

COMPLIMENTARY LIVE WEBINAR



Decoding Prebiotics Using a Patient-Centered Approach

PRESENTED BY

Heather Rasmussen, PhD, RDN

September 1, 2022
2-3 pm ET



EARN
1 CEU

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DISCLOSURES

Heather Rasmussen, PhD, RDN, faculty for this event, has no relevant financial relationship(s) with ineligible companies to disclose.

LEARNING OBJECTIVES

1. Describe the importance of gastrointestinal health on the whole individual.
2. Define prebiotics and distinguish prebiotics from other plant-based foods and food components.
3. Explain the supporting evidence and use of prebiotics for gastrointestinal and systemic health.
4. Counsel clients using prebiotic-centered approaches and real-world scenarios.

GASTROINTESTINAL HEALTH

Relation to the Whole Individual

CRITERIA FOR A HEALTHY GASTROINTESTINAL TRACT

Effective Digestion and Absorption of Food

- Nutrient absorption, transit time, stool consistency

Absence of GI Illness

- Inflammatory bowel disease, Celiac disease, intestinal cancer

Normal and Stable Intestinal Microbiota

- Bacterial overgrowth, composition, diversity

Effective Immune Status

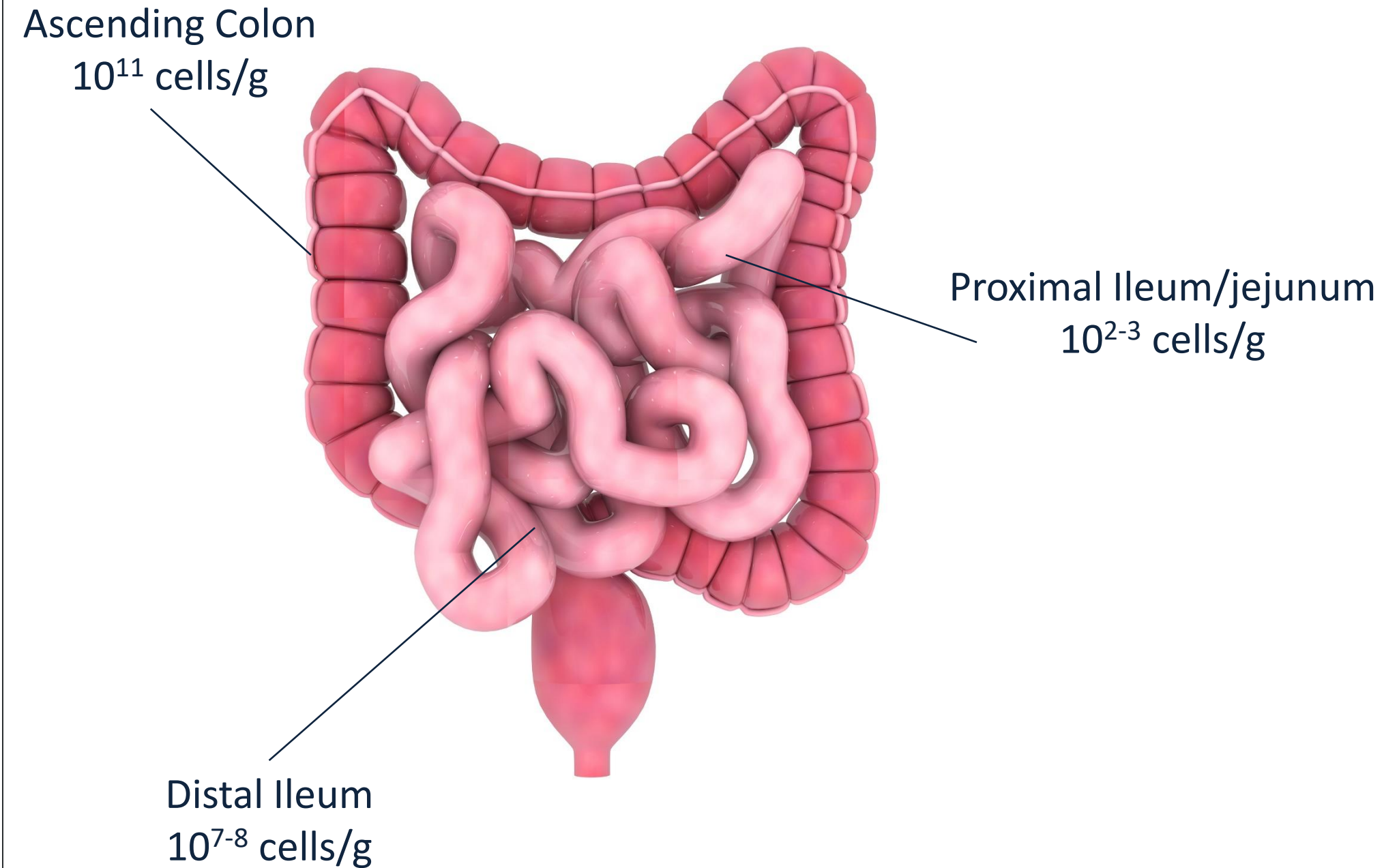
- Barrier function, immune cell activity, immune tolerance

Status of Well-Being

- Quality of life, serotonin, enteric nervous system

MICROBIOTA

- Large, functionally stable community of bacteria
- ~ 40 trillion microbial cells, equal to that of human cells
- ~1000 bacterial species in the gastrointestinal microbiota, ~160 per person
- Role in nutrient metabolism, barrier function, immunity
- Modulation at a young age

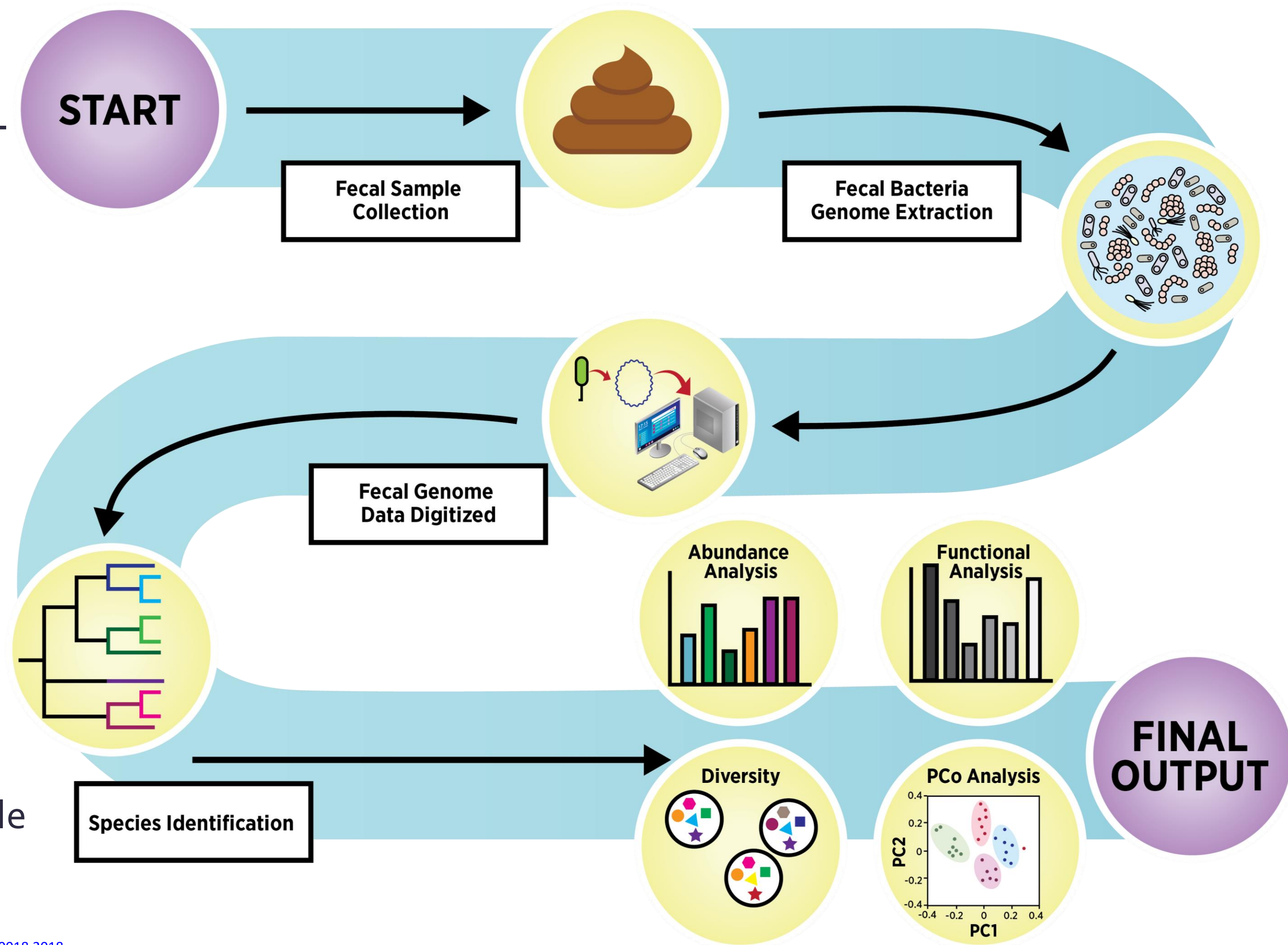


MICROBIOTA MEASUREMENT

- **Beneficial Bacteria:**

- Bifidobacterium
- Lactobacillus
- Butyrivibrio
- Dorea (clostridia)
- Roseburia
- Anaerostipes
- Prevotella

- Greater diversity desirable



WHY DO WE CARE?

Bifidobacterium

Lactobacillus

Butyrivibrio

Dorea (clostridia)

Roseburia

Anaerostipes

Prevotella

Fecalibacterium spp.



*"Bad
Bacteria"*

Staphylococcus

Clostridium perfringens

Escherichia coli

Desulfovibrio

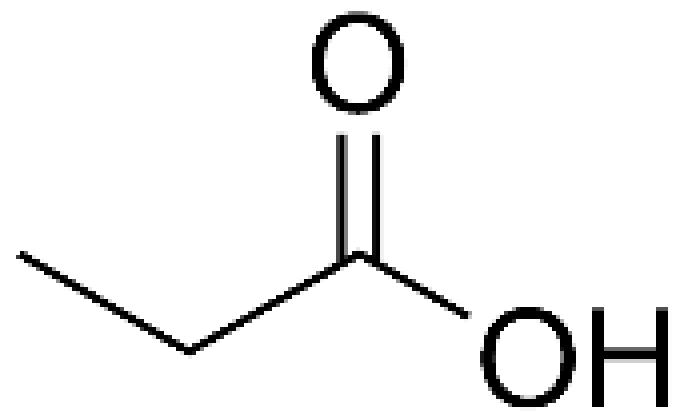
Bilophila wadsworthia

*"Good
Bacteria"*

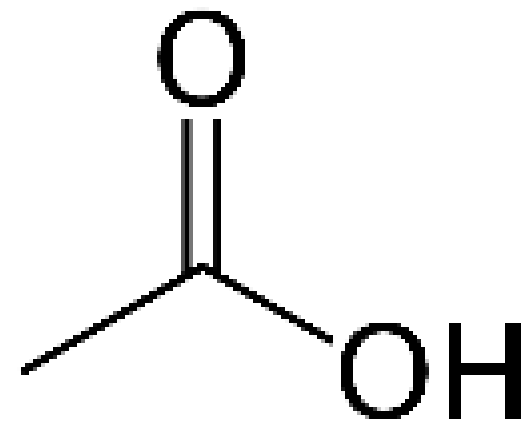


Link between the amount of "good" and "bad" bacteria and their relation to health and disease

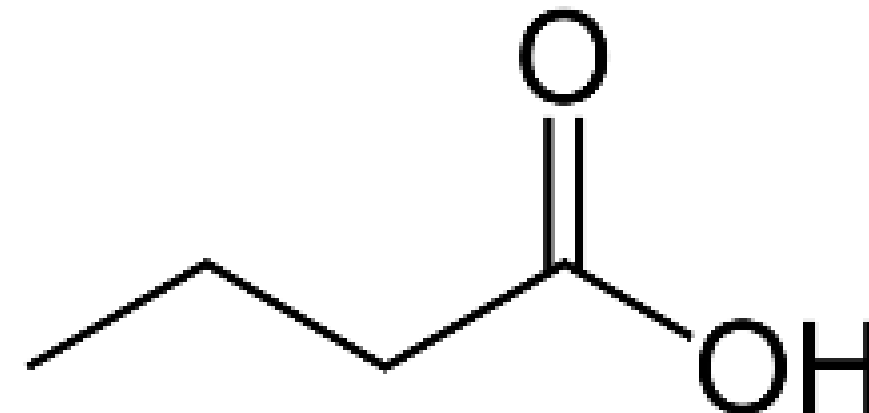
SPECIFIC MICROBIOTA PRODUCE BENEFICIAL BYPRODUCTS, INCLUDING SHORT-CHAIN FATTY ACIDS (SCFA)



Propionate



Acetate



Butyrate

Microbiota

Short-chain
Fatty Acids

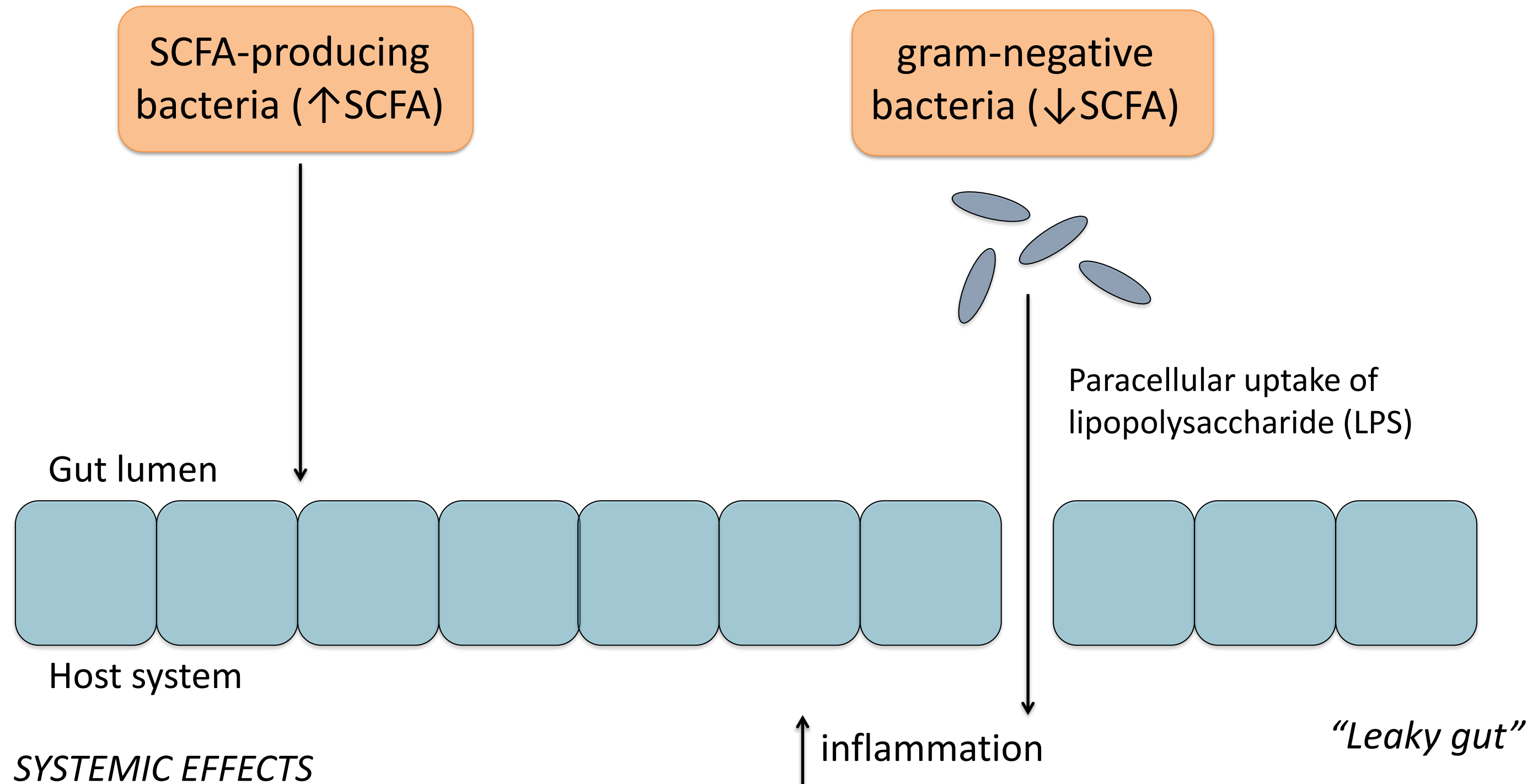
Gut Barrier

Glucose metabolism
Lipid metabolism
Satiety

Anti-inflammatory function

SCFA AND THE INTESTINAL BARRIER

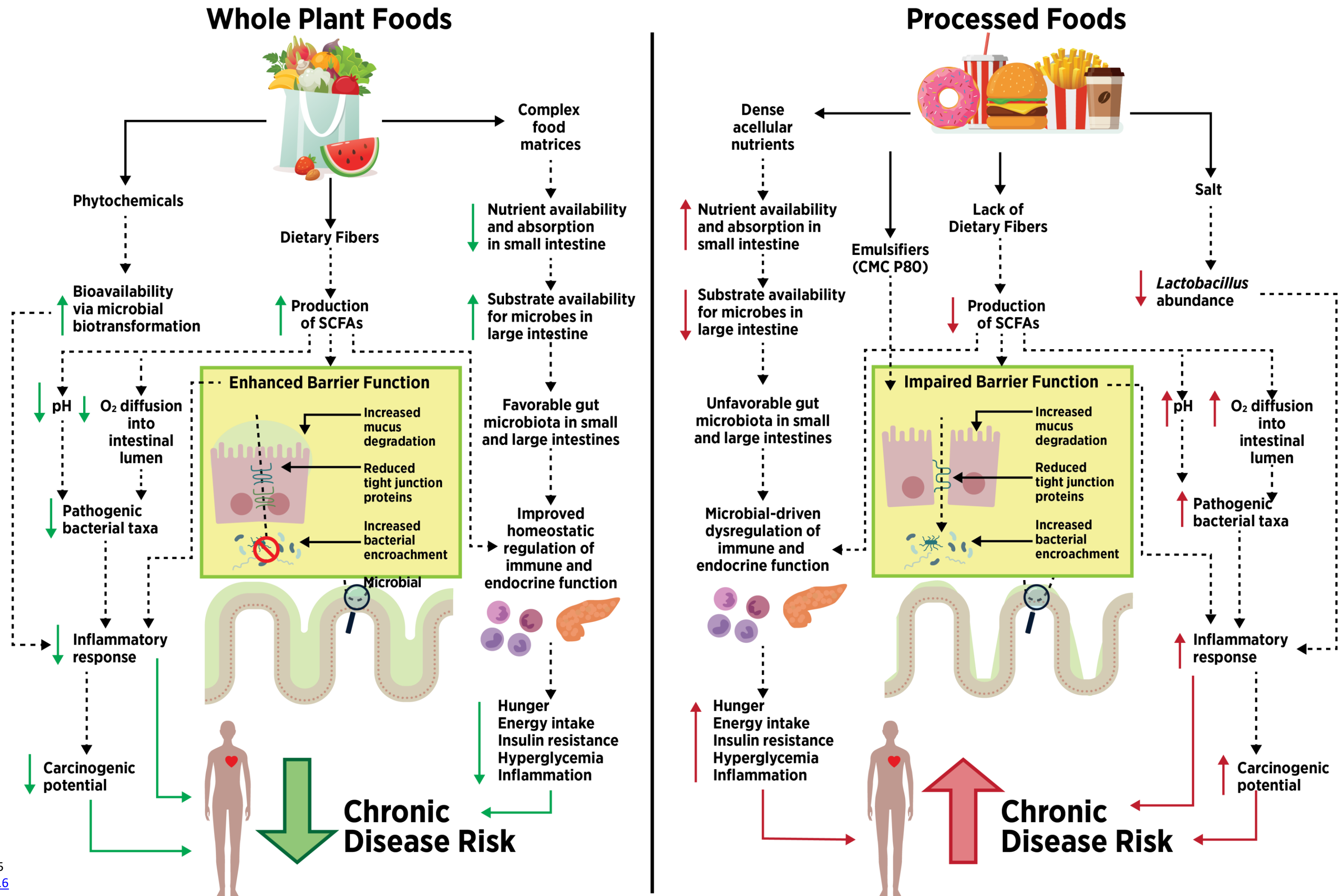
INCREASE MUCUS PRODUCTION
INCREASE TIGHT JUNCTION PROTEINS
REDUCE GROWTH OF PATHOGENIC BACTERIA
IMMUNE REGULATION



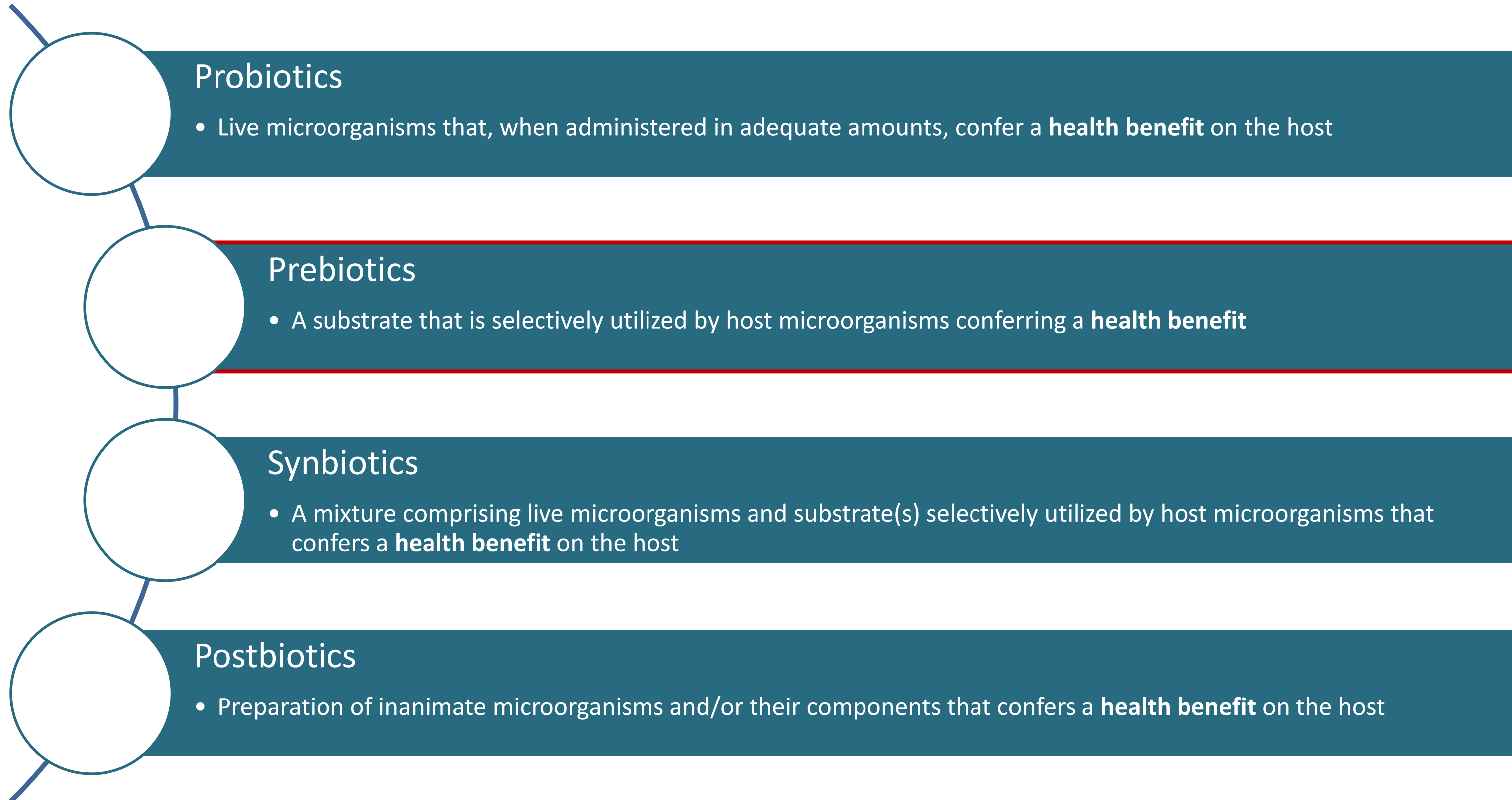
DIETARY INTAKE AND GASTROINTESTINAL HEALTH

Microbiota-Favorable Dietary Patterns, Fiber,
and Prebiotics

DIETARY INTAKE FOR GUT HEALTH



DIETARY COMPONENTS THAT CAN MODULATE THE GUT FOR HEALTH BENEFIT



PREBIOITC DEFINITION

01

SUBSTRATE

Often a fiber, but not always. If a fiber, then it is a fermentable one.

02

SELECTIVITY

Substrate only modifies select bacteria. Global changes in microbiota do not count.

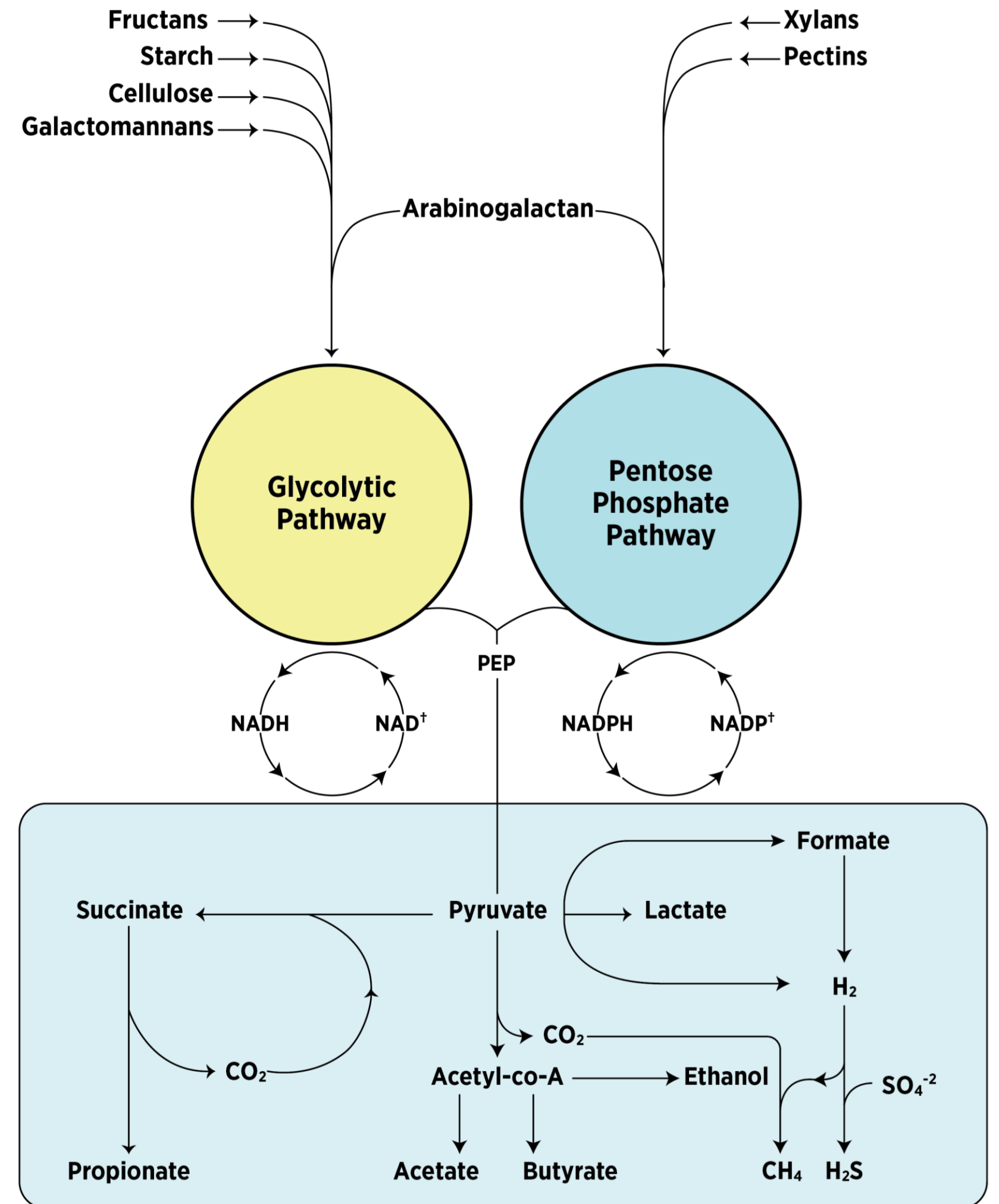
03

HEALTH BENEFIT

Direct link to benefiting human health through microbiota modulation

FERMENTATION OF FIBER TO PRODUCE SCFA

- Carbohydrates (fiber) as substrate
- Metabolized by bacteria
 - CAZymes
- SCFA produced
 - Butyrate et al
- Also produced
 - CH₄, H₂S, ethanol
- *B. thetaiotaomicron*
 - 18% of its genome for fiber utilization
- Product of one fermentation may be substrate of other reaction
- Prebiotic beneficially impacts the host



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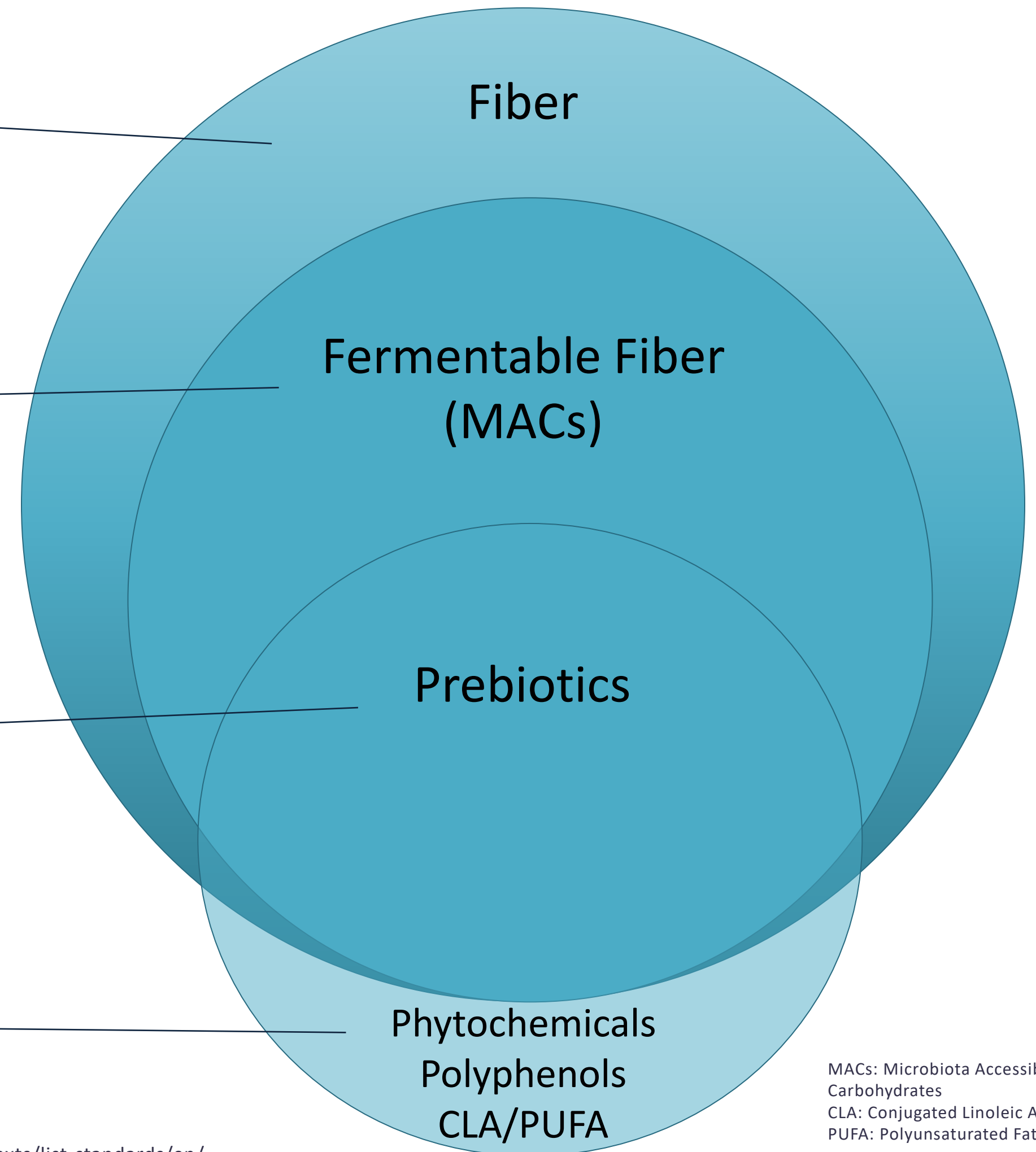
Carbohydrate polymers with ten or more monomeric units, which are not hydrolyzed by the endogenous enzymes in the human small intestine...(2009)

Soluble vs insoluble

Fiber that can stimulate the growth and/or activity of beneficial gut bacteria

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

Not all prebiotics are fibers



MACs: Microbiota Accessible Carbohydrates
CLA: Conjugated Linoleic Acid
PUFA: Polyunsaturated Fatty Acid

FIBER

Inulin, FOS, GOS, HMOs,
Resistant Starch, Soluble
Corn Fiber, β -glucan, Xylo-
oligosaccharides, Cellulose,
Psyllium, Bran

MACs: Microbiota Accessible Carbohydrates
FOS: Fructo-oligosaccharides
GOS: Galacto-Oligosaccharides
HMOs: Human Milk Oligosaccharides

FERMENTABLE FIBER (MACs)

Inulin, FOS, GOS, HMOs,
Resistant Starch, Soluble
Corn Fiber, β -glucan,
Xylo-oligosaccharides

PREBIOTICS

Inulin, FOS, GOS, HMOs

Combination of fermentable fibers may be important
Response to all fibers are individualized

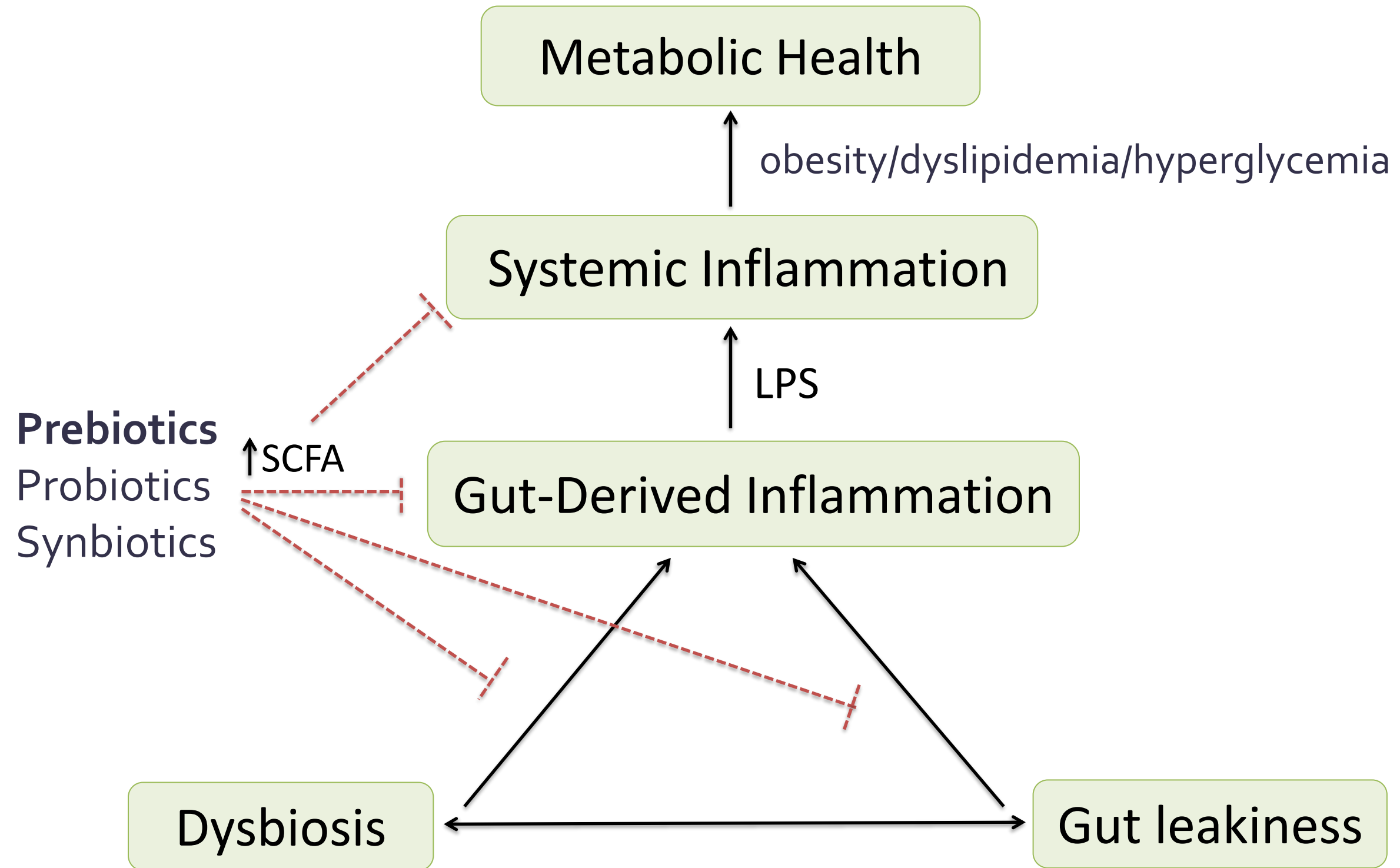
POLYPHENOL CLASSES, COMPOUNDS AND CONTENT IN COMMON FOODS

Polyphenol Class	Polyphenol Subclass	Example Compounds	Dietary Sources (mg/serving)			
			8-25	25-50	50-100	>100
Flavonoids	Flavonols	Kaempferol, Myricetin, Quercetin	Black Tea (22) Walnuts (19) Black Beans (10)	Spinach (36) Plum (31) Onion (29) Blueberry (29)	Capers (56)	
	Flavanones	Naringenin, Narirutin, Hesperetin			Grapefruit (67) Orange (63)	
	Flavan-3-ols	Catechin, Epigallocatechin Gallate, Procyanidin		Red Wine (41) Cocoa (28)	Dark Chocolate (60)	Black Tea (176) Green Tea (171)
	Flavones	Apigenin, Luteolin				
	Anthocyanins	Anthocyanidin, Anthocyanin	Red Wine (20)	Black Beans (35) Plum (32)	Blueberry (99)	
	Isoflavones	Diadzein, Genistein		Tofu (35)		
Lignans	Lignans	lariciresinol, Matairesinol, Secoisolariciresinol			Flaxseed (61)	Sesame Oil (217)
Phenolic Acids	Hydroxybenzoic acid; Hydroxycinnamic acids	Egallic Acid, Vanillic Acid, Caffeic Acid, Ferulic Acid	Grape Juice (15)	Flaxseed (47)	Plum (59)	Coffee (509)
			Red Wine (15)	Black Tea (45)		Walnut (127)
			Rosemary (12)	Green Olives (38)		Blueberry (101)
			Grapefruit (10)	Black Beans (32)		
Stilbenes	Stilbenes	Resveratrol, Resveratrol 3-O-glycoside				
Other Polyphenols	Tyrosol, Curcuminoids	Hydroxytyrosol, Curcumin	Olive Oil (8)		Green Olives (59) Turmeric (54)	

PREBIOTICS AND HEALTH

Evidence for Benefit

PREBIOTICS CAN BENEFICIALLY IMPACT HEALTH



HEALTH IMPACTS OF PREBIOTICS

Prebiotic	Health Effects
Inulin	<ul style="list-style-type: none">Stool consistency and frequencyCalcium absorption/bone mineralizationMetabolic health (body weight, lipids, glucose)
Fructo-oligosaccharides (FOS)	<ul style="list-style-type: none">Bowel habitSatietyMetabolic health
Galacto-oligosaccharides (GOS)	<ul style="list-style-type: none">Diarrhea/bowel habitAllergiesImmune functionBarrier functionMetabolic health

30 g INULIN vs CELLULOSE FOR WEIGHT MANAGEMENT IN INDIVIDUALS WITH PREDIABETES

Weight Loss	Body Composition
Greater weight loss in weight maintenance phase	Lower hepatic and soleus muscle fat content after weight maintenance phase

PREBIOTIC SOURCES: INULIN, FOS, GOS

FORTIFIED FOODS & SUPPLEMENTS



Granola Bars



Cereal



Infant formula (GOS)



Supplements

Added prebiotics or supplements to get ~5 g/day

WHOLE FOODS



Bananas



Onion



Garlic



Jerusalem artichokes

Low quantities - variety of foods

15 g INULIN-TYPE FRUCTAN-RICH VEGETABLES

Microbial Modification	Increase in satiety
Consumption of artichoke, leek, onion, garlic increased proportion of Bifidobacterium genus	Consumption of artichoke, leek, onion, garlic induced satiety and reduced desire to eat sweet, salty and fatty food

Changes reversed 3 weeks after intervention

DOES DIETARY INTAKE FOR GUT HEALTH DIFFER FROM DIETARY INTAKE FOR THE WHOLE INDIVIDUAL?

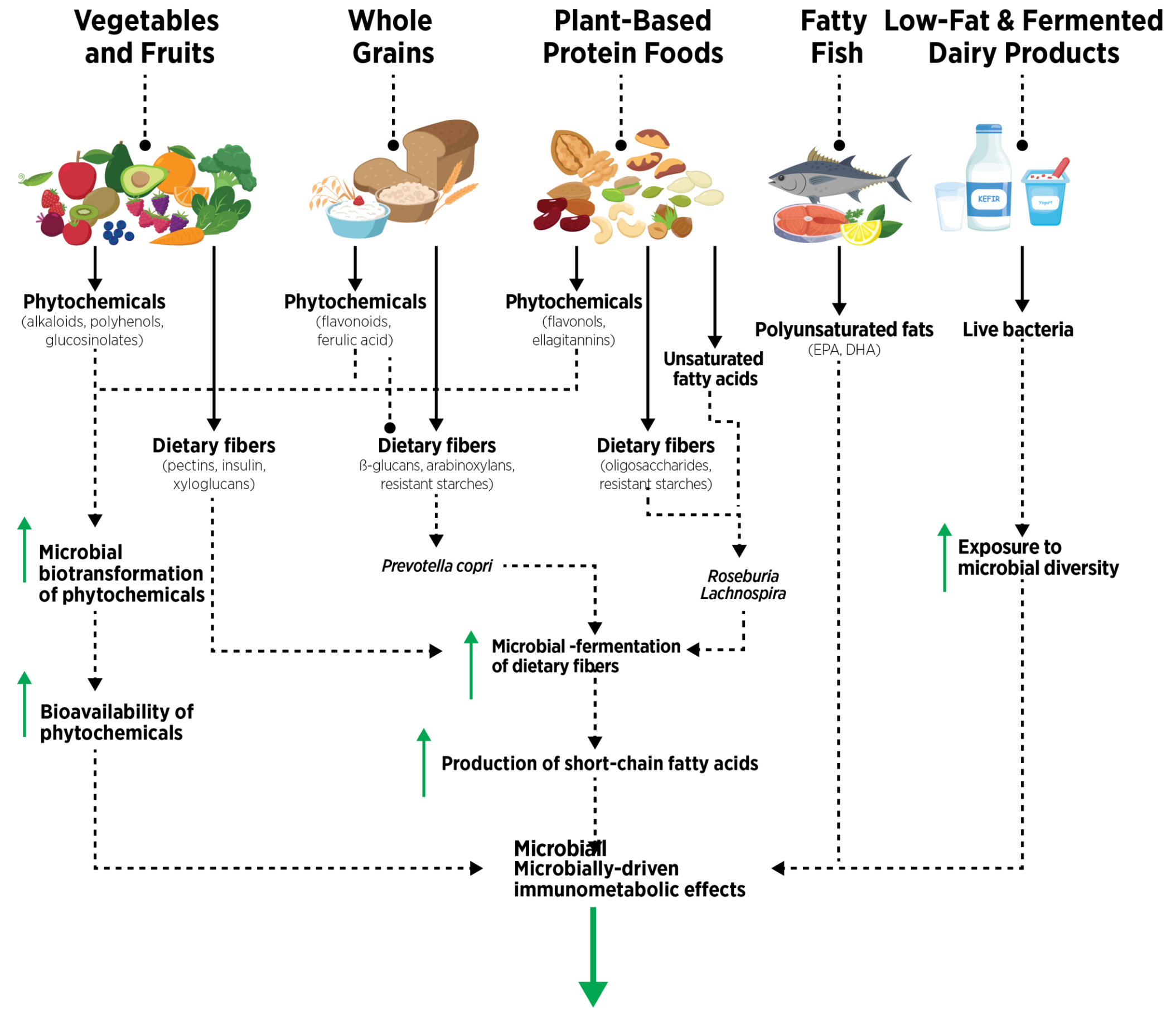


Do the nuances matter?

DIETARY INTAKE FOR GUT HEALTH

Consumption of vegetables, fruits, whole grains, plant-based proteins, fatty fish, low-fat dairy, fermented dairy

Moderate red meat, limited high-fat dairy and processed meat



Microbiome considerations support dietary recommendations to consume vegetables, fruits, whole grains, plant-based protein foods, fatty fish, and low-fat and fermented dairy products regularly.

DIETARY GUIDELINES

Food Groups	Healthy U.S. Style	Mediterranean	Vegetarian
Vegetables (cup eq/day)	2.5		
Dark Green Vegetables (cup/eq/wk)	1.5		
Red and Orange Vegetables (cup/eq/wk)	5.5		
Beans, Peas, Lentils (cup eq/wk)	1.5		6 (legumes)
Starchy Vegetables (cup eq/wk)	5		
Other Vegetables (cup/eq/wk)	4		
Fruits (cup eq/day)	2	2.5	
Grains (ounce eq/day)	6		6.5
Whole Grains (ounce eq/day)	≤3		
Refined Grains (ounce eq/day)	>3		
Dairy (cup eq/day)	3	2	
Protein Foods (ounce eq/day)	5.5	6.5	3.5
Meats, Poultry, Eggs (ounce eq/wk)	26		3 (eggs)
Seafood (ounce eq/wk)	8	15	6
Nuts, Seeds, Soy Products (ounce eq/wk)	5		7 (nuts/seeds) 8 (soy)
Oils	27	Olive Oil	
Limit on Calories for other uses (kcal/%)	240 (12%)	11%	250 (13%)
Alcohol		Included	

MEDITERRANEAN DIET AND GUT HEALTH

MICROBIOTA, CHOLESTEROL, & INSULIN SENSITIVITY

Mediterranean diet intervention reduced plasma cholesterol, increased genes for microbial carbohydrate degradation linked to butyrate metabolism. Microbiota linked to changes in bile acid degradation and insulin sensitivity

MICROBIOTA AND INFLAMMATION

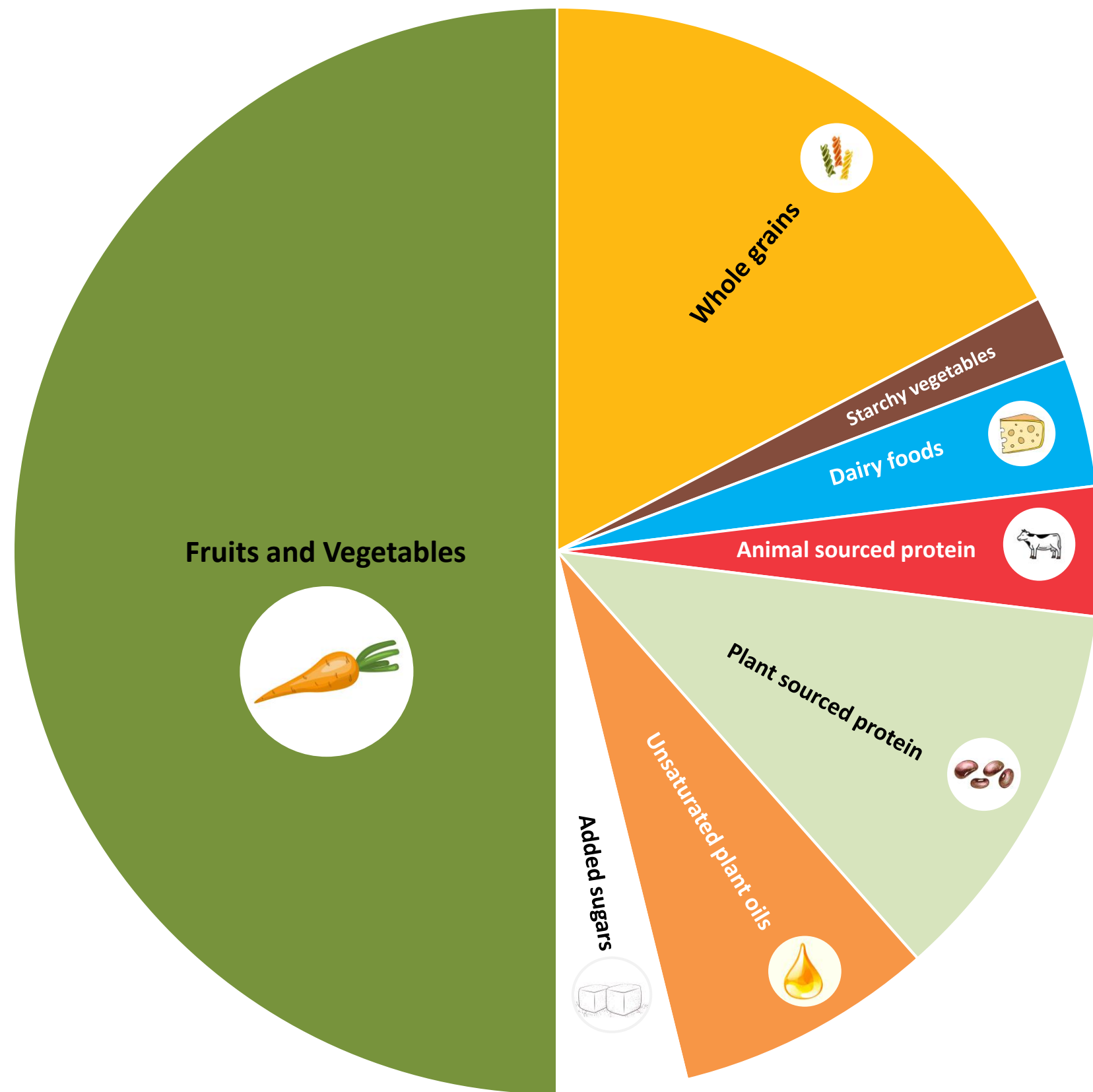
Mediterranean diet associated with fiber-degrading microbiota and lower levels of gut inflammation

Likely that a microbiota-favorable dietary pattern lies within currently recommended dietary patterns secondary to combination of beneficial dietary components



“Transformation to healthy diets by 2050 will require substantial dietary shifts. Global consumption of fruits, vegetables, nuts and legumes will have to double, and consumption of foods such as red meat and sugar will have to be reduced by more than 50%. A diet rich in plant-based foods and with fewer animal source foods confers both improved health and environmental benefits.”

Summary Report of the EAT-Lancet Commission



Sustainable Food Systems are those that sustain people, animals, and environment.

Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.

Plant-focused approach

Do the nuances matter?

A dietary pattern for planet and human health is a dietary pattern for gut health.

Additional fermentable fiber OR prebiotics may be useful to close the “fiber gap.”

APPLICATION

Inulin as an Example

PATIENT INTERESTED IN WEIGHT LOSS

58 yo female, BMI 29 kg/m². Patient is interested in losing weight for her daughter's wedding. 24-hr recall and patient report reveals she is consuming adequate fruits, limited vegetables. Diet is high in refined grains as family does not like "brown food with seeds." Entire family enjoys nightly sweets. Energy intake likely above energy needs. Labs are WNL except glucose of 112 mg/dL.

What is your approach?

DIETARY PATTERN AND SUPPLEMENT AS AN OPTION

MEDITERRANEAN DIETARY PATTERN

Wide variety of vegetables

Continue fruit intake w/ berries

Incremental/experimental addition of whole grains

Olive oil and other unsaturated fats

Inclusion of fish

Low-fat dairy, including fermented

Focus on bananas, onion, leeks, garlic

INULIN

Supplemental inulin an option

5 g prebiotics recommended, up to 30 g in trials: g may not be included on labels

Powdered supplement or in foods

CHICORY ROOT EXTRACT, WHOLE GRAIN OATS, NATURAL STRAWBERRY FLAVORED FRUIT PIECES (SUGAR, CRANBERRIES, CITRIC ACID, NATURAL FLAVOR, ELDERBERRY JUICE CONCENTRATE, SUNFLOWER OIL, SOY LECITHIN), RICE FLOUR, HIGH MALTROSE CORN SYRUP, BARLEY FLAKES, SUGAR, ALMOND PIECES, HONEY, CANOLA OIL, MALTODEXTRIN, GLYCERINE, RICALCIUM PHOSPHATE, PALM KERNEL OIL, SOY LECITHIN, SALT, FRUCTOSE, COCOA PROCESSED WITH ALKALI, MALT EXTRACT, BAKING SODA, NATURAL FLAVOR, CARAMEL COLOR, MILK, MIXED TOCOPHEROLS ADDED TO RETAIN FRESHNESS

Consider side effects- incremental increase

Solubility

Our role is to thoughtfully guide patients and clients using current evidence and continue to

follow and incorporate new literature

ADDITIONAL CONSIDERATIONS

Most patients will not be familiar with the term prebiotic

Host genetics and gut microbial community may influence the ability of an individual to respond to prebiotic supplementation

If consumption of a plant-based diet, then foundation supplied for supplementation of prebiotic

Supplemental prebiotics contribute to daily fiber goal of ~28 g/day (2000 kcal diet)

Other fermentable fibers may be of benefit: Resistant starch, resistant maltodextrin

Acceptability will depend on ease of recommendation and incorporation (granola bars, oatmeal, smoothies)

SUMMARY

01

PREBIOTICS

Emerging health benefits, but optimism for use. Look for expanded substrates and concrete links to health benefits with new research.

02

FOODS AND DIETARY PATTERN

Wholistic approach to modify gut bacteria for health benefit. Inclusive of fermentable fibers and prebiotics.

03

CONSIDERATION FOR THE INDIVIDUAL

Individualized conditions, response, preferences

COMPLIMENTARY LIVE WEBINAR

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Health Literacy: Practical Interprofessional Strategies for Enhancing Health Equity

PRESENTED BY

Brenda Hage

PhD, DNP, CRNP, CCM

David Hage

MSW, LCSW, ACSW, C-ASWCM

September 21, 2022

2-3 pm ET



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