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Architect for a Healthy Future

The Human Gut – A Foundation for Brain Development and Overall Health

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The Gut-Brain Axis is a rapidly progressing field of research. Every month there is more data emerging from universities and private labs around the globe that continues to illuminate the role of gut microbes and intestinal function in human health at all stages of development. Similarly, damage to the gut microbiome through antibiotic exposure and limited contact with nature has now been shown to be predictive of a wide variety of childhood diseases ranging from autism to asthma, allergies to autoimmune diseases, acne to anxiety.

First in the United States, and now in many other developed (and developing) countries, we have witnessed extraordinary epidemics in childhood chronic diseases with some surveys now showing as many as 46% of American children having a chronic disease. This is in stark contrast to 4% of the entire population having a chronic disease in the 1960s. The conditions that are becoming prevalent today reflect damage to every organ system in the body, and include the autism spectrum disorder, depression and anxiety, attention deficit hyperactivity disorder, food allergies and sensitivities, environmental allergies, metabolic challenges like precocious puberty, abnormal reproductive development, diabetes, autoimmune conditions, and cancer – childhood cancers on the fastest rise include various lymphomas, leukemias, sarcomas, and brain tumors. Research from many university groups around the globe suggests that genomic, autoimmune, and neurologic disruptions are resulting from the rapid reduction in microbiome diversity.

In the midst of all these factors, our group of scientists and many others around the world are increasingly recognizing that the root cause of this health collapse lies in the “soil” of the human body: the microbiome. Bacteria, fungi,

parasites, yeasts, and viruses that live in every nook and cranny of our body seem to be collectively responsible for the provision of the life-giving nutrients that our bodies need to function properly. With the loss of this gut microbiota comes the loss of the protective intestinal barrier, ultimately leading to disruption of the enteric (gut) endocrine system and enteric nervous system.

So, what is the magnitude of this disruption, and how does the Gut-Brain Axis factor in?

The Gut-Brain Axis is comprised of three systems: the intestinal barrier and immune system, the endocrine (hormone producing cells) system, and the nervous system which includes the enteric, parasympathetic (relaxation, digestion, metabolism), and sympathetic (fight or flight). Approximately 15% of this intestinal lining is composed of enteric endocrine cells, which produce over 90% of the serotonin and over 50% of the dopamine neurotransmitters. The brain does not produce its own neurotransmitters, the gut does!

This is a massive paradigm shift in the current ideology of the brain’s functions. Perhaps even more remarkably, it has been shown that these enteric endocrine cells only produce neurotransmitters if the correct species of bacteria are present on the surface of these cells. In light of this new data, it is not surprising that damage to the microbiome and intestinal lining is commonly associated with neurologic diseases such as autism, depression, and anxiety. The gut barrier is the first line of defense against intestinal pathogens and toxins. It is responsible for the carefully regulated passage of water, electrolytes, macro-, and micronutrients from our diet. In order for our bodies to function properly, our gut must first do so.

How does gut health relate to the Gut-Brain Axis and developmental processes?

Many perinatal influences affect the developing nervous system and the gut microbiota. The health or injury of the gut microbiota as well as the larger Gut-Brain Axis influence the risk of many neurologic conditions such as autism, attention deficit, anxiety, depression, and sleep disorders. At birth, the intestinal barrier as well as the immune system that lies just beyond this barrier, are functionally and structurally immature. The foundation of a healthy gut is first laid through the colonization of the infant's skin, nose, ears, eyes, and mouth with mom's microbiome that is passed on during the infant's transit through the vaginal canal, then through breast feeding and skin-to-skin nurture. The neural, hormonal, and immune pathways of the Gut-Brain Axis become fully established in late teens or early 20s. Therefore, early dysfunctional Gut-Brain Axis can affect brain development and function at all stages of life.

Intestinal permeability is regulated by the structural integrity of tight junctions. Tight junctions function to regulate the passage of large organic molecules between adjacent epithelial cells, and also to prevent the passage of microorganisms and other unwanted foreign materials and toxins into our body. Therefore, defective intestinal barrier integrity can lead to leak of organic and inorganic compounds and overwhelm of the immune system, and ultimately to the myriad of chronic inflammatory and autoimmune diseases.

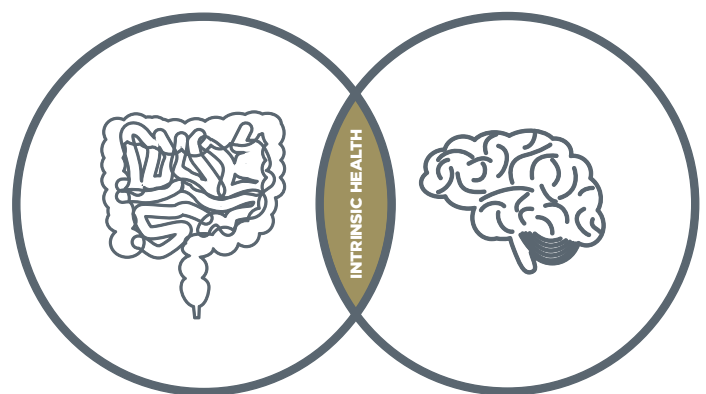
What do we know going forward?

It is well-known that manipulation of gut microbiome and intestinal permeability can affect the Gut-Brain Axis development. A diverse microbiome can support the intestinal barrier and reduce epithelial barrier dysfunction in physical and psychological stress experiments. Our research laboratories at Biomic Sciences have been working to explain the connection between the loss of the microbiome and the increase in gut and blood/brain dysfunction (leaky gut and leaky brain) which has now

been recognized to be a primary pathway to many chronic diseases in children and adults. We have been able to demonstrate that the communication network provided by the digestive molecules of the microbiome directly support these critical barriers. This suggests that the loss of the microbiome and its regulatory capacity is ground zero for our chronic disease epidemics.

While our lab results concerning soil extract supplementation are exciting, it is the human stories that have emerged from our experience with these ancient soil sources of microbiome intelligence that are the most extraordinary to witness. How fascinating it is that a massive ecosystem of bacteria and fungi in the soils of the jungles and rainforests of 60 million years ago passed down to us a molecular communication system that would support human health in the most toxic and desperate moments of our short history on this planet. Even as we destroy the soils of the earth with global chemical farming, Mother Earth delivers this ancient gift. We can hope that this gift is not just for our physical health, but also to reveal a deeper truth about the interconnectedness and collaborative capacity of the nature that we have been born into.

Gut-Brain Axis



GUT HEALTH = BRAIN HEALTH