

Could It Be the Gut?: An Introduction to the Brain-Gut Axis

READERS SUMMARY:

1. What is the brain gut axis?
2. What diseases likely are tied to its breakdown?
3. Why might medical training force us to miss the importance of this axis?
4. How did I discover the brain gut axis in my own clinical practice?
5. Did evolution dictate where the initial battle of immunity should lie?

When many doctors hear me talk about the brain gut axis I get lots of funny looks. See, this is an axis that we do not formally learn about in anatomy in medical school. We learn about systems in anatomy that are organized as tissues within organs. Physiology is where organ integration and its function is taught. Guess what? We did not learn about the brain gut axis there either. In fact, when I was in medical school and residency, I never once heard or attended a lecture of this axis that I believe is the fifth most important levee in my cellular theory of health! I personally believe that medicine is going to revolutionized by the science that is uncovered in this axis over the next few decades. I believe the diseases that currently have no cure or known cause will be tied to this axis eventually. Diseases like amyotrophic lateral sclerosis (ALS), MS, Lupus (SLE), Rheumatoid Arthritis, Autism, Depression, Crohn's disease, Parkinson's disease and Alzheimer's disease to name a few. When I tell this to my fellow physicians they get this look on their face like I am nuts. Then I began to explain WHY I believe this; and they stop and listen. The science is being discovered as we speak

by countless researchers. Often, it is based completely on the sciences we already know about. The biologic plausibility resides in neuroanatomy, biochemistry, and physiology of humans. I opened my textbooks 5 years ago and the answers were right there but I just understood the problem from a new perspective.

During residency training I had no time to even consider these issues because of the lack of time but scientific truth still exists even if I failed to recognize the pattern the connections before. Seeing diseases in my clinic and the operating room for the last 15 years made me have a 30,000 foot view of the larger issues surrounding diseases. The microcosm world of biochemistry and physiology is often a "myopic" 30 foot view into clinical medicine. When you are down at that level you have no perspective on how certain biochemicals reactions effect organisms and disease states; or how they may modulate health. Most empirical knowledge is really one kind of knowledge. It's not real truth even when it appears to be so. Even with microscopes, what we see with our eyes is only a narrow spectrum of light between red and violet. We see only five percent of the 'real' world. Most of what is out there remains hidden to the naked eye.

Clinical medicine has allowed me a new way to look at old problem, osteoporosis. For many years I never saw it how young people could get osteoporosis from a gut issue. In training when we encountered it, it was usually blamed upon genetic determinism. I realize now that was an easy out back then from thinking about why this could happen. Then my thoughts changed about osteoporosis when I saw a young woman below 30 years old come into the ER with severe osteoporosis about 5 years ago. She came into the emergency room partially paralyzed from severe degenerative disc disease and a broken vertebrae in her neck. She had zero risk classic factors for this presentation. Her case changed my perspective big time. I wanted to know why it happened to her. I found out it was related to her diet of

extreme processed foods, coupled with low vitamin D levels, heavy use of grains, and very low testosterone and estrogen levels. Once we altered her diet and added back Vitamin D3 and K2 with some minerals she depleted from her leaky gut she magically improved over 18 months. She really changed the way I looked at all spinal disorders as a neurosurgeon.

The more I thought about her case the more I realized it was about co-evolution of our gut bacteria and our diet. We rely on our gut and our gut relies on us to maintain health and curb disease. If both are not congruent with one another this symbiotic relationship will allow bad things to occur. My training was firmly entrenched in conventional medical principles and it was reductionistic in its logic. Her case forced me out of that box because I had no way to explain it. That bothered me. I was trained to look at individual layers of the organism and its structure and how they interacted. This is a good way to learn a large amount of data in four short years of medical school. I realized after my residency it fell short in treating chronic diseases of my patients in my office. So I embarked on changing my paradigm of how I thought about disease. I put my iPod on and kept staring at the floor to see what all the textbooks had in common. And it dawned on me as I looked at a small book buried under my Grey's Anatomy book. It was evolution. Everything is tied to it.

The evolution of the gut bacteria in a human usually is congruent with the type of chronic disease they will face in their life time. It appears the key in this levee 5 is to keep inflammation at low level as possible to retain your health. The types of food we eat and the quality of those foods appears to be directly proportional to the amount of inflammation we generate in our gut to promote disease. There are many complex interactions occurring within the gut between bacteria and our own immune systems. It appears it is vital to our developing immune system to properly introduce bacteria so

that immunity and its response develop properly. The links of many autoimmune diseases to gut health now are now being established in the gastrointestinal literature. It also appears that the basic anatomy of our gut may predispose us to certain diseases in certain locations of our gut. For example, I do not believe it is chance alone that colon cancer and ulcerative colitis are found far more commonly in the left descending colon because this territory of the gut is not protected by the brain with direct innervation for surveillance. It appears that the vagus nerve gives direct input to the brain via numerous tracts to monitor gut contents but also modulate gut health. There is also some interesting obesity research being done with vagal nerve stimulators to show that stimulation may improve leptin sensitivity.

In summary, the complex biochemical reactions that occur in the gut appear to be the genesis of where inflammation initially passes in to our body. We need to realize this and avoid eating the things that cause this inflammation. As I have said for close to five years now this means strict avoidance of omega 6's, all grains and especially wheat of any kind and very limited fructose (fruit or synthetic sources) The gut associated lymphatic tract (GALT) is the first place where our immune systems interact with the outside world. This occurs right below the intestinal brush border and is our first line of defense. It seems to me that evolution has dictated that this is precisely where the battle between health and disease begin in humans and why our immune system is set up ready on that battle front.

CITES

1. The Lancet 2000 355:1518-1519
2. Multiple sclerosis patients have peripheral blood CD45R0+ B cells and increased intestinal permeability.
Dig Dis Sci 1996 Dec;41(12):2493-8
3. Gastrointestinal absorption of intact proteins.
Annu Rev Nutr 1988;8:329-50

4. Review article: Intestinal permeability in Crohn's disease.
Aliment Pharmacol Ther 1997 Dec;11 Suppl 3:47-53; discussion
53-6

5.

<http://yourlife.usatoday.com/health/story/2011/08/Researchers-say-theyve-found-common-cause-of-of-ALS/50089982/1>