

NUTRITION Clinician Handout

Erika La Vella, DO
Bariatric Surgeon, Samaritan Health Services

*“Let food be thy medicine and
medicine be thy food.” – Hippocrates*



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THE GUT MICROBIOME AND PAIN

The connection between mind and body resides in the human gut microbiome. Research has highlighted the importance of a good diet for reducing inflammation seen in many chronic ailments such as cancer, autoimmune disease, metabolic disease, psychiatric conditions, and pain. When the diet is rich in antioxidants and fiber, all aspects of health benefit. The link between nutrition and health outcomes lies in the health of the human gut microbiome. The microbiome contains the most extensive collection of microbes in the body, consisting of primarily bacteria, as well as archaea, fungi, and viruses which chemically crosstalk with human tissue. Good nutrition is the foundation for a healthy microbiome. Diets deficient in antioxidants and fiber have low microbial species diversity which is associated with worse health outcomes.¹ Providers should screen for symptoms of a poor diet. These symptoms include:

- Fatigue
- Reduced cognitive abilities and emotional processing
- Muscle aches and joint pains
- Increased anxiety and depression
- Bloating, abdominal pain, GERD, and constipation/diarrhea
- Poor sleep quality
- Inflammation and impaired immune response

Providers should remind their patients to eat more prebiotic foods such as fresh fruits, vegetables, and whole grains to optimize their health. Micronutrient rich foods are those in whole food form. A simple phrase to use is “Eat the colors of the rainbow.”

Common Definitions

A **prebiotic** is a plant fiber that feeds beneficial gut bacteria. Prebiotic rich foods include onion, leeks, garlic, asparagus, chicory, Jerusalem artichoke, etc.

A **probiotic** is a beneficial bacterium that can be cultured and given as a supplement with a health-promoting benefit. Probiotic foods include plain yogurt, kefir, miso, sauerkraut, kimchi, kombucha, and others.

A **postbiotic** is a short-chain-fatty-acid (SCFA) metabolite from complex carbohydrates’ fermentation within the GI tract. The most notable SCFA to-date is butyrate, which the human colonocyte uses as its only energy substrate. A healthy colon is dependent on a healthy gut microbial ecosystem in a mutualistic manner. A healthy diet creates many postbiotic substrates that are beneficial in every organ system, including the nervous system and brain.²

WHY IS THE GUT MICROBIOME IMPORTANT? THE GUT-BRAIN AXIS

The gut and the brain are connected via the microbiome-gut-brain axis and communicate via neural, metabolic, immune, and endocrine means. Through bi-directional communication, the gut and the brain are hard-wired through the vagal nerve pathways and lymph-circulatory systems. Several studies demonstrate that poor gut health and nutrition can increase symptoms of anxiety/depression, age-related cognitive decline, and lower resiliency to stress. Research has shown that gut microbes secrete byproducts that convey messages to the nervous and endocrine systems. The cell-signaling involved can turn on inflammation, turn on susceptibility to disease, and even further damage the gut environment, as in IBD.³ The human gut microbiome synthesizes up to 95% of the serotonin and GABA in our bodies. Studies show micronutrient rich diets have less mental illness because gut bacteria are integral to the nervous system response.^{4,5} Clinicians need to watch for symptoms of anxiety/depression, age-related cognitive decline, lower resiliency to stress and consider the impact of nutrition.

GUT-BARRIER INTEGRITY

The intestinal tract begins in the mouth and becomes an acidic environment by stomach acid. It gradually becomes more alkalotic towards the cecum with bile and pancreatic secretions mixing in the duodenum. There are specific populations of bacteria that live in each digestive compartment unique to that niche’s exposure to oxygen and pH. The lining of the intestinal tract from mouth to anus is covered in a mucosal layer. The integrity of the mucosal layer is significant for the microbiome and immune response. Under the intestinal cells live the body’s most extensive collection of lymph tissue. If the mucosal lining is damaged or weakened, the undigested food particles and unhealthy species of bacteria, viruses, and parasites can cross



the gut barrier and incite immune activation. This process is known as increased intestinal permeability and is proven to proceed chronic conditions, including anxiety, depression, and chronic pain.⁶

WHAT CAN DISRUPT OUR GUT MICROBIOME?

Diet low in fiber and high in saturated fat and processed foods

The Standard American Diet (SAD) is low in fiber and high in saturated fat and processed foods, which produce low levels of beneficial microbiome metabolites needed for healthy gut-brain axis function. Dietary habits that support the microbiome include a whole foods diet with antioxidants, minerals, and fiber with little to no processing and probiotic-rich foods.

Common OTC medications can interrupt the gut microbiome

Medications such as antacids are proven to change the stomach's pH such that it changes the native bacterial populations from favorable to dysbiosis. Likewise, drugs commonly prescribed for pain also cause disturbances to the gut lining and microbiome. Through prostaglandin inhibition, NSAIDs cause thinning of the mucus membrane, subjecting those who take it to compromised gut barrier function.^{7,8}

Stress increases intestinal permeability

The bi-directionality of the gut-brain axis implies that while there are nutritional and gut-mediated pathways to mental well-being, brain-gut mediated pathways mediate gastrointestinal health. Research shows that the stress response releases corticotropin-releasing hormone which systemically releases enzymes from mast cells at the gut level. These enzymes degrade tight junction proteins linking enterocytes together, causing increased intestinal permeability. Often pain is exacerbated by stress physiology, especially as it pertains to the emotional and cognitive relationship to their pain. Providers need to understand the importance of stress on the gut microbiome and its impact on chronic pain.⁹

ANTIBIOTICS

While antibiotics have revolutionized medical care, they must be used prudently. Native bacterial species are destroyed with every antibiotic and recovery is contingent upon diet, medications, stress, and environmental exposures to microbes. Antibiotic use in early childhood causes metabolic disorders, obesity, and neurodegenerative diseases. Inquire about antibiotic use and frequency to shed light on your patient's gastrointestinal health. Probiotic supplements and foods have been shown to decrease complications from antibiotics.¹⁰

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