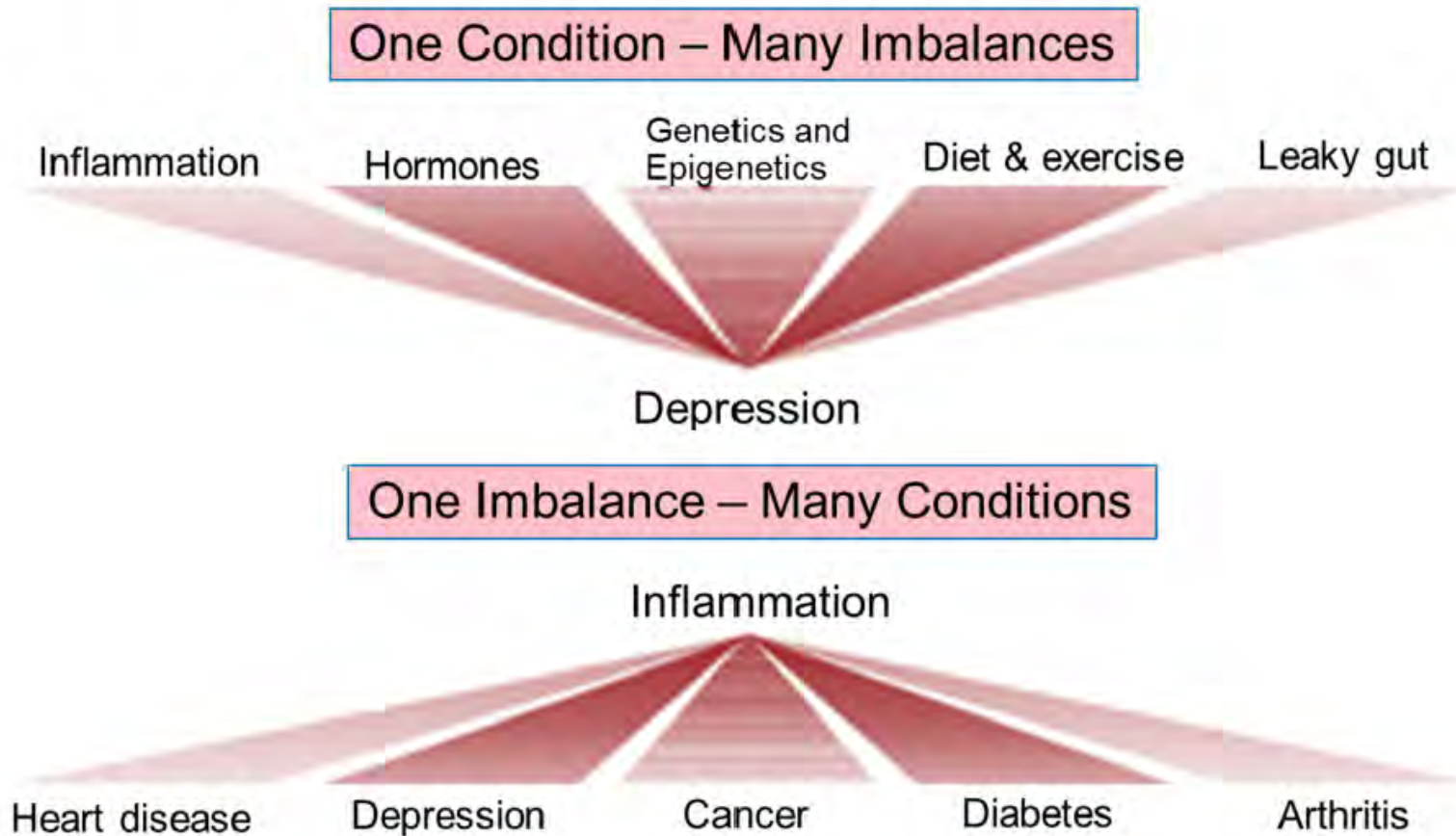
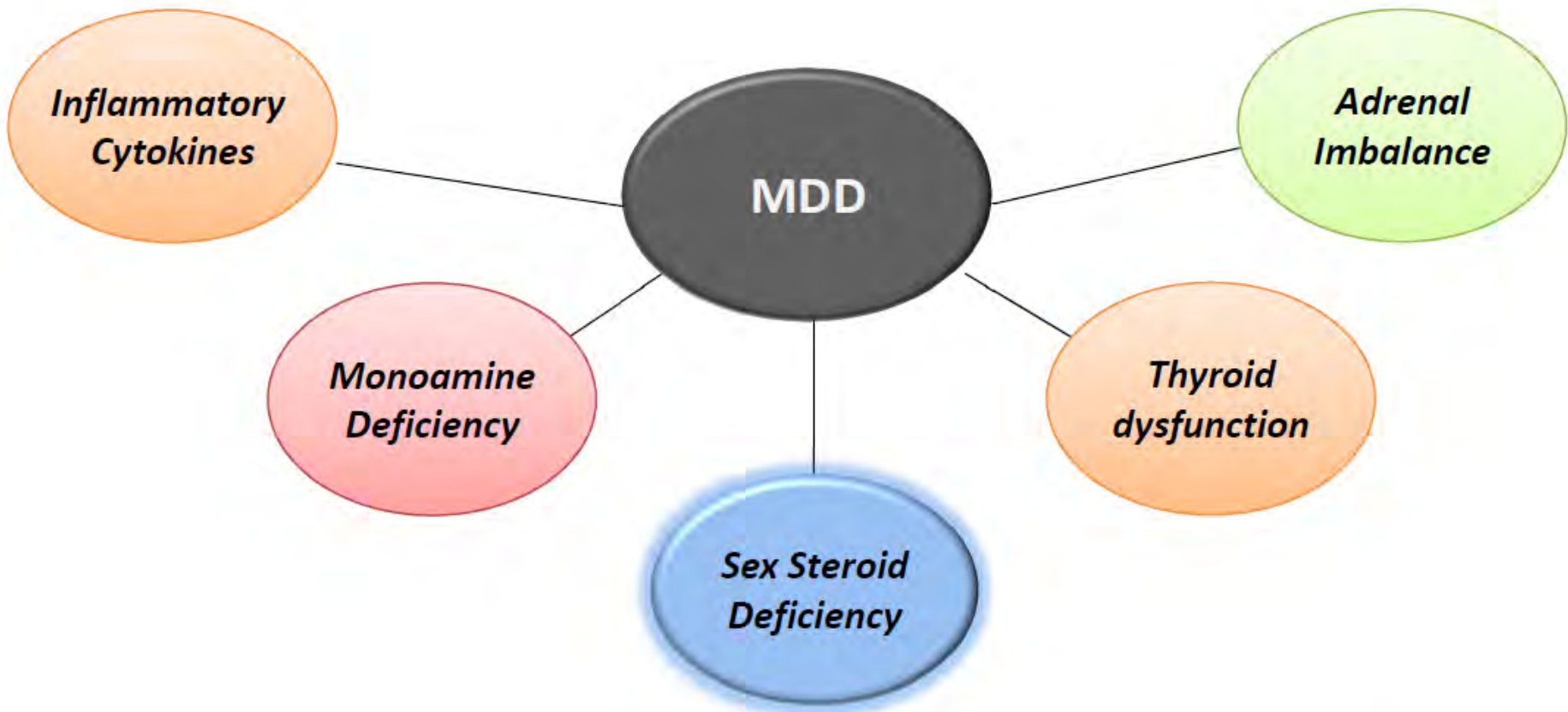


Despite Many Advances in the
Neurosciences Over the Last 30
Years....

“There are few examples of successful CNS diagnostics owing to our poor understanding of the mechanisms of diseases...Part of the problem lies in the tremendous heterogeneity in these diseases.”



Potential Imbalances in Multiple Messenger Systems in MDD



Autonomic & Adrenal Control of Immunity: Summary

Excessive adrenergic, noradrenergic, and glucocorticoid activity = anti-inflammatory effects



Low adrenergic, noradrenergic, and glucocorticoid activity = Pro-inflammatory effects

Brain Foods



NIH Public Access

Author Manuscript

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Brain foods: the effects of nutrients on brain function

Fernando Gómez-Pinilla

“Although food has classically been perceived as a means to provide energy and building material to the body, its ability to prevent and protect against diseases is starting to be recognized. In particular, research over the past 5 years has provided exciting evidence for the influence of dietary factors on specific molecular systems and mechanisms that maintain mental functioning.”

produced in the brain itself, influence cognitive ability. In addition, brain-derived regulators of synaptic plasticity, such as brain-derived neurotrophic factor, can function as metabolic modulators, responding to peripheral signals such as food intake. Understanding the molecular basis of the effects of food on cognition will help us to determine how best to manipulate diet in order to increase the resistance of neurons to insults and promote mental fitness.

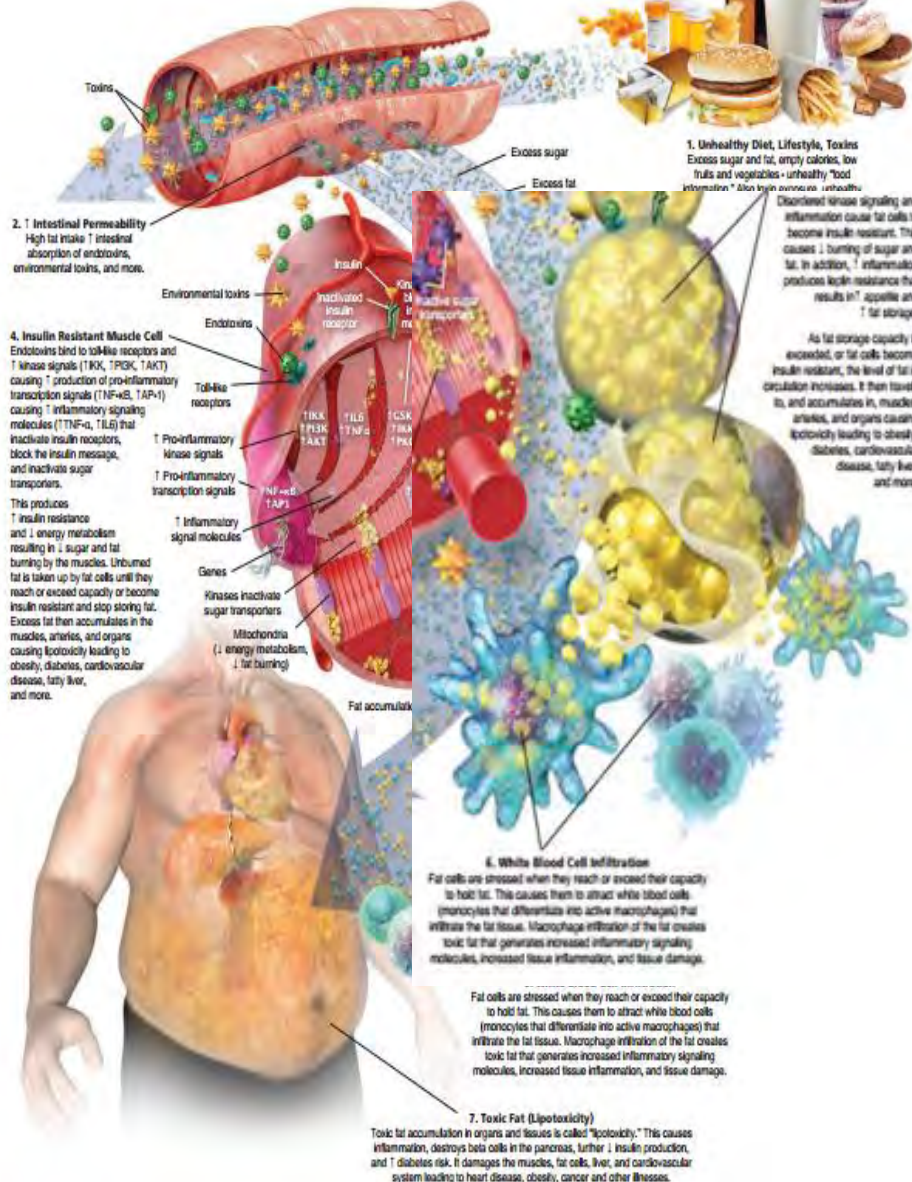
Gómez-Pinilla F. *Nat Rev Neurosci*. 2008;9(7):568-578.

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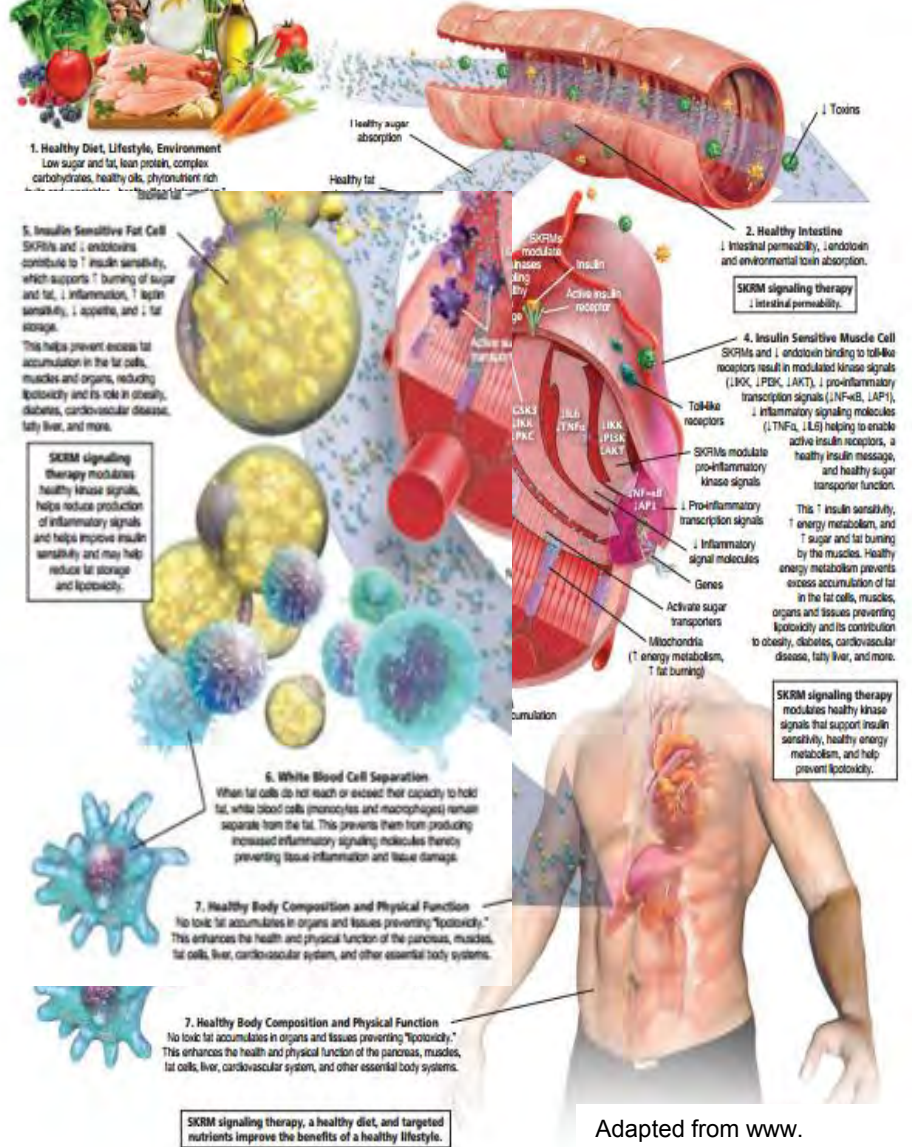
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Reducing Lifestyle-Induced Metabolic Disease

The Causes of Unhealthy Metabolism

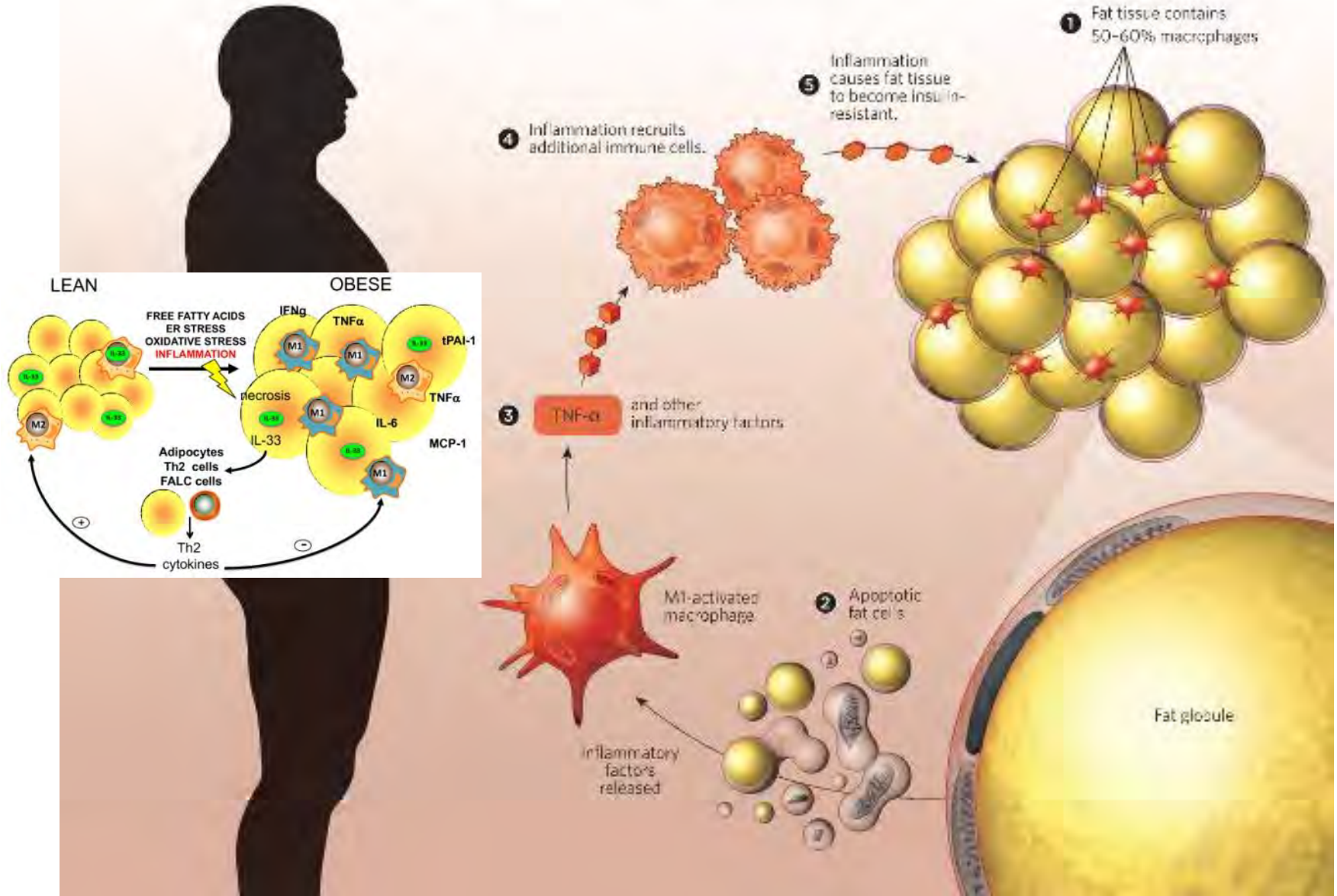


Achieving Healthy Metabolism



ADIPOSE TISSUE METABOLISM IN OBESE INDIVIDUALS

The adipose cells in obese individuals are both greater in number and size than in lean individuals, and the tissue contains a much higher percentage of macrophages **1**. As a result of storing excessive amounts of fat, the stressed adipose cells release inflammation-inducing factors and undergo apoptosis **2**. Both outcomes activate macrophages in a traditional M1 inflammatory state **3** in which they release tumor necrosis factor- α (TNF- α), which recruits and activates additional immune cells to the site **4**. This low level sustained inflammation causes tissues to become resistant to insulin **5**, the first step in developing diabetes.



INTESTINAL HEALTH



Healthy Function

Healthful bacteria that coats and protects the intestinal wall, along with other factors obtained from food or from natural intestinal secretions, inhibit unhealthful bacteria and contribute to maintaining bacterial balance and optimal intestinal health.

Lactoperoxidase:
A protein enzyme that damages unhealthful bacteria.

Globulin Proteins: Proteins that prevent unhealthful bacteria from adhering to the intestine.

Lactoferrin: A protein that traps iron and blocks its use by unhealthy bacteria, thus starving them.



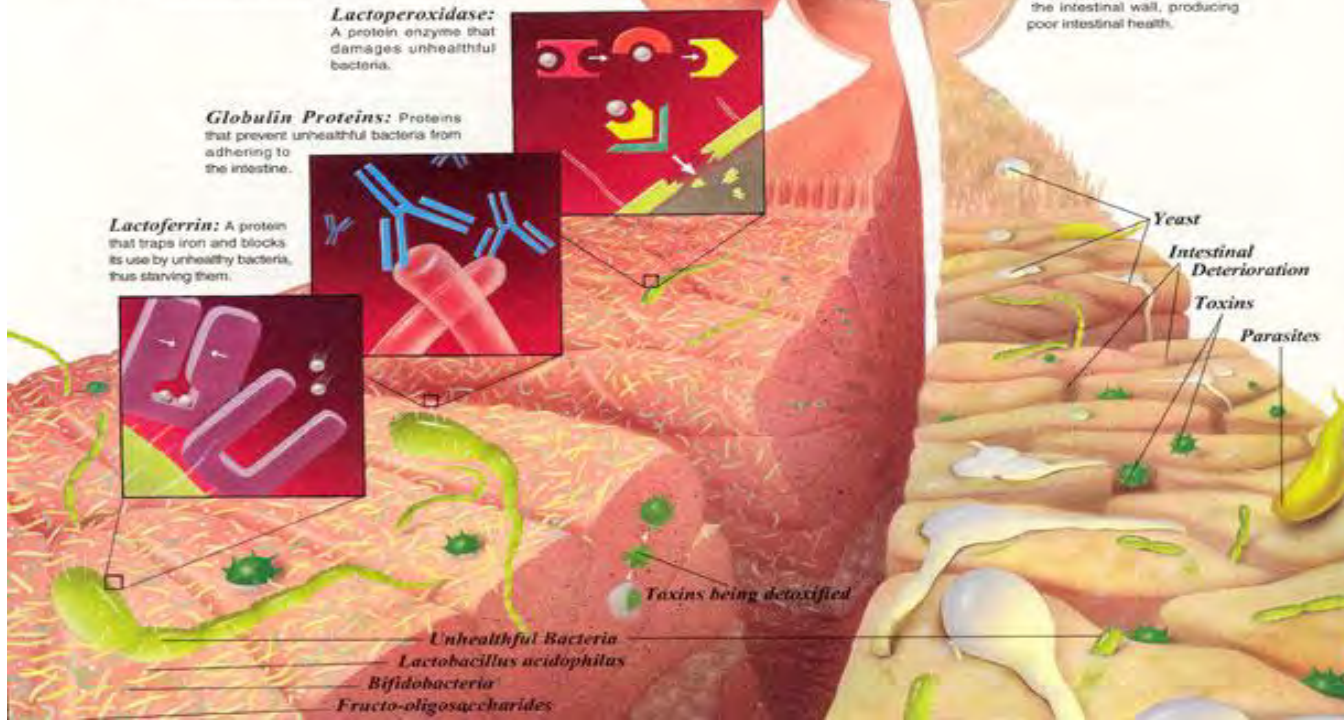
Unhealthy Function

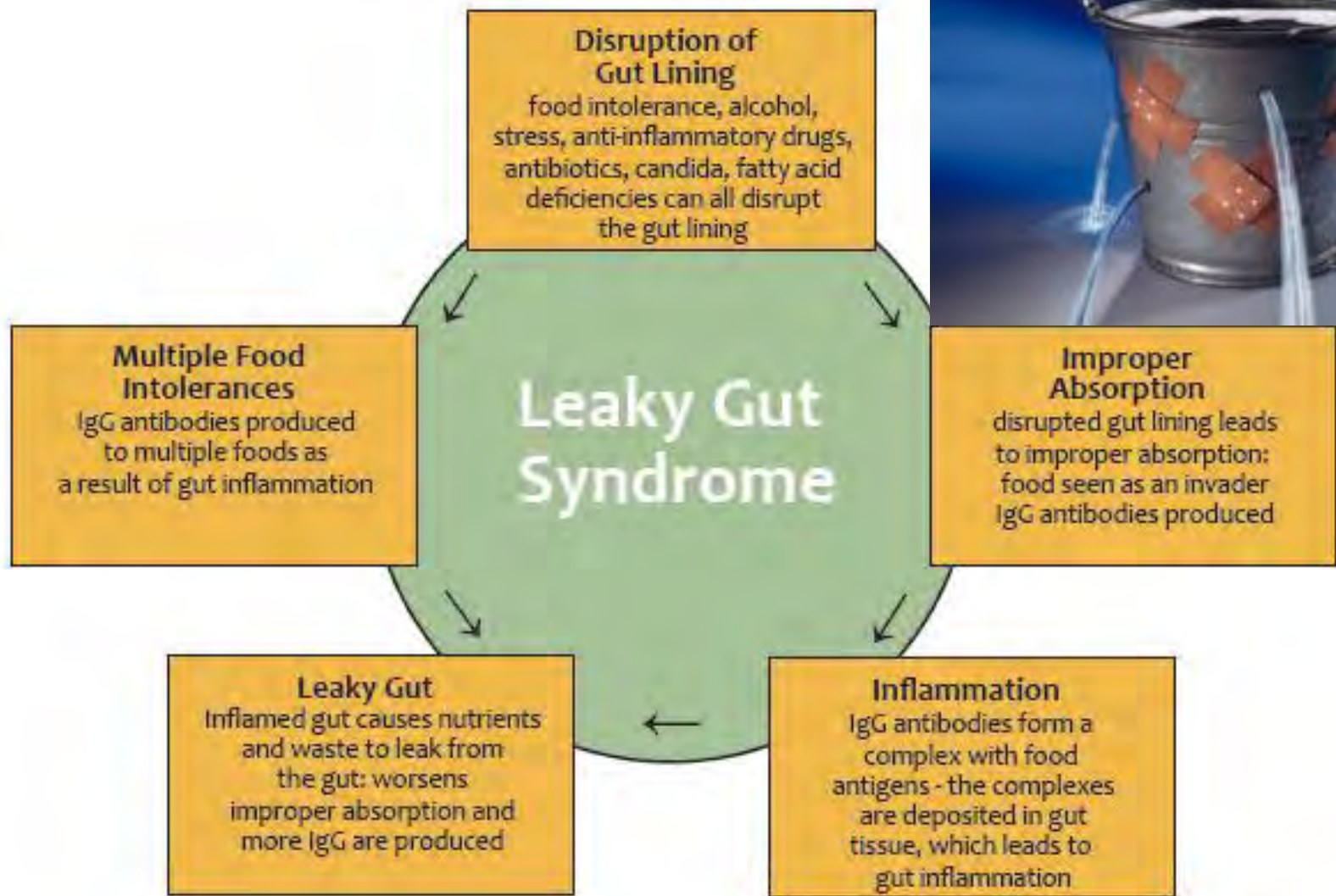
With healthful bacteria and other protective factors missing, unhealthful bacteria, yeast, parasites and toxins may accumulate, damaging the intestinal wall, producing poor intestinal health.

Yeast
Intestinal Deterioration
Toxins
Parasites

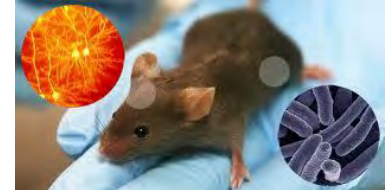
Toxins being detoxified

Unhealthful Bacteria
Lactobacillus acidophilus
Bifidobacteria
Fructo-oligosaccharides





Intestinal Microbiota

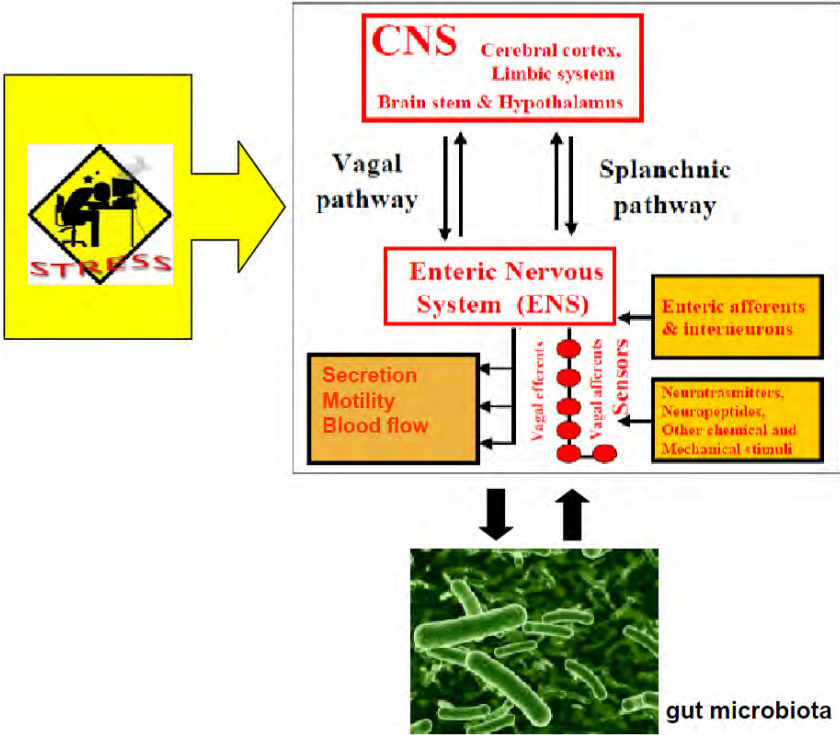
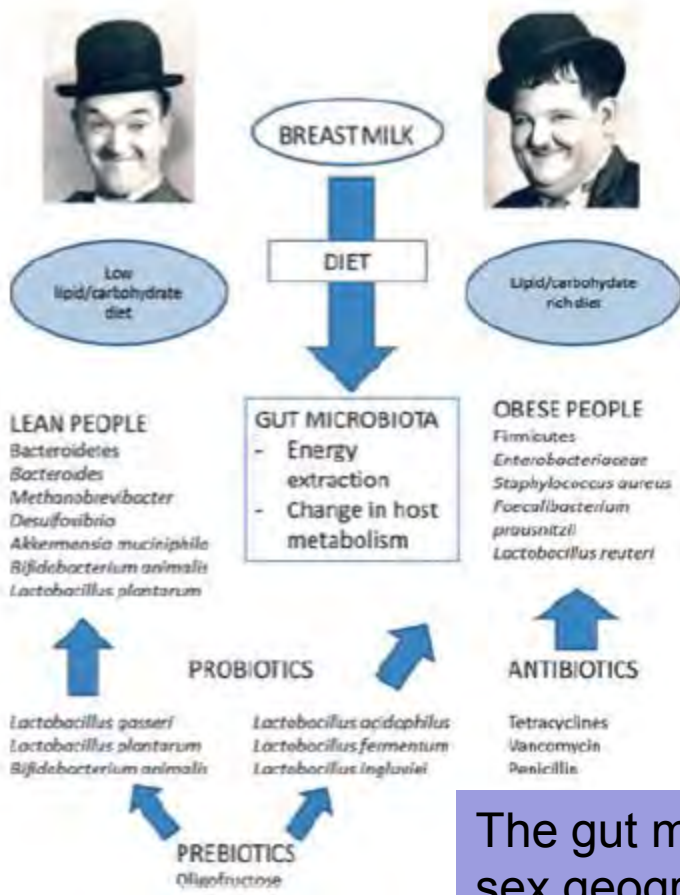


- Function like a “**Metabolic Organ**” with a bidirectional communication network.
- Afferent fibers connect with integrative CNS structures and efferent projections to smooth muscle.
- Brain signals influence **motor, sensory and secretory function in GI tract**
- Visceral messages from gut affect brain function-hypothalamus-stress regulation

Gut bacterial microbiota and obesity

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BRAIN - GUT - AXIS

The gut microbiota composition depends on age, sex, geography, ethnicity, family and diet and can be modulated by prebiotics, probiotics and antibiotics.

Learn to:

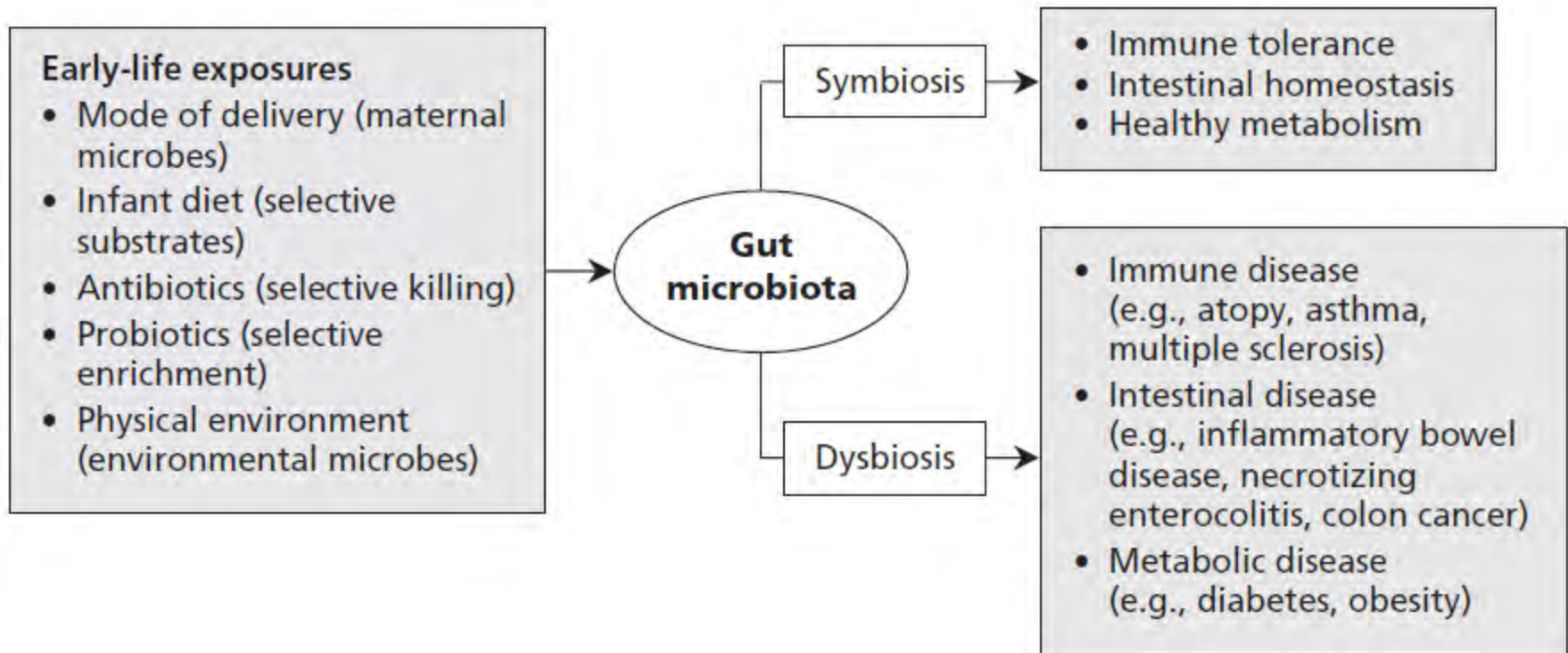
- Bolster your immune system against disease
- Alleviate allergies and asthma
- Keep a proper bacterial balance
- Improve the health of your digestive tract

Dr. Shekhar K. Challa
Board Certified Gastroenterologist

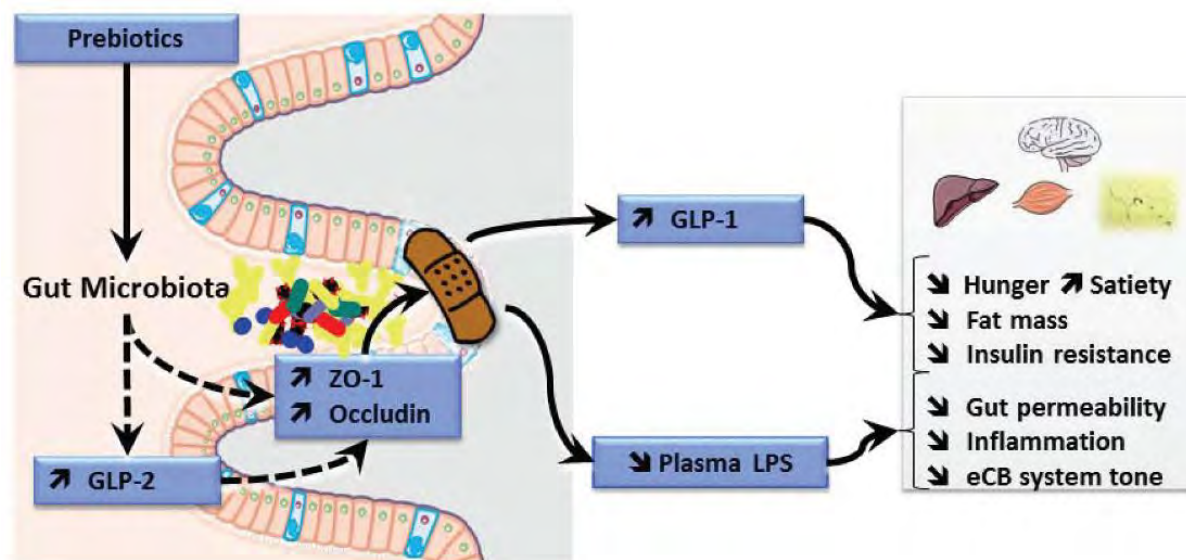


Gut microbiota of healthy Canadian infants: profiles by mode of delivery and infant diet at 4 months

Meghan B. Azad PhD, Theodore Konya MPH, Heather Maughan PhD, David S. Guttman PhD, Catherine J. Field PhD, Radha S. Chari MD, Malcolm R. Sears MB, Allan B. Becker MD, James A. Scott PhD, Anita L. Kozyrskyj PhD, on behalf of the CHILD Study Investigators



Modulation of the gut microbiota by nutrients with prebiotic properties: consequences for host health in the context of obesity and metabolic syndrome



Improvement of obesity and related metabolic disorders by the prebiotic approach. Nutrients with prebiotic properties allows, by changing the gut microbiota, to promote the endocrine function of the gut (increase in GLP-1, and GLP-2 producing cells), and to modulate the activation of the endocannabinoid system in the intestine and in the adipose tissue. All those effects contribute to lessen gut permeability (improved distribution of the tight junction proteins ZO-1 and Occludin), thereby decreasing endotoxemia, and systemic inflammation. Changes in GLP-1 contribute to decrease food intake, fat mass, glycemia and insulin resistance. eCB, endocannabinoid; GLP-1, glucagon-like peptide 1; GLP-2, glucagon-like peptide 2; LPS, lipopolysaccharides; ZO-1, zonula occludens 1.