

AWARENESS

FOUNDATION



The Microbiome

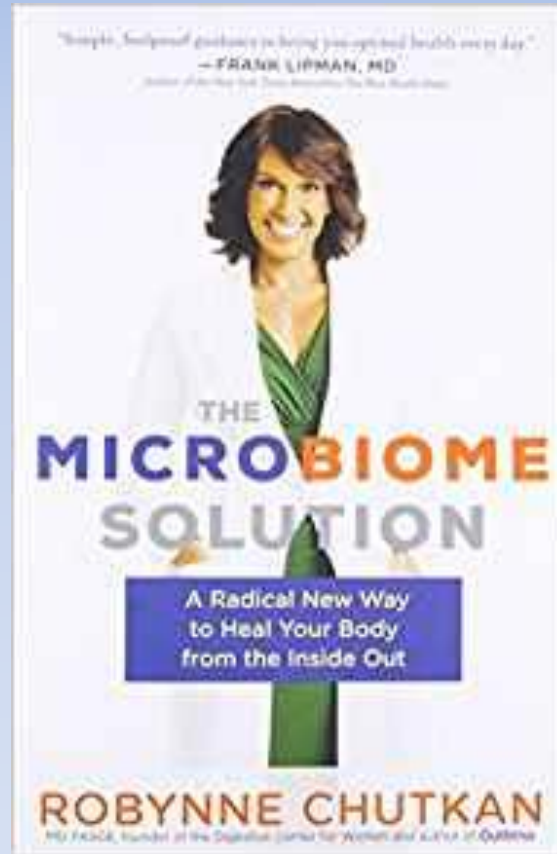
Presented by the
Prostate Awareness Foundation

John Bohan MS, Ken Malik

The Prostate Awareness Foundation (PAF) offers information, support, and education about the treatment options available to those with prostate issues and concerns.

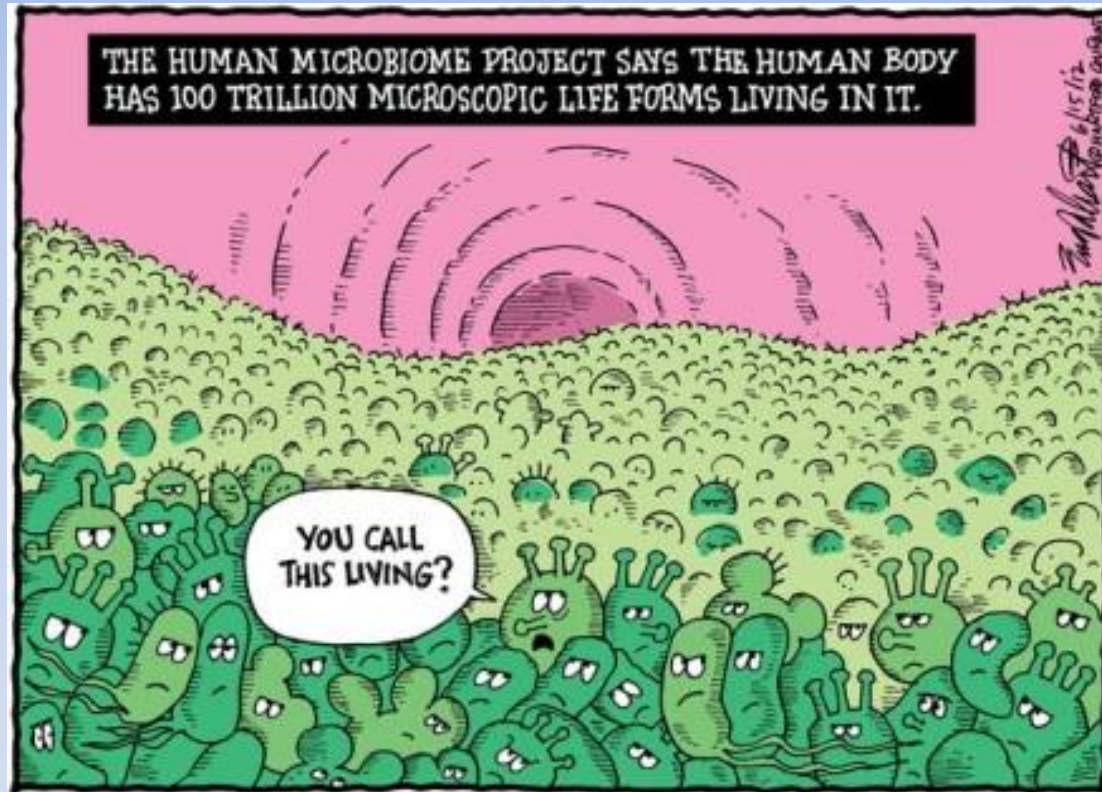


The Microbiome



Chutkan, Robynne. The Microbiome Solution: A Radical New Way to Heal Your Body from the Inside Out. Penguin Publishing Group.

The Microbiome



The microbiome refers to all of the organisms that live in or on your body: all of the bacteria, viruses, fungi, protozoa, and helminths (worms, for those of us who have them), as well as all of their genes. A staggering hundred trillion microbes that include thousands of different species inhabit your nooks and crannies—with more than a billion bacteria in just one drop of fluid in your colon alone.

The Importance of the **MICROBIOME** by the Numbers



90%

Up to 90% of all disease can be traced in some way back to the gut and health of the microbiome



10–100 trillion

Number of symbiotic microbial cells harbored by each person, primarily bacteria in the gut, that make up the human microbiota

>10,000

Number of different microbe species researchers have identified living in the human body

100

100 to 1

The genes in our microbiome outnumber the genes in our genome by about 100 to 1

10X

There are 10 times as many outside organisms as there are human cells in the human body



22,000

Approximate number of genes in the human gene catalog

3.3 million

Number of non-redundant genes in the human gut microbiome



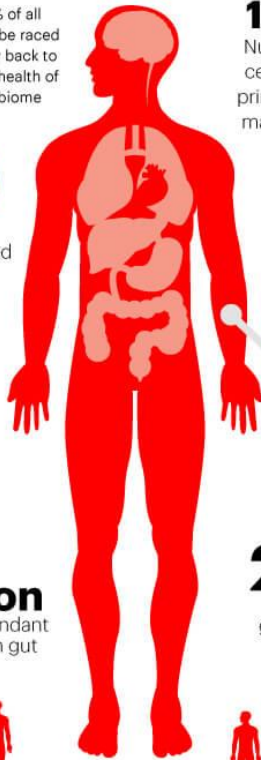
99.9%

Percentage individual humans are identical to one another in terms of host genome



80%–90%

Percentage individual humans are different from one another in terms of the microbiome

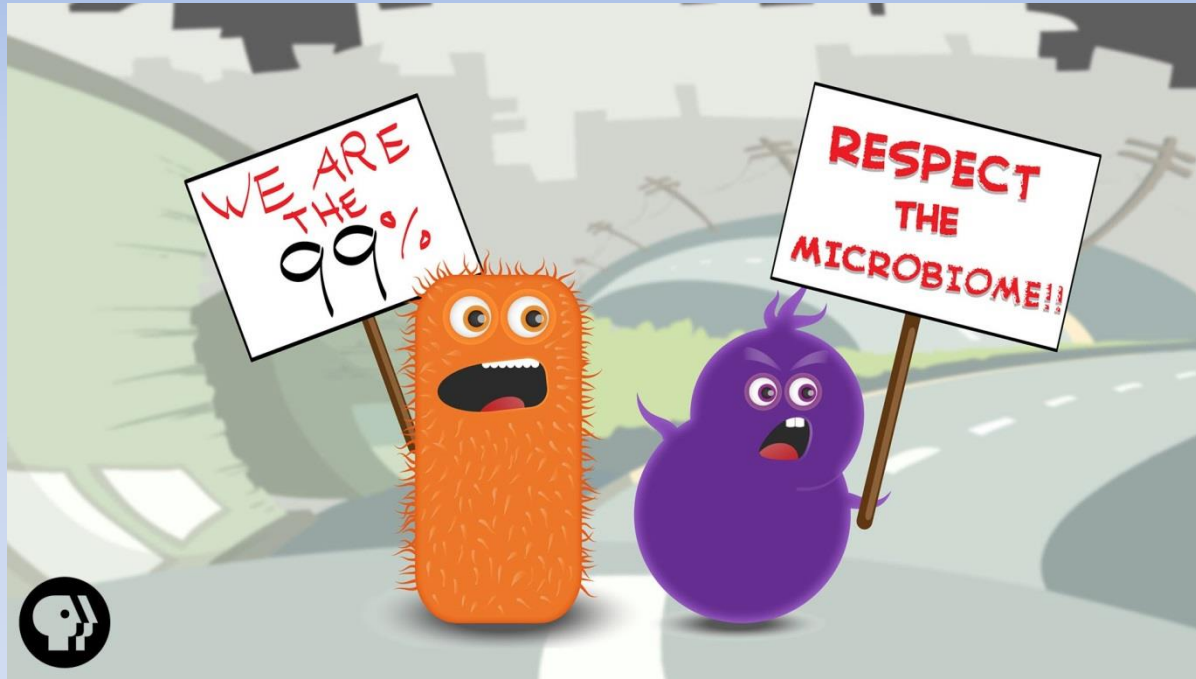


The Microbiome

Your unique microbial footprint develops over your lifetime, and it reflects everything about you:

- your parents' health
- how and where you were born
- what you've eaten (including whether your first sips were breast milk or formula)
- where you've lived
- Your occupation, personal hygiene, past infections, exposure to chemicals and toxins, medications, hormone levels
- even your emotions (stress can have a profound effect on the microbiome).

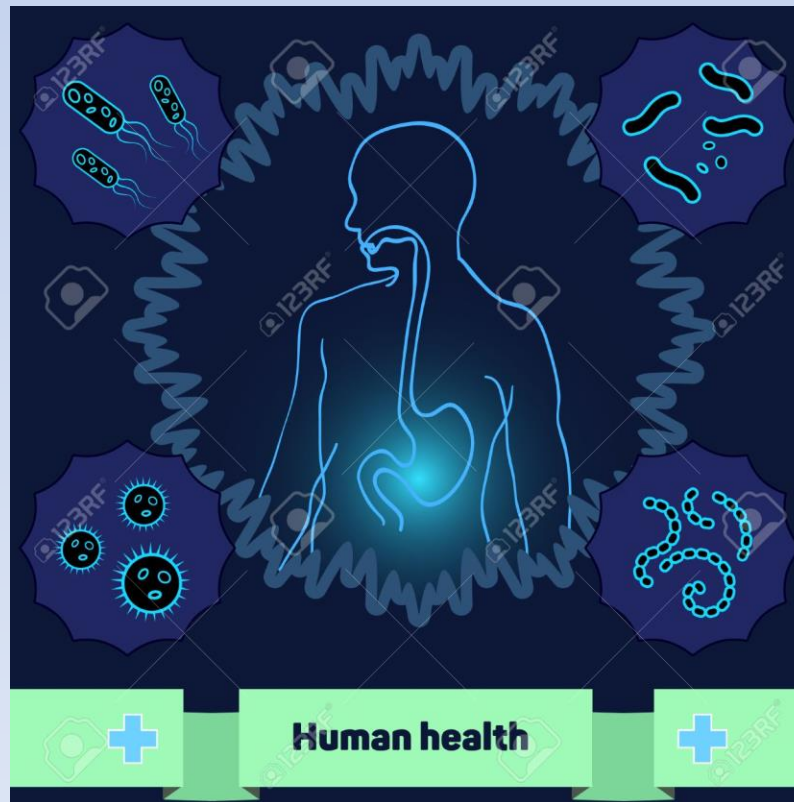
The Microbiome



The end result is a microbial mix so distinctive from person to person that yours is a more accurate identifier of you than your own DNA. Chutkan, Robynne. (p. 4).

The Microbiome

The overwhelming majority of our microbes aren't germs that cause disease. Quite the contrary—they're an essential part of our ecosystem and play a vital role in keeping us healthy.





Development of The Microbiome

Pregnancy

During pregnancy, cells in the vaginal lining ramp up production of a carbohydrate called glycogen, sending glycogen-loving *Lactobacillus* bacteria into a feeding frenzy and increasing their numbers.

Lactobacilli convert lactose and other sugars to lactic acid, creating an acidic, unfriendly environment that helps to protect the growing fetus from potential invaders.

Transplanting gut bacteria from late-trimester pregnant women into nonpregnant mice produces identical changes in the mice—confirming that the transformation is indeed mediated by gut bacteria, not hormones.

Development of The Microbiome

Birth

During a normal delivery, the baby's head turns to face the mother's rectum as it crowns and exits the birth canal. This turning brings the baby's nose and mouth into direct contact with her vaginal and rectal contents. What better way to get inoculated with a good dose of bacteria than to come face-to-tush with the source? It turns out that exposure to bacteria is a critical early step in the development of our immune system.

Breast-feeding

Human milk oligosaccharides (HMOs) are the third-most common ingredient in breast milk, despite the fact that they're completely indigestible by infants. HMOs are indigestible because they're not there to feed the baby. They're there to feed the baby's bacteria—specifically, *Bifidobacterium*, present in high numbers in breast-fed infants. *Bifidobacterium* repels *Staphylococcus* and other harmful microbes on the mother's nipple, so it's an essential part of the baby's microbial arsenal.

Development of The Microbiome

- We start out in the womb with no microbes at all, and we eventually acquire trillions. What happens to all of those microbes when we die? Interestingly, the microbes aren't recycled. They die with us,
- as a result of medications, our over processed diet, and our super-sanitized lifestyle. Americans today have only about two-thirds as many bacterial species as native tribesmen in the Amazon who haven't been exposed to antibiotics.
- The human microbiome may well be the next big frontier in medicine, providing answers to why we get sick and novel solutions for how to heal ourselves.



Microbes: Your Worker Bees

We've evolved over millions of years to host an incredible army of worker bee microbes that are gainfully employed assisting in all of our bodily functions. They produce substances our bodies require but can't make. They fight most of our battles for us. They even turn our genes on and off, activating those we need and dismantling those we don't. In exchange, we provide room and board.

three main groups:

1. Commensal bacteria that cohabit peacefully with us
2. Symbiotic organisms (sometimes called mutualists) that help keep us healthy
3. Pathogens (also known as opportunistic flora) that can do us harm



Microbes: Your Worker Bees

TABLE 2–1 • Predominant Bacteria Present in Humans

Location

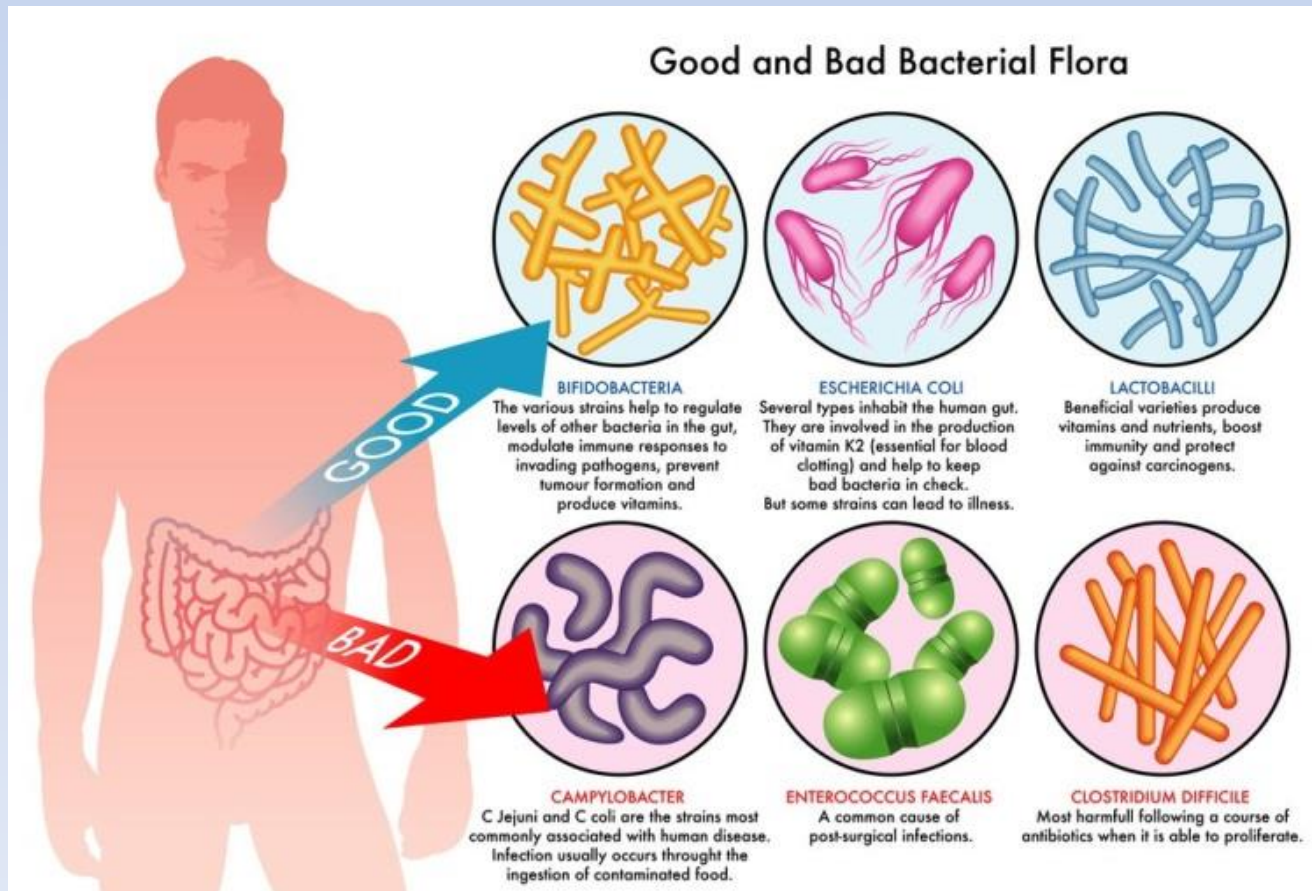
- Skin
- Nose
- Mouth
- Throat
- Stomach
- Small intestine
- Colon
- Urinary tract
- Vagina

Bacteria

Staphylococci, Corynebacteria
Staphylococci, Corynebacteria
Streptococci, Lactobacilli
Streptococci, Neisseria
Helicobacter pylori
Bifidobacteria, Enterococci
Bacteroides, Enterococci, Clostridia
Staphylococci, Corynebacteria
Lactic acid bacteria

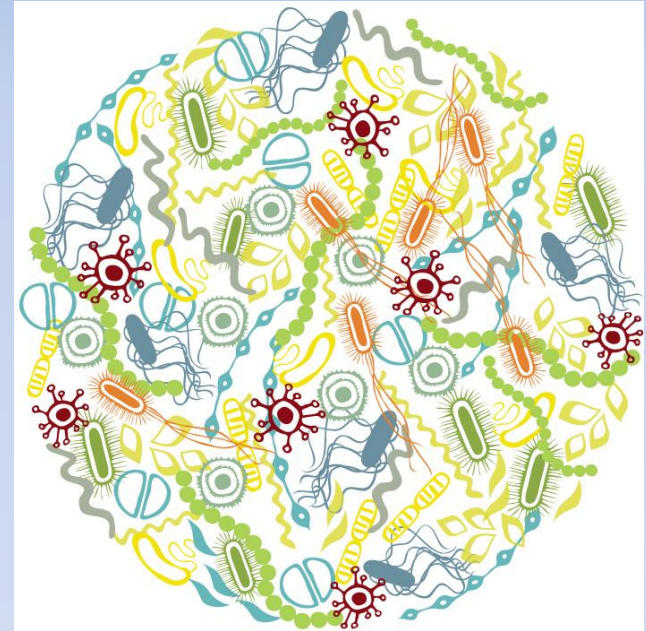
Microbes: Your Worker Bees

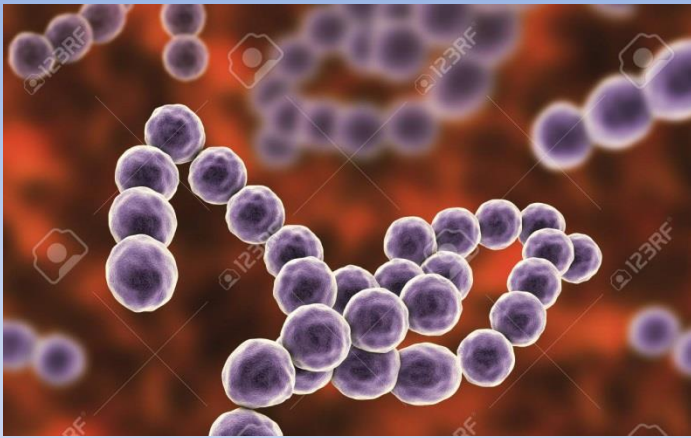
Food can't be properly broken down and its constituent parts can't be fully absorbed without these essential gut bacteria, which means that even if you're eating a super-healthy diet, if you don't have enough of them, you may not be able to absorb and assimilate all of the vitamins and nutrients in your food.



What Do Your Gut Bacteria Do?

- Convert sugars to short-chain fatty acids (SCFAs) for energy
- Crowd out pathogens
- Digest food
- Help your body absorb nutrients such as calcium and iron
- Keep pH balanced
- Maintain the integrity of the gut lining
- Metabolize drugs
- **Modulate genes Neutralize cancer-causing compounds**
- Produce digestive enzymes
- Synthesize B-complex vitamins (thiamine, folate, pyridoxine)
- Synthesize fat-soluble vitamins (vitamin K)
- Synthesize hormones
- Train the immune system to distinguish friend from foe





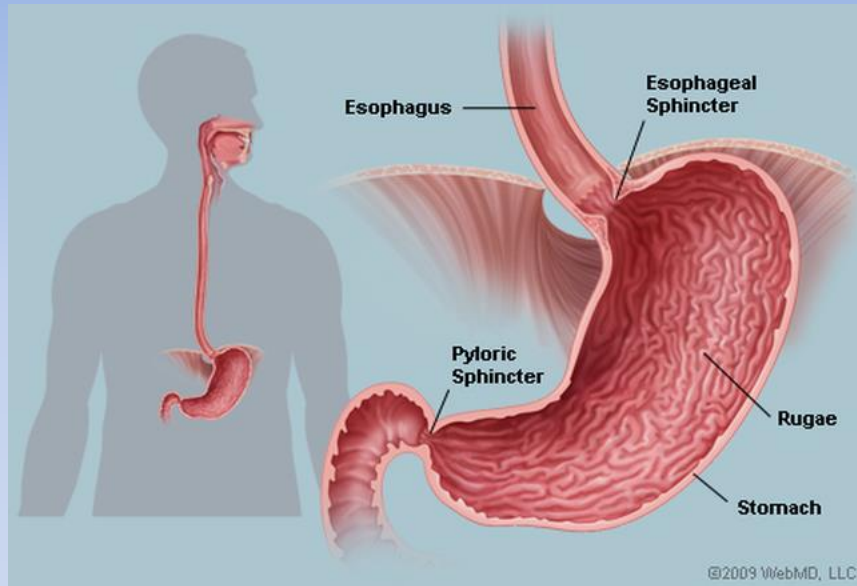
Immune Regulation

- Exposure to lots of different microbes—both good and bad—is essential for priming and training your immune system, so that later on it's able to distinguish between harmless organisms that it should ignore and dangerous pathogens that it needs to respond to.
- Bacteria also help determine which diseases are expressed, turning various human genes on and off in response to the body's internal milieu, which can influence whether or not a disease that you're genetically predisposed to actually develops.
- you should really be asking yourself what you should be eating to grow a good **gut garden**, because disease is rare when gut bacteria are balanced, bountiful, and diverse.

MESSING UP THE MICROBIOME

- The microbial communities established in our bodies at birth, during infancy, and in early childhood mold our health as we grow and help determine whether or not we develop illness.
- modern plagues,...Hashimoto's thyroiditis, type 1 diabetes, lupus, multiple sclerosis (MS), rheumatoid arthritis, and eczema. Their hallmark, regardless of what organ they affect, is that the immune system wages war against the body's own healthy tissues, leading to chronic inflammation.
- drug-resistant genes, from neighboring bacteria, ... allow them to survive even the deadliest attacks... **resistant superbugs**—kill more Americans every year than murders and car accidents combined.

Leaky Gut



- Your digestive tract forms a hollow tube that runs from your mouth to your anus. Your intestinal contents aren't really inside your body until they're absorbed through the lining of that tube into your bloodstream. This inner lining forms a selective barrier that allows some substances to pass through while preventing others.
- Bacterial imbalance and overgrowth of potentially harmful microbes can compromise the integrity of the barrier, allowing toxins and other undesirables to enter and interfering with absorption of nutrients—a condition called leaky gut.



Leaky Gut

- a diet high in refined sugar, processed food, preservatives, and chemicals are contributing factors, as is consumption of gluten, a protein found in wheat, rye, and barley.
- Too much alcohol, radiation treatment, and chemotherapy can all damage the gut lining, and chronic stress can weaken your immune system, affecting your ability to fight off invading pathogens and worsening the symptoms of leaky gut.
- Medications such as aspirin and NSAIDs damage the lining of your gut, antacids change the pH, and steroids alter the intestinal milieu—and all are associated with increased intestinal permeability (IP)..

Common Autoimmune Diseases

- we still don't know what causes autoimmune illnesses...
emerging evidence suggests that bacteria do indeed play a major role, but it may be their absence rather than their presence that leads to the diagnosis.
- The **hygiene hypothesis** accounts for this uneven distribution by suggesting that less childhood exposure to bacteria and parasites in affluent societies like the United States and Europe actually increases susceptibility to disease by suppressing the natural development of the immune system.
- We need interaction with dirt and germs to train our immune system in how to respond appropriately to stimuli in our environment—what to react to and what to ignore.

Common Autoimmune Diseases

- Addison's disease
- Alopecia areata
- Ankylosing spondylitis
- Celiac disease
- Crohn's disease
- Dermatomyositis
- Diabetes (type 1)
- Eczema
- Eosinophilic esophagitis
- Graves' disease
- Hashimoto's thyroiditis
- Idiopathic thrombocytopenic purpura (ITP)
- Interstitial cystitis
- Juvenile arthritis
- Lupus (SLE)
- Multiple sclerosis (MS)
- Myasthenia gravis
- Polymyositis
- Primary biliary cirrhosis
- Primary sclerosing cholangitis
- Psoriasis
- Psoriatic arthritis
- Raynaud's phenomenon
- Rheumatoid arthritis
- Sarcoidosis
- Scleroderma
- Sjögren's syndrome
- Ulcerative colitis
- Urticaria
- Vasculitis
- Vitiligo

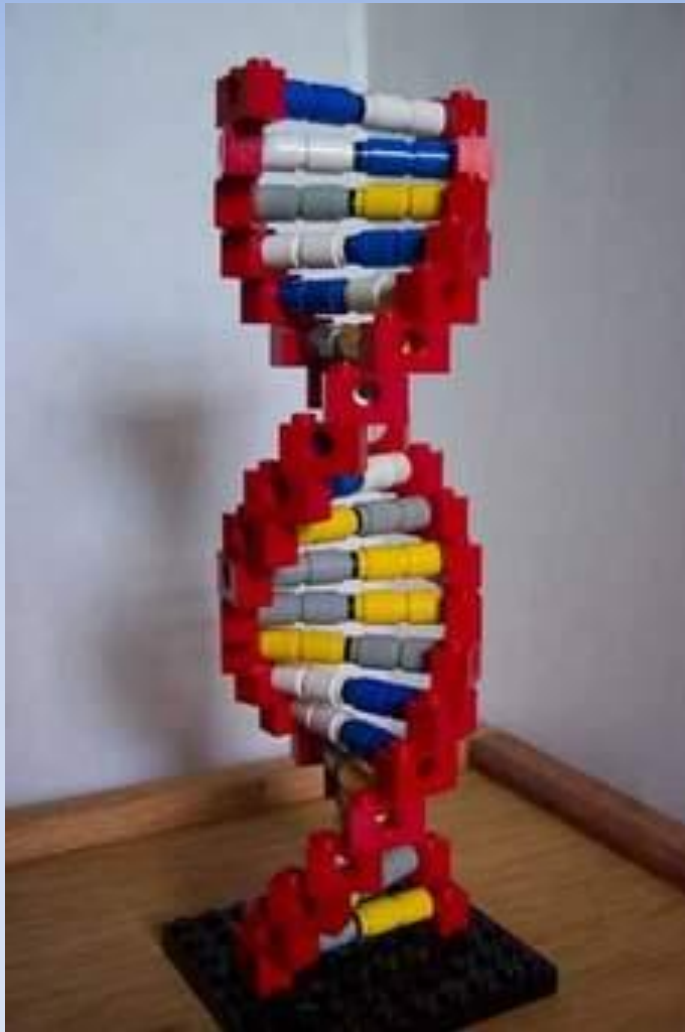


Common Autoimmune Diseases

...it's worth pointing out that modern practices, while improving our lives in many ways, have created unforeseen health challenges.

such as:

- chlorinated drinking water
- industrial agriculture
- pesticides
- sanitation
- antibiotics



Where Do Our Genes Come In?

- Many diseases that run in families that we thought were primarily genetic, such as heart disease and some forms of cancer, turn out to be hugely influenced by gut bacteria.
- WHAT WE'RE FINDING is that the environment living inside us—our microbiome—has one of the biggest impacts on our genes, **turning them on and off and determining which ones are ultimately expressed as disease.**
- In fact, **which gut bacteria you end up with may be even more important than which genes you inherit...** This is an empowering way of looking at disease, since we can't change our real family, but we can change our microbial family.



Too Clean on the Inside?

There's such a strong link between antibiotic use and digestive issues that it's literally the first question I ask new patients in my practice.

As luck would have it, the bad bacteria are often harder than the good ones and more likely to survive the antibiotic assault. They end up multiplying and filling the gap created by the overall loss in numbers, which creates the typical profile seen in people with IBD: an overall decrease in diversity of gut bacteria, higher levels of pathogenic species, and lower levels of protective ones.



Pharmageddon and the Antibiotic Paradox

- Conservative estimates suggest that almost half of all antibiotic use is inappropriate, resulting in increased side effects, higher costs, and resistance to antibiotics that threatens to plunge us back into the dark ages of medicine, before we had these drugs at our disposal.
- Genetic mutations allow some bacteria to grow thicker membranes that prevent access, while others adapt by producing toxins that neutralize antibiotics or borrow drug-resistant genes from neighboring bacteria that allow them to survive even the deadliest attacks... resistant superbugs—kill more Americans every year than murders and car accidents combined.
- Side effects like nausea, vomiting, diarrhea, skin rashes, and stomach aches pale in comparison to the main risks of antibiotics: indiscriminate elimination of droves of your essential bacteria, and the hard-to-treat illnesses that ensue as a result.



Pharmageddon and the Antibiotic Paradox

- There are some infections that definitely require antibiotic treatment, but more often the need for antibiotics is a gray area.
- Two out of every three adults who see a health practitioner for cold or flu symptoms are prescribed antibiotics, which 80 percent of the time don't meet Centers for Disease Control and Prevention (CDC) guidelines for antibiotic therapy.
- For most elective procedures, the risk of an antibiotic-associated complications such as severe diarrhea, a rash, or even potentially deadly infections, outweighs the risk of infection.
- Prescribing antibiotics prophylactically can actually make us sicker—lengthening our recovery time and putting us at increased risk for more serious infection by killing off essential protective bacteria along with any pathogens, leaving us less prepared for the next infection.



Pharmageddon and the Antibiotic Paradox

We've become so accustomed to reaching for an antibiotic when we're sick that it's a revelation for many of my patients to hear that it's possible to soldier through non-life-threatening infections without any antimicrobial therapy...**We have to radically change our expectations about illness and suffering, and indeed about health itself, accepting that a certain degree of inconvenience and periodic discomfort are part of normal life—and also part of strengthening our immune system.**

Parasites

the Centers for Disease Control and Prevention (CDC) estimates that almost one-third of us harbor parasites,

Infections with parasites such as giardia can lead to nausea, diarrhea, bloating, and even IBS, but as we explored in Chapter 3, some studies have suggested that other parasites, especially helminths such as hookworm, can be an effective therapy for Crohn's disease and other illnesses that involve a heightened immune response by dampening the immune system and improving symptoms.

Celiac Disease and Gluten Sensitivity

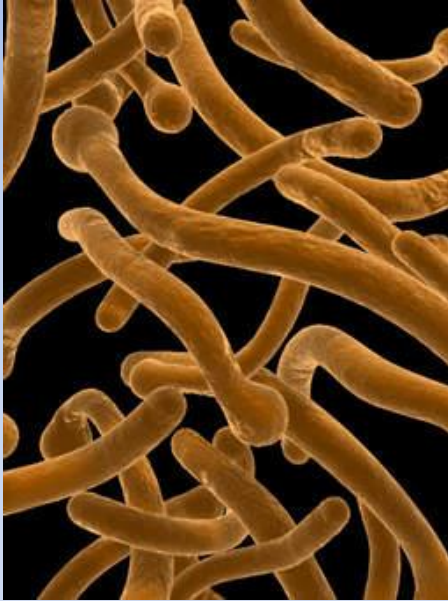
Celiac disease is an autoimmune disorder that damages the lining of the small intestine as a result of eating gluten, a protein found in wheat, rye, and barley. About a third of people of European ancestry carry genes that predispose them to developing celiac disease, but only a small percentage actually develop the disease,



Dysbiosis

Dysbiosis is an alteration of the microbial community that diminishes a person's essential population of good bacteria and allows pathogenic (bad) bacteria that are normally present in low amounts to flourish—in essence, it is a microbial imbalance in or on your body.

- Stomach acid is one of our main defenses against undesirable bacteria that enter the body through the mouth. Acid-blocking drugs transform the normally inhospitable acidic environment of the stomach into a friendly place for bacteria to grow and multiply, potentially throwing off your microbial balance and causing dysbiosis.
- Acid suppressive therapy also puts you at increased risk for pneumonia and dreaded *Clostridium difficile* that would normally be repelled by stomach acid
- (Corticosteroids are a danger) to the microbiome because they suppress friendly bacteria and allow the proliferation of fungal species, which can be associated with severe forms of bacterial imbalance.



Dysbiosis

“Dysbiosis is an alteration of the microbial community that diminishes a person’s essential population of good bacteria and allows pathogenic (bad) bacteria that are normally present in low amounts to flourish

Dysbiosis affects up to thirty million Americans, in large part because the factors that damage our gut bacteria are so ubiquitous.

Dysbiosis is often the root cause behind many poorly understood and increasingly common medical conditions like **leaky gut, irritable bowel syndrome, and several autoimmune disorders”**

Causes of Dysbiosis:

- Most of the patients I see with dysbiosis have multiple risk factors, including treatment with acid-suppressing drugs, lots of antibiotics, intermittent steroid use for inflammation, and a steady diet of junk food in their early years.
- I suspect that the symptoms one develops are closely linked to which species of bacteria are depleted or dominant, but we lack large population-based studies that correlate specific risk factors with symptoms.

Dysbiosis May Be the Root Cause of the Following Conditions:

- Food cravings
- Bloating
- Weight gain
- Yeast overgrowth
- Irritable bowel syndrome (IBS)
- Inflammatory bowel disease (IBD)
- Small intestinal bacterial overgrowth (SIBO)
- Leaky gut Parasites Celiac/gluten sensitivity
- Vaginosis
- Food allergies and sensitivities
- Chronic fatigue syndrome (CFS)
- Depression
- Skin conditions (acne, rosacea, eczema)

Gut Bacteria Food Cravings:

- Gut bacteria are able to influence our food choices by releasing molecules that affect our brain, including hormones like serotonin that affect mood and make us feel good after eating certain foods. They can even change the properties of taste receptors so that particular flavors are more or less satisfying to our palate.
- **Bloating** Microbial imbalance leads to overproduction of bloat-causing hydrogen and methane gases,
- **Weight Gain** We can predict obesity with 90 percent accuracy just by examining your gut bacteria,
- **Yeast Overgrowth**

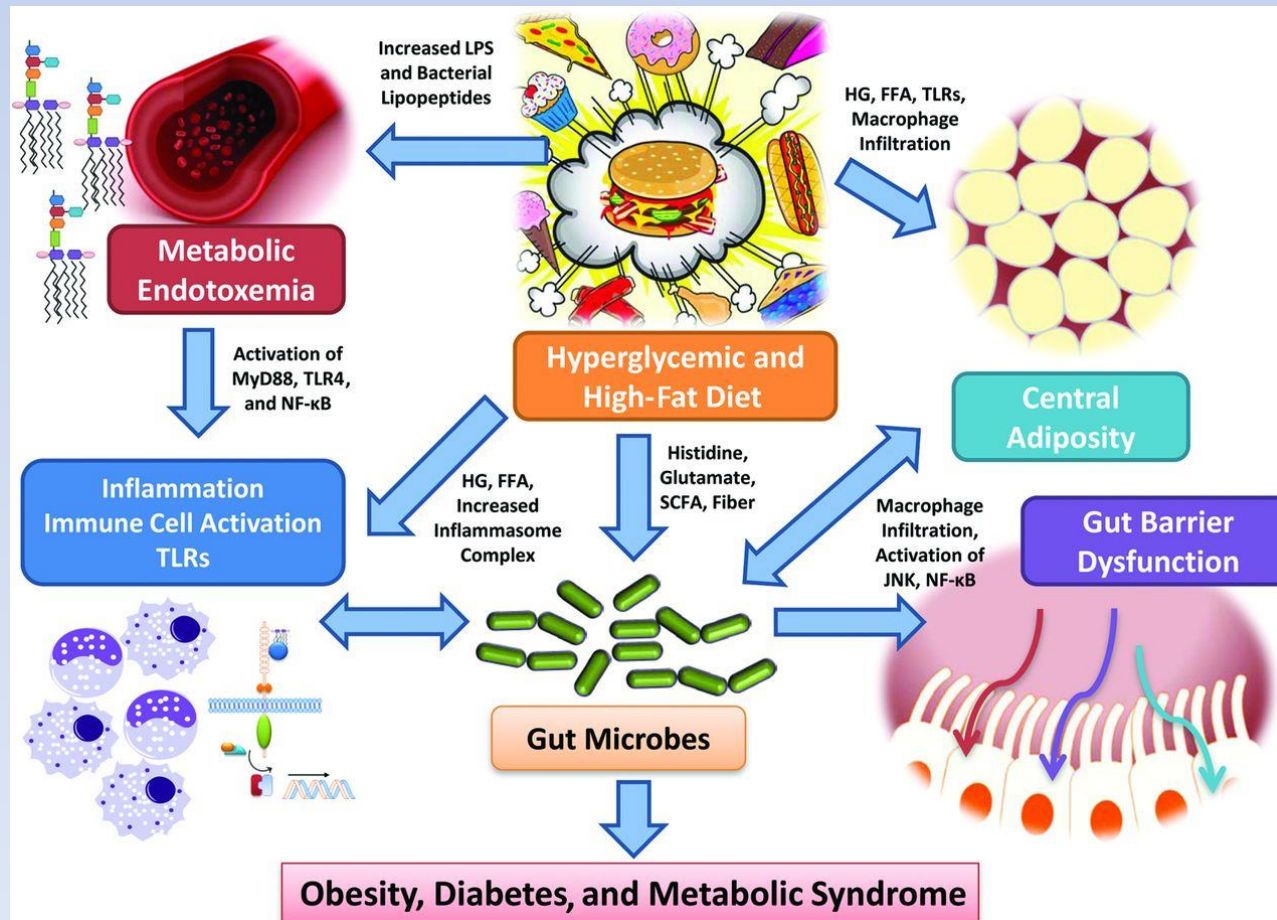


Yeast Overgrowth Symptoms:

- Bloating
- Constipation
- Depression
- Diarrhea
- Fatigue
- Food sensitivities
- Headaches
- Impaired concentration Irritability
- Nail infections
- Oral thrush (white lesions in mouth)
- Poor memory
- Rectal itching
- Skin problems (eczema, acne, hives, athlete's foot, ringworm, dandruff)
- Sugar/carbohydrate cravings
- Unstable blood sugar
- Vaginal itching

People usually want to treat their yeast problem with aggressive over-the-counter or prescription antifungals, but repopulating the gut with essential bacteria that can crowd out yeast and keep their growth in check is the hallmark of a successful treatment program, not just temporarily suppressing them with medication.

Pharmaceutical cures can be lifesaving, but watchful waiting while you allow your body—and your microbes—to heal and recover is sometimes the most judicious approach.



Causes of Dysbiosis:

- Antibiotics
- PPIs (proton pump inhibitors)/antacids
- NSAIDs (nonsteroidal anti-inflammatory drugs)
- BCP (birth control pills)/hormones
- Steroids
- Chemotherapy
- Artificial sweeteners
- Too much sugar and fat Not enough fiber
- Alcohol
- Stress
- Infections

Probiotics: Not a Cure-All, Either



- although probiotics can be helpful in restoring microbial balance, they're not a panacea. It's inaccurate to tout them as a miracle antidote to antibiotics, which are a powerful force to be reckoned with in terms of their effects on the microbiome.
- Destroying your gut bacteria and then trying to replenish them with a probiotic is like draining a full bathtub and replacing the contents with a single cup of water—it's literally a drop in the bucket.
- The reality is that most of us with a healthy, balanced microbiome can weather the storm of an antibiotic every few years, but we may have a difficult time recovering from persistent excessive use. The drugs are just too potent. And for those of us who've fed our microbes a steady diet of processed food, our ability to bounce back from antibiotics is even more limited.



Novel Ways to Rewild Yourself



The theory is that controlled infection with helminths such as hookworms can restore the body's autoimmune system to a more balanced state, decreasing the response to stimuli and reducing inflammation in the gut. Helminthic therapy is still in the experimental stages, but under the right circumstances it may ultimately prove to be a step in the right direction toward rewilding ourselves and reclaiming our health...healing inflammation in the gut by altering the microbiome through diet was a realistic and worthwhile goal.

- Our usual practice is to start with dietary modification, along with robust probiotics (live beneficial bacteria ...
- adding in medications with low toxicity if needed
- occasionally graduating to the bigger-gun drugs
- We also incorporate biofeedback to teach patients how to relieve spasm in the involuntary muscles of their digestive tracts through mind-body techniques of guided meditation and visualization.



Novel Ways to Rewild Yourself

Bottom line: one of the most powerful tools in preventing and treating our modern plagues might be the food we eat, since that's what determines which bacteria grow in our gut garden.

- The diet excludes most grains, sugars, and starches
- includes healthy carbohydrates such as fruits, vegetables, and legumes.
- Fecal Implants



Fiber

- Not enough fiber can be even worse for your microbiome than too much sugar, starch, and fat.
- prebiotics: non-digestible ingredients that encourage the growth of beneficial species and are a crucial part of restoring and maintaining microbial balance.
- Foods like lentils, beans, oats, apples, nuts, and flaxseeds increase the population of helpful Lactobacillus species in the gut,

References & Links:

- www.lifeextension.com (Valuable supplement info and sales)
- Chutkan, Robynne. The Microbiome Solution: A Radical New Way to Heal Your Body from the Inside Out. Penguin Publishing Group.

The End



Gut Bacteria Determine Weight

Obese mice have a higher ratio of Firmicutes to Bacteroidetes phyla compared to their lean counterparts, as well as reduced microbial diversity, and the same seems to be true of obese humans.

Several experiments have shown that when we transplant microbes from obese mice into germ-free lean mice, they gain weight and their fat deposition increases, without any change in their diet or exercise regimen.

microbes from obese mice—and from people, too—seem to be able to extract more calories from the same food. Although we're not sure exactly how this happens, there are a number of ways bacteria can change their energy harvest: by controlling the transit time of food through the digestive tract, which determines how many calories can be extracted and absorbed; by influencing hormones that determine whether calories are deposited as fat versus used as energy; and by themselves consuming extra calories for tissue repair or other tasks. And it's not just energy that's extracted differently; certain microbiomes are able to extract more nutrients from food, too, which can be advantageous in situations where nutrient-dense foods are scarce. People colonized with gut bacteria that are more efficient at breaking down food are able to absorb more calories and end up gaining more weight, while bacteria that are not as good at extracting calories are associated with leanness.

Gut Bacteria Determine Weight

Researchers have identified a family of bacteria called Christensenellaceae that seem to help people stay lean.

just as some microbes can extract more calories and nutrients from the same food, some microbes can extract less.

Is Chemotherapy Killing Off Your Cells?

Unfortunately...when these powerful drugs do their work of poisoning cells, lots of microbial cells are affected, too.

If you're facing a serious cancer, you may not be able to avoid chemo, but paying careful attention to the health of your gut bacteria during and after chemo and feeding them the most nourishing food possible should be an integral part of your treatment plan.

Artificial sweeteners are fermented by gut bacteria in the colon, which produces lots of bloat-causing gas, and a 2014 study published in the journal Nature suggests that they also damage gut bacteria in the process.

Genes

But your microbes may actually have more say than your genes in whether you end up overweight or not.

The Microbiome

**Presented by the
ALZ Rogue Group**

John Bohan MS, Paula Wolfert

The ALZ Rogue Group is dedicated to bringing the latest
Alzheimer's treatment info to its members