



Hormones, Hunger, Happiness

DR. BETSY GREENLEAF

CEO FEMVERSITY & THE PELVIC FLOOR STORE

HORMONES, HUNGER, HAPPINESS





MENU RESTAURANT

CHEF'S MENU

Option 1

Greasy Glum Gazpacho

Blackened Inflammation

Side of Fried Fatigue

Pairs with a Chronic Disease Chianti

Salted Sugar High Sore-bet

Option 2

Glowing Grilled Greens Salad

Free Range Herbed Health & Happiness

Side of Hormone Harmony Haricots

Libido Layer Cake and Sexy Sundae

CHRONIC DISEASES IN AMERICA

6 IN 10

Adults in the US
have a **chronic disease**



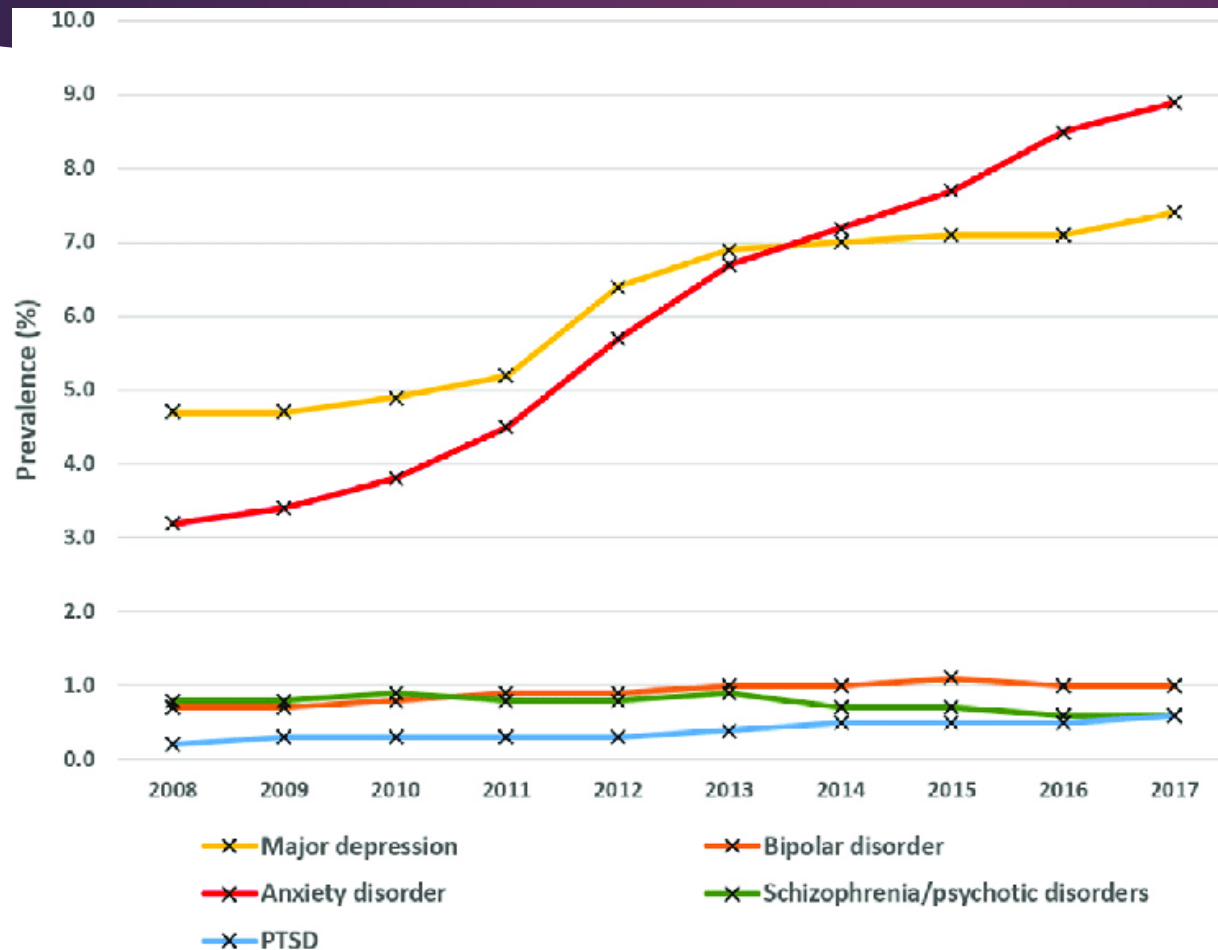
4 IN 10

Adults in the US
have **two or more**

THE LEADING CAUSES OF DEATH AND DISABILITY
and Leading Drivers of the Nation's **\$4.1 Trillion** in Annual Health Care Costs



Depression and Anxiety Trending Up



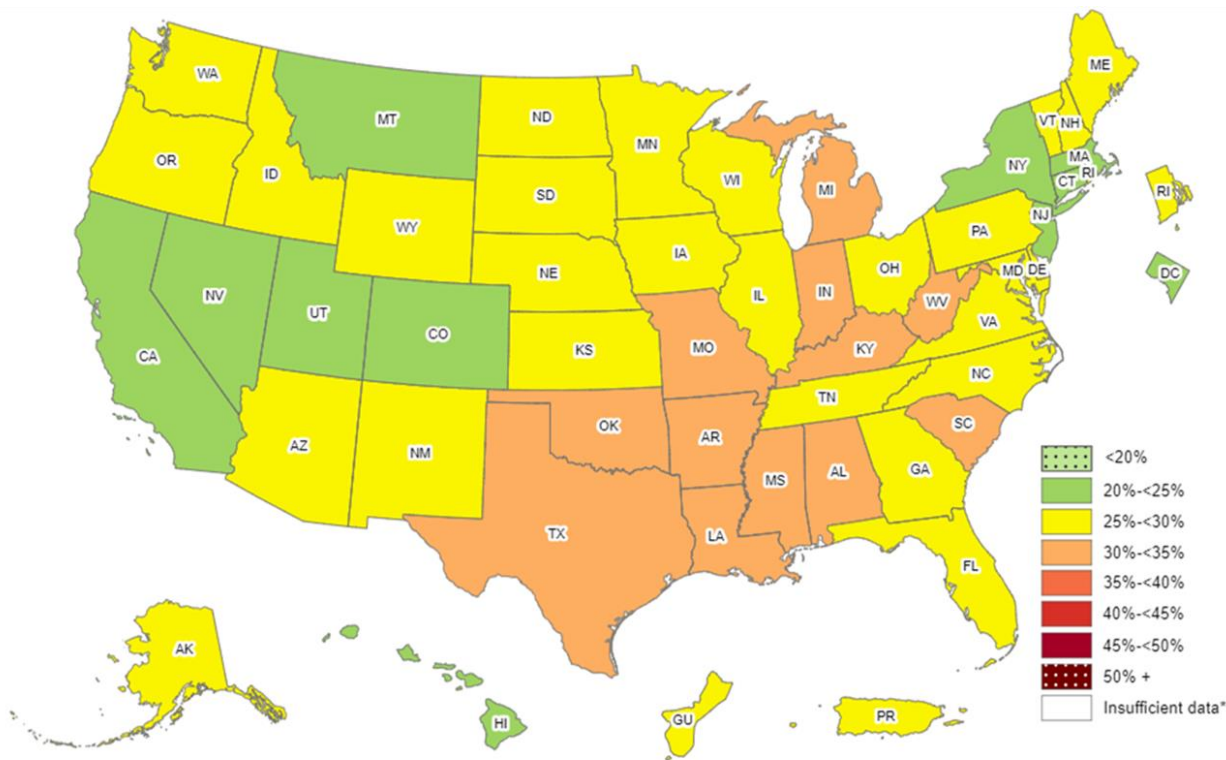
Intimate Health

- ▶ Sexual Dysfunction
 - ▶ 43% of Women
 - ▶ 31% of Men

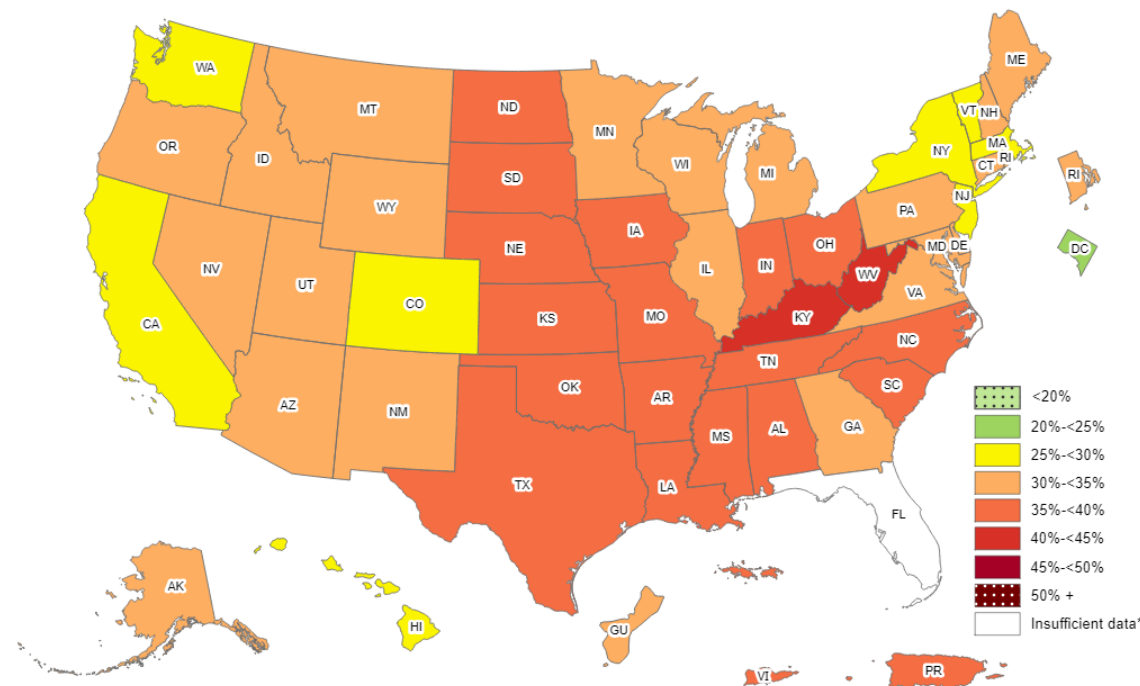


Rates of Obesity Have Increased

2011



2022

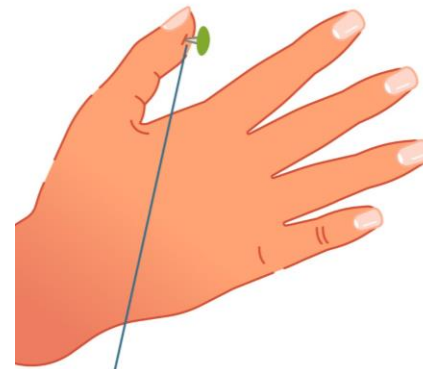




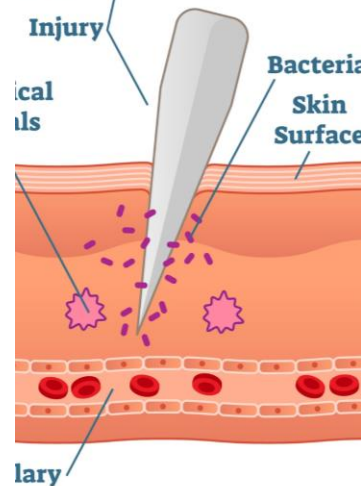
INFLAMMATION

When is Inflammation Good?

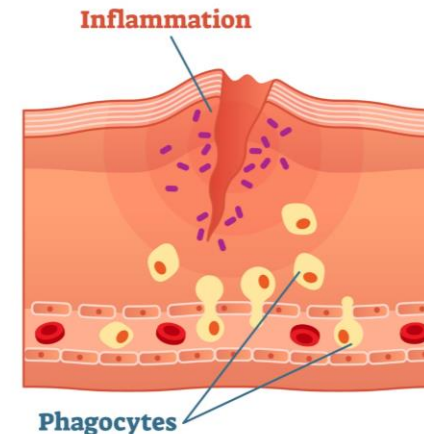
- ▶ Fight off infections: Inflammation helps to remove harmful pathogens such as bacteria and viruses, and prevent their spread.
- ▶ Heal injuries: Inflammation is involved in the healing process by increasing blood flow to the injured area and providing the necessary nutrients and immune cells to promote tissue repair.
- ▶ Remove damaged cells: Inflammation helps to remove dead or damaged cells that could otherwise contribute to disease or infection.
- ▶ Activate the immune system: Inflammation triggers the activation of the immune system, which helps to fight off pathogens and protect the body from harm.



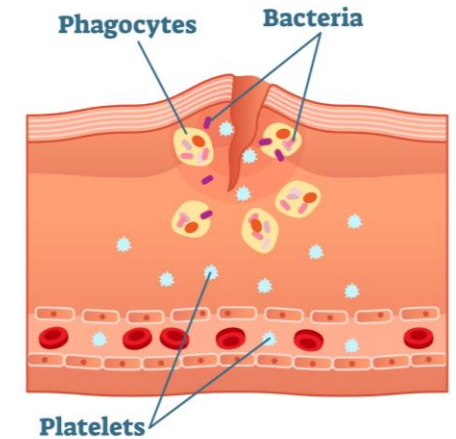
INJURY INFLAMMATION



Tissue Injury
Release of chemical signals
(Histamine)



**Dilation and Increased
Leakiness of Capillary**
Phagocytes Migrate to the Area



**Phagocytes Consume Bacteria
and Cell Debris**
Platelets Move Out of the Capillary to
Seal the Wounded Area

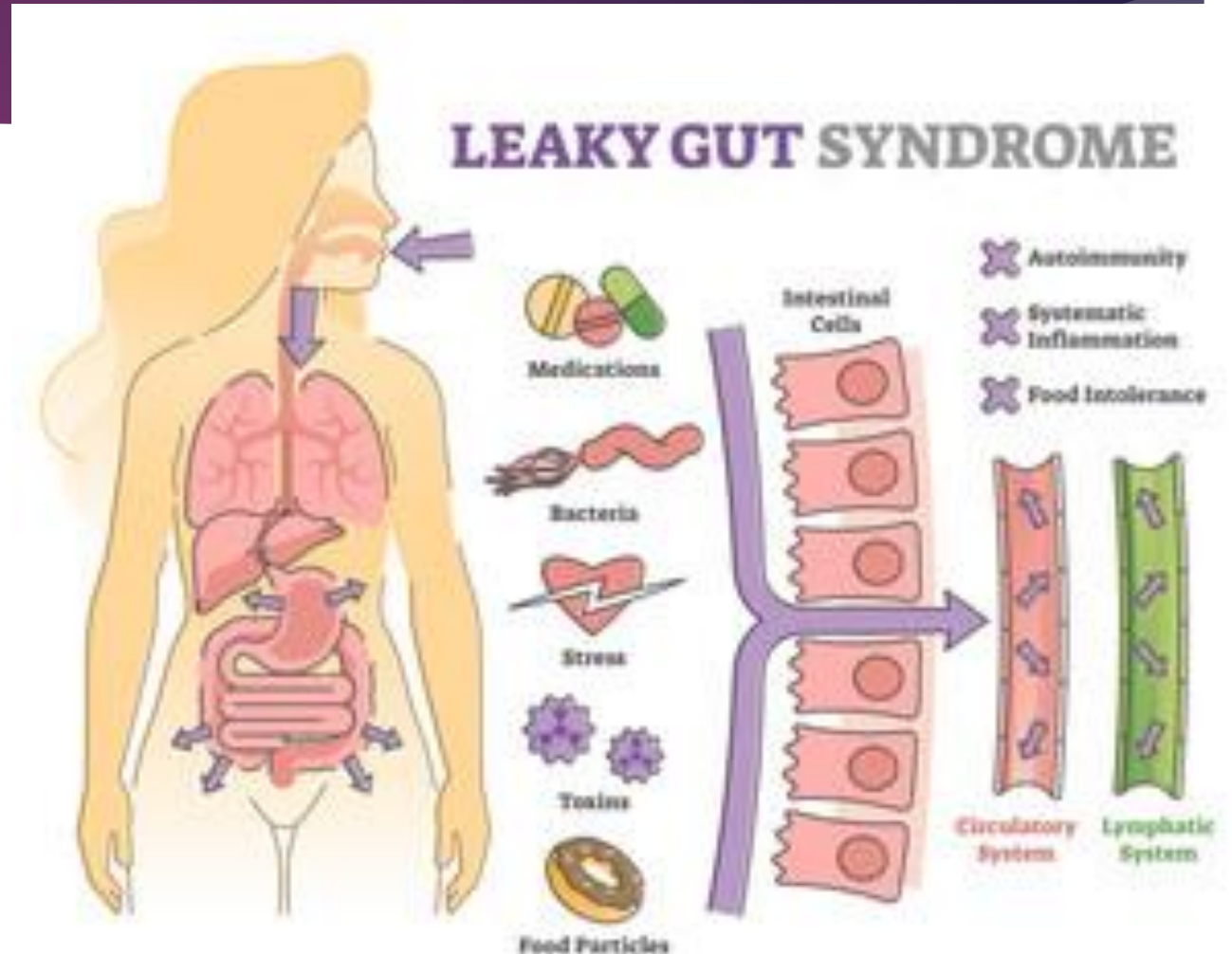
When is Inflammation Bad?

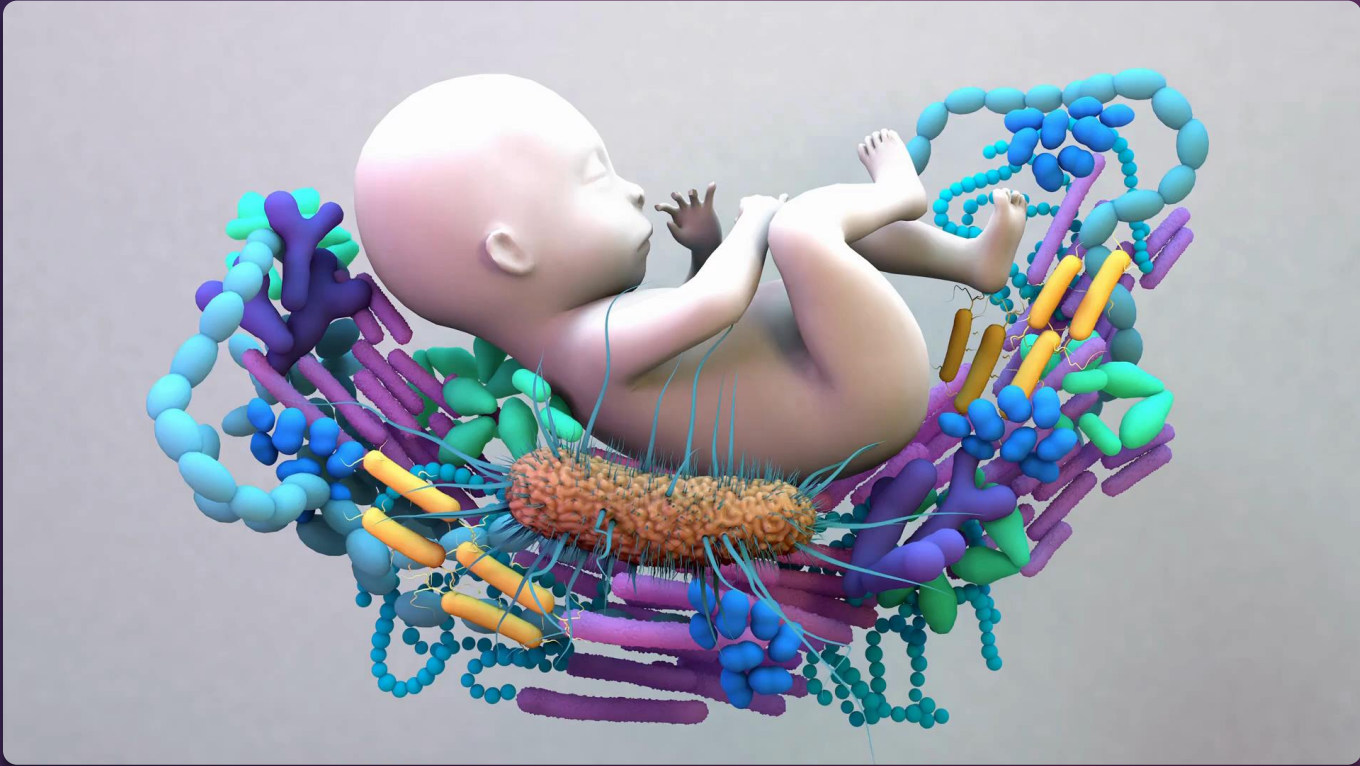
- ▶ Inflammation is considered bad or harmful when it becomes chronic, prolonged, or excessive. Chronic inflammation occurs when the immune system is persistently activated without injury or infection and can contribute to the development and progression of various diseases.



Leaky Gut Leads To Inflammation

- Activation of the immune system: The immune system sees the invading substances as harmful and mounts an immune response, leading to inflammation.
- Production of cytokines: When harmful substances enter the bloodstream due to a leaky gut, cytokine production increases, leading to inflammation.
- Altered gut bacteria: leading to an overgrowth of harmful bacteria and further contributing to inflammation.
- Systemic inflammation: Inflammation caused by a leaky gut can spread throughout the body, contributing to systemic inflammation and an increased risk of chronic diseases such as heart disease, diabetes, and certain cancers.

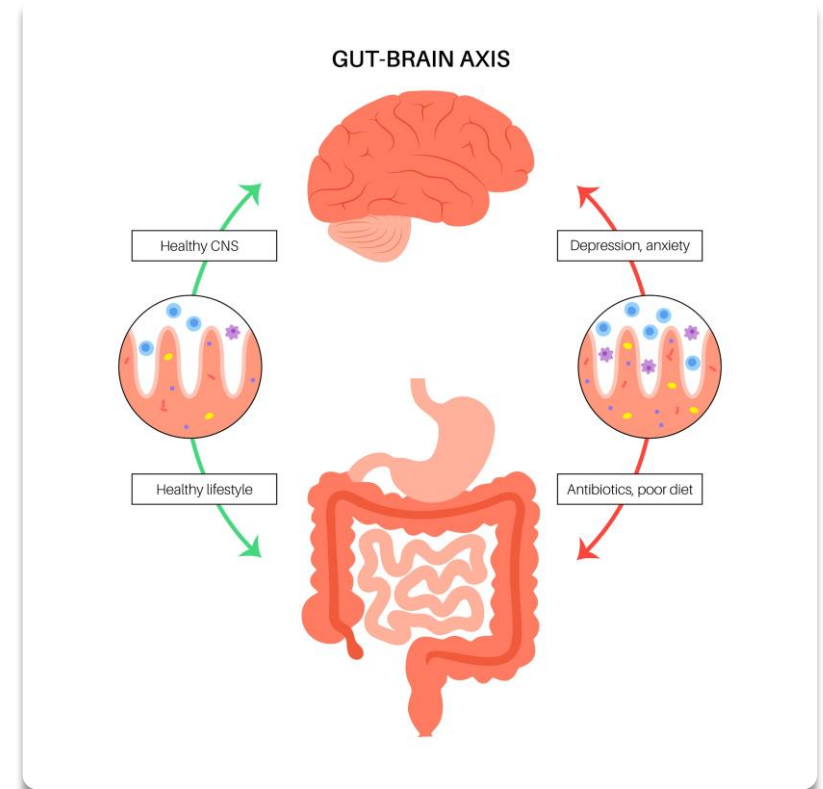




MICROBIOME

Stress Affects the Microbiome

- ▶ Alters gut bacteria populations: Stress can alter the populations of different types of bacteria in the gut, leading to an overgrowth of harmful bacteria and a reduction in beneficial bacteria. This can result in inflammation and contribute to the development of various health problems.
- ▶ Suppresses the immune system: Chronic stress can suppress the immune system, reducing the body's ability to fight off infections and leading to an altered microbiome.
- ▶ Increases gut permeability: Stress can increase gut permeability, also known as leaky gut, allowing harmful substances to enter the bloodstream and triggering an immune response, leading to inflammation.
- ▶ Decreases nutrient absorption: Stress can also reduce the production of digestive enzymes, leading to decreased nutrient absorption and affecting the health of the gut microbiome



Neurotransmitters Made In The Gut

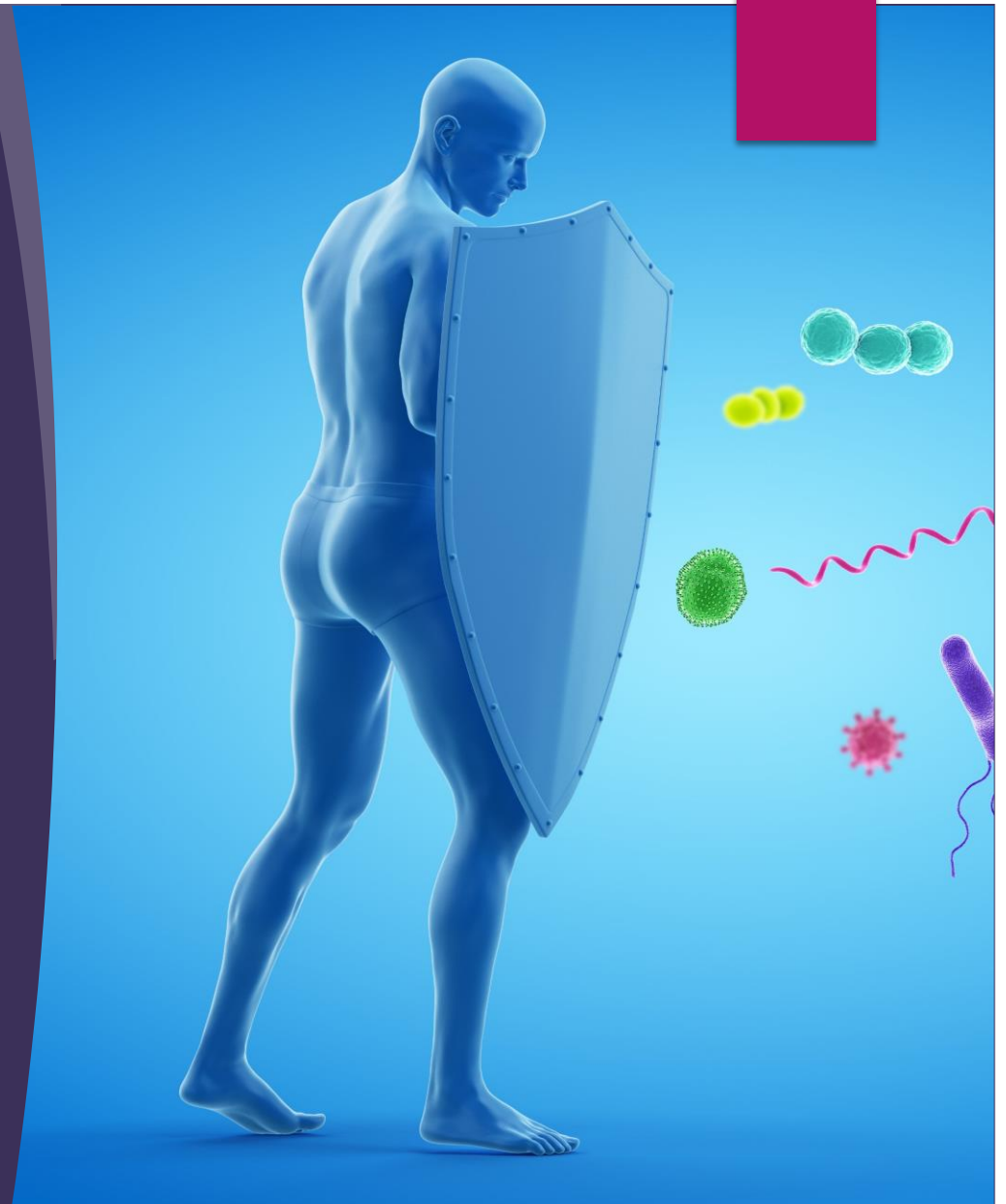
- ▶ Serotonin: Regulates mood, appetite, and sleep. It is estimated that 90% of the body's serotonin is produced in the gut.
- ▶ GABA (gamma-aminobutyric acid): regulates anxiety and helps to promote relaxation.
- ▶ Acetylcholine: regulation movement, depression, anxiety, memory and learning
- ▶ Substance P: pain sensation and inflammation.
- ▶ Dopamine: regulates movement, motivation, and reward.

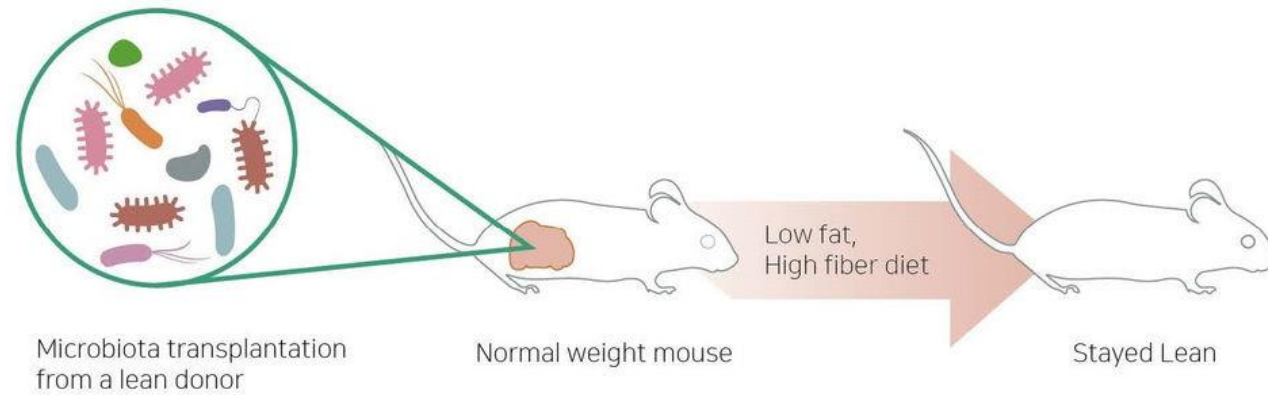
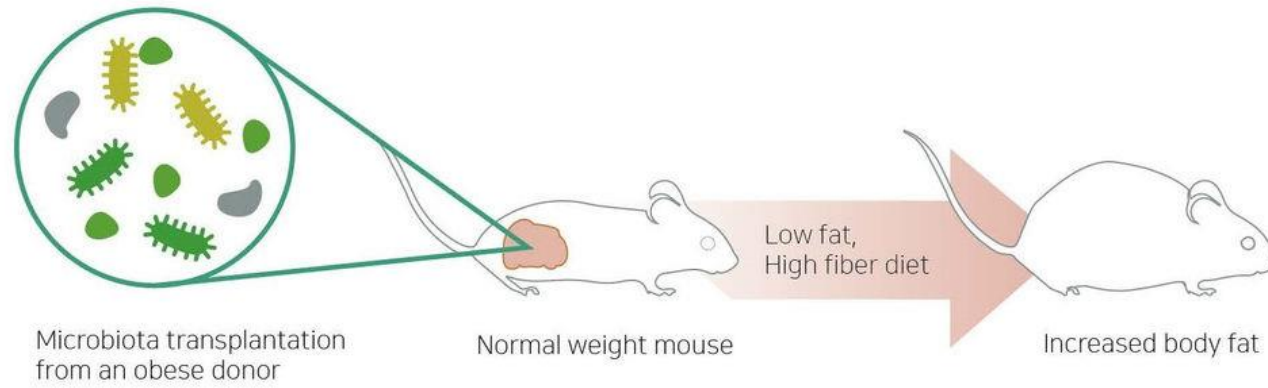


Immune System Made in the Gut

90% of Secretory IG A is made in the gut

T helper cells are activated in the gut and bile and bacteria are considered activating factors





Microbiome's impact on Obesity

Role of Stress on Hormones, Microbiota and Inflammation

Parasympathetic & Sympathetic

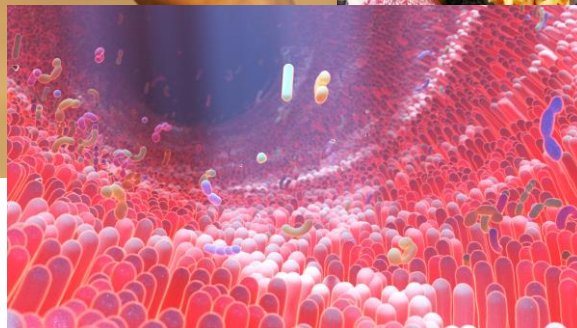
Parasympathetic

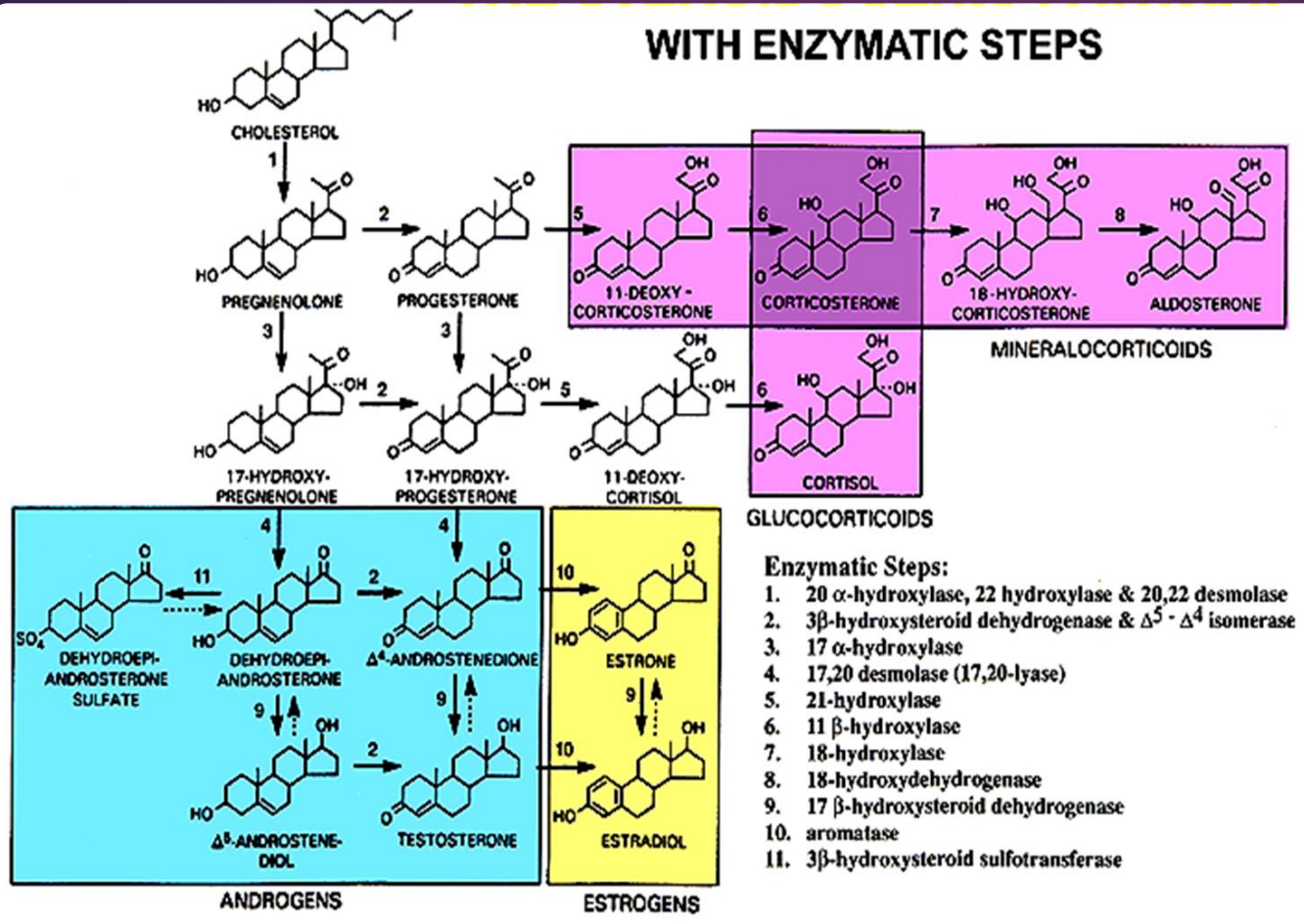


Sympathetic



Stress





Hormone Cascade

Why is cortisol good?

Regulating metabolism: Cortisol plays a key role in regulating glucose metabolism and maintaining blood sugar levels. It does this by stimulating the liver to release glucose into the bloodstream.

Reducing inflammation: Cortisol is an anti-inflammatory hormone, meaning that it helps to reduce inflammation in the body. This is important for reducing the risk of chronic diseases such as arthritis and cardiovascular disease.

Supporting the immune system: While cortisol can suppress the immune system in high doses, it is also necessary for proper immune function. Cortisol helps to regulate the immune response, preventing it from becoming too strong or too weak.

Managing stress: Cortisol is often called the "stress hormone" because it is released in response to stress. However, cortisol can also help the body to manage stress by increasing alertness, focus, and energy levels.

When is cortisol bad?

Increased risk of chronic diseases: Prolonged exposure to stress and elevated cortisol levels can increase the risk of chronic diseases such as heart disease, diabetes, and autoimmune disorders.

Suppressed immune function: Elevated cortisol levels can suppress the immune system, making the body more susceptible to infections and other illnesses.

Mental health problems: Chronic stress and elevated cortisol levels can increase the risk of mental health problems such as anxiety and depression.

Weight gain: Elevated cortisol levels can lead to increased appetite and cravings for high-calorie foods, which can contribute to weight gain.

Sleep problems: Chronic stress and elevated cortisol levels can disrupt sleep patterns, leading to insomnia and other sleep problems.

Digestive problems: Elevated cortisol levels can lead to digestive problems such as bloating, constipation, and diarrhea.

So we now know that inflammation leads to

Leaky Gut

Chronic Disease

Anxiety/Depression

Immune
Dysfunction

Obesity

Hormone
Dysregulation

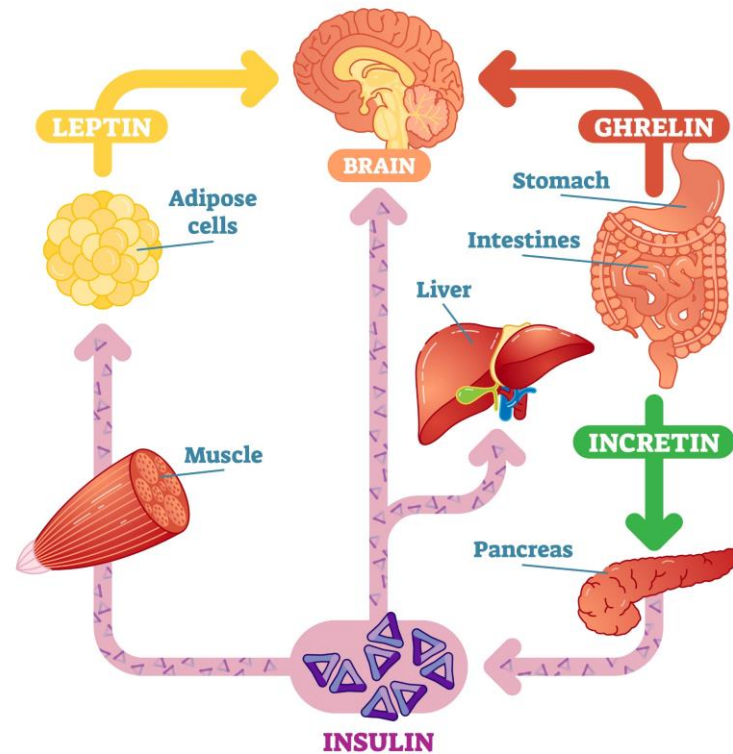
Low Libido

Fertility Challenges



Hunger

APPETITE AND HUNGER HORMONES



Biochemistry of Hunger

Hormones of Hunger: Ghrelin

- ▶ Stomach GROWLING hormone
- ▶ Ghrelin is a hormone produced mainly in the stomach and small intestine. It is known as the "hunger hormone" because it stimulates appetite and promotes food intake. Ghrelin levels increase before meals and decrease after meals, indicating its role in regulating hunger and satiety.



Leptin

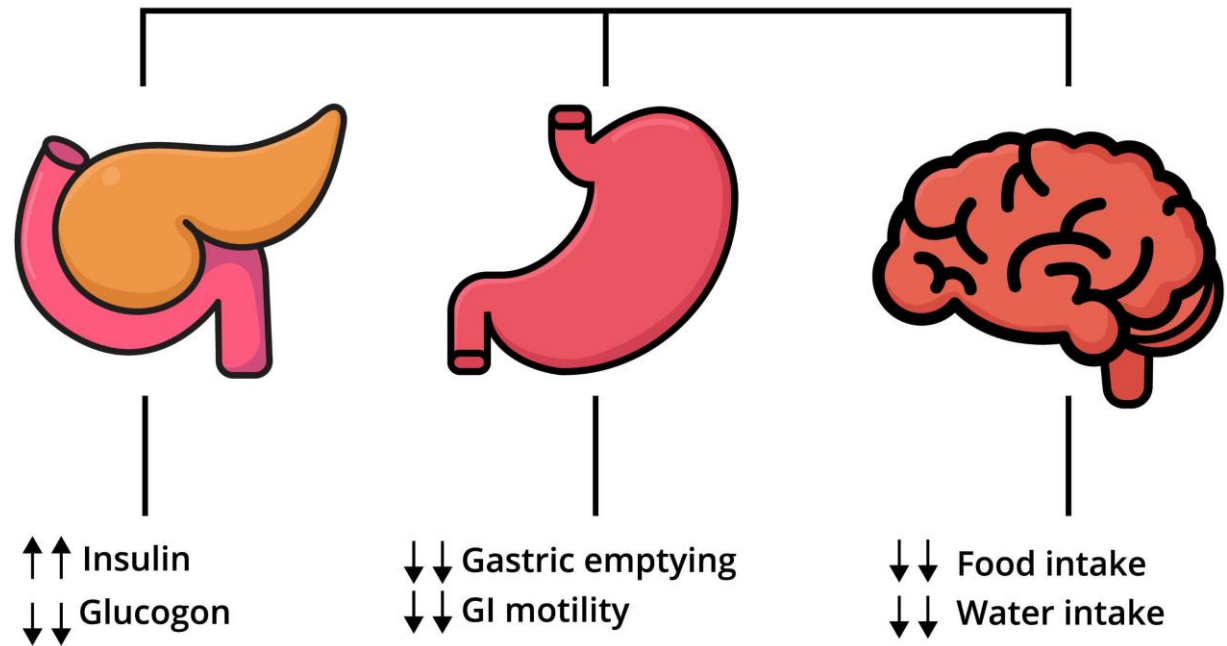
- ▶ LEAVE IT ALONE Hormone
- ▶ Leptin, on the other hand, is a hormone produced by adipose (fat) tissue. It is known as the "satiety hormone" because it signals the brain to reduce food intake and increase energy expenditure. Leptin levels increase with the amount of body fat, and it acts as a long-term regulator of energy balance, helping to maintain a healthy body weight.



Glucagon-like peptide 1

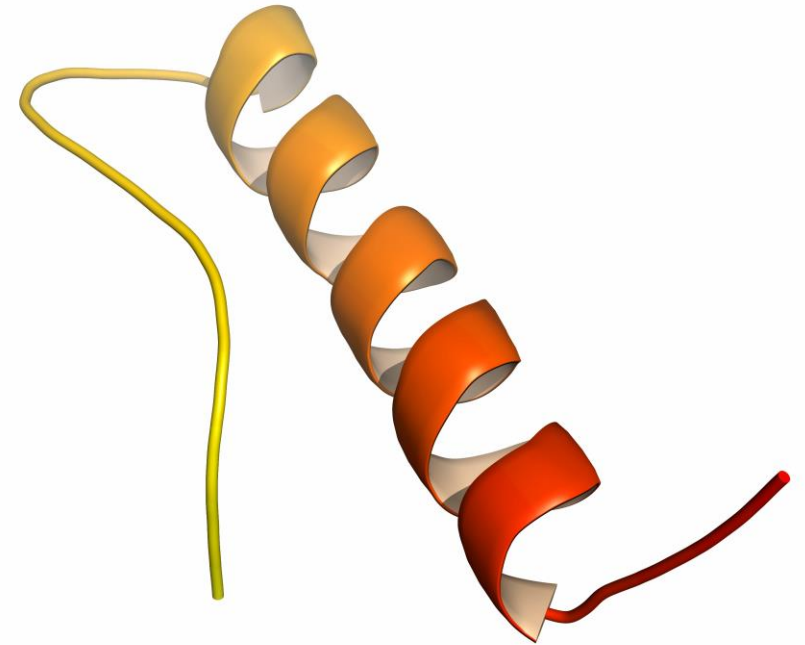
- ▶ Glucagon-like peptide-1 (GLP-1) is a hormone produced in the gut in response to food intake.
 - ▶ plays a critical role in the regulation of hunger and satiety
 - ▶ signaling in the hypothalamus leads to the activation of neurons that reduce hunger and increase energy expenditure
 - ▶ acts on the stomach and intestines to slow gastric emptying and reduce the absorption of nutrients
 - ▶ GLP-1 also promotes insulin secretion from the pancreas, which helps to regulate blood sugar levels and prevent spikes in blood sugar after meals. This can help to reduce cravings and promote satiety

GLP-1



Peptide YY

- ▶ a hormone produced by cells in the gastrointestinal tract, primarily in the ileum and colon
- ▶ released in response to food intake, and its levels increase as food travels through the digestive tract.
- ▶ acts on hypothalamus to reduce hunger and increase feelings of fullness.
 - ▶ activation of neurons that reduce hunger and increase energy expenditure
- ▶ acts on the stomach and intestines to slow gastric emptying and reduce the absorption of nutrients
- ▶ PYY levels are regulated by
 - ▶ type and amount of food consumed,
 - ▶ GLP-1
 - ▶ insulin





We think hunger is controlled by hormones or willpower.....but are we being turned into zombies at the will of our microbes?

Microbes and Hunger

- ▶ Microbes have a role in feeding frequency and food choices by
 - ▶ influencing reward pathways in the brain
 - ▶ producing mood-altering toxins
 - ▶ hijacking taste receptors
- ▶ Prevotella and Candida likes carbohydrates
- ▶ Bifidobacterium and Bacteroidetes likes fats



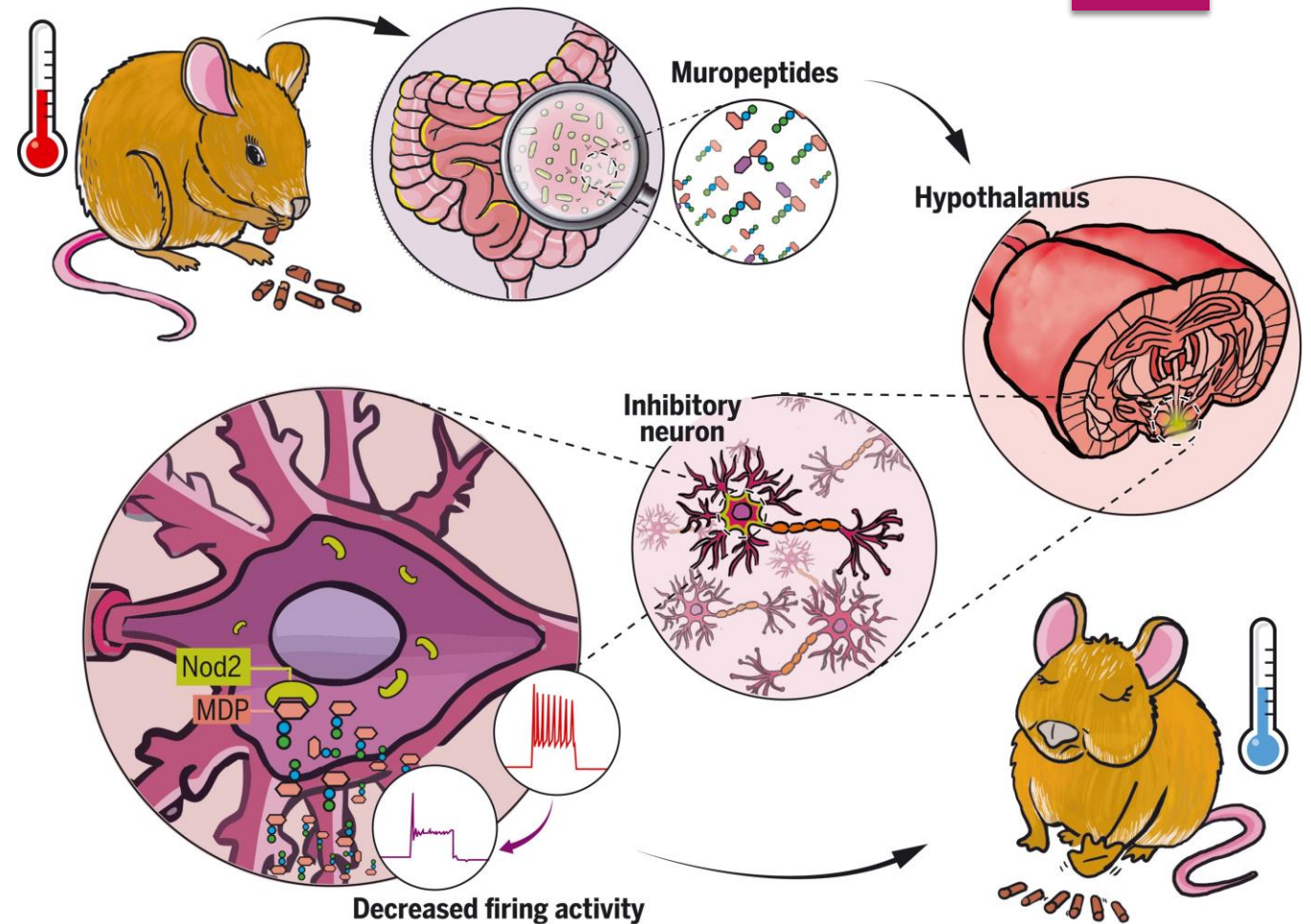
Short Chain Fatty Acids and Microbes

- ▶ Short-chain fatty acids (SCFAs) are produced by gut bacteria during the fermentation of dietary fiber
- ▶ SCFAs have been shown to promote feelings of fullness and reduce hunger by increasing the production of hormones such as GLP-1 and PYY
 - ▶ *Akkermansia muciniphila*



Microbes control feeding to support their survival

- ▶ Microbe studies have found the presence of certain microbes in the gut affecting
 - ▶ Drive feeding but then once feeding threshold reached, these bacteria which release muropeptides which were sensed by the brain to decrease feeding and body temperature



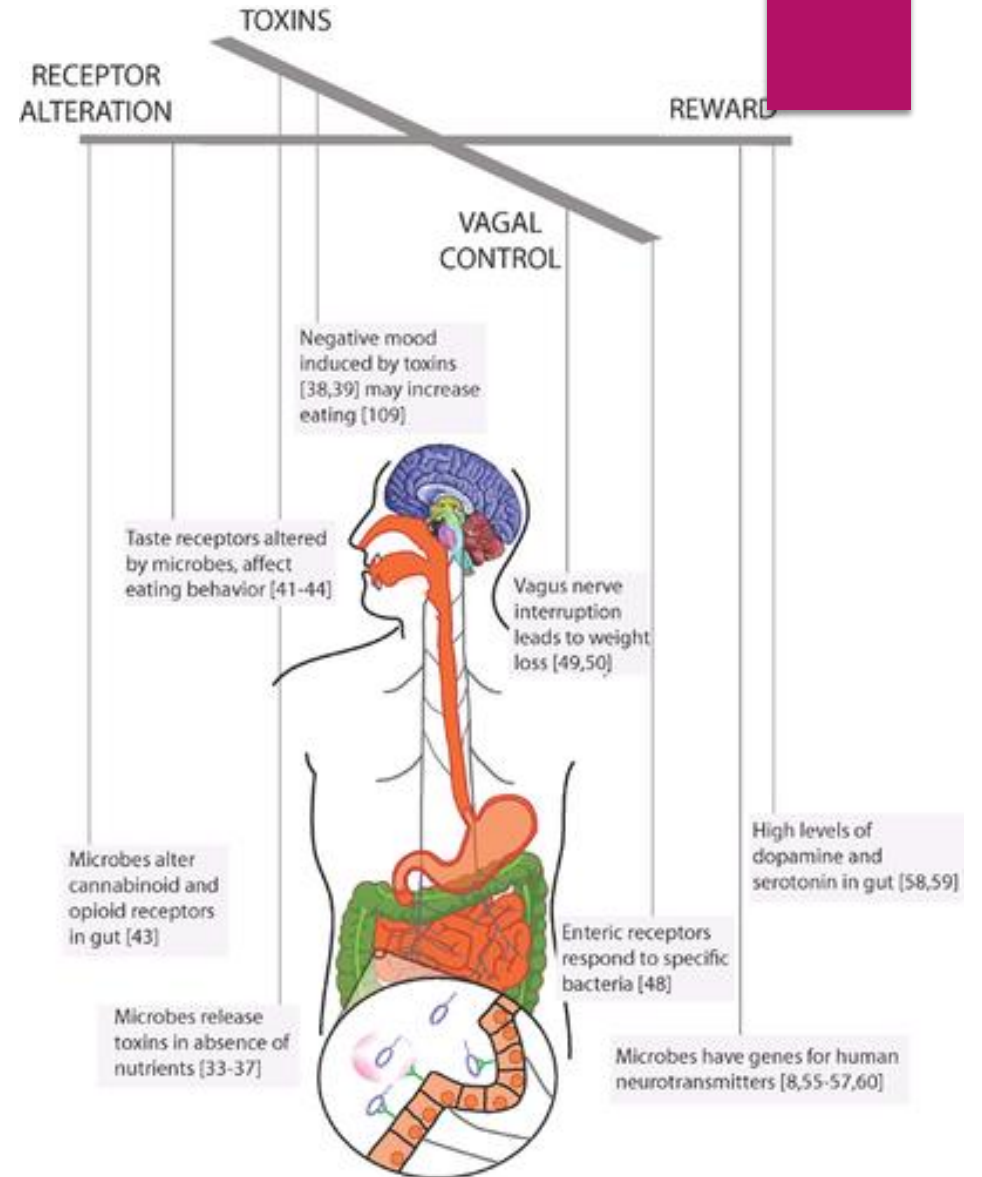


Leptin Resistance

- ▶ Leptin resistance can develop due to several factors
 - ▶ chronic inflammation
 - ▶ high levels of triglycerides in the blood
 - ▶ changes in the gut microbiota

Mood

Microbes are our puppetmasters



Organisms effect on mood & behavior

Organism	Effect
Lactobacillus casei	Boosts mood, lowers anxiety
Camphylobacter jejuni	Increases anxiety
Lactobacillus acidophilus	Increases endocannabinoid and opiod receptors thus affects pain perception
Escherichia coli	Manufactures dopamine
Bacillus infantus	Raises tryptophan levels

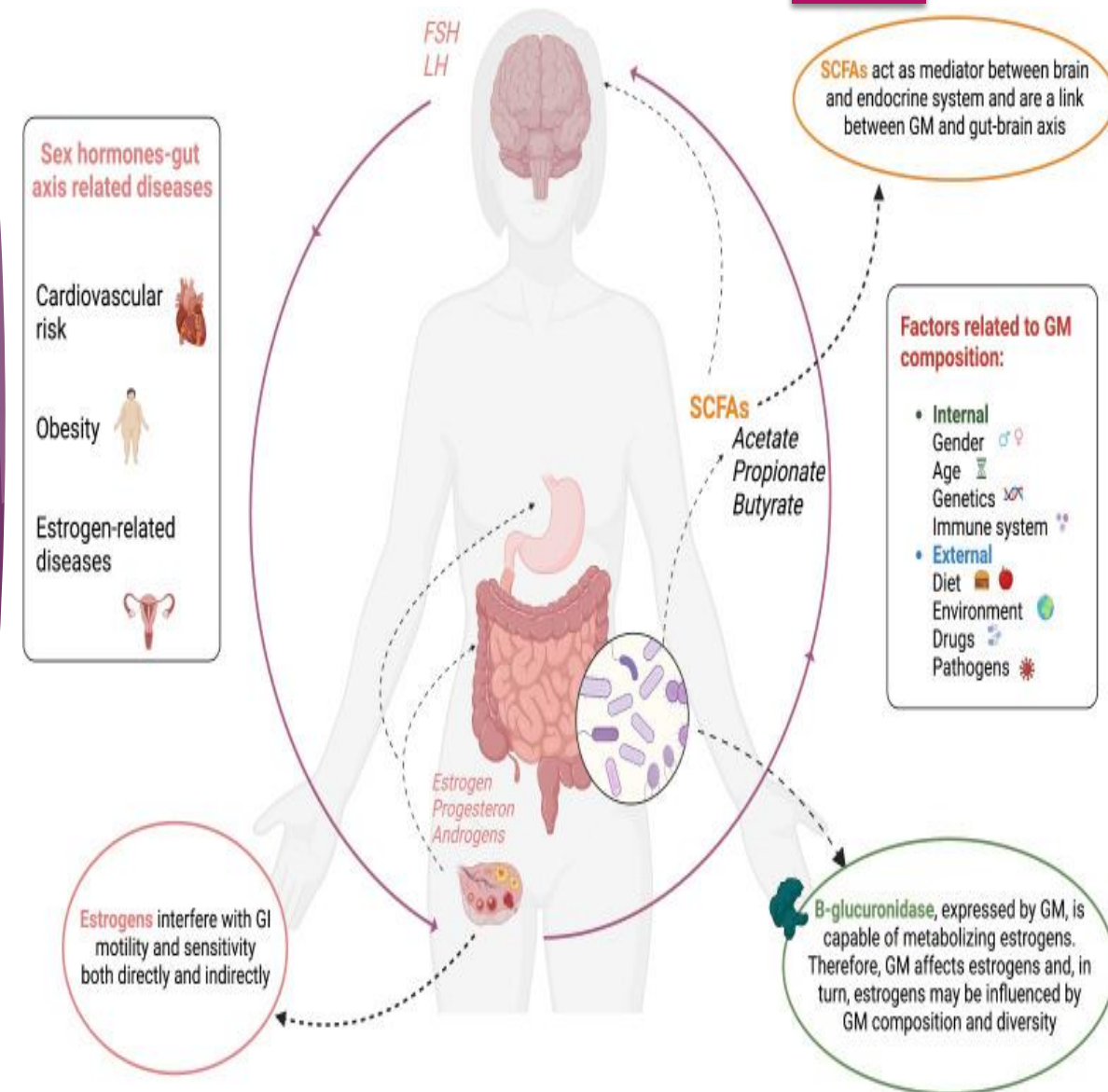


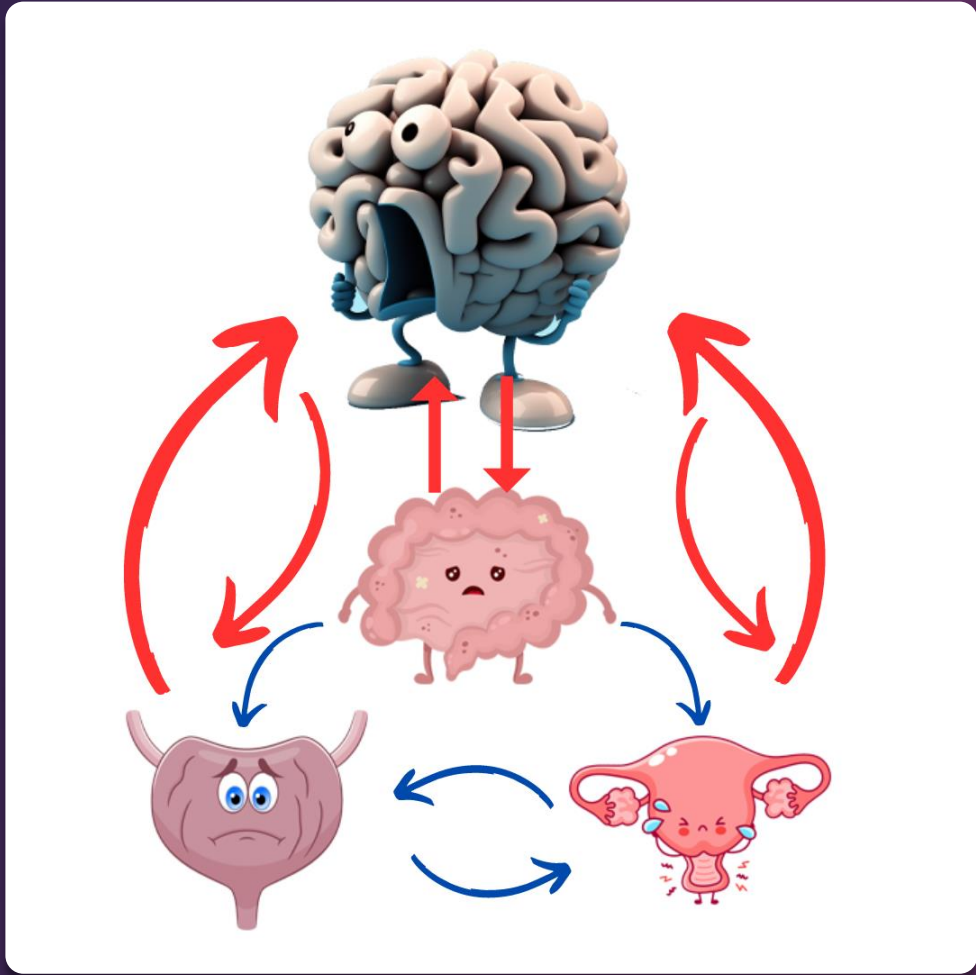
Microbes control libido and fertility

- Lack of diversity in the gut and reproductive tract leads to a decrease sex drive by affecting brain-based behavior
- Microbiome also affects hormone production

Hormones and Microbiota

- Hormone production influenced by microbiota
 - B glucuronidase produced by microbes aids in food estrogen usage
- Hormones can influence what types of microbes present
 - Postmenopausal women have a microbiome similar to men
 - Polycystic Ovarian patients have decreased diversity of microbome
 - reduced butyrate production, higher BMIs and higher testosterone serum concentrations
 - dysbiosis may lead to insulin resistance and alterations in glucose metabolism, higher insulin levels stimulate the ovary in producing androgens, thus perpetuating the pathogenetic mechanism of PCOS





Connecting it
all together

Testing options for the Gut Microbiome

- ▶ Diagnostic Solutions: GIMAP
- ▶ Patient directed care
 - ▶ Viome
 - ▶ Flore
 - ▶ Biohm
 - ▶ Ombre





The future is ingesting
specific microbes

- ▶ Are microbes the new medicine?

But the constant is.....

Healthy Foods



Nutrients are important

Antidepressant foods have:

- ▶ Folate
- ▶ Iron
- ▶ Long chain omega-3 fatty acids (EPA, DHA)
- ▶ Magnesium
- ▶ Potassium
- ▶ Selenium
- ▶ Thiamine
- ▶ Vitamin A
- ▶ Vitamin B6
- ▶ Vitamin B12
- ▶ Vitamin C
- ▶ Zinc



Food category	Mean AFS
Vegetables	48%
Organ meats	25%
Fruits	20%
Seafood	16%
Legumes	8%
Meats	8%
Grains	5%
Nuts & seeds	5%
Dairy	3%

Diversity leads to health

- ▶ Low microbiome biodiversity is associated with increased risk of disease and dysfunction
- ▶ Changing diet to whole foods increases microbiome biodiversity







Feeding our Microbiome

- ▶ Fruits and vegetables:
- ▶ Whole grains
- ▶ Legumes
- ▶ Fermented foods
- ▶ Nuts and seeds
- ▶ Healthy fats







Aim for one serving of
fermented foods daily

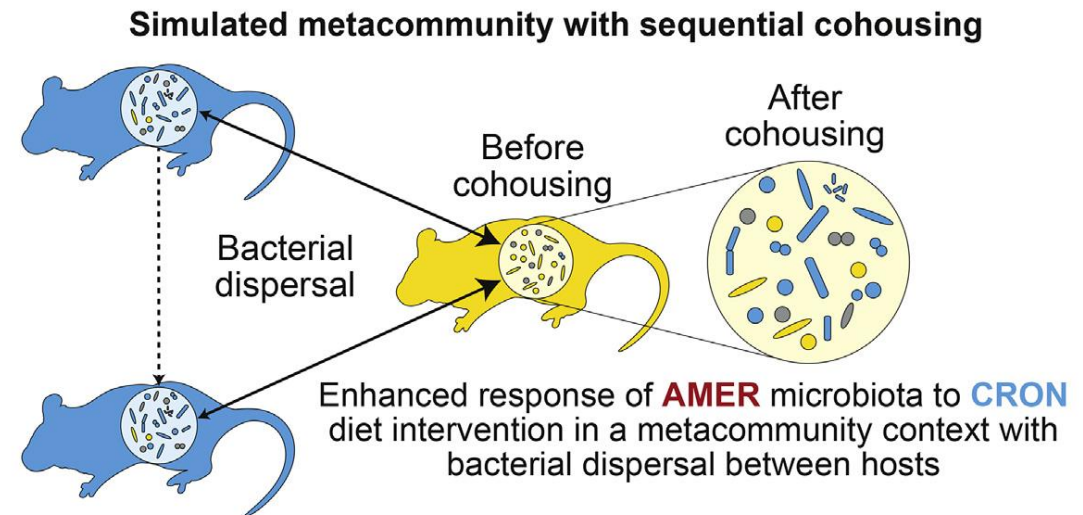
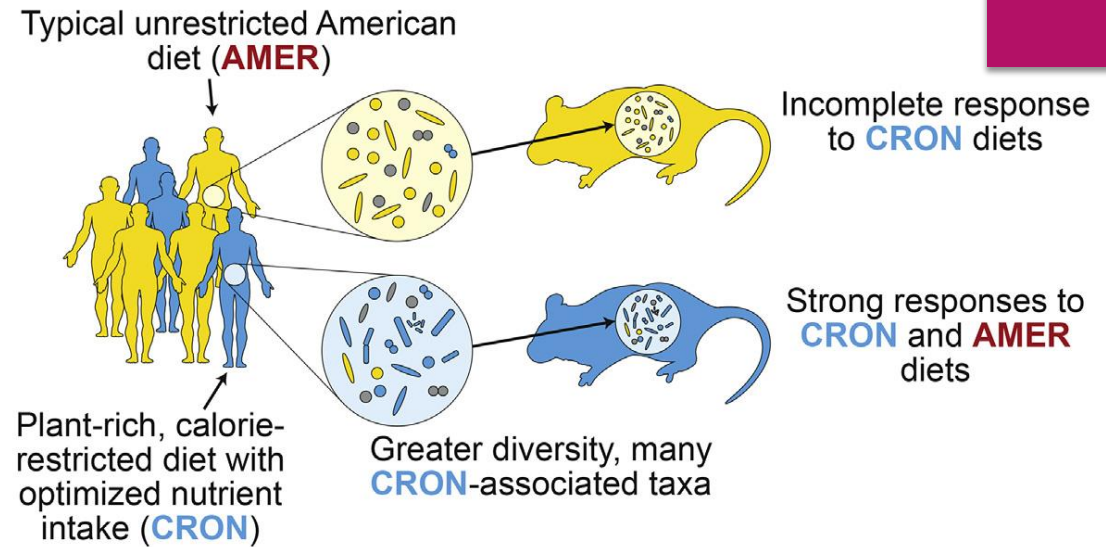
- ▶ Sauerkraut
- ▶ Kimchi
- ▶ Pickles
- ▶ Yogurt
- ▶ Kombucha
- ▶ Kefir



How do we
make a
change?

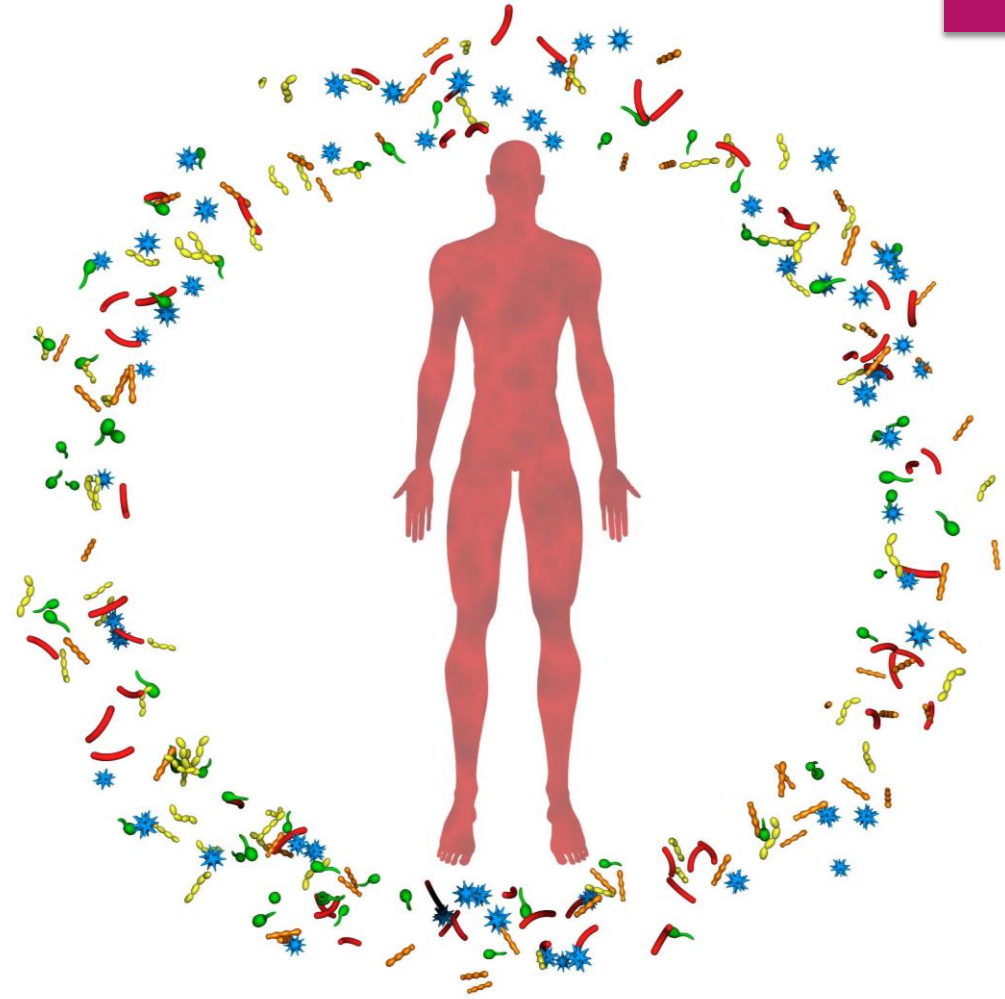
Change takes time

- ▶ You can't change microbiome diversity overnight by switching to a healthy diet.
- ▶ Westernized communities are associated with lower biodiversity



The company you
keep can influence
your microbiome

▶ Humans emit 10 Million
biological particles per
hour



Other factors affecting the microbiome

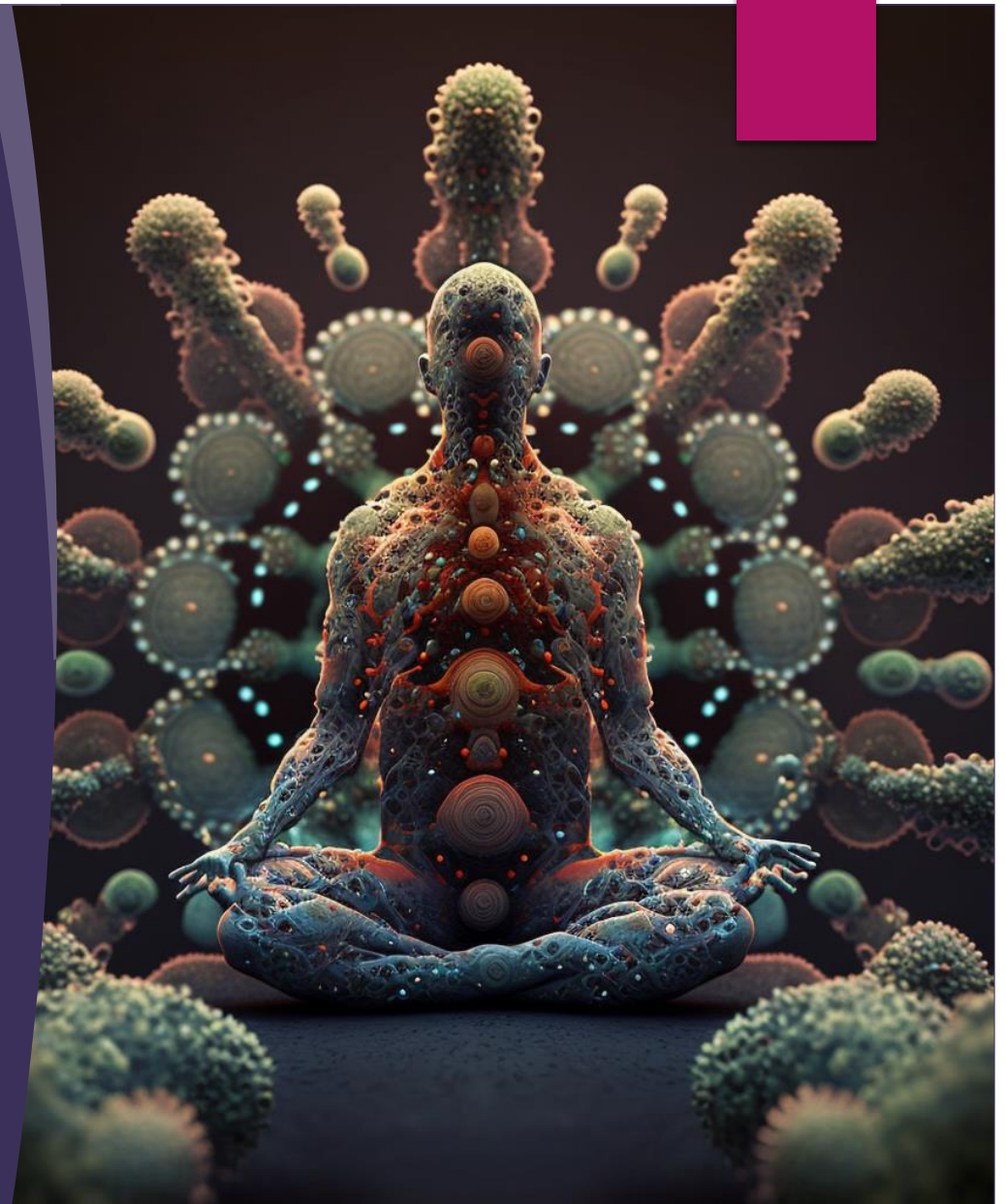
Further research on the microbiome

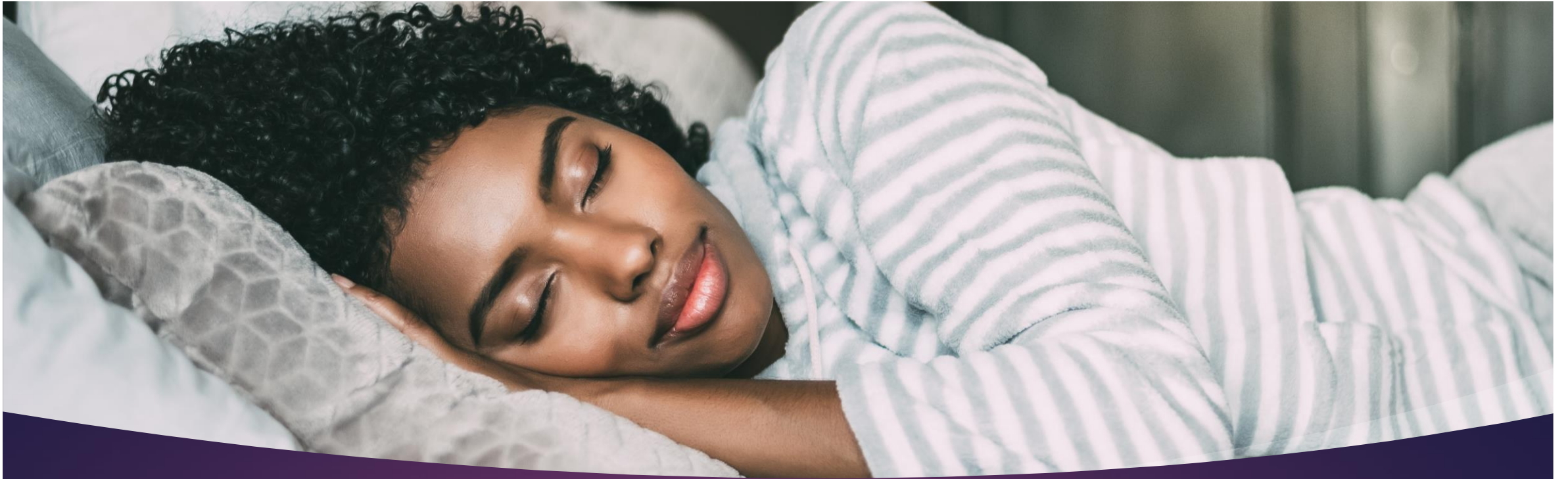
- ▶ **Air pollution** – NIEHS-funded research found breathing ultrafine particles, a component of air pollution, altered the gut microbiome and changed lipid metabolism in mice with atherosclerosis.
- ▶ **Antimicrobial products** such as triclosan affected gut microbiome resulting in altered stress response, antibiotic resistance, and heavy metal resistance.
- ▶ **Artificial sweeteners** – Sucralose, and acesulfame potassium is associated with chronic inflammation and weight gain
- ▶ **Flame retardants** – Early life exposure to types of flame retardants called polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) can have a life-long impact on disease risk, which the gut microbiome may shape.
- ▶ **Heavy metals** – changed the gut microbiome and altered molecular pathways in bacteria that are important to biological functions like DNA repair.
- ▶ **Pesticides** – Exposure to the widely used agricultural insecticide diazinon changed the gut microbiome adding to toxic effects on the nervous system.



Meditation improves Microbiome

- ▶ Individuals who practice deep meditation
 - ▶ Improved microbiome diversity
 - ▶ found to have increased numbers of bacteria species associated with wellbeing
 - ▶ intestinal markers associated with improved barrier function



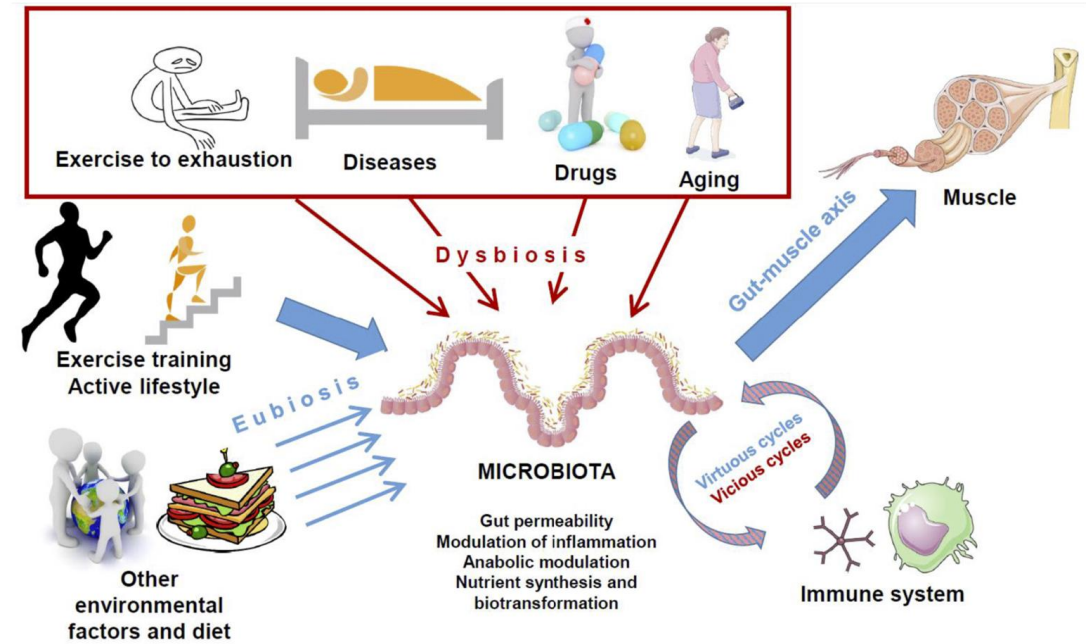


Sleep & Microbiome

- ▶ Microbe diversity with adequate sleep
- ▶ Microbes have demonstrated their own circadian rhythm separate from environmental cues

Exercise & Microbiome

- ▶ Positive modulator of biodiversity
 - ▶ However excess, strenuous exercise can result in inflammation and gut disturbances
- ▶ Gut Muscle Axis
 - ▶ Resulting in protein utilization
 - ▶ Muscle development



Wrapping it Up

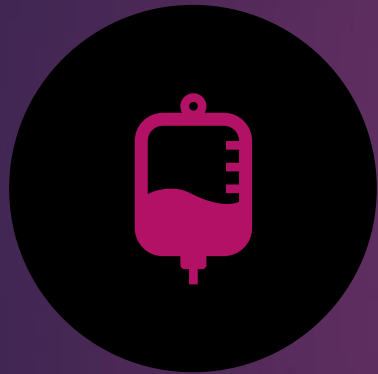
Our Microbiome affects our

Hormones

Hunger

Happiness

By influencing



HEALTH



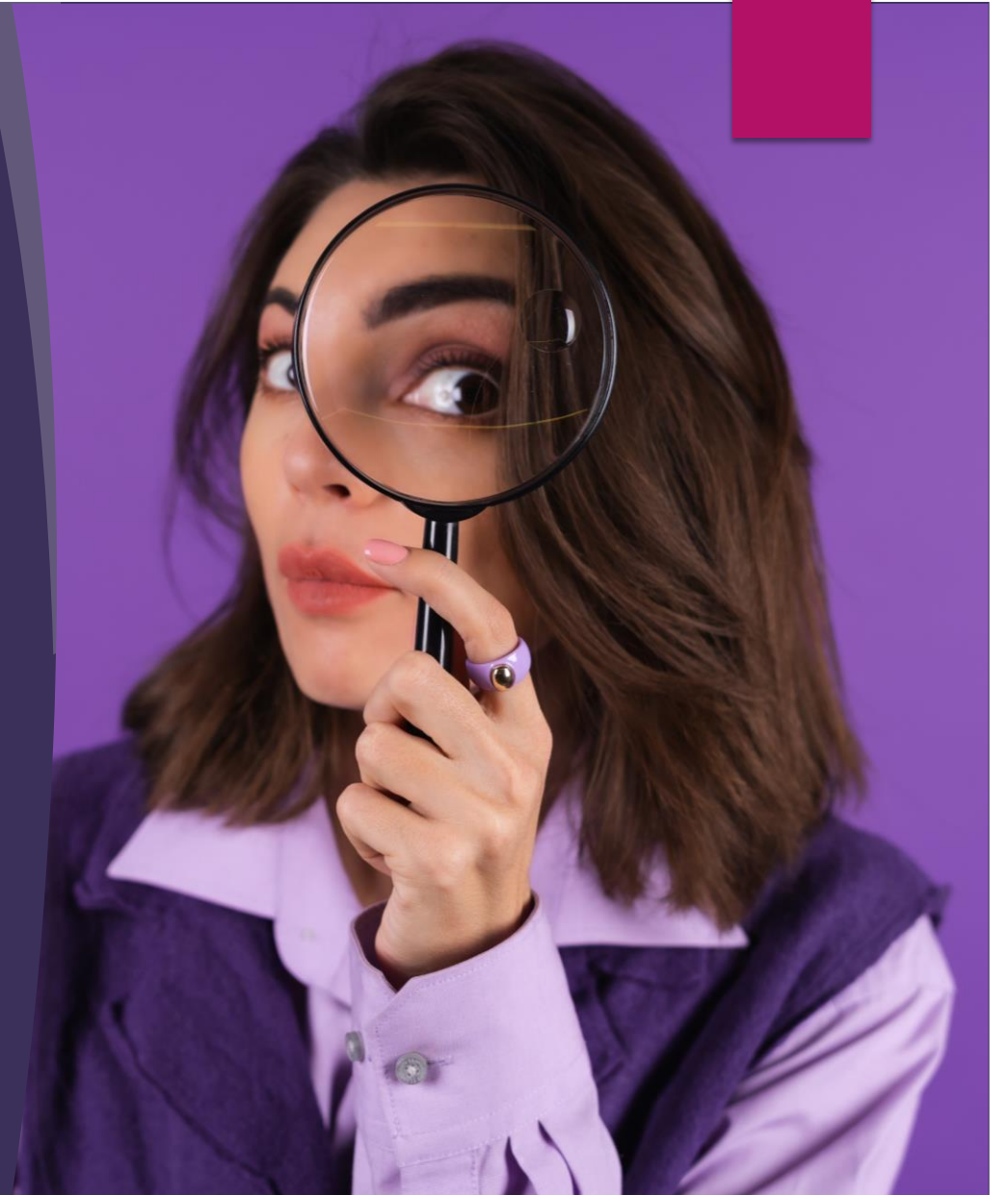
MOOD



BEHAVIOR

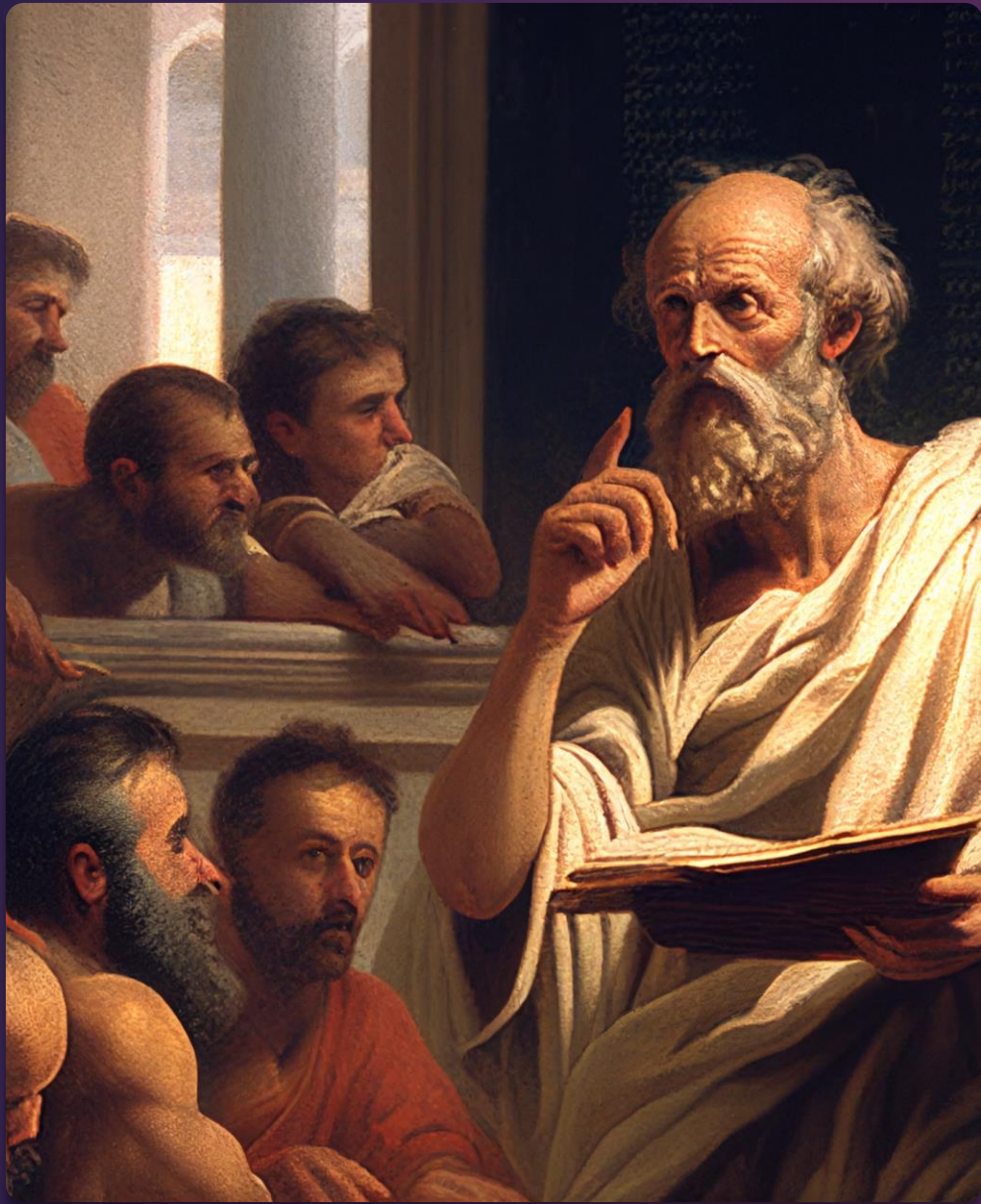
When addressing clients

- ▶ What are their symptoms?
- ▶ What are their habits?
- ▶ What are they eating?
- ▶ Who are they spending time with?
- ▶ What is their medical history?
- ▶ What is toxin exposure?
- ▶ What is their stress level? And stressors?





You Are The Superheros



Let Food Be
Thy Medicine
- Hippocrates
440 BC

GOOD FOOD = GREAT MOOD





Heal your gut, calm
your mind, health
and wellness you'll
find.



Together we can.....
Save the Microbiome
Save the World