



**UNDERSTANDING
CHRONIC
DIGESTIVE ILLNESSES**

Understanding chronic digestive illnesses from the perspective of a dysfunctional digestive ecosystem

The following is the story of Caroline, a patient who came into the office with chronic multisystem complaints.

Caroline's history

Caroline is a 30 year old legal secretary. She has a five year history of multisystem complaints including nausea, chronic fatigue, abdominal fullness after meals, abdominal bloating, belching, abdominal distention, flatulence, migraine headaches, muscle aches, anxiety, depression, insomnia, irregular bowel habits and a recent weight gain of 20 pounds.

She had been evaluated by several functional and integrative medicine specialists, two gastroenterologists and a nutritionist. She was recently referred to an intestinal specialty clinic at a nearby medical center. The last medical provider she had contact with was a psychiatrist who prescribed antianxiety and antidepressant medications.

Her evaluations have included multiple blood tests, stool examinations, gallbladder x-rays, stomach emptying tests, CT scans of the abdomen, esophagus/stomach and colon endoscopies. All her studies were reported to be normal.

Caroline repeatedly commented, *"If all my tests are normal, why do I feel so terrible?"*

Caroline had tried lactose free diets, low-fat diets, low FODMAP diets, sugar free diets, gluten-free diets, nightshade free diets, high protein diets, bone broth diets, keto diets, and intermittent fasting. She had been treated with several rounds of antibiotics to cover the possibility of bacterial overgrowth in her small intestines, small bowel bacterial overgrowth (SIBO).

When first evaluated, Caroline was taking four prescription medications, seven minerals and vitamins, a probiotic and several "nutritional" supplements. Most of the non-prescription items that she was taking came from advice gained from the Internet from those who shared similar symptoms.

Caroline's story is not unique. Every medical care provider has evaluated many patients like Caroline in their practices. Most of these patients have been diagnosed with "irritable bowel syndrome", "functional gastrointestinal disorder", or a "nervous stomach". Most often, Caroline had been told that her symptoms were due to the stresses in her life. Many, like Caroline, have left the offices of their providers still feeling ill, confused, frustrated and despondent.

Dr. Will Bulsiewicz, a gastroenterologist, writes in his book, *Fiber Fueled*, about his encounter with a patient like Caroline in his practice who told him, "This isn't the life I envisioned for myself. I am way too young to be feeling this old."

Caroline's symptoms can be interpreted as a dysfunctional digestive ecosystem

A way to understand Caroline's many symptoms is by considering the digestive tract as an ecosystem—a group of interacting and interdependent parts. The parts of the digestive ecosystems include the following:

- Microbes— bacteria, viruses, fungi, protozoa and archaea made up of several thousand species.
- Nutrients—compounds in foods that provide energy essential for growth or repair.
- Non-nutrients— substances that are not essential for growth and repair of the body such as food additives, tobacco, toxins, pesticides, pharmaceuticals, and inorganic debris (dust, dander, wood, soil, gases, and metals).
- Digestive tract secretions— those substances produced by the body that sustain bodily functions such as saliva, stomach acid, bile, pancreatic secretions, enzymes, and mucus, so called *eobiotics*.
- Intestinal lining cells (enterocytes)-- the single layer of cells that coats the interior digestive tract and carries out the dual functions of digestion, water and nutrient absorption and also forms a protective barrier against the entry of pathogens and other toxins.
- Intestinal immune system— a combination of antibodies and activated white blood cells that protect the integrity of the digestive tract from invasion by pathogens, food antigens, and toxins.
- Intestinal endocrine cells (enteroendocrine system)—cells that secrete a variety of hormones that control hunger, satiety, sugar metabolism, secretions and motility.

- Intestinal nervous system—millions of nerve cells lining the intestinal tract that communicate between the gut and the brain and form a part of the gut-brain axis.

The harmonious interaction between these eight components is necessary for a stable equilibrium, the hallmark of intestinal wellness. Without this harmonious interaction, the digestive ecosystem becomes dysfunctional which may result in the decline of overall health—as in the case of Caroline.

Defining the digestive tract--form and function

The digestive tract is a twenty eight foot muscular tube that extends from the tip of the tongue to the anal opening. It is composed of five digestive organs, the mouth, esophagus, stomach, small intestine, and large intestine (colon). There are also four accessory digestive organs, the salivary glands, liver, gallbladder and pancreas.

Mouth: The mouth is the headwater to the digestive tract. As nutrients enter the mouth, the chemical process of digestion begins. Salivary glands initiate digestion of sugars and fat busting enzymes are released in the mouth that begin the digestion of fats—although fat digestion is a limited function in the adult and found primarily in the newborn.

Dental procedures and restorations like cavities, caps, implants, extractions, bridges, dentures, root canals, etc., provide a telling clue to the state of the oral ecosystem. Symptoms of mouth burning, tingling, numbness and/or recurrent mouth erosions and/or ulcerations (canker sores) may be reflective of a dysfunctional oral ecosystem.

Esophagus: The esophagus is the tubular conduit that runs from the mouth to the stomach. Symptoms of heartburn, difficulty swallowing, and signs of esophageal precancerous changes in the lining cells may all be reflections of a dysfunctional esophageal ecosystem.

Esophageal symptoms may not totally be caused by backflow of strong chemicals from the stomach (GERD) as so often is diagnosed but may, in fact, have its origins in the faulty adjoining ecosystems “upstream” in the gums, mouth, lungs, nose, ears, eyes and sinuses.

Stomach: The stomach is an organ that primarily mixes and grinds foodstuffs into a consistency that can be best utilized by the digestive processes that follow. A key property of the stomach's lining cells is its ability to secrete concentrated hydrochloric acid that assists in the destruction of microbes that have been

swallowed. Although highly beneficial in patients when used judiciously for acid related problems, the chronic overuse of acid reducing medications may permit microbes that are not destroyed by acid to proceed downstream contributing to symptoms of loss of appetite, recurrent nausea, vomiting, abdominal pains, feeling of uncomfortable fullness, abdominal bloating and distention.

Small intestines: The major harvesting of energy from foodstuffs is carried out by the small intestine aided by enzyme secretions from the pancreas and bile from the liver. The small intestine, however, has a limited toolbox of digestive enzymes so that certain food products escape the small intestines' digestive efforts and pass undigested into the large intestine (colon) where microbes that have hundreds of enzymes exist to complete the digestive process.

Large intestines (colon): The colon is more than a conduit for the exodus of waste products. The colon is a beehive of chemical activity where microbes convert the "leftovers" from the small intestine into components critical for the body to function. As humans, we provide our microbes with "bed and breakfast" and they, in turn, carry out numerous metabolic functions that we are unable to perform.

In addition to its digestive function, the digestive tract serves as a drainage site for the transport and disposal of secretions and metabolites produced in four nearby organs:

- Tears from the eyes
- Secretions from the facial sinuses
- Fluid from the middle ears
- Mucus from the lungs (phlegm)

The contributions of the accessory digestive organs and the release of fluids from these 4 adjoining organs must all be considered to fully understand symptoms in patients with digestive complaints.

A closer look at some of the other components of the digestive tract ecosystem

The microbiome

In addition to the known 78 body organs that anatomists have described over the last 300 years, there is now a new appreciation for a vast community of organisms that live in and on the body made up of bacteria, viruses, fungi, protozoa, and archaea and their genes collectively known as the microbiome.

By cell count, microbes far outnumber body cells by trillions and their genes are 150 times more plentiful than those in the human genome meaning that over 99% of gene activity carried out within the body is done by our microbes. Ninety-five percent of these trillions of microbes reside within the large intestine (colon).

The health of the human gut cannot be fully understood without considering these resident microbes and the part they play in the digestive ecosystem. Microbes have come to be known in some medical circles as "the 79th organ".

The body has outsourced a multitude of critical functions to the microbes including the following:

- Generation of energy which keep the microbes alive but also shared with the human host to keeps the intestinal cells alive.
- Training the immune system to recognize and respond to potentially harmful elements.
- Production of a protective mucus barrier.
- Activation and deactivation of medications.
- Synthesis of antimicrobial peptides which act like antibiotics to repel pathogens.
- Production of vitamins which are shared with the human host and essential for human existence.
- Communication with the intestinal endocrine cells and nerve cells to regulate intestinal hormones, secretions and peristaltic movement of the gut.
- Regulation of permeability of junctions between each intestinal cell to prevent unfettered access of fluids, microbes, food substances and toxins into the body (leaky gut).
- Regulation of the metabolism of insulin, sugar utilization, fat storage, and protein synthesis.
- Control of the feelings of hunger and satiety.
- Stimulation of chemicals known as neurotransmitters like norepinephrine, dopamine and serotonin that help modulate mood and behavior.

Encouraging the survival and proliferation of our microbes is key to attaining a functioning and productive digestive tract. Mistreating, damaging or destroying our microbes with resultant disruptions of the intestinal ecosystem is one of the prime reasons for feeling "unwell".

Nutrients

Perhaps the digestive activity that humans have the most control over is the selection of which nutrients to ingest that will interact within the digestive ecosystem. For most individuals, the opportunity to make that selection occurs three or more times a day.

The human body is capable of digesting and absorbing only a limited number of nutrients. Digestion begins in the mouth, as described before, with further prep work done in the stomach, but it is the small intestine that is the workhouse of the body absorbing sugars, fats, and proteins. Since the small bowel has a limited repertoire of digestive enzymes the completion of digestion must be carried out by microbes in the large intestine.

For example, refined sugars are easily and readily absorbed from the upper intestinal tract but complex sugars contained in most fruits and vegetables are passed undigested and unabsorbed into the large bowel. These sugar products, commonly known as dietary fiber serve as the nutrient of choice to sustain the microbial community allowing it to carry out the beneficial functions listed above.

In the absence of dietary fiber (i.e. non-absorbable sugars), microbes turn to alternative sources of nutrition and begin by digesting away the sugar rich protective mucus layer overlying the intestinal cells. Loss of this coating has been shown to increase gut permeability eventually allowing microbes to come into contact with underlying body tissues.

The penetration through a permeable barrier of foreign substances is perceived by the body's immune system as a threat resulting in an inflammatory reaction with seepage of inflammatory metabolites into the body. These metabolites may cause symptoms to occur not only in the gut but in peripheral tissues including liver, heart, brain, thyroid, kidneys, skin, and bone as well.

The immune system—a key player in the intestinal ecosystem

From the time of birth, all food, fluids, gases, microbes, preservatives, toxins, pharmaceuticals and/or supplements that enter the body are foreign. They are introduced into the body which then must determine whether to tolerate or reject them.

The body has an extensive system of detection and identification of everything it meets and a protective immune system to prevent invasion and destruction by foreign elements.

The immune system, therefore, represents the Department of Homeland Defense and is made up of the following:

Physical Barriers

- The film of mucus that coats the entire surface of the digestive tract from mouth to anus containing antimicrobial chemicals.
- Semipermeable junctions that exist between each lining cell (tight junctions) that protect border crossings and prevent the translocation of toxins, microbes, and food antigens into the body (leaky gut)

First Responders

- Activated white blood cells (lymphocytes, monocytes, eosinophils) mast cells and fibroblasts that activate the release of an array of destructive chemicals known as cytokines, of which, at least 40 are known to exist in the human.

Trained Reinforcements (antibodies)

- Antibodies are chemicals produced and released from the bone marrow that have a memory of past encounters with a specific foreign microbe, antigen or toxin. Since they have encountered the specific foreign element before they have learned tactics for destroying or neutralizing the element if and when seen again.

CAROLINE'S REHABILITATION PLAN

The following plan was given to Caroline and has been used with other patients as a strategy to help rehabilitate the components of the digestive ecosystem.

WHAT TO EAT AND NOT TO EAT

- Eat a plant-based diet made up primarily of fruits, vegetable, beans, lentils, nuts, berries, seeds, and whole grains. The popular Mediterranean diet may be a good starting point (with some modifications) for those seeking dietary advice. Try to ingest 28 grams or more of total fiber in your diet if you are a female and 35 grams, of more, if you are a male.
- If affordable and available, select organic fruits and vegetables. Organic food products not only add less contaminants to our food supply, but the agricultural methods required to qualify for the label "organic" are better for sustaining the earth.

- Incorporate a wide variety of fruits and vegetables into your diet. Nutrition experts frequently encourage eating a wide variety of different colored fruits and vegetables. They use the phrase, “eat the rainbow.”
- Reduce eating products that contain high concentrations of refined sugars like cookies, candies, cakes, ice cream, etc.
- Eat animal protein sparingly.
- Avoid eating processed meats (examples include hot dogs, salami, bologna, meat sausages and most deli meats).
- Avoid emulsifiers particularly, polysorbate 80, carboxymethylcellulose, and carrageenan.
- Avoid energy boosting drinks (examples, Red Bull®, Jolt®, Monster®).
- Avoid all cola drinks.
- Avoid carbonated beverages.
- Avoid sugary drinks.
- Avoid artificial sweeteners except for Stevia.
- Avoid protein powders, protein pills and protein shakes or smoothies
- Drink no more than one alcoholic beverage per day--a single mixed drink of spirits, a 12 ounce bottle or can of beer, or a four ounce glass of wine.
- Drink a minimum of two to three liters (quarts) of fluid per day unless your healthcare provider advises fluid restrictions. Distilled water should be your fluid of choice. If your source of water coming into your residence is well water, have the water checked annually by your county health department for bacterial contamination (coliforms).
- Drink no more than two 6-8 ounces cups of coffee per day.
- **Optional:** Drink one or two cups of hot green tea mixed with a teaspoon of Jarrow Formulas Inulin FOS powder® (purchase at Amazon.com) and a teaspoon of Benefiber®. Sweeten with manuka honey to satisfy your taste. Add a dash of cinnamon to the top for taste. Do not prepare with premixed bottles of green tea. Make the tea fresh from tea bags.

WHEN TO EAT

- Avoid eating for 10-12 hours after the last meal of the day.
- Try to eat meals at roughly the same time every day.
- Allow at least 3-4 hours after your last meal before going to sleep.

VITAMINS, MINERALS AND SUPPLEMENTS

- Take a methyl B12 supplement once a week (example, Jarrow Formulas Methyl B12® 1000 micrograms).

- Have your blood level of vitamin D checked once a year, ideally in the fall or winter months, and take a vitamin supplement as directed by your healthcare provider to keep your blood level above 32 nanograms/ml.
- Avoid taking vitamins, minerals, probiotics, herbal supplements and homeopathic remedies unless specifically recommended and monitored by your healthcare provider. Many over the counter supplements can cause serious side effects when mixed with other supplements or with prescription medications. Always confer with your healthcare provider and/or pharmacist before self medicating with over-the-counter supplements.

OTHER RECOMMENDATIONS

- Try to go to sleep at approximately the same time every day. Sleep restores both the microbiome and the body. Keep the bedroom cool enough that a light blanket is comfortable. Get 7-8 hours of sleep a day.
- Use an air filtration unit in your sleeping area that contains a HEPA filter
- Avoid all tobacco products and vaping.
- Avoid recreational drugs.

GET REGULAR EXERCISE—"SITTING IS THE NEW SMOKING"

Sedentary activities require low levels of energy expenditure usually when seated at work, while texting, playing video games, or watching TV.

Many individuals have tried to compensate for this lack of activity by participating in vigorous physical activity like exercise classes or jogging in hopes that 30 to 40 minutes will suffice. Bursts of vigorous physical activity provide many health benefits; however, the metabolic consequences of prolonged sitting may still increase the risk of chronic diseases according to a study published by the Cancer Prevention Research Center.

Regular standing and regular movement should be the ultimate goal. A convenient reminder could be to set an alarm on your cellphone or your computer to move about at hourly intervals throughout the day

PHARMACEUTICALS

- Only use nasal sprays (steroids, antihistamines, decongestants) under the direct supervision of your healthcare provider.
- Only use acid reducing medications under the direct supervision of your healthcare provider. (Examples, Prilosec®, Prevacid®, Protonix®, Nexium®, Zegerid®, Dexilant®).

DENTAL HEALTH MEASURES

- Dental examinations and dental cleanings should be scheduled at least twice a year or more often if you have had multiple dental procedures (cavities filled, dental caps, dental implants, root canals, dentures, bridges, etc.) or you wear a temporary or permanent mouth retainer.
- Teeth should be brushed at least twice a day for a minimum of two minutes each time. Brush with an electronic rechargeable toothbrush (for example, Sonicare®) that contains a timing device to alert you to the time you have spent brushing your teeth.
- Change the brush tip on your toothbrush at least every 90 days.
- Use a fluoride containing toothpaste that contains baking soda to neutralize acid in the mouth and to reduce dental cavities. (Examples, Arm & Hammer Advanced White® or Colgate Baking Soda and Peroxide®).
- Floss your teeth after meals and/or use GUM Soft Picks®.

RECOGNIZING SYMPTOMS THAT MAY REQUIRE IMMEDIATE MEDICAL ATTENTION

Contact your primary medical care provider, or Dr. Kramer (352-331-6736), if you experience any of the following “alarm symptoms”:

- Increasing abdominal pain
- Frequent nausea
- Recurrent vomiting
- Passage of large amounts of blood, or repeated passage of blood, in or on the stool
- Fever (temperature above 100 degrees)
- Shaking chills
- Involuntary weight loss
- Repeated episodes of diarrhea
- Passage of fewer than three bowel movements a week
- Repeated passage of hard stools that require exertion to evacuate

New signs or symptoms may arise which may not be directly related to the dysfunctions discussed above. What may have been undetected on previous studies may now become more apparent on further physical exams, X-rays, imaging studies, and/or laboratory tests. Any changes, therefore, in your health condition should always be called to the attention of your health care provider.

Patience. . .

Your health history may be similar to Caroline's. The expectation of reversing your condition with a week or two of modifications will almost certainly be met with disappointment. It may take weeks or months to achieve a more comfortable state and require multiple adjustments to custom design a program specifically for your body's needs—one size does not fit all!

These recommendations are, therefore, not a “quick fix”. The science behind these recommendations, however, has been well accepted and the long term benefits are potentially huge.

Caroline's follow up

What has happened to Caroline?

Since Caroline started her program, the nausea, abdominal fullness, burping, bloating, distention, and irregular bowel function have completely resolved. Her strength and energy have returned. She has been sleeping longer and more soundly.

Caroline is exercising regularly, and she is following the recommended dental hygiene measures. Her anxiety and depression have dissipated. She has stopped taking anti-anxiety and antidepressant medications and no longer takes any over-the-counter supplements other than vitamin B-12 and vitamin D. And . . . she has lost 12 pounds.

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