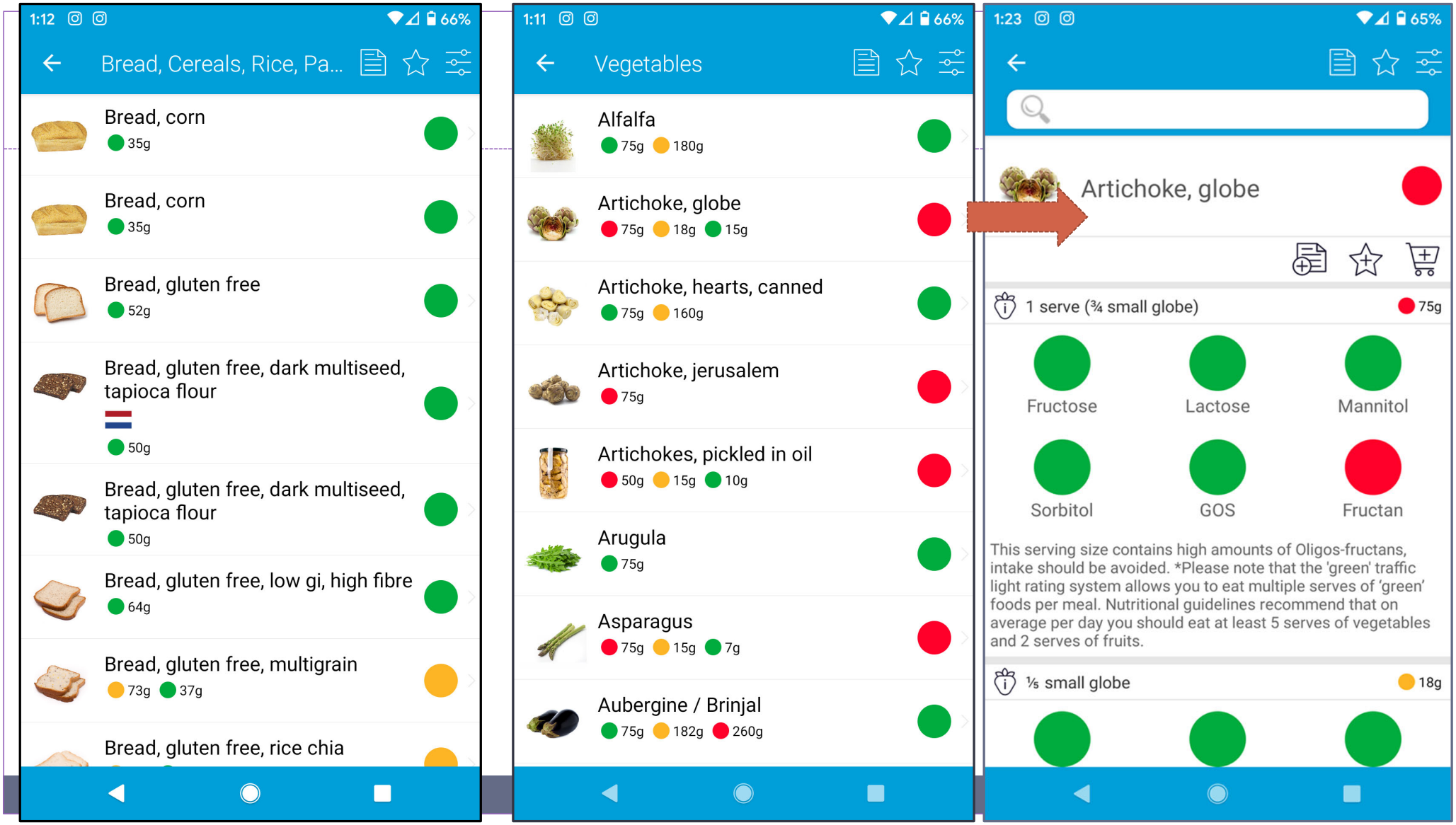
1:12
66%
Bread, Cereals, Rice, Pa...
Bread, corn
35g
Bread, corn
35g
Bread, gluten free
52g
Bread, gluten free, dark multiseed, tapioca flour
50g
Bread, gluten free, dark multiseed, tapioca flour
50g
Bread, gluten free, low gi, high fibre
64g
Bread, gluten free, multigrain
73g 37g
Bread, gluten free, rice chia
1:11
66%
Vegetables
Alfalfa
75g 180g
Artichoke, globe
75g 18g 15g
Artichoke, hearts, canned
75g 160g
Artichoke, jerusalem
75g
Artichokes, pickled in oil
50g 15g 10g
Arugula
75g
Asparagus
75g 15g 7g
Aubergine / Brinjal
75g 182g 260g
1:23
65%
Artichoke, globe
1 serve (¾ small globe)
75g
Fructose
Lactose
Mannitol
Sorbitol
GOS
Fructan
This serving size contains high amounts of Oligos-fructans, intake should be avoided. *Please note that the 'green' traffic light rating system allows you to eat multiple serves of 'green' foods per meal. Nutritional guidelines recommend that on average per day you should eat at least 5 serves of vegetables and 2 serves of fruits.
⅕ small globe
18g

High FODMAPs by Category: Avoid

Excess fructose	Lactose	Fructans	Galactans	Polyols
Fruit – apple, boysenberries, cherries, figs, mango, nashi, pear, tinned fruit in natural juice, watermelon	**Milk –** milk from cows, goats or sheep, custard, ice-cream, yogurt *Most people will tolerate small amounts – 4 grams daily.	**Vegetables –** artichokes, asparagus, beetroot, broccoli, Brussels sprouts, cabbage, eggplant, fennel, garlic, jicama, leek, okra, onion (all), shallots, soybeans, spring onion	**Legumes –** baked beans, chickpeas, kidney beans, lentils, soybeans **Nuts/Seeds –** cashews, pistachios	**Fruit –** apple, apricot, avocado, blackberry, cherry, lychee, nashi, nectarine, peach, pear, plum, prune, watermelon
Vegetables – asparagus, artichokes, snap peas				**Vegetables –** cauliflower, green bell pepper, mushroom, sweet corn, snow peas
Sweeteners - fructose, high fructose corn syrup, agave, honey, corn syrup, frusiana (fruit sugar)		**Cereals –** barley, wheat and rye, in large amounts (bread, crackers, cookies, couscous, pasta)		
Large Total Fructose dose – concentrated fruit sources, large servings of fruit, dried fruit, fruit juice, 100% fruit juice jams, fruit juice concentrates	**Cheeses –** soft unripened cheeses (cottage cheese, mascarpone, ricotta)	**Fruit –** custard apple, persimmon, watermelon, currants, dates, dried figs, grapefruit, nectarine, persimmon, plums, prunes, white peaches		**Sweeteners –** sorbitol (420), mannitol (421), isomalt (953), maltitol (965), xylitol (967), polydextrose
		Others – tea (chamomile, fennel & oolong), pistachios, cashews, chicory, dandelion, inulin, agave, legumes, foods fortified with FOS, carob > 2 tsp, lentils > ½ cup canned, chickpeas > ¼ cup canned		

FODMAP Resources

- FODMAP APP/Monash University: https://www.monashfodmap.com/ibs-central/i-have-/get-the-app/
- Sue Shepherd MS, RD at Shepherd Works: http://shepherdworks.com.au/
- Taste.com.au: www.taste.com.au/recipes/collections/low+fodmap+diet+recipes
- Kate Scarlata, RDN: www.katescarlata.com
- Patsy Castos MS, RD, LD: www.ibsfree.net

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Other Resources at SIBOinfo.com

- **Allison Siebecker, ND**
  - SIBO Specific Food Guide (SSFG) and other resources on the Bi-Phasic Diet, a SIBO app for iPhone & iPad
  - Bi-Phasic Diet, Dr. Jacobi
  - Bi-Phasic Diet by Rebecca Coomes
  - Cedars-Sinai Diet (C-SD)
  - Many podcasts and other resources
- **Mark Pimentel, MD**
  - Cedar Sinai-Diet
  - *A New IBS Solution*, Health Point Press Publisher.

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Angeline

CASE STUDY

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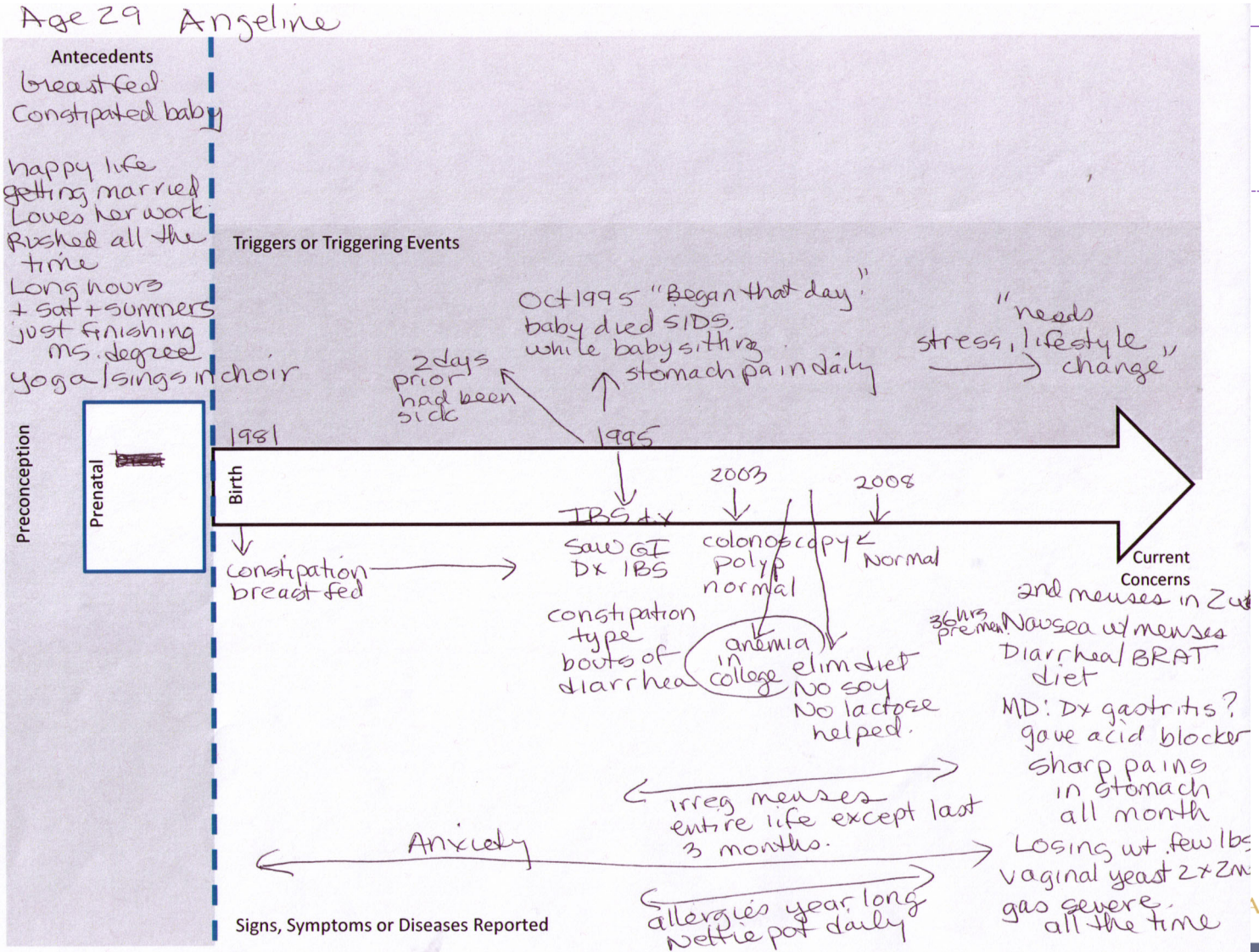
Age 29 Angeline
Antecedents
breast fed
Constipated baby
happy life
getting married
Loves her work
Rushed all the time
Long hours + sat + summers just finishing MS. degree
yoga / sings in choir
Preconception
Prenatal
Triggers or Triggering Events
1981
Birth
2 days prior had been sick
Oct 1995 "Began that day" baby died SIDS while babysitting
stomach pain daily
1995
"needs stress, lifestyle change"
IBS dx
2003
2008
saw GI Dx IBS
colonoscopy polyp normal
Normal
constipation breast fed
constipation type bouts of diarrhea
anemia in college
elim diet No soy No lactose helped.
Current Concerns
2nd menses in 2 wks
36 hrs pre men Nausea w/ menses
Diarrhea / BRAT diet
MD: Dx gastritis? gave acid blocker
sharp pains in stomach all month
Losing wt. few lbs
vaginal yeast 2 x 2 wks
gas severe all the time
irreg menses entire life except last 3 months.
Anxiety
allergies year long Nettie pot daily
Signs, Symptoms or Diseases Reported

Food Diary

- Banana with organic peanut butter
- water throughout the day.
- White rice with garlic and Kebabs: chicken, sausage, tomatoes, peppers, onions, zucchini & pineapple, topped with avocado
- Piece of chocolate
- 1 large lemon poppy cookie
- 8 oz Pomegranate Cherry juice
- 1 vegetarian Mexican Gumbo soup (rice, pinto beans, black beans, pico de gallo, corn salsa, lettuce, tortilla strips)
- Popcorn with olive oil, salt and butter
- 1 glass of Pino Grigio rose

NUTRIENT ANALYSIS:

Meets needs for fiber and fat

Protein 67%

>Carbs: 139% / >Sugars

Servings veg/fruit: 5

Insufficient micronutrients: B1, B2, B5, B6, B12, Folate, Vitamins A, C, D, E, K, Calcium, Cu, Fe, Mg, P, K, Se, Zn

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Initial plan and intervention

1. Initiate diet change: Low-FODMAP
2. Probiotic supplement and foods
3. Ask physician for:
   - Celiac testing
   - SIBO testing
   - Vitamin D testing
   - Possible stool testing

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3 Week Follow-Up

- SIBO test negative.
  - Physician treated empirically with Rifaxamin.
- No IBS
- No anxiety
- Allergies gone
- No issues with menses
- Best felt in life

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8 Week Follow-Up

- Feels great on low-FODMAP diet
- Digestive issues “so good lately”.
  - **Ate rice, got horrible gas, felt like stomach twisted. “Reminded me of the old days.”**
  - **Gets immediate pain when eating beans or lentils.**
- **Plan:**
  - Begin herbal protocol for SIBO
  - Continue probiotics.
  - Added proteolytic enzymes on empty stomach 2 BID

12 Week Follow-Up

"I haven't felt this good since birth. Even when I'm sleepy I'm still more clear headed than ever."

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6 Month Follow-Up

- Exposed to mold from air conditioner.
- Allergies kicked in
- Digestive system, pretty good.
- On GAPS diet with gaps!
- Can have bits of pasta or ice cream and okay.
- Beans give gas
- Wedding in 2 weeks.

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9 month follow-up

"After learning what I can and can't eat, I now have a better relationship with food—one that doesn't involve pain! I'm happier and more energized and I'm expecting my first baby this spring."

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Specific Carbohydrate Diet

Who Benefits from a Specific Carbohydrate Diet

- Children with pediatric Crohn's disease
- Adults with Crohn's and Inflammatory Bowel Disease
- People who cannot break down disaccharides

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SCD Allowed Foods

- Vegetables/non starchy
- Honey, fruit, & juices
- Dairy: Yogurt (homemade), hard cheeses dry-curd cottage cheese
- Meat: Fish, poultry, beef, bison, lamb, +
- Legumes: string beans, lima beans
- Nuts, seeds, nut butters
- Oils: avocado, coconut, olive, ghee, e
- Broths

	Suskind et al., 2014	Cohen et al., 2014	Olendski et al., 2014	Suskind et al., 2016
Study Intervention	7 children •SCD diet 5-30 months *(average 4.6 +/- 10.8 months)* •No medications	10 children enrolled, 9 completed •12-week SCD diet at least 85% of calories	40 patients with CD and UC •27 went on anti-inflammatory diet	417 patients with IBD who had tried SCD (47% CD/43% UC/ 10% indeterminate colitis)
Conclusion	**•All symptoms "notably resolved" in 3 months** •Labs: albumin, CRP, HCT, calprotectin normalized or significantly improved	**All indexes sign > :** Harvey-Bradshaw, Lewis, PCDAI, blinded capsule endoscopy **Clinical & mucosal improvements** seen in children who used SCD for 12 and 52 weeks.	24/27 patients had significant changes in HBI and CDAI 3 had ambivalent or negative response	4% clinical remission before beginning the diet 33% reported remission at 2 months 42% were in remission at 6 and 12 months.

Table 2 IBD-AID food phase chart

Phase type	Phase I	Phase II	Phase III	Phase IV
	Soft, well-cooked or cooked then pureed foods, no seeds	***Soft Textures: well-cooked or pureed foods, no seeds, choose floppy or tender foods***	***May still need to avoid stems, choose floppy greens or other greens depending on individual tolerance***	***If in remission with no strictures***
Vegetables	Butternut Squash, Pumpkin, Sweet Potatoes, Onions	Carrots, Zucchini, Eggplant, Peas, Snow peas, Spaghetti squash, Green beans, Yellow beans, Microgreens (2 week old baby greens), Watercress, Arugula, Fresh flat leaf parsley and cilantro, Seaweed, Algae	Butter lettuce, Baby spinach, Peeled cucumber, Olives, Leeks Bok Choy, Bamboo shoots, Collard greens, Beet greens, Sweet peppers, Kale, Fennel bulb	Artichokes, Asparagus, Tomatoes, Lettuce, Brussels sprouts, Beets, Cabbage, Kohlrabi, Rhubarb, Pickles, Spring onions, Water chestnuts, Celery, Celeriac, Cauliflower, Broccoli, Radish, Green pepper, Hot pepper
	Pureed vegetables: Mushrooms, Phase II vegetables (pureed)	Pureed vegetables: all except cruciferous	Pureed vegetables: all from Phase IV, Kimchi	
Fruits	Banana, Papaya, Avocado, Pawpaw	Watermelon (seedless), Mangoes, Honeydew, Cantaloupe, May need to be cooked: Peaches, Plums, Nectarines, Pears, (Phase III fruits are allowed if pureed and seeds are strained out)	Strawberries, Cranberries, Blueberries, Apricots, Cherries, Coconut, Lemons, Limes, Kiwi, Passion fruit, Blackberries, Raspberries, Pomegranate (May need to strain seeds from berries)	Grapes, Grapefruit, Oranges, Currants, Figs, Dates, Apples (best cooked), Pineapple, Prunes
Meats and fish	All fish (no bones), Sardines (small bones ok), Turkey and ground beef, Chicken, Eggs	Scallops	Lean cuts of Beef, Lamb, Duck, Goose	Shrimp, Prawns, Lobster
Non dairy unsweetened	Coconut milk, Almond milk, Oat milk, Soy milk			
Dairy, unsweetened	Yogurt, Kefir	Farmers cheese (dry curd cottage cheese), Cheddar cheese	Aged cheeses	
Nuts/Oils/Legumes/Fats	Miso (refrigerated), Tofu, Olive oil, Canola oil, Flax oil, Hemp oil, Walnut oil, Coconut oil	Almond flour, Peanut flour, Soy flour, Sesame oil, Grapeseed oil, Walnut oil, Pureed nuts, Safflower oil, Sunflower oil	Whole nuts, Soybeans, Bean flours, Nut butters, Well-cooked lentils (pureed), Bean purees (e.g. hummus)	Whole beans and lentils
Grains	Ground flax or Chia Seeds (as tolerated)	Steel cut oats (well-cooked as oatmeal)	Rolled well-cooked oats	
Spices	Basil, Sage, Oregano, Salt, Nutmeg, Cumin, Cinnamon, Turmeric, Saffron, Mint, Bay leaves, Tamari (wheat free soy sauce), Fenugreek tea, Fennel tea, Vanilla	Dill, Thyme, Rosemary Tarragon, Cilantro, Basil, Parsley	Mint, Ginger, Garlic (minced), Paprika, Chives, Daikon, Mustard	Wasabi, Tamarind, Horseradish, Fenugreek, Fennel

Olendzki BC et al. 2014;13(1):5. doi:10.1186/1475-2891-13-5.

SCD References

- Cohen SA, Gold BD, Oliva S, Lewis J et al. Clinical and mucosal improvement with specific carbohydrate diet in pediatric Crohn disease. J Pediatr Gastroenterol Nutr. 2014 Oct;59(4):516-21. doi: 10.1097/MPG.0000000000000449.
- Olendzki BC et al. An anti-inflammatory diet as treatment for inflammatory bowel disease: A case series report. Nutrition Journal. 2014;13(1):5. doi:10.1186/1475-2891-13-5.
- Suskind DL, Wahbeh G, Gregory N, Vendettuoli H, Christie D. Nutritional therapy in pediatric Crohn disease: the specific carbohydrate diet. J Pediatr Gastroenterol Nutr. 2014 Jan;58(1):87-91. doi: 10.1097/MPG.0000000000000103.
- Suskind DL, et al. Patients Perceive Clinical Benefit with SCD for IBD. *Dig Dis Sci.*. 2016 Nov;61(11):3255-3260. Epub 2016 Sep 16.

Trial of Specific Carbohydrate and Mediterranean Diets to Induce Remission of Crohn's Disease (DINE-CD)

- Crohn’s and Colitis Foundation and PCORI/NIH.
- 34 sites
- 194 adults with Crohn’s disease
- 6 weeks of meals delivered
- Randomized to one of the two diets
- Results expected Summer 2021

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Comparison FODMAP and SCD in IBS

- 73 people with IBS divided into 2 groups SCD and FODMAP for 3 months
- Low FODMAP diet showed significant improved bloating and distension. Vitamin D levels declined from 38 ng/ml to 32 ng/ml. Folic acid levels dropped from 18 mg/dL to 15 mg/dL.
- SCD showed small improvement in IBS. Vitamin D levels dropped to 22 ng/ml (significantly different). Folic acid levels dropped to 8 mg/dL (significantly different).

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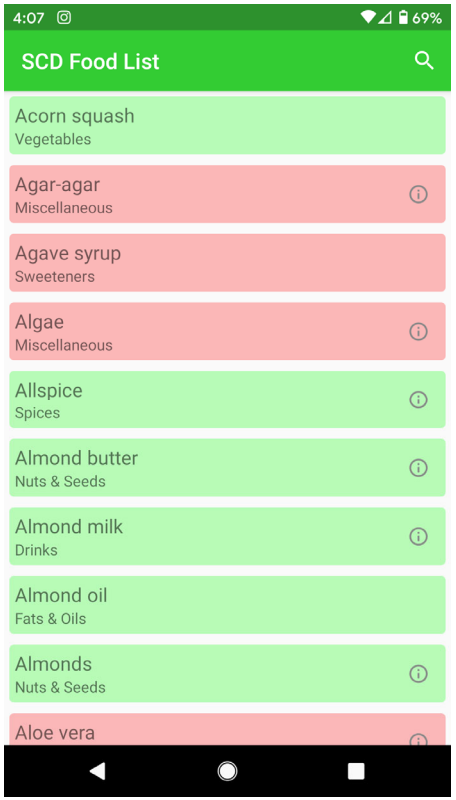
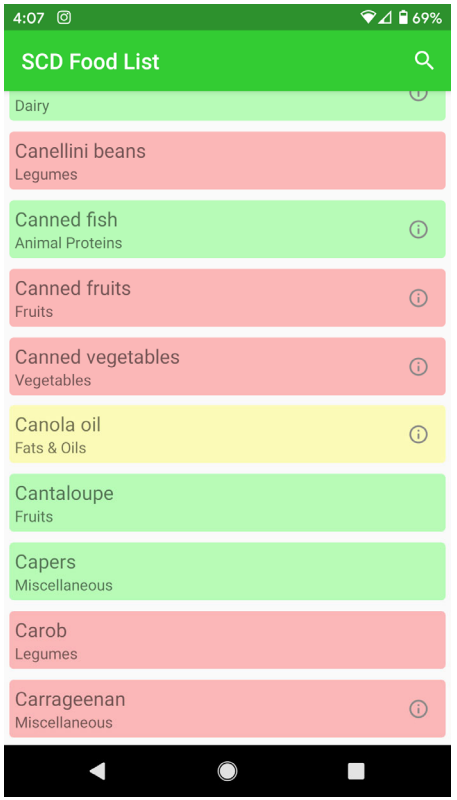
Vincenzi M, Del Ciondolo I, Pasquini E, Gennai K, Paolini B. Effects of a Low FODMAP Diet and Specific Carbohydrate Diet on Symptoms and Nutritional Adequacy of Patients with Irritable Bowel Syndrome: Preliminary Results of a Single-blinded Randomized Trial. J Transl Int Med. 2017 Jun 30;5(2):120-126. doi: 10.1515/jtim-2017-0004.

App: SCD Food List





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Specific Carbohydrate Diet Resources

- *Breaking the Viscious Cycle* by Elaine Gotschall, PhD
- Main Website: www.breakingtheviciouscycle.info
- App: SCD Food List
- Stanford University: https://med.stanford.edu/content/dam/sm/gastroenterology/documents/IBD/CarbDiet%20PDF%20final.pdf
- Seattle Children's Hospital: https://www.seattlechildrens.org/about/stories/can-the-specarbohydrate-diet-treat-inflammatory-bowel-disease/
- *Grain Free Gourmet* by Jodi Bager and Jennie Lass
- *SCD Cookbook* by Noah Jerris
- *Recipes for the Specific Carbohydrate Diet* by Raman Prasad
- Supplements: http://www.giprohealth.com/scdcomplete.aspx

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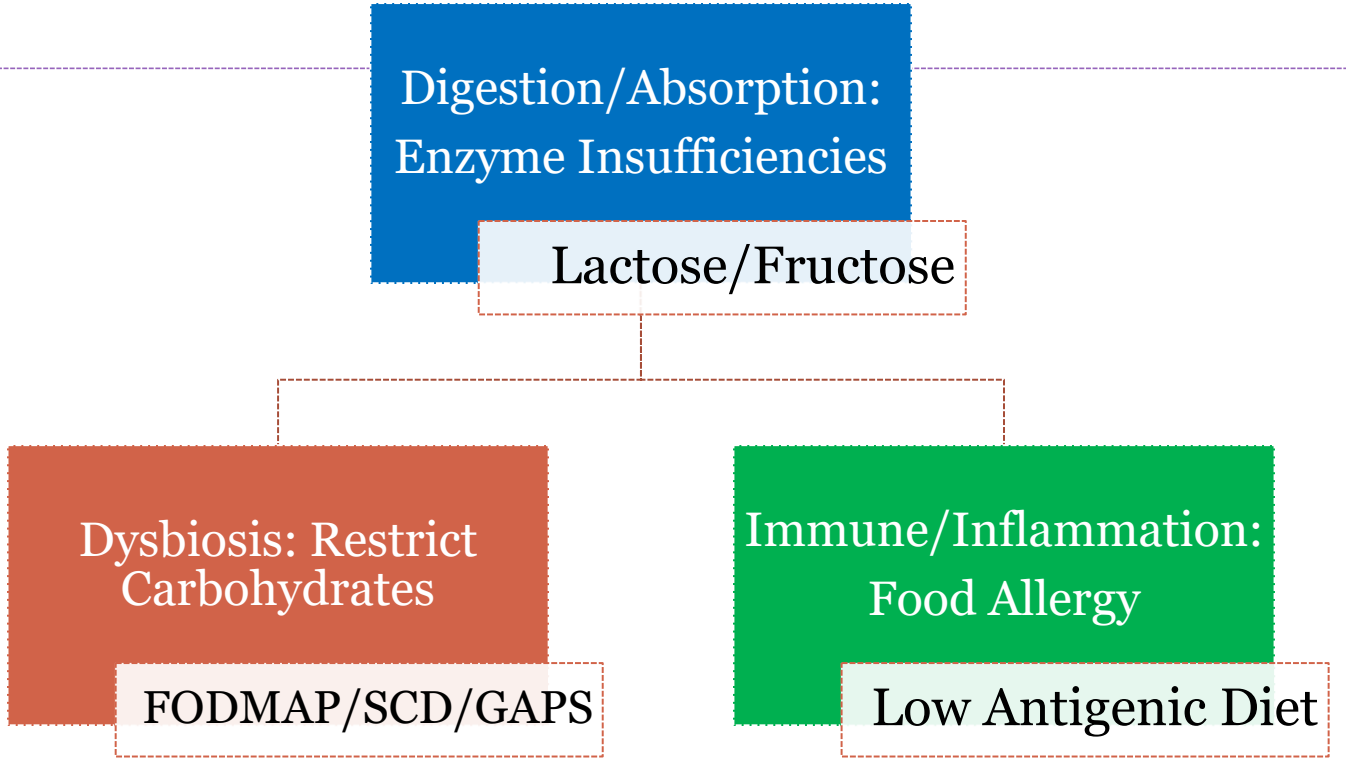

Orion Truss, MD
Father of the Candida Hypothesis

1. Tissue injury induced by Candida albicans: Mental and neurologic manifestations. Journal of Orthomolecular Psychiatry, 7:1, 17:37, 1978.
2. Restoration of Immunologic Competence to Candida Albicans Orth10(4), 1981, Pp. 228-238.
3. Metabolic Abnormalities in Patients with Chronic Candidiasis The Acetaldehyde Hypothesis JOURNAL OF ORTHOMOLECULAR PSYCHIATRY, 13(2) Orthomolecular psychiatry, 9 (4), 1980, Pp. 287-301.
4. Truss, C. O., 'The role of Candida Albicans in human illness', *Orthomolecular Psychiatry*, 1981, 8: 228–238.

Anti-Fungal Diets: Variations on a Theme

- **Lacking research, yet clinicians see benefits**
- Low in sugars, refined carbohydrates, mold-contaminated foods, restrict fruit (dried fruit, juices, fresh, frozen)
- Limits starchy vegetables and grains
- May or may not include fermented foods: yogurt, kefir, sauerkraut, kimchi
- May or may not include raw nuts and seeds
- **Allows:** all animal proteins, fats, oils, non-starchy vegetables (greens, spinach, broccoli, cabbage, cauliflower, squash, etc), and fresh herbs

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Anti-Fungal Diet with Nystatin

- 120 patients with diagnosis of Candida overgrowth were divided into two groups
  - Of people who finished the study, 80 received Nystatin plus an antifungal diet; 40 received Nystatin alone (controls)
- **10 days later:** performed mycological assessment and symptom assessment
  - 70% of diet group had significant benefit and 72.5% in control group had the same benefit (no statistically significant difference)
- **3 months later:**
  - 85% of diet + Nyastatin group had complete symptom improvement; 42.5% of the Nystatin only group had the same

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Otašević S, Momčilović S, et. al.The dietary modification and treatment of intestinal Candida overgrowth - a pilot study. J Mycol Med. 2018;28(4):623-627. doi:10.1016/j.mycmed.2018.08.002

Dr. William Crook's Yeast Questionnaires

YEAST QUESTIONNAIRE — ADULT

Answering these questions and adding up the scores will help you decide if yeasts contribute to your health problems. For each "yes" answer in Section A, circle the point score in that section. Total your score and record it at the end of the section. Then move on to sections B and C and score as indicated. Add the total of your scores to get your Grand Total Score.

SECTION A: HISTORY

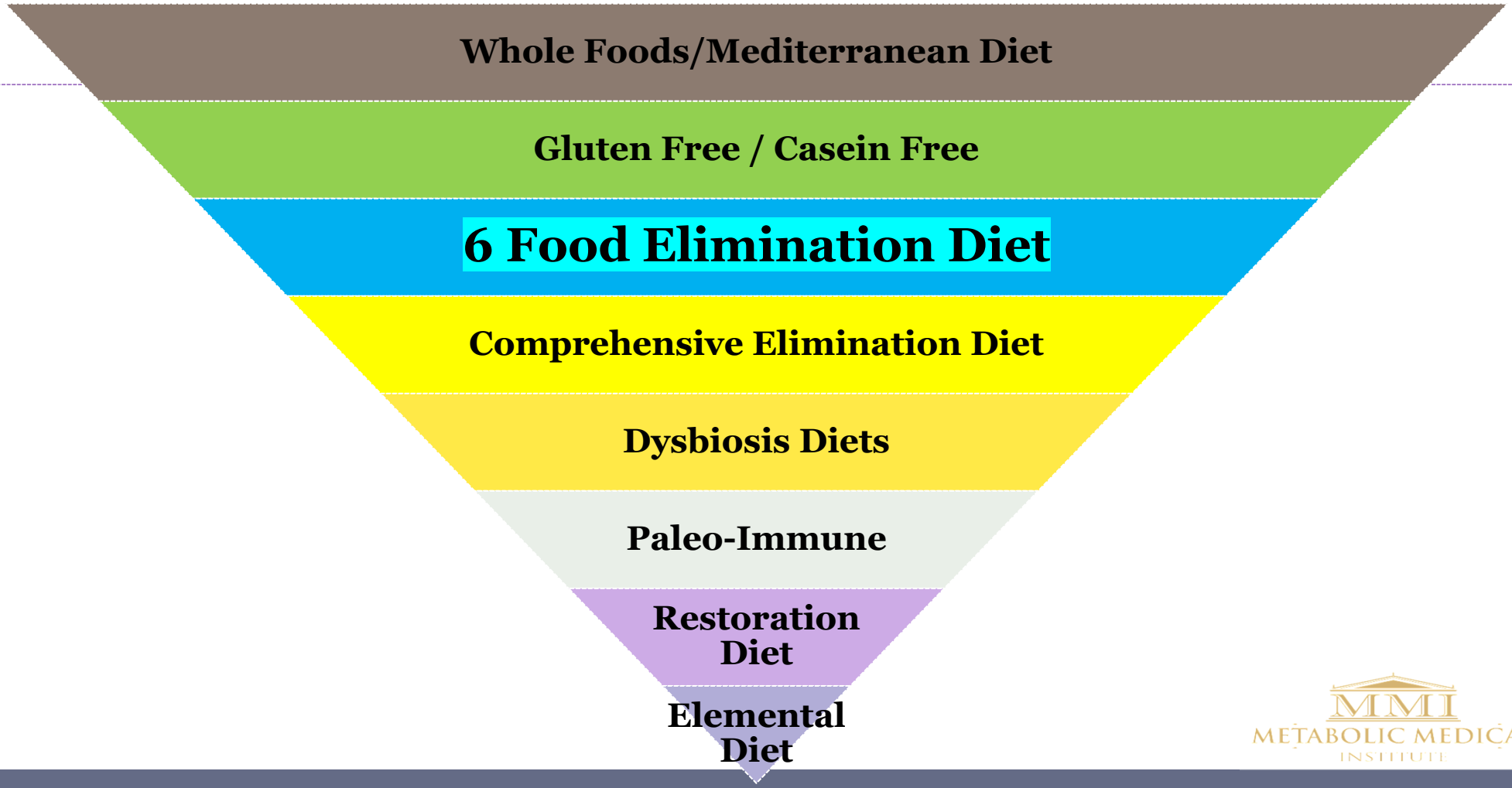
1. Have you taken tetracyclines (Sumycin, Panmycino, Vibramycin, Minocin, etc.) or other antibiotics for acne for one month (or longer)? 35
2. Have you, at any time in your life, taken other "broad spectrum" antibiotics* for respiratory, urinary, or other infections (for two months or longer, or in shorter courses four or more times in a one-year period)? 35
3. Have you taken a broad spectrum antibiotic drug*, even a single course? 6
4. Have you, at any time in your life, been bothered by persistent prostatitis, vaginitis, or other problems affecting your reproductive organs? 25
5. Have you been pregnant two or more times? 5
   Pregnant one time? 3
6. Have you taken birth control pills for more than two years? 15
   For six months to two years? 8
7. Have you taken prednisone, Decadrong or other cortisone-type drugs for more than two weeks? 15
   For two weeks or less? 6
8. Does exposure to perfumes, insecticides, fabric shop odors, and other chemicals provoke
   Moderate to severe symptoms? 20
   Mild symptoms? 5
9. Are your symptoms worse on damp, muggy days or in moldy places? 20
10. Have you had athlete's foot, ringworm, jock itch, or other chronic fungus infections of the skin or nails? Have such infections been: Severe or persistent? 20
    Mild to moderate? 10
11. Do you crave sugar? 10
12. Do you crave breads? 10
13. Do you crave alcoholic beverages? 10
14. Does tobacco smoke really bother you? 10

Section A Total Points: _____

YEAST QUESTIONNAIRE — CHILD

Answering these questions and adding up the scores will help you decide if yeasts contribute to your child's health problems. For each "yes" answer, circle the points that correspond to that question. Total the score and record it at the end of the questionnaire.

1. During the two years before your child was born, were you bothered by recurrent vaginitis, menstrual irregularities, premenstrual tension, fatigue, headache, depression, digestive disorders, or "feeling bad all over"? 30
2. Was your child bothered by thrush?
   Mild? 10
   Severe or persistent? 20
3. Was your child bothered by frequent diaper rashes in infancy?
   Mild? 10
   Severe or persistent? 20
4. During infancy, was your child bothered by colic and irritability lasting longer than three months?
   Mild? 10
   Severe or persistent? 20
5. Are your child's symptoms worse on damp days or in damp or moldy places? 20
6. Has your child been bothered by recurrent or persistent "athlete's foot" or chronic fungus infections of his or her skin or nails? 30
7. Has your child been bothered by recurrent hives, eczema, or other skin problems? 10
8. Has your child received:
   - Four or more courses of antibiotic drugs during the past year? Or has your child received continuous "prophylactic" courses of antibiotic drugs? 80
   - Eight or more courses of "broad-spectrum" antibiotics (such as amoxicillin,Keflex, Septra, Bactrim, or Ceclor) during the past three years? 50
9. Has your child experienced recurrent ear problems? 10
10. Has your child had tubes inserted in his or her ears? 10
11. Has your child been labeled "hyperactive"?
    Mild? 10
    Severe? 20
12. Is your child bothered by learning problems (even though his or her early developmental history was normal)? 10
13. Does your child have a short attention span? 10
14. Is your child persistently irritable, unhappy, and hard to please? 10
15. Has your child been bothered by persistent or recurrent digestive problems, including constipation, diarrhea, bloating, or excessive gas?
    Mild? 10
    Moderate? 20
    Severe? 30



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Eosinophilic Esophagitis (EOE): Motility/Immune/Inflammation

- Seen in 0.4% of adults and children in Western countries
- Antigen-based immune condition (mainly food antigen)
- Elevated eosinophils on biopsy of esophagus (at least 15 eos)
- Most people also have a history of atopic illness
- PPI's can be used to help with diagnosis and treatment
- Underlying factors: C-section, premature birth, bottle fed, antibiotics during infancy, food allergies, impaired barrier function, rural living, one case of nickel allergy
- Other causes are rare: allergic vasculitis, parasitic infection, Crohn's disease of the esophagus, esophageal leimyomatosis

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Eosinophilic Esophagitis: Symptoms

ADULTS

- Dysphagia
- Food impaction
- Regurgitation of food
- Nausea or vomiting
- Diarrhea
- Stomach or chest pain
- GERD
- Poor appetite
- Bloating
- Anemia
- Blood in stool
- Malnutrition
- Insomnia

CHILDREN

- Dysphagia
- Food impaction
- Feeding/Eating problems
- Failure to thrive
- Vomiting
- Abdominal pain
- GERD but not responsive to medication

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Allergy Tests do NOT Predict Food Triggers in EoE

- 82 patients with EoE tested in 5 ways to determine Food Triggers
  - Serum IgG
  - Serum IgE
  - Skin Prick testing
  - Skin Patch testing
  - Basophil activation test

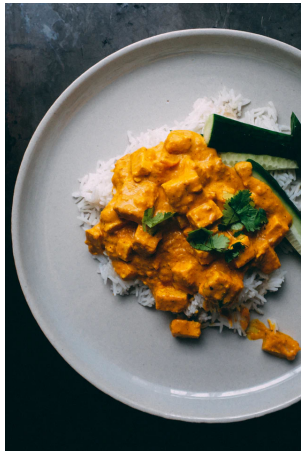
- Results: None of the 5 types of tests accurately were able to predict food triggers.

Philpott H. Allergy tests do not predict food triggers in adult patients with eosinophilic oesophagitis. A comprehensive prospective study using five modalities. Aliment Pharmacol Ther. 2016;44(3):223-233.

Six-Food Elimination Diet

AVOID

- Cow's milk
- Soy
- Wheat
- Egg
- Peanut/Tree Nuts
- Fish & Shellfish



Gonsalves N, Yang G, Doerfler B et al. A prospective trial of six food elimination diet and reintroduction of causative agents in adults with eosinophilic esophagitis (EE). Gastroenterology. 2008;134(4):S1A104-105.

6 Food Elimination Diet for EoE

- Forty-nine **(73.1%) patients exhibited significant reduced eosinophil counts** (< 15 eos/hpf)
  - A single offending food was identified in 35.71% of patients
  - 2 triggers in 30.95% and 3 or more triggers in 30.95%
- **Cow's milk was the most common food antigen** (61.9%), followed by wheat (28.6%), eggs (26.2%) and legumes (23.8%)
- Prior allergy testing showed NO CONCORDANCE with food reintroduction challenge results.

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Lucendo A, Arias Á, González-Cervera J, et al. Empiric 6-food elimination diet induced and maintained prolonged remission in patients with adult eosinophilic esophagitis: A prospective study on the food cause of the disease. *The Journal of allergy and clinical immunology*. 2013;131(3):797–804.

Pediatric Response to Dairy Free Diets and Six Food Elimination Diets for EoE

- Wong: Overall response: DFD 56.9% and SFED 52.0% Treatment period < 10 weeks to > 12 weeks. No different by timing or age.
- Kagalwalla: DFD 65% and second paper: 75% to SFED
- Cotton: 69% response to SFED

Wong J,. Efficacy of Dairy Free Diet and 6-Food Elimination Diet as Initial Therapy for Pediatric Eosinophilic Esophagitis: A Retrospective Single-Center Study. Pediatr Gastroenterol Hepatol Nutr. 2020;23(1):79-88. doi:10.5223/pghn.2020.23.1.79;

Kagalwalla AF, Shah A, Li BU, Sentongo TA, Ritz S, Manuel-Rubio M, et al. Identification of specific foods responsible for inflammation in children with eosinophilic esophagitis successfully treated with empiric elimination diet. J Pediatr Gastroenterol Nutr. 2011;53:145–149.;

Kagalwalla AF, Shah A, Ritz S, Melin-Aldana H, Li BU. Cow's milk protein-induced eosinophilic esophagitis in a child with gluten-sensitive enteropathy. J Pediatr Gastroenterol Nutr. 2007;44:386–388;

A Cotton CC, Eluri S, Wolf WA, Dellon ES. Six-food elimination diet and topical steroids are effective for eosinophilic esophagitis: a meta-regression. Dig Dis Sci. 2017;62:2408–2420.

Cost-Base Analysis: Topical Steroids vs SFED
Systematic Review 8 SFED, 25 tCS

	Six-Food Elimination Diet	Topical budesonide	Topical fluticasone
Symptom Response	87.3%	87.9%	82.3%
Eosinophil count < 15 per hpf	69.0%	76.8%	70.9%
Cost over 5 years	$5719.72 per person	$9261.58 per person	

"Our data suggest that, on average, when compared to tCS as first-line therapy for EoE, SFED should be about as effective and substantially less expensive from a payer perspective over five-years."

Cotton CC, Erim D, Eluri S, et al. Cost Utility Analysis of Topical Steroids Compared With Dietary Elimination for Treatment of Eosinophilic Esophagitis. *Clin Gastroenterol Hepatol. 2017;15(6):841-849.e841.*

Chris: “Difficulty swallowing”

- Male, age 64. For 15 years occasional trouble swallowing. Several endoscopies and dilation of esophagus. Dx: interstitial esophagitis
- 2016 scoped with biopsy: Dx EoE and stricture in esophagus.
- Put on PPI and inhaled steroids 3 months.
- Re-scoped: No improvement.
- 5 months 6-food elimination diet + inhaled steroids.
- Re-scoped: no eosinophils in biopsy, no stricture, no inflammation.
- 3 months later, beginning to have swallowing issues. Self-removed beer and wine. Improvement again.

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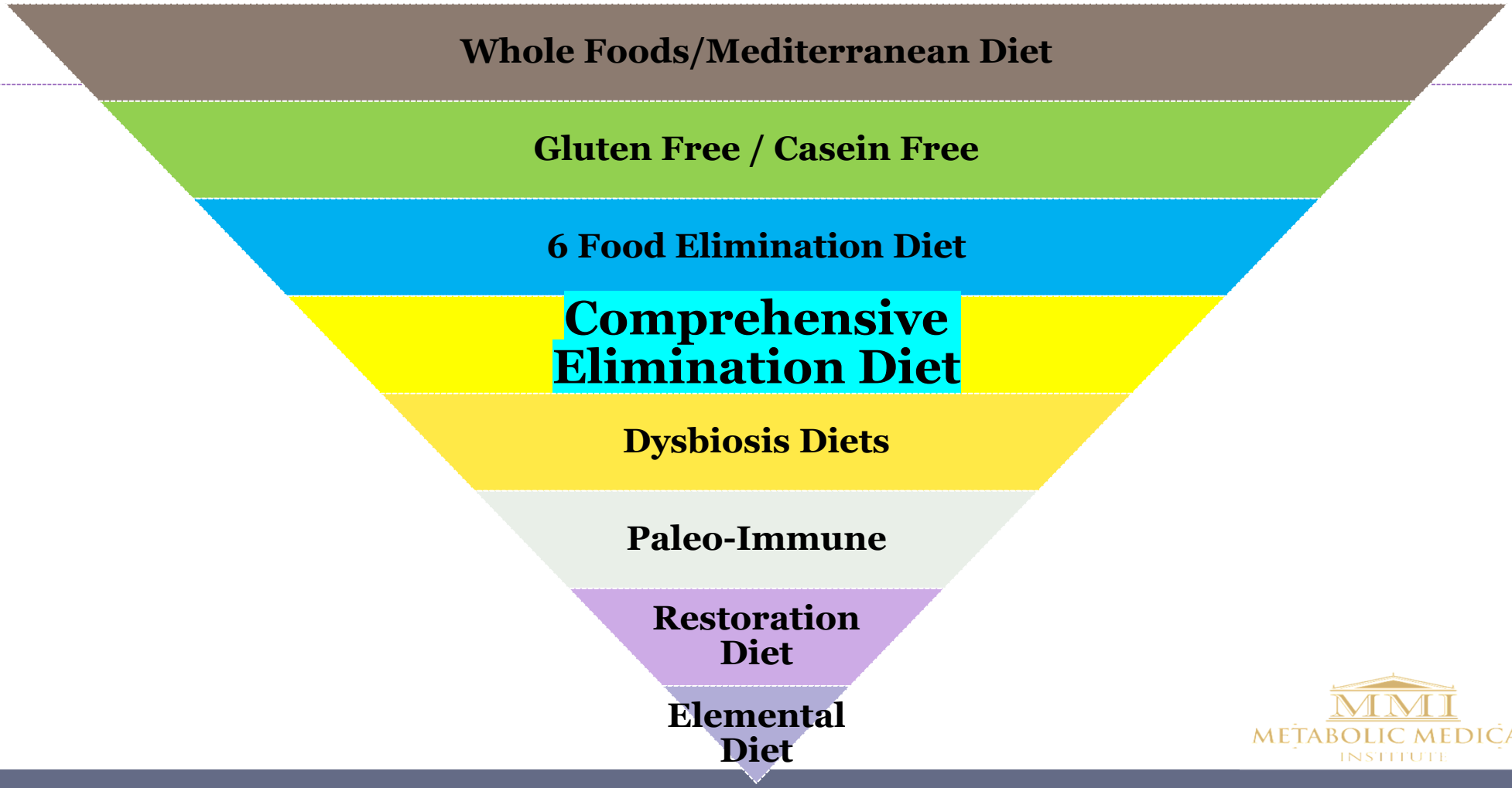
Low Histamine Diet for EoE?

- Histamine Intolerance
- No diet research yet, but histamine-producing cells (including mast cells & basophils) have been implicated in EoE & evidence of altered histamine receptor expression has been found
- Research on eczema, hives, diarrhea, headache, asthma, pruritic, flushing
- **Main foods to avoid:** Leftovers, any cultured or fermented food, fish unless really fresh, alcohol, mature cheese, smoked meats, sausages, nuts, chocolate

Merves J, Chandramouleeswaran PM, Benitez AJ, et al. Altered Esophageal Histamine Receptor Expression in Eosinophilic Esophagitis (EoE): Implications on Disease Pathogenesis. Andl CD, ed. PLoS ONE. 2015;10(2):e0114831. doi:10.1371/journal.pone.0114831.


Whole Foods/Mediterranean Diet
Gluten Free / Casein Free
6 Food Elimination Diet
Comprehensive Elimination Diet
Dysbiosis Diets
Paleo-Immune
Restoration Diet
Elemental Diet
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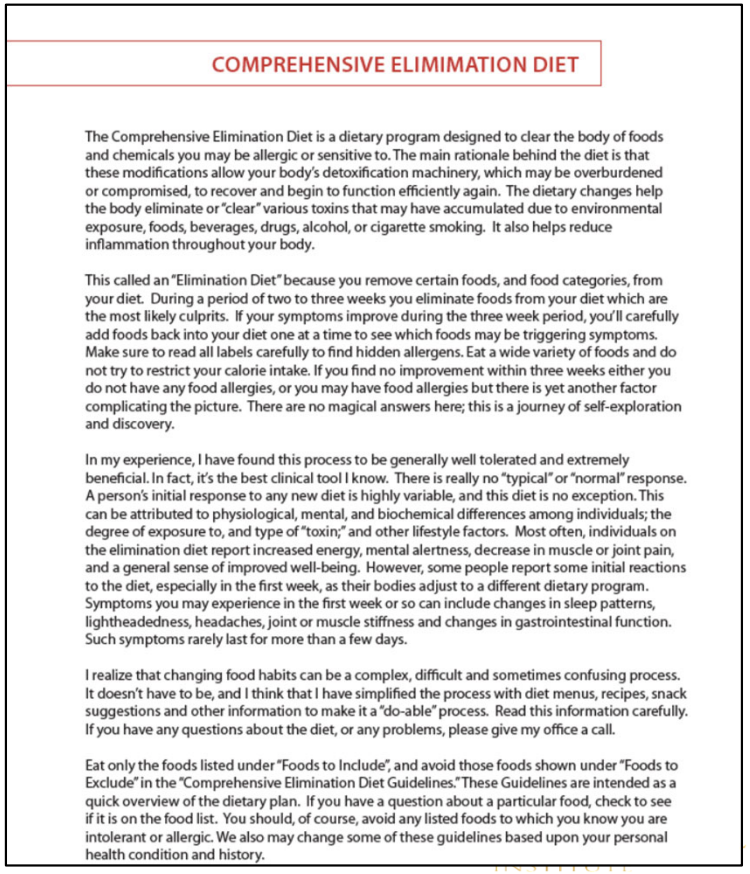
Comprehensive Elimination Diet

- Pain
- Inflammation
- Immune conditions
- Mystery conditions
- Mood disorders
- GI issues
- Allergies, Eczema, Asthma
- History of antibiotic use
- Food sensitivities



COMPREHENSIVE ELIMIMATION DIET

The Comprehensive Elimination Diet is a dietary program designed to clear the body of foods and chemicals you may be allergic or sensitive to. The main rationale behind the diet is that these modifications allow your body's detoxification machinery, which may be overburdened or compromised, to recover and begin to function efficiently again. The dietary changes help the body eliminate or "clear" various toxins that may have accumulated due to environmental exposure, foods, beverages, drugs, alcohol, or cigarette smoking. It also helps reduce inflammation throughout your body.

This called an "Elimination Diet" because you remove certain foods, and food categories, from your diet. During a period of two to three weeks you eliminate foods from your diet which are the most likely culprits. If your symptoms improve during the three week period, you'll carefully add foods back into your diet one at a time to see which foods may be triggering symptoms. Make sure to read all labels carefully to find hidden allergens. Eat a wide variety of foods and do not try to restrict your calorie intake. If you find no improvement within three weeks either you do not have any food allergies, or you may have food allergies but there is yet another factor complicating the picture. There are no magical answers here; this is a journey of self-exploration and discovery.

In my experience, I have found this process to be generally well tolerated and extremely beneficial. In fact, it's the best clinical tool I know. There is really no "typical" or "normal" response. A person's initial response to any new diet is highly variable, and this diet is no exception. This can be attributed to physiological, mental, and biochemical differences among individuals; the degree of exposure to, and type of "toxin;" and other lifestyle factors. Most often, individuals on the elimination diet report increased energy, mental alertness, decrease in muscle or joint pain, and a general sense of improved well-being. However, some people report some initial reactions to the diet, especially in the first week, as their bodies adjust to a different dietary program. Symptoms you may experience in the first week or so can include changes in sleep patterns, lightheadedness, headaches, joint or muscle stiffness and changes in gastrointestinal function. Such symptoms rarely last for more than a few days.

I realize that changing food habits can be a complex, difficult and sometimes confusing process. It doesn't have to be, and I think that I have simplified the process with diet menus, recipes, snack suggestions and other information to make it a "do-able" process. Read this information carefully. If you have any questions about the diet, or any problems, please give my office a call.

Eat only the foods listed under "Foods to Include", and avoid those foods shown under "Foods to Exclude" in the "Comprehensive Elimination Diet Guidelines." These Guidelines are intended as a quick overview of the dietary plan. If you have a question about a particular food, check to see if it is on the food list. You should, of course, avoid any listed foods to which you know you are intolerant or allergic. We also may change some of these guidelines based upon your personal health condition and history.

ALLOW:

- Vegetables/fruits
- Non-gluten grains (rice, quinoa, oat, buckwheat)
- Fish, organic poultry and lamb
- Flax/coconut
- Brown rice syrup or stevia
- Herbs, spices
- **Vegetarians: legumes**

AVOID:

- Wheat, gluten grains
- Eggs
- Corn
- Beef, pork, shellfish, cold cuts
- Soy
- Refined sugars
- Dairy products
- Food chemicals
- Peanuts

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Case History

- 48 year old male
- Weight: 245 lbs. Height: 6'1"

- <u>Main Complaint:</u>
- GI cramps constant 2-3 days, sharp pains are relieved with diarrhea which lasts 2-3 days. Occurs several times a month
- Abdominal bloating
- BM: At least three times daily

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Secondary Complaints

- Lower back: fairly consistent low-grade pain with flare-ups sending pain to hips and legs
- Muscle inflammation, difficult to grip without pain.
- Constant pain in hands and feet.
- Eczema
- Allergies/stuffy nose: cats, dust, pollen, molds
- Depression
- Low energy level
- Caffeine to jump start
- Legs swollen by the end of the day

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History/Family History

- Life-long GI issues---remembers several times a year as a child RAP and diarrhea.
- Asthma as a child- age 10
- Brothers also had asthma
- Had stomach ulcer—as a child
- No significant family history noted.

Prior Testing

- Upper GI: negative
- Endoscopy: negative except for hiatal hernia
- Colonoscopy: negative

Current Medical Diagnoses

1. IBS
2. Osteo-arthritis
3. Depression
4. Hypertension
5. High cholesterol
6. Eczema
7. Obesity (BMI 32)
8. Allergies

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Medications/Supplements

- Welbutrin XL
- Benicar HCT
- Topical steroid ointment
- Aspirin
- Previously had been on Lipitor

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Initial Plan

- IgG and IgE food sensitivity/allergy testing
- Ask physician to run Celiac Panel
- In the meantime, begin Elimination Diet plan for 2 weeks
- Begin taking supplemental potassium (99 mg) & magnesium (200 mg) & calcium (400 mg) due to depletion from hydrochlorothiazide diuretic

- Recheck in 2 weeks

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2-week check in

- Celiac testing: negative (IgG, trans-glutaminase, endomysial, anti-gliaden)/ Just sent in IgG/IgE testing
- Was faithful to elimination diet
- Did not take mineral supplement
- Lost 8 pounds
- No gut pain, cramping or diarrhea
- No hand, foot, leg, or hip pain
- Played fiddle at a concert for 3 hours
- Depression has lifted
- Has not started calcium, magnesium or potassium.
- Nasal congestion has cleared.
- Plan: Continue with diet.

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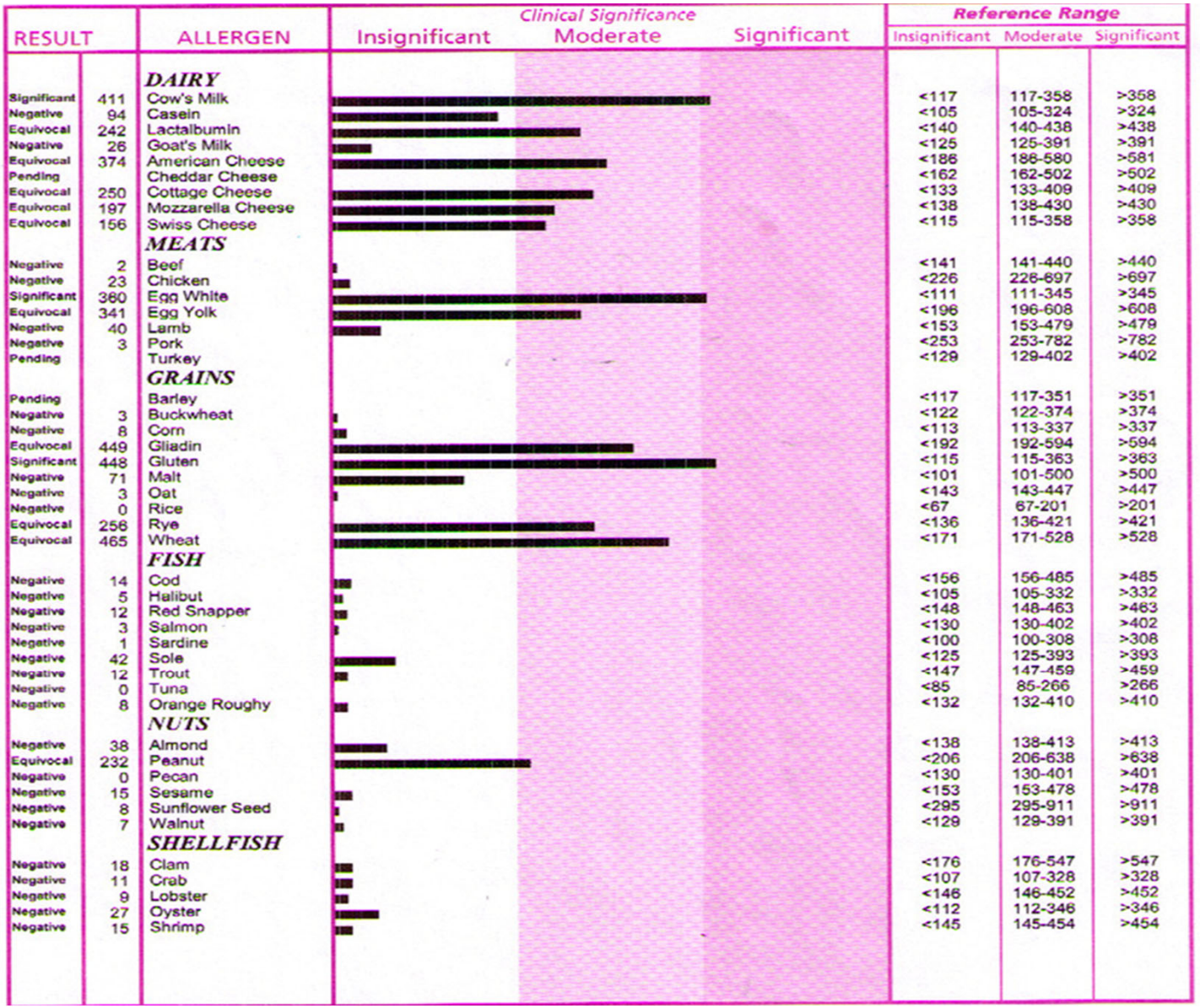

RESULT		ALLERGEN	Clinical Significance			Reference Range		
			Insignificant	Moderate	Significant	Insignificant	Moderate	Significant
		DAIRY						
Negative	83	Bleu Cheese				<101	101-297	>297
Equivocal	117	Parmesan				<111	111-328	>328
Equivocal	198	Ricotta				<153	153-472	>472
Equivocal	261	Yogurt				<127	127-399	>399
		GRAINS						
Negative	3	Flaxseed				<180	180-554	>554
Negative	0	Millet				<142	142-432	>432
Negative	0	Psyllium Seed				<43	43-124	>124
Negative	0	Safflower Seed				<137	137-430	>430
Significant	648	Spelt				<145	145-449	>449
Equivocal	307	Triticale				<113	113-342	>342
Negative	5	Brown Rice				<21	21-200	>200
		VEGETABLES						
Negative	41	Alfalfa				<139	139-411	>411
Negative	0	Artichoke				<141	141-417	>417
Negative	19	Bamboo Shoots				<208	208-640	>640
Negative	18	Bean Sprouts				<168	168-519	>519
Negative	14	Black-eyed Peas				<243	243-757	>757
Negative	0	Bok Choy				<114	114-337	>337
Negative	1	Brussels Sprouts				<154	154-479	>479
Negative	5	Collard Greens				<206	206-634	>634
Negative	0	Garbanzo Bean				<122	122-366	>366
Negative	0	Kale				<98	98-301	>301
Negative	0	Mung Bean				<94	94-280	>280
Significant	517	Navy Bean				<124	124-362	>362
Negative	0	Okra				<76	76-229	>229
Negative	0	Olive (Green)				<90	90-270	>270
Negative	23	Parsnip				<107	107-332	>332
Equivocal	230	Pinto Bean				<102	102-310	>310
Negative	0	Radish				<115	115-350	>350
Negative	4	Red Pepper				<106	106-315	>315
Negative	3	Rutabaga				<177	177-513	>513
Negative	65	Squash (Summer)				<114	114-340	>340
Negative	2	Squash (Winter)				<208	208-645	>645
Negative	2	Turnip				<134	134-416	>416
Negative	0	Water Chestnut				<63	63-189	>189
Negative	15	Watercress				<135	135-410	>410
Negative	62	Yam				<91	91-298	>298
Negative	70	Zucchini				<153	153-475	>475
		FRUITS						
Equivocal	173	Blackberry				<155	155-479	>479
Negative	0	Boysenberry				<118	118-358	>358
Negative	0	Cantaloupe				<122	122-378	>378
Negative	0	Cherry				<144	144-466	>466
Negative	0	Currants				<261	261-813	>813
Equivocal	250	Fig				<246	246-767	>767
Negative	0	Grape (White)				<209	209-652	>652
Negative	0	Honeydew				<91	91-275	>275
Negative	37	Lime				<104	104-320	>320
Negative	0	Persimmon				<148	148-442	>442
Negative	0	Rhubarb				<116	116-344	>344
Negative	26	Tangerine				<104	104-318	>318

6 weeks

- More improvement without eggs in diet
- Has lost 18 pounds
- No arthritis
- No IBS symptoms
- Off Welbutrin
- Has good energy, not relying on caffeine
- No improvement with eczema
- Hyper-sensitive to gluten

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3 month follow-up

- Continues to feel great. “I never realized I’d actually feel younger.”
- Found Belgian beers without gluten
- Lost 30 pounds
- Energy level is high
- No IBS/ No arthritis /No depression
- Stopped Medications
- Eczema changing slowly
- Extreme sensitivity to gluten

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1 year check in

- Still on the diet
- Not taking supplements
- Feeling great!
- Off of all medications
- > Cholesterol and >blood pressure
- Eczema not cleared
- Gums are healthier than ever
- Still sensitive to gluten
- Seems more sensitive to dairy than previously
- Hayfever and allergies are diminished

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"I find myself ridiculously happy, rediscovering myself, spending lots of time alone with my thoughts, enjoying this glorious Spring."

David

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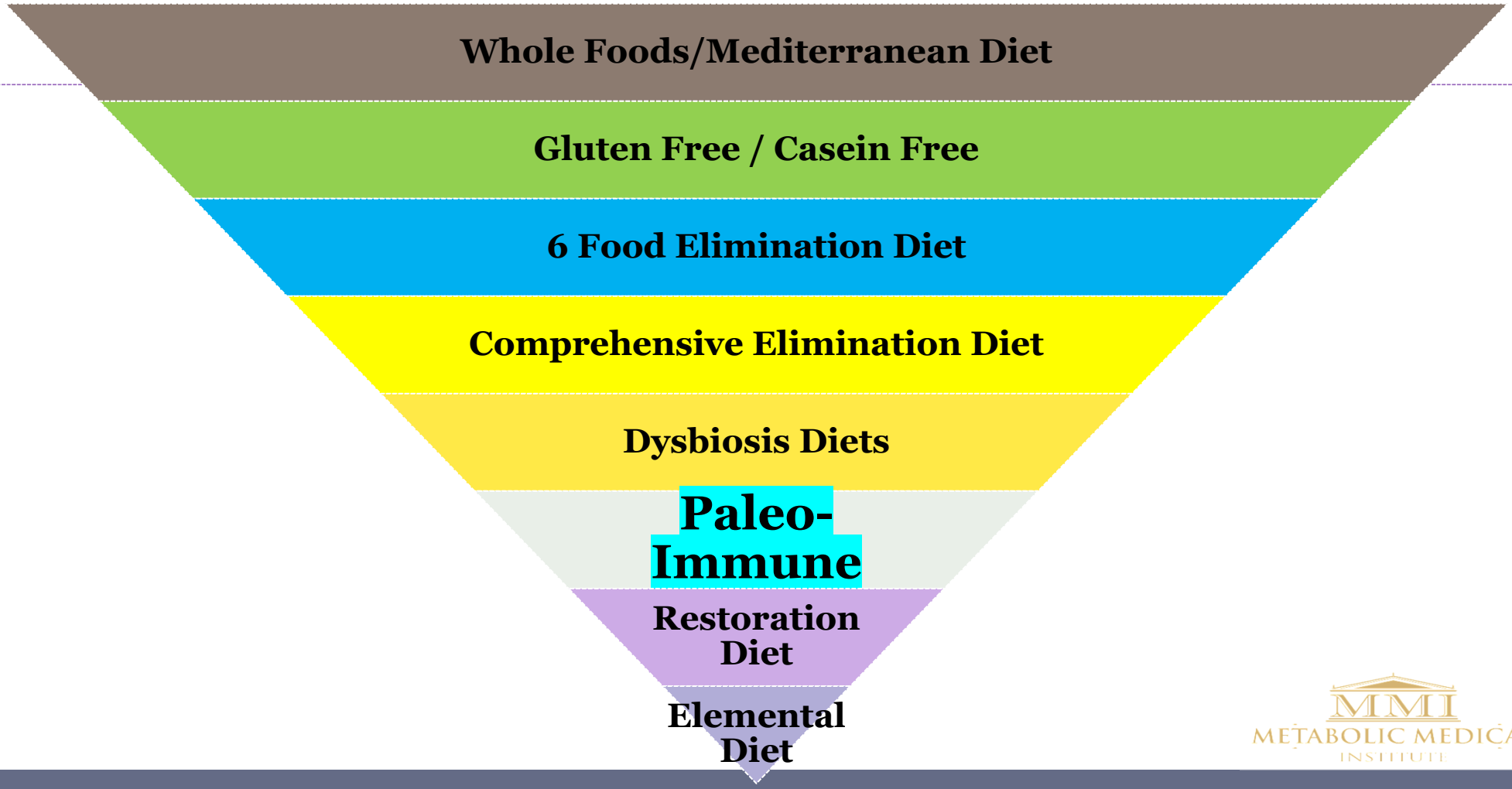

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Autoimmune Diet for IBD

- 15 people with IBD (mean 19 years duration) use of biological medications in 7 (47%)
- 9 had Crohn's Disease/6 Ulcerative colitis
- 6 week plan
- **Eliminated:** grains, legumes, nightshades, dairy, eggs, coffee, alcohol, nuts, seeds, refined sugars, oils, food additives
- **Eat:** fresh foods, bone broth, fermented foods

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Konijeti GG, Kim N, Lewis JD, Groven S, Chandrasekaran A, Grandhe S, Diamant C, Singh E, Oliveira G, Wang X, Molparia B, Torkamani A. Efficacy of the Autoimmune Protocol Diet for Inflammatory Bowel Disease. Inflamm Bowel Dis. 2017 Nov;23(11):2054-2060. doi: 10.1097/MIB.0000000000001221.

Results:

- Clinical remission by 6 weeks in 11/15 (73%); maintained at 11 weeks
- This is = in benefit to most Rx for IBD
- Can be used along with conventional therapy
- In 2 patients with ileal strictures got worse

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Konijeti GG, Kim N, Lewis JD, Groven S, Chandrasekaran A, Grandhe S, Diamant C, Singh E, Oliveira G, Wang X, Molparia B, Torkamani A. Efficacy of the Autoimmune Protocol Diet for Inflammatory Bowel Disease. Inflamm Bowel Dis. 2017 Nov;23(11):2054-2060. doi: 10.1097/MIB.0000000000001221.

Paleo Immune: Allowed foods

Protein

- Animal protein
- Eggs
- Protein Powders
- Beans/Pulses
- Hemp protein

Vegetables

- All non-starchy vegetables

Fruit

- Berries, cranberries, cherries, kiwi, pomegranate

Nuts and Seeds: All

Oils and Fats:

- Avocado
- Coconut oil and milk
- Ghee (clarified butter)
- Butter
- Olives and olive oil
- Sesame

Dairy Alternatives *(unsweetened)*

- Coconut kefir
- Coconut yogurt
- Nut or seed milk

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Konijeti, G. G., Efficacy of the autoimmune protocol diet for IBD, 23(11), 2054-2060.

Paleo Immune: Allowed foods

Beverages

- Water
- Broth/Stock
- Seltzer
- Tea: decaffeinated green tea, herbal teas
- Coconut water kefir
- Freshly made vegetable juice

Herbs and Spices

Condiments

- Coconut amino acids
- Lemon & Lime juice
- Miso
- Mustard (stone ground)
- Tamari
- Vinegars (apple cider, balsamic, etc.)

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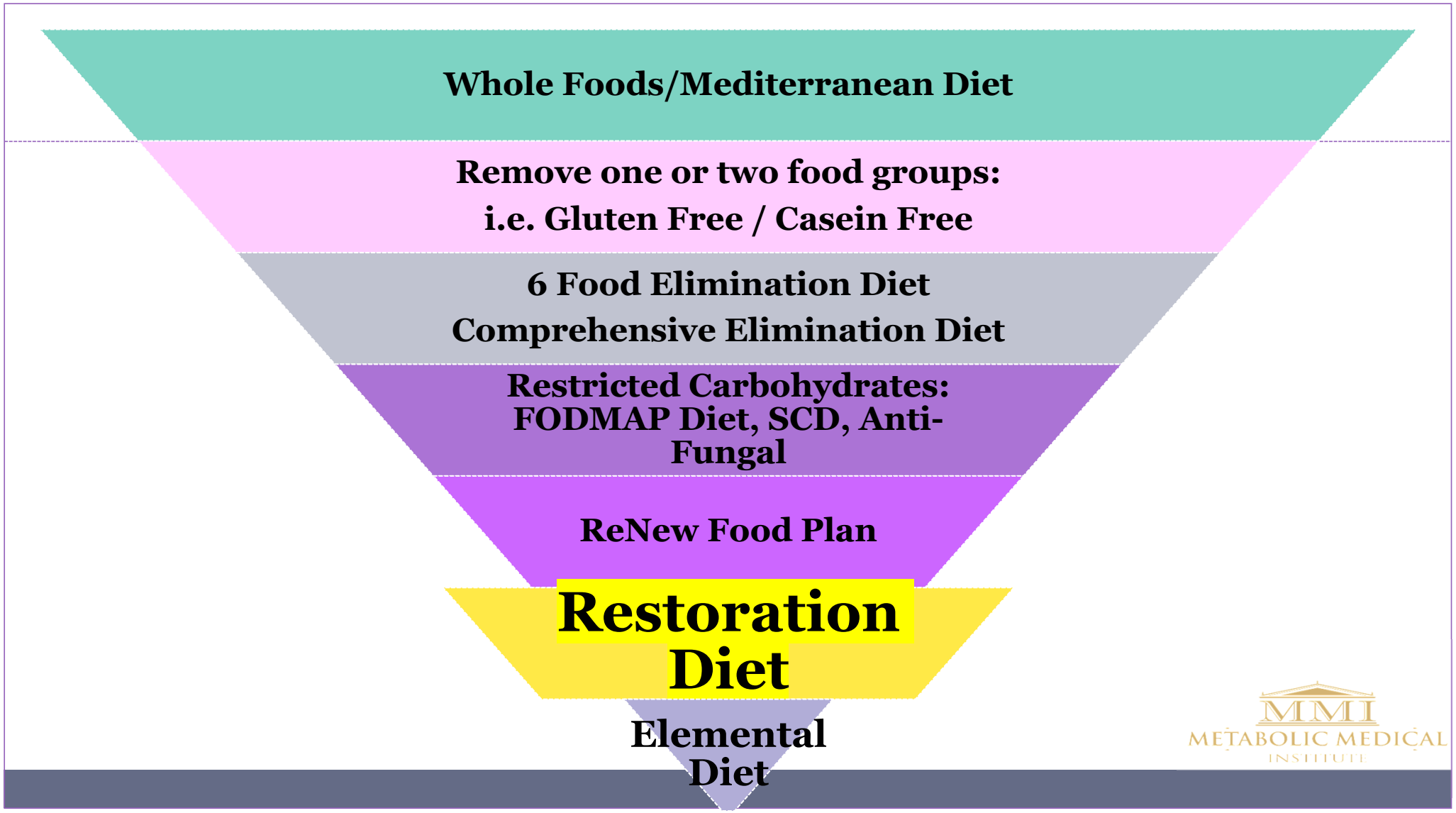

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Restoration Diet
Debilitated, Frail, Can digest limited amount of foods

- **Medical Foods**
- **Bone broths**
- **Puréed foods / Smoothies**
- **Poi**
- **Soups**
- **Animal protein:** stews, soups, slow cooked, purée, marrow, eggs
- **Grains:** congee (rice porridge)
- **Vegetables:** juiced, well-cooked, pureed
- **Fruits:** really ripe fruit, cooked fruit, puree
- **Fats:** coconut oil, ghee, olive oil, avocado
- **Fermented:** goat or sheep kefir, coconut kefir, kraut juice, sauerkraut, umeboshi plums

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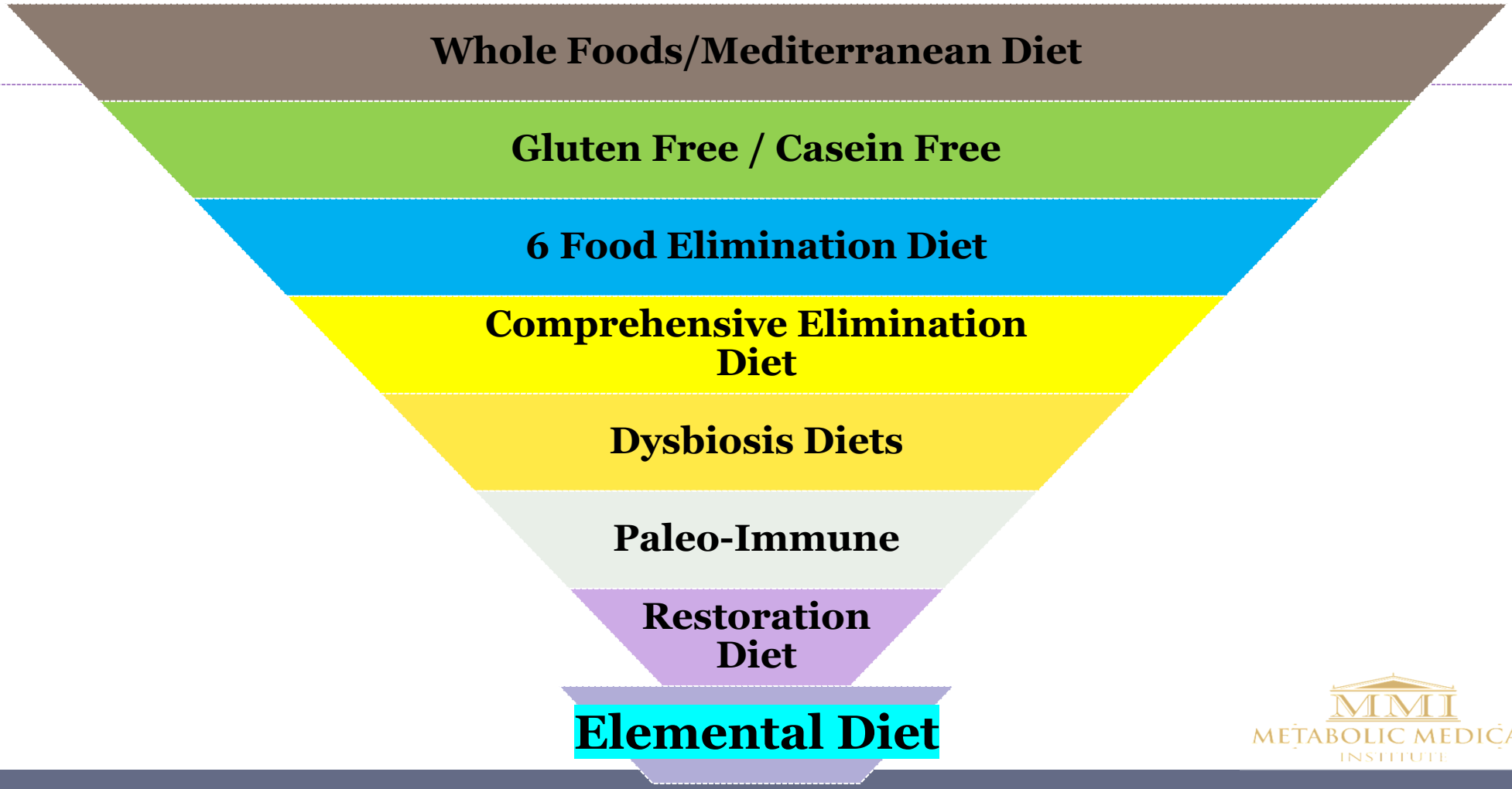

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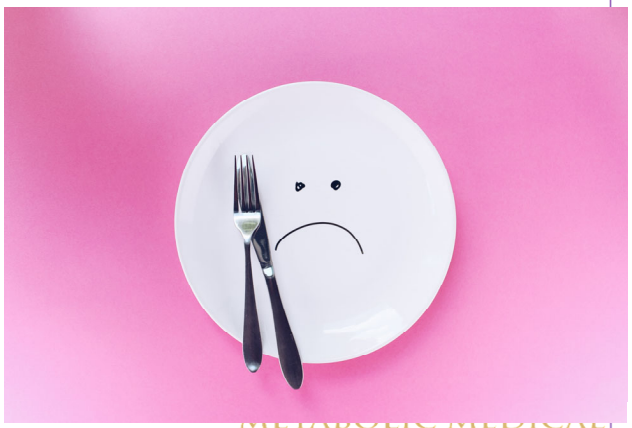
Elemental Diet

- Used for people with malabsorption, for rest and healing
- Hypoallergenic, predigested, easily absorbed and assimilated
- Free amino acids, MCT, glucose or maltodextrin, vitamins, minerals
- Utilized for Eosinophilic Esophagitis, IBD, refractory celiac, pancreatitis, SIBO, Short Bowel Syndrome, aspiration pneumonia, pouchitis, radiation induced mucosal damage
- TREATMENT FOR DYSBIOSIS



Elemental Diet for SIBO

- Elemental Diet: N = 93 people
  - 80% (74) normalized lactulose breath tests in 14 days
  - 85% (5 more people) normalized in 21 days
  - 66.4% improvement in bowel symptoms

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Pimentel M, Constantino T, Kong Y, Bajwa M, Rezaei A, Park S. A 14-day elemental diet is highly effective in normalizing the lactulose breath test. *Dig Dis Sci*. 2004;49(1):73-77. doi:10.1023/b:ddas.0000011605.43979.e1

Elemental Diet: Barriers

- **No food for 2-3 weeks**
- **Taste**
- **Weight loss potential**
- **Caution: person with Diabetes or Chronic Kidney Disease**

Elemental Formulas

Homemade Recipe:

- **Amino Acid powder** 45-55 gm/day
- **Carbohydrate:** honey, dextrose (glucose) glucose flavored liquid, grape syrup
- **Fat:** MCT or coconut oil
- **Multi-vitamin with minerals** without fiber or additions

- **Many different pre-bought brands:** Flavored or unflavored

Siebecker, A. Elemental Formula: Options for homemaking (n.d.) http://www.siboinfo.com/elemental-formula.html

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Possible Additions

- Broiled, plain chicken breast, no skin
- Weak herbal black tea/black coffee
- Magnesium for constipation
- Small amounts of stevia

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Siebecker, A. Elemental Diet for Treatment of SIBO. (n.d.) http://www.siboinfo.com/elemental-formula.html

After Treatment…

DAY 1-2

- Meats
- Eggs
- ¼-½ cup of white rice
- Lactose free dairy

DAY 3

Low FODMAP vegetables

DAY 4

Regular diet

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Siebecker, A. Elemental Diet for Treatment of SIBO. (n.d.) http://www.siboinfo.com/elemental-formula.html

Other Resources at www.SIBOinfo.com

- **Allison Siebecker, ND:**
  - SIBO Specific Food Guide (SSFG) and other resources on the Bi-Phasic Diet, a SIBO app for iPhone & iPad
  - Bi-Phasic Diet, Dr. Jacobi
  - Bi-Phasic Diet by Rebecca Coomes
  - Cedars-Sinai Diet (C-SD)
  - Many podcasts and other resources
- **Mark Pimentel, MD**
  - Cedar Sinai-Diet
  - *A New IBS Solution*, Health Point Press Publisher.

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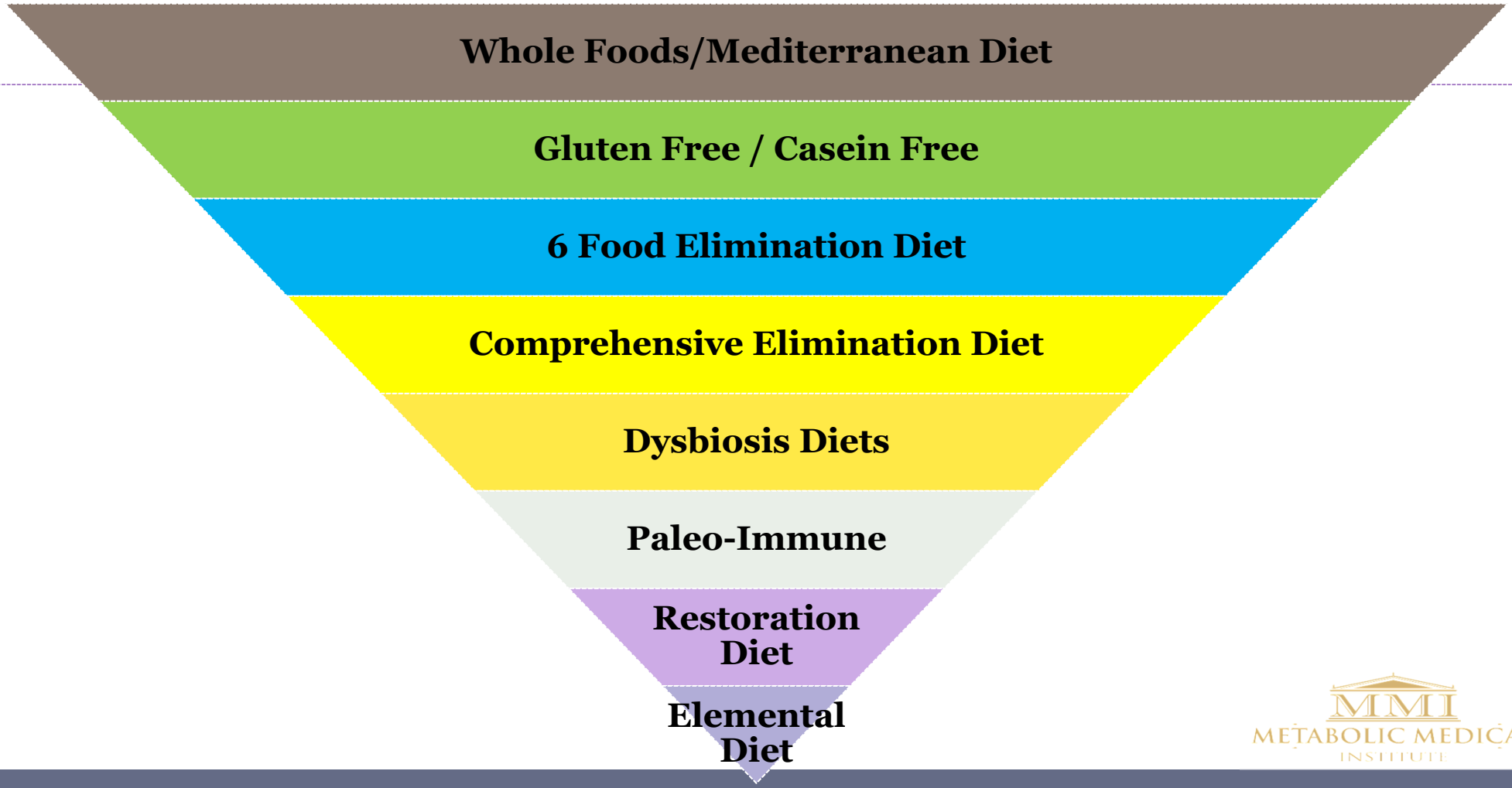
Whole Foods/Mediterranean Diet
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Questions to still to be Researched

- Low histamine diets for EoE
- Ketogenic diet in GI conditions
- Time-restricted feeding/Alternate day dieting
- Mediterranean diet vs. SCD in Crohn's disease
- Paleo-immune/ReNew for conditions other than IBD
- More research on anti-fungal diets
- Effect of GAPs diet in GI conditions
- Long-term carnivore diet

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Main GI Therapeutic Dietary Plans

Digestion/Absorption: Enzyme Insufficiencies

- Lactose intolerance
- Fructose Intolerance, Sucrose Intolerance

Microbiome: Dysbiosis Diets: Restrict Prebiotics and Carbohydrates

- FODMAP
- Specific Carbohydrate Diet
- Gut & Psychology Syndrome Diet
- Anti-Fungal Diets

Immune/Inflammation/Increased Permeability: Food Allergy and Sensitivity: Low-Antigenic Diet

- Gluten Free/Casein Free/Egg Free
- Comprehensive Elimination Diet
- Celiac Disease: Gluten Free
- Rotation Diet
- Low Histamine Diet
- Renew / Paleo Immune

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Diets currently best matched for Current Research & Specific Diagnoses

IBS = FODMAP Diet

Carbohydrate Diet, Elemental Diet, Parenteral Nutrition with Elimination Diet, Paleo Immune in

Celiac Disease = Eliminate Gluten, consider Elim Diet.

Eosinophilic esophagitis or gastritis = 6-Food Elimination Diet

Fungal Overgrowth= Anti-Fungal Diet *(limited research)*

Auto-immune = Paleo Immune, Elimination Diet

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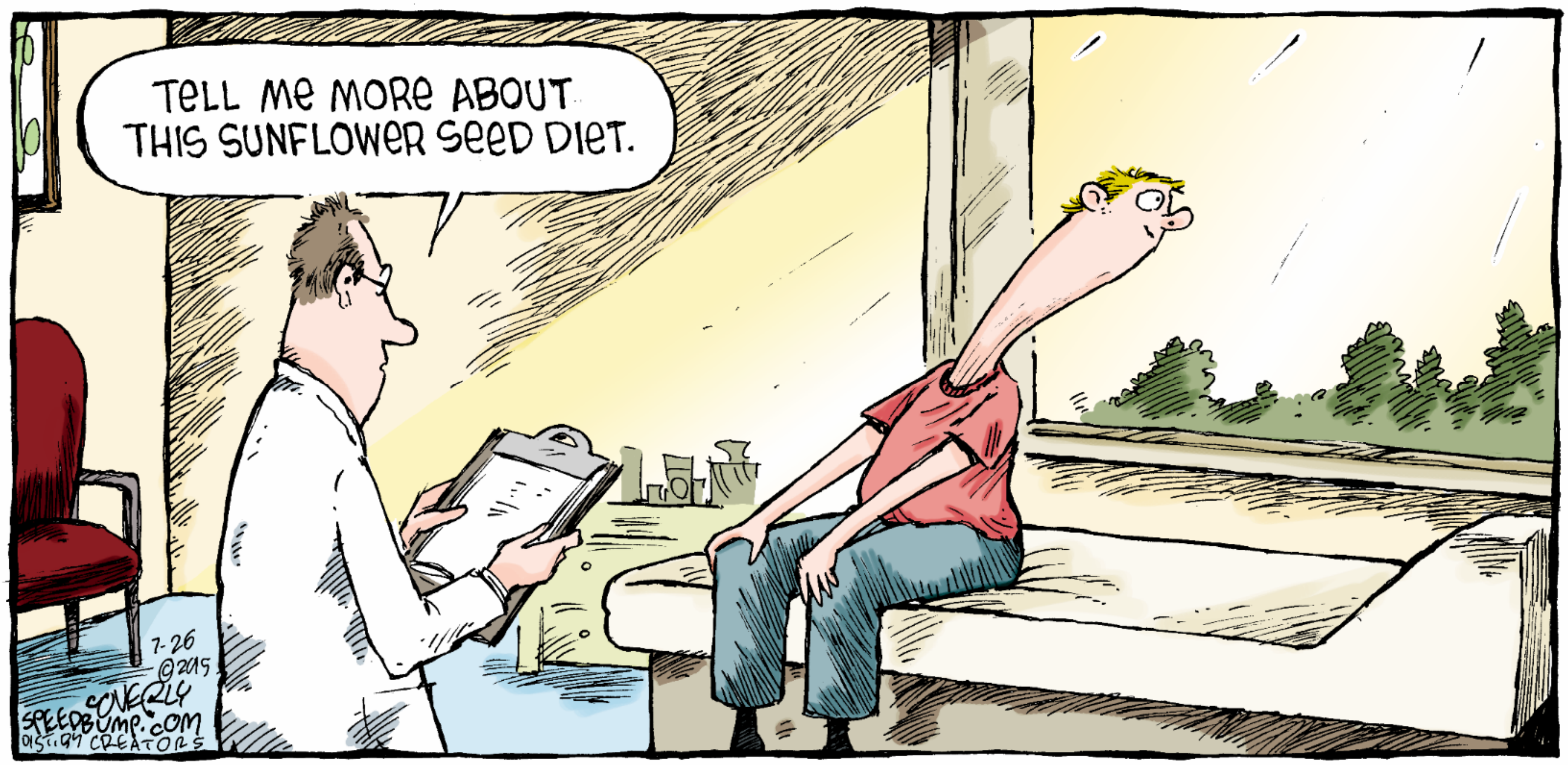
Specialized Diets for GI Healing: Allowed Foods & Forbidden Foods

	Comprehensive Elimination Diet	Gluten Free/ Casein Free	Specific Carbohydrate Diet	Gut & Psychology Syndrome Diet	Anti-Fungal Diet	FODMAP Diet	Restoration Diet
Protein	ALL unprocessed meats: chicken, turkey, duck, goose, quail, ostrich, fish, shellfish, lamb, venison, rabbit, eggs. Wild game.	ALL unprocessed meats	ALL unprocessed meats: beef, pork, chicken, turkey, duck, goose, quail, ostrich, fish, shellfish, lamb, venison, rabbit, eggs. Processed meats that do not have any SCD forbidden ingredients	Eggs, fresh (if tolerated) Fresh meats (not preserved), fish, shellfish Broths with every meal. Canned fish in oil or water only	ALL unprocessed meats: beef, pork, chicken, turkey, duck, goose, quail, ostrich, fish, shellfish, lamb, venison, rabbit, eggs. Tofu, tempeh, Texturized vegetable protein	All unprocessed meats Eggs	All unprocessed meats in small amounts: Pureed, well-cooked, stews, soups.
Dairy Products & Dairy Alternatives	NONE Dairy alternatives are allowed: coconut, hemp, rice, soy	NONE Dairy alternatives are allowed: nut, coconut, hemp, rice, soy .	All natural cheeses ***except for: ricotta, mozzarella, cottage cheese, cream cheese, feta, processed cheeses and spreads.*** Homemade yogurt cultured 24 hours.	All natural cheeses Yogurt-homemade	Eggs, plain yogurt (cow, sheep, goat) with live cultures, organic soy milk, soy cheese, coconut milk, unaged goat cheese	Lactose-free dairy products: milk, cottage cheese Rice milk, almond milk, hemp milk	Goat milk or sheep milk kefir. Dairy alternatives as coconut kefir
Fats & Oils	Sunflower, olive, flax, ghee, coconut, avocado, nut oils.	ALL	Avocados, olive oil, coconut oil, corn oil, avocado oil, etc.	Butter, ghee, coconut, avocado oil, olive	ALL	ALL	Ghee, coconut, olive, Sam Queen's restorative ghee
Nuts & Seeds	Coconut, pine nuts, chia seeds, flaxseeds, almonds, Brazil nuts, walnuts, chestnuts, filberts, pecans, nut flours, and meals	ALL that are non-processed with dairy or gluten.	Almonds, Brazil nuts, walnuts, chestnuts, filberts, pecans, nut flours and meals	Almonds, avocado, Brazil nuts, coconut, filberts, walnuts, chestnuts, pecans, nut flours and meals, peanuts, nut butters	ALL	*Nuts & Seeds in moderation* *Nut butters in moderation,* Psyllium	Butters


TELL ME MORE ABOUT THIS SUNFLOWER SEED DIET.
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Prof. Liz Lipski, PhD, CNS, FACN, IFMCP, BCHN

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Maryland U of Integrative Health www.muih.edu
Digestive Health Appraisal Questionnaire
www.dhaq.info
Email: llipski@muih.edu

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