



Medical Nutrition Therapy in Lower Gastrointestinal Diseases: Gut Microbiome

فاطمه رمضانی

فوق دکترا و متخصص تغذیه و رژیم درمانی

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Outline

Intestine Structure & function

Gut Microbiome & dysbiosis

Celiac disease & gluten related disorders

Inflammatory bowel disease

- Ulcerative Colitis

- Crohn's disease

Irritable Bowel Disease

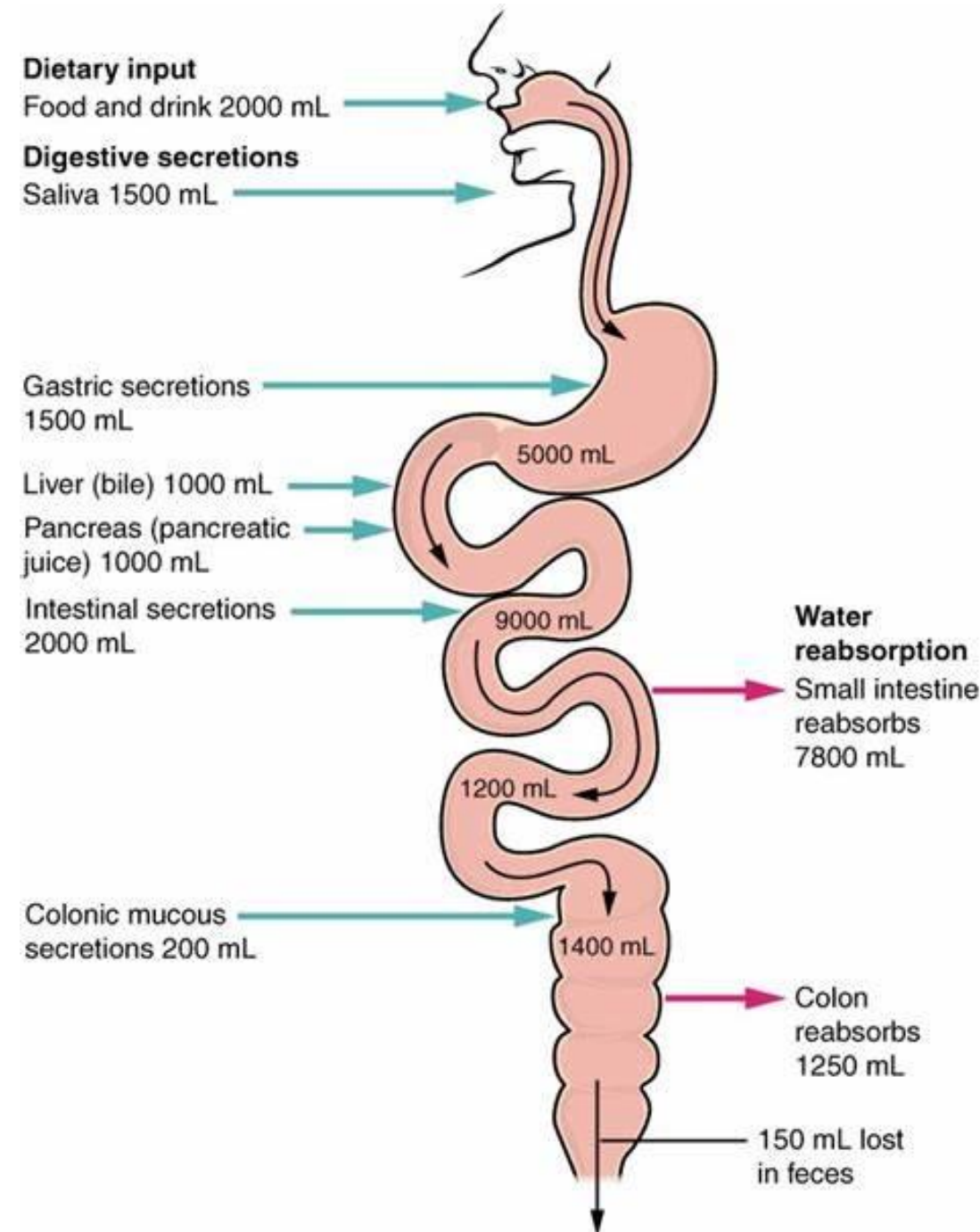
Diverticular Diseases

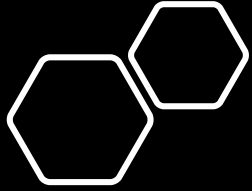
- Diverticulosis

- Diverticulitis

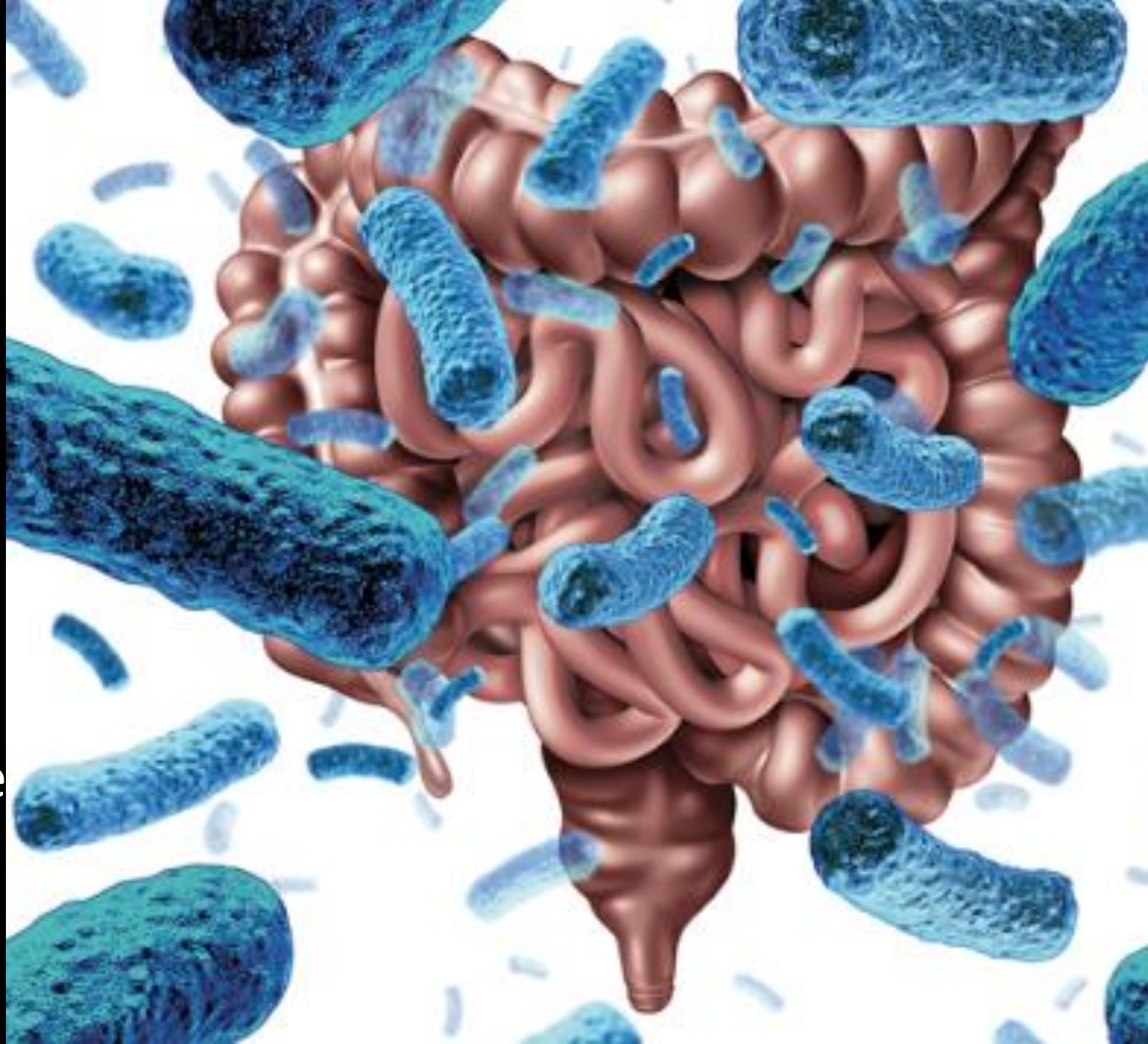
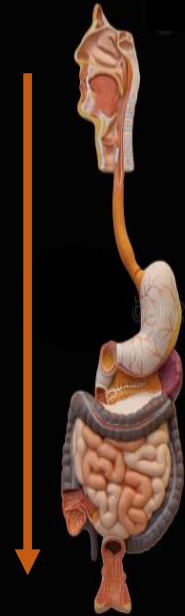
Intestine Structure & function

- Ingestion
- Digestion
- Absorb nutrients
- Absorb water
- Balance of electrolytes
- Prepare waste for elimination
- Intestinal immune system
- Gut Microbiome





What is the Gut Microbiota



A collection of microorganisms (bacteria, fungi, and viruses) that live in the digestive tracts from mouth to rectum

Gut Microbiome

† Refers to the catalog of gut microbes and their genes that outnumber the human genome (Human microbiome project, Nature: 2012)

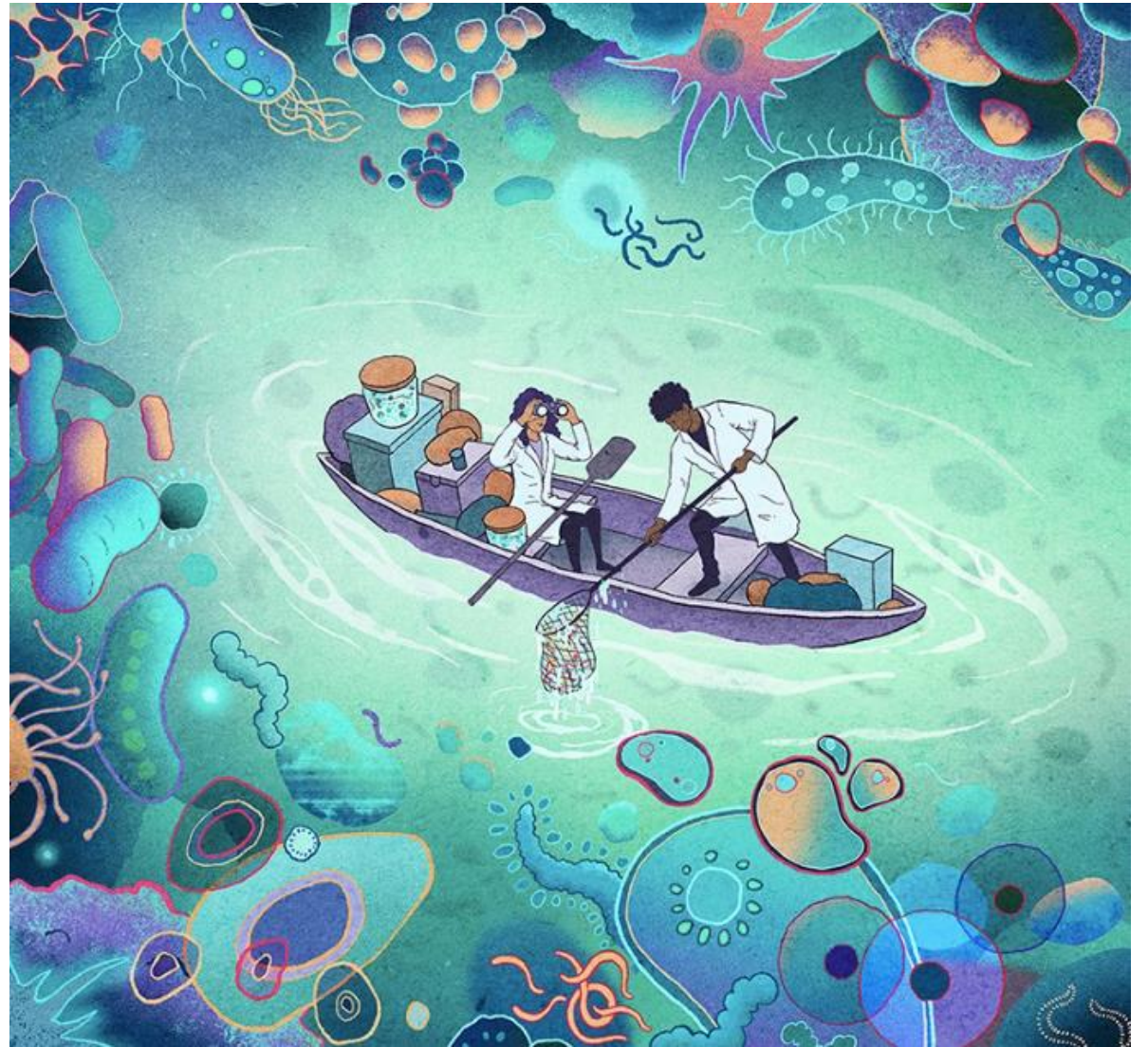


The Origin of Gut Microbiome Research

First reported in the scientific literature: **less than 100 years ago**

Clinical relevance (RCT, 2013): **stopped *Clostridium difficile* infection** by infusing healthy donor feces vs. treatment with antibiotics

Attempts to improve **human health** by modulating the gut microbiota through **replacing** the “**bad**” microbes that cohabitate our body with “**good**” microbes



Gut Microbiome Functions

Known to be a super organ with metabolic activities

- ✦ Support Immune function:
 - ✦ Competition with pathogens
 - ✦ Production of antimicrobial peptides
- ✦ Support intestinal function
- ✦ Production and absorption of nutrients

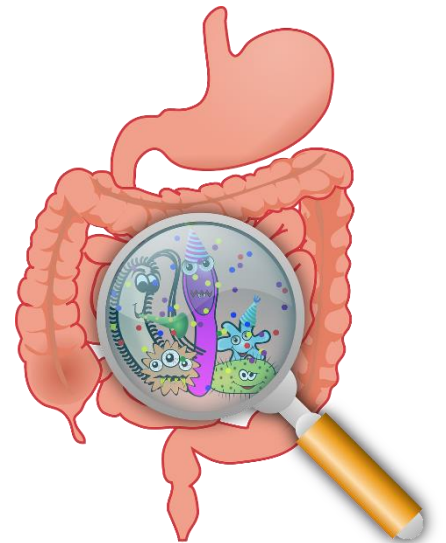
Production of fermented by-products using dietary fiber: majorly short chain-fatty acids (SCFAs): propionate, acetate and butyrate

Biological Roles of Short Chain Fatty Acids

- Ion transportation
- Regulation of appetite
- Modulation of intercellular pH and cell volume
- Regulation of Gene expression

Butyrate

- The main energy source of human colonocytes
- Induces apoptosis of colon cancer cells
- Improves absorption of electrolyte and water
- Regulates intestinal immunity and integrity
- Regulates homeostasis of energy and sugar
- Prevents gut microbiota dysbiosis

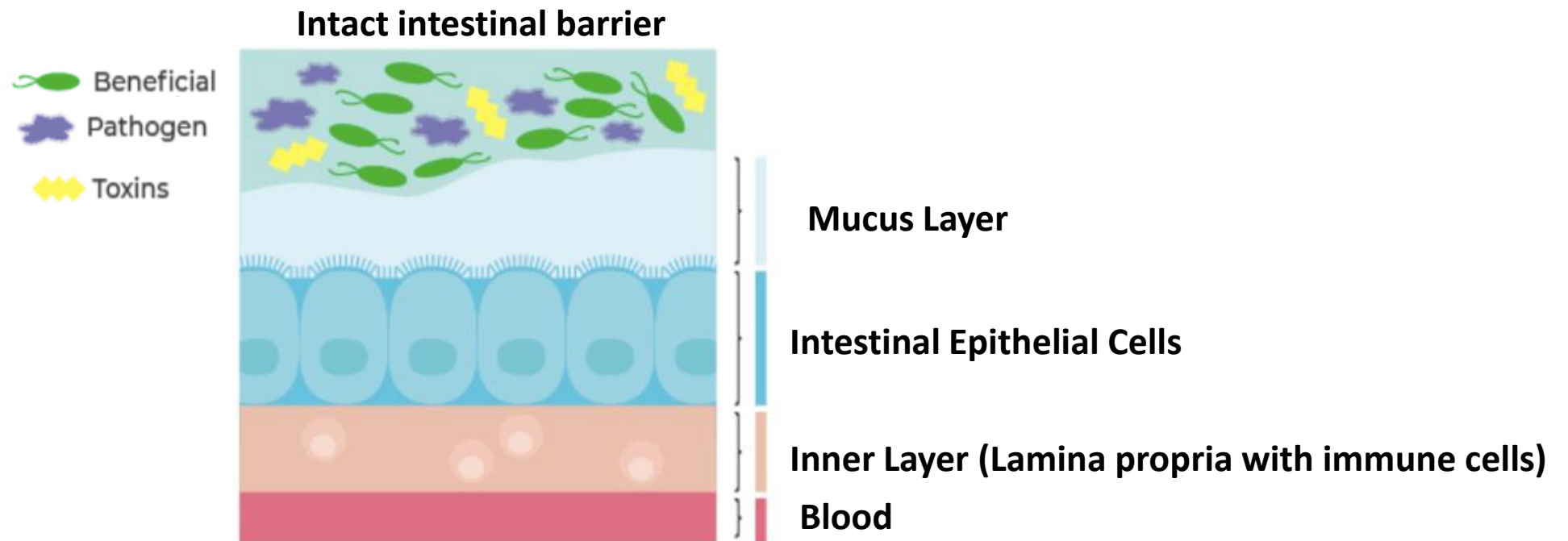


Decreased Butyrate

- Apoptosis
- Inflammation
- Mucosal atrophy
- Higher acetate/ Butyrate associated with clonic pathology

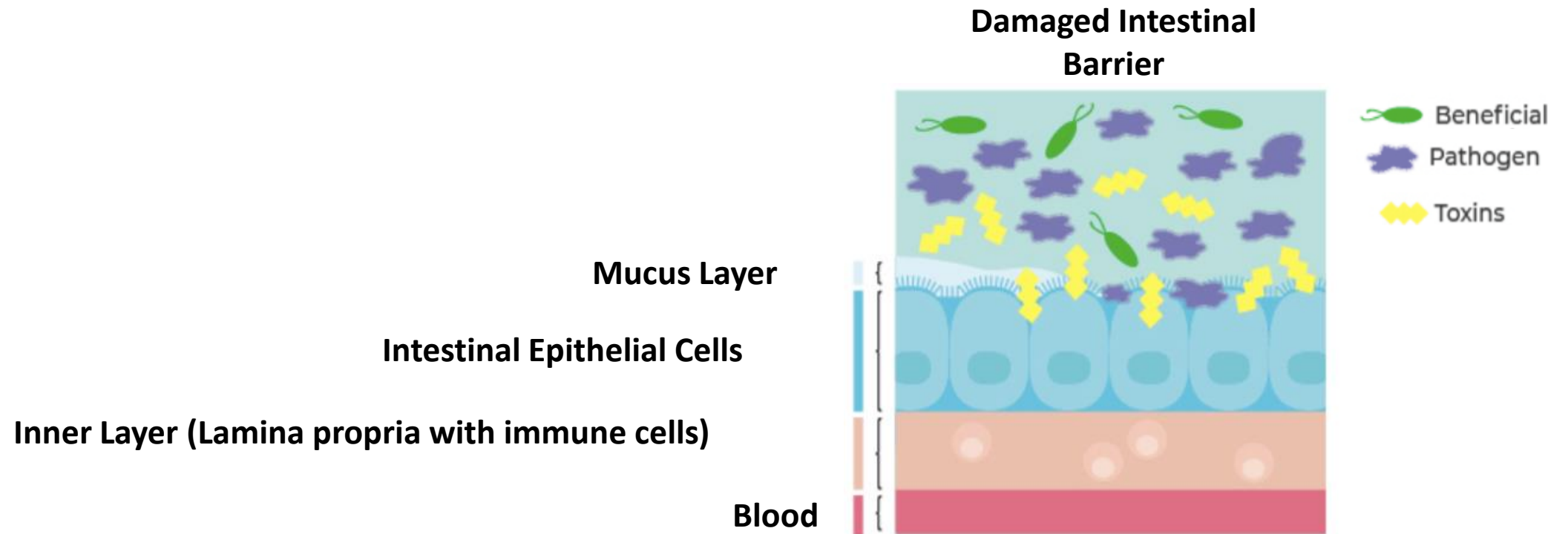
Healthy Gut Microbiome and Gut Homeostasis

- ✚ A balanced gut microbiome has an intricate relationship with the intestinal epithelial cells and immune cells that support gut homeostasis



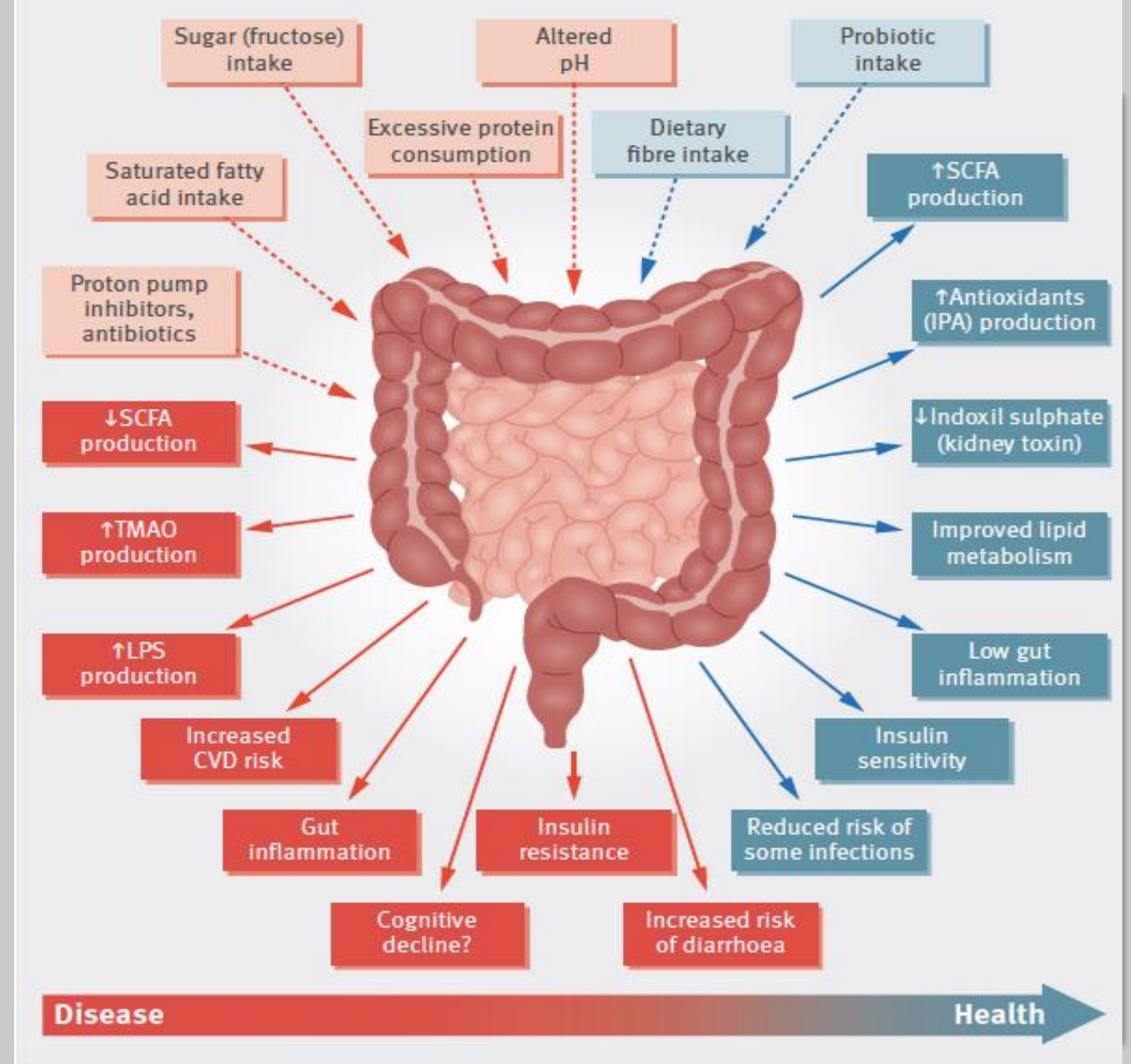
Gut Dysbiosis and Unhealthy Gut Microbiota

Low diversity of bacteria and imbalanced microbial composition

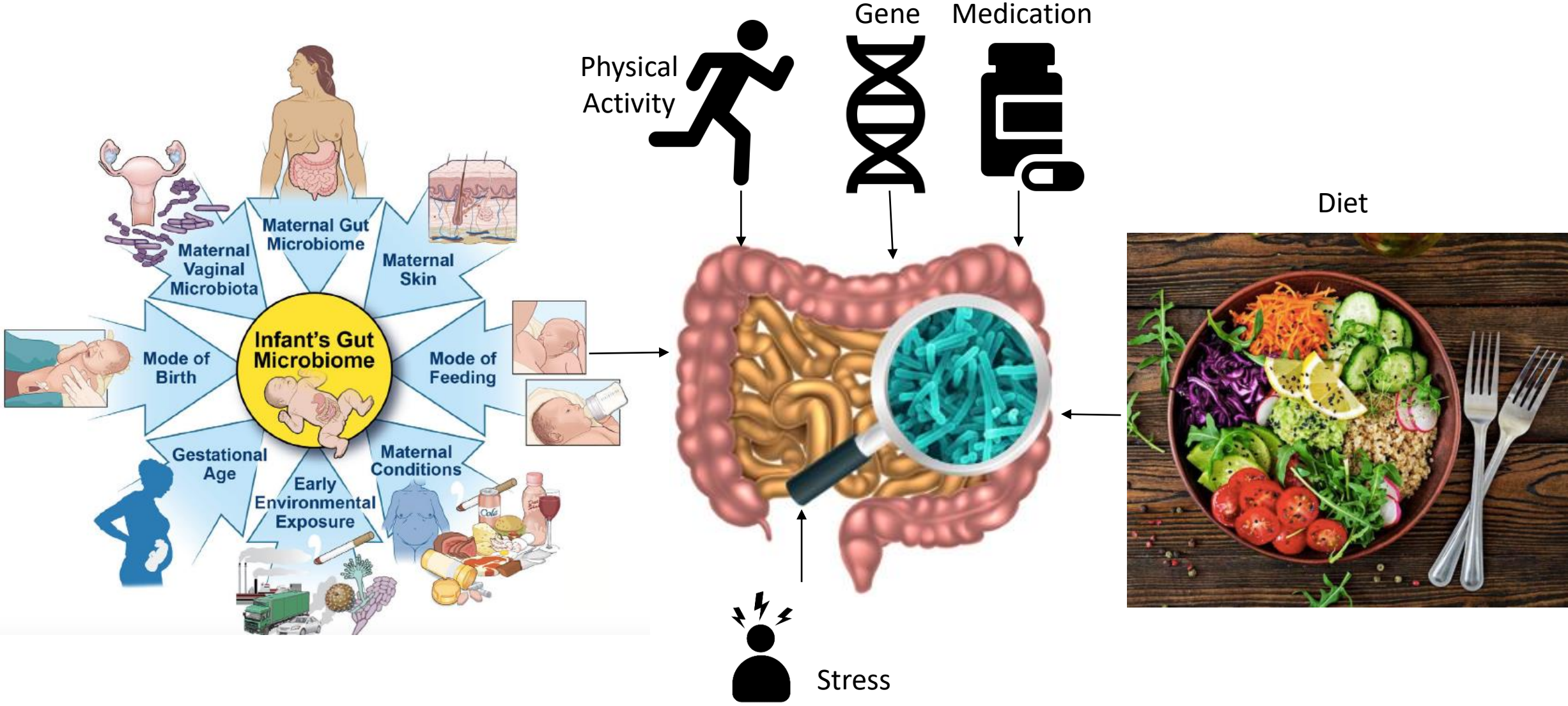


Role of Gut Microbiota in Health and Disease

- Gastrointestinal conditions:
 - Reflux, peptic ulcers
 - Irritable bowel syndrome (IBS)
 - Non-alcoholic liver disease
 - Inflammatory bowel disease (IBD)
- Systemic conditions:
 - Obesity
 - Atherosclerosis
 - Type 2 diabetes
 - Cancer
 - Alzheimer's
 - Parkinson's disease
 - Sclerosis
 - Autism spectrum disorder



Factors Shaping Gut Microbiota



Western Diet

Increased sucrose intake

- ❖ Lack of fruits and vegetables
- ❖ A low intake of dietary fiber
- ❖ Increased consumption of red meat and alcohol
- ❖ Altered omega-6/omega-3 fatty acid ratios
- ❖ Insufficient vitamin D intake (*Hlavaty et al, 2015*).

Prebiotics

Dietary Fiber

- Supports epithelial barrier function
- Improves the intestinal immune response
- Improve bowel movement

Soluble



OATS



SEEDS



NUTS



APPLES



BEANS



BERRIES

Insoluble



WHEAT BERRIES



BROWN RICE



KAMUT



SPELT



RYE



FRUITS & VEGGIES



Prebiotics

Oligosaccharide:

Fructooligosaccharide (FOS)

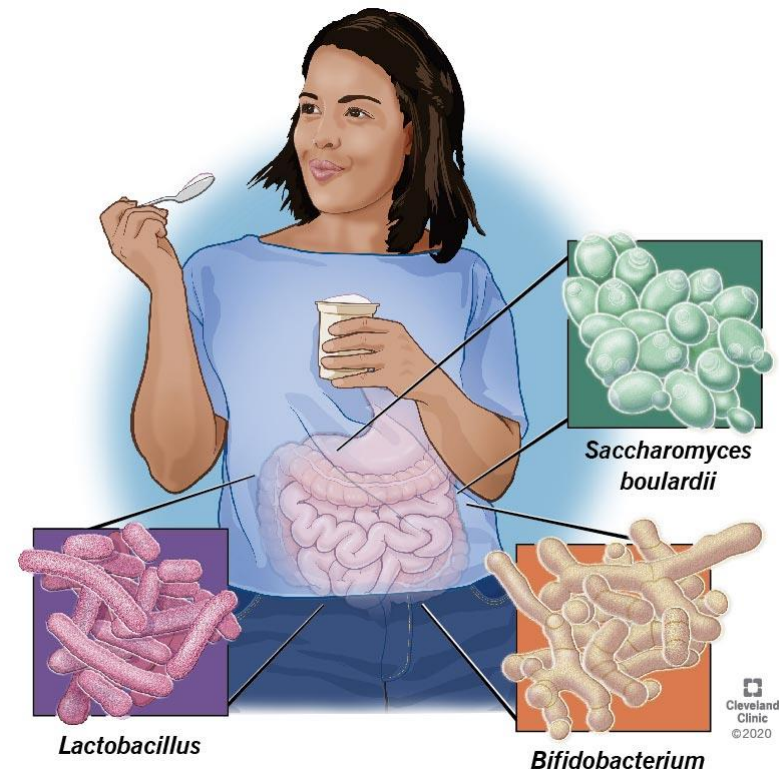
Galactooligosaccharides (GOS)

Inulin (Fructans)

Probiotic Supplementation

“Live microorganisms which when administered in adequate amounts confer a health benefit on the host”

Food and Agricultural Org., WHO,
2001



Synbiotic Supplementations

- Supplementation of live bacteria with their foods
- A combination of probiotics and prebiotics supplementation



Postbiotic Supplementations

- SCFAs: bacterial fermented by-products: **Tributylin**
- Therapy with butyrate and SCFAs supplementation improve pathological status in IBD





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