David Haase, MD: Healing the Gut and Brain Through Electrophysiology

Interview by Craig Gustafson

Facilitated by the Gut-Brain Relationship Conference, 11 through 12, 2016, in Marina del Rey, California. For more information, please visit http://innovisionhm.com/gutbrain/.

***David Haase, MD,** will speak at the upcoming Gut-Brain Relationship Conference in Marina del Rey, California, November 11-12, 2016. He is a doctor, teacher, and innovator who is deeply committed to maximizing wellness one unique person at a time. Dr Haase received his medical training at Vanderbilt University in Nashville, Tennessee, and completed his residency in family medicine at Mayo Clinic in Rochester, Minnesota. He is board certified in family medicine and integrative holistic medicine.*

Early in his clinical practice, Dr Haase knew that something very important was imbalanced. He realized his training had been dominated by an almost exclusively pharmaceutical approach to managing disease and focused little on how to instead create health. To fill the void, he sought out additional medical training and certifications in nutrition, integrative and holistic medicine, functional medicine, health coaching, neurofeedback, systems biology, genomics, bioinformatics, and precision medicine. Dr Haase treats a wide range of conditions and has special expertise in brain-related disorders (fatigue, mood, attention, anxiety, insomnia, Alzheimer's, Parkinson's, seizures, head injury), inflammatory and immune dysregulation, allergy, and cancer support.

He founded the The MaxWell Clinic for Proactive Medicine in 2003 with 2 locations in Tennessee. Dr Haase is chief medical officer for TrendShift, which specializes in personal risk factor monitoring, health trend tracking, and health care cost reduction for large employers. He is cofounder of MDOmics, a company that analyzes complex data sets to enable more precise clinical care, and a nonprofit organization that helps youths make healthier choices for their bodies and their communities. He is the chief medical and innovation director for XYMOGEN, a leading professional nutraceutical company. Dr Haase serves as medical advisor to Evoke Neuroscience, a company that delivers technologies that promote brain health, and Metabolon, which develops metabolomics diagnostics for precision medicine. Dr Haase holds a faculty position at the Institute for Functional Medicine and as adjunct professor at the University of South Florida, University of Miami, and Western States University.

***Integrative Medicine: A Clinician's Journal* (*IMCJ*):** You will be presenting at the Gut-Brain Relationship Conference in Marina Del Rey, California, in November. Have you narrowed down your topic?

Dr Haase: It is wonderful that the awareness of the gut-brain axis has increased as of late. To transform this awareness into better clinical results requires us to understand the gut-brain axis as an interface between electrophysiology and biochemistry. Most integrative doctors are experts in biochemistry and I am excited to show them more of what is going on "under the hood" via quantitative EEG—brain mapping. With this tool, we can actually look inside the brain and gain further insight as to how to help our patients function.

***IMCJ*:** How does electrophysiology affect the gut-brain connection? What can clinicians learn from that?

Dr Haase: The brain and the gut are intimately related on both an electrical basis as well as a biochemical basis. The brain speaks to the bowel and the bowel speaks to the brain. Oftentimes, practitioners who are focused on the biochemistry may not recognize the opportunity that is there to interface with health or to improve health by addressing the electrophysiology as well. My method is to assess the brain via quantitative electroencephalography, or qEEG; heart rate variability, or HRV; event-related potentials, referred to as ERT; and low resolution brain electromagnetic tomography, otherwise known as LoRETA brain mapping, which enables us to 3-dimensionally visualize brain function. I use a platform from Evoke Neuroscience that enables a medical assistant to set up and run this test in the office. We also do biochemical analysis of vitamins, minerals and essential fatty acids, organic acids, toxins, and whatever else is indicated by that patient's history. Then we ask the question, "How do these fit together?" If something is real, it should be real from whatever angle you look at the problem—be that through the lens of history, biochemistry, or electricity.

For instance, the insula is an area of the brain that has to do with somatic perception. Somatic perception is our

feeling in the gut, and this area is tightly linked to the biochemical and inflammatory state of the bowel. When there is inflammation or increased lipopolysaccharide exposure in the blood stream, turning on an inflammatory process, you will often see effect in areas like the insula and the anterior singular cortex. Why is this helpful? It is helpful because this is a bidirectional mechanism. Individuals with electrical instability, as recognized on qEEG in these areas, I have found to be much more susceptible to the impact of toxins and inflammagens from their gut. By being aware of the bidirectionality of the gut-brain axis we get to choose the most direct method to improve a patient's health.

***IMCJ*:** When you talk about some of these inflammatory processes being affected, particularly when you are dealing with toxins, does this have a direct impact on permeability of either the tight junctions in the gut or the blood-brain barrier?

Dr Haase: Yes. I would say the brain and our relationship with the world around us is the master axis by which most health is created or destroyed. Stressful episodes—and when I say *stress* it means "a change in our world"—have been shown to increase the amount of bacterial toxins in the blood stream. Our perception of stress plays a very large role in the expression of inflammation that comes with exposure to that stress.

Individuals under chronic stress are going to be more potently affected by a dysbiotic bacterial/fungal population in their bowel. So susceptibility changes according to brain function.

What I find interesting about that is we can change the brain's set point using neurofeedback and biofeedback and decrease the level of perceived threat from our environment. By doing so, we decrease the amount of endotoxin exposure to our system, decreasing inflammation and creating a positive feedback cycle with regard to the gut-brain axis. That is very exciting because in integrative and functional medicine we recognize the health of the gut is central to well-being and the process of disease formation.

Let me back up here. I have been doing and teaching about QEEG and neurofeedback for so long that I forget it is not yet as well-known or implemented as it soon will be. Biofeedback is bringing into conscious awareness of that which is unconscious—the function of the autonomic nervous system. We can train autonomic signals, such as temperature, heart rate, or respiratory rate and affect the stress response.

Neurofeedback is the training of higher brain-wave functions; it is biofeedback for the brain. When using autonomic-biofeedback and cortical-neurofeedback together, you have the autonomic system and the central nervous system both moving toward a state of perceived safety in the world.

This method has been shown to be very helpful in my practice in the treatment of irritable bowel syndrome, or IBS. IBS has had a lot of attention recently with some new laboratory markers that identify an autoimmune response to vinculin—triggered via molecular mimicry to an original immune response against cytolethal distending toxin-B—as markers of damage to the enteric nervous system. This autoimmune process disturbs the neurologic set-point, so in addition to addressing the problem of gut dysbiosis, we must retrain the neurology of the bowel. Once we recognize that a part of irritable bowel syndrome is a neurologic injury, we can step back and say that it makes more sense to use a neurologic intervention to help heal this dysfunction, or dysrhythmia, of the enteric nervous system.

There are so many powerful interplays between the gut and the brain. In our often biologically and gut-centric practices, I recognize the opportunity is there to dramatically improve results in integrative practices by more complete evaluation of the neurologic system as we consider health in all of its domains. I think that multidimensional assessment of brain health is a centerpiece of functional diagnosis. I view my brain map, heart rate variability assessment, and neuropsychiatric profiles with neurocognitive testing as important as any stool test that I would run in my practice.

***IMCJ*:** So you are saying that with regard to stress-related chronic illness, perception is reality?

Dr Haase: The fact is the brain *is* the center of health. The brain defines what we experience. It is our organ of perception. If our organ of perception is not functioning well, then we cannot perceive accurately. If we cannot perceive accurately, we are going to have a hard time moving forward in our health and well-being. Often, we put this in the realm of the logical. I would venture to say that *mental illness*, as that term is typically used, does not exist. *Mental illness* is a term that has been hijacked to give explanations for behavior.

Where does behavior come from? It comes from our brain, the function of that organ, and our learned cues. Either it is a problem with its functioning or with the learned cues and exposures that we have been presented with. I do not, in any way, shape, or form, want to diminish the recognition that what we currently call *mental illness* is a horrible burden. I am profoundly empathetic for everybody who is suffering with symptoms described using the current term of *mental illness* such as anxiety disorder, bipolar disorder, or attention deficit disorder. I think people with those symptoms often are benefitted by having a name for what is going on. But those names can so often become part of the problem, because they cause us to stop searching for the underlying cause of the issue. We can think that that diagnosis is who we are, when in fact it is an expression of our brain. It is an expression of

our learned behaviors—and those can be changed. Our biochemistry that impacts how the electrophysiology of the brain manifests can be changed. We are not trapped unless we believe we are trapped.

When we recognize that the brain is amazingly powerful in its ability to learn—because that is the sum total function of the brain long term, to learn what is going to take to keep this body alive and therefore keep that brain alive—we can understand how biofeedback and neurofeedback work. We are just making the invisible visible to the brain. Maybe we are looking at blood pressure, our temperature, or our heart rate and we are using that to take a physiologic reality and be able to see it as a number on a screen and mindfully become aware of that and, thereby, learn to influence it.

We can affect our temperature up and our temperature down with some small degree of training as demonstrated by holding a thermometer. Likewise, you can learn to shift your brainwave patterns if we can just show you your brainwave patterns via neurofeedback. Because neurons that fire together, wire together, we can actually help people heal, long term, via feedback. We can help individuals create a more efficient functional brain that they then take out into the world and continue to build upon in a way that continues to increase in function and continues to foster well-being.

It is some of the most exciting work I have ever done in functional medicine. By addressing the brain and improving its electrical efficiency, we open up tremendous capacity for the body to heal in levels we had not been able to achieve before such training.

***IMCJ*:** The tools of this training, are they akin to meditation?

Dr Haase: Neurofeedback is also called *brain computer interface training*. We place a full cap on the patient's head with multiple sensors, or electrodes, and then we use software, much like global positioning software, to localize the internal electrical dynamics of the brain and the relationships of the electrical dynamics in different parts of the brain to each other. We set a goal for our patient. The computer watches the brain waves of the patient who is wearing the cap and then, when we get closer to the electrical goal—this 3-dimensional electrical constellation that we want the patient to get to—the patient gets a reward and when the patient drifts away from the 3-dimensional electrical pattern that we want to reinforce, the reward gets removed. We have many different software packages, but one such package will play a movie for the patient. The movie will become bright and loud when the patient is experiencing a brain-wave pattern that we want to reinforce and the movie will get dark and quiet when the electrical pattern moves away from what we want to reinforce.

The brain wants to watch the movie, so it figures out what pattern it needs to fire off to make the movie play. Because neurons that fire together, wire together, those pathways become reinforced and, therefore, more efficient in the long term. Those pathways become more likely available for that patient to use in their everyday life when they are actually processing thoughts and stimuli and information. Neurofeedback is just training electricity. It does not matter what movie is playing. It does not matter what stimuli. We are not programming the brain with any content. We are improving the brain's electrical efficiency.

***IMCJ*:** Once this therapy is initiated, must it be kept up, or does the brain maintain the changes, once established?

Dr Haase: That is a great question. My life has been devoted to finding therapies in which the longer you use them, the less you need them. That is the mark of a healing therapy. Neurofeedback definitely falls in that category because neurons that fire together, wire together. Once the brain learns a new trick, unless that brain is injured or metabolically severely compromised, it gets to keep that trick. Not just keep it, but it gets to build upon it, which is remarkable. Depending upon the technology, the necessary number of training sessions can be anything from 20 to 80 sessions. I have patients with severe head injury and autism who have done over 200 sessions because we were getting continued improvement. In our clinic we do full-cap database-linked neurofeedback, which in my experience has decreased the number of sessions necessary to achieve desired results.

Not only do you typically get to hold onto the results that you achieve, but the brain can then build upon those results to overcome barriers that it has had in the past. That is why I feel so strongly that these kinds of interventions need to be done as early as possible in life. Brain mapping on kids and neurofeedback to deal with processing disorder, learning disorders, and attention disorders early in life allow what can become more functional pathways to be incorporated into learning, long term. We cannot even begin to measure how important early intervention is.

Life is neurofeedback. If we understand that concept, then everything we do is training our brains to become more efficient to do that thing again. If we learn how to play the piano at a very early age, guess what? It is not that difficult to pick it up again later in life. Early childhood development gives us a good model to understand this pyramidal understanding of neurologic function. As you improve your foundations, you have more and greater opportunity to build upon those foundations.

Coming back to the gut, again, if that individual who is engaging in brain training of some sort has an increase in intestinal permeability and high inflammatory load as a result of a gut dysfunction, then that individual is going to be impaired in their ability to learn most effectively, and neurofeedback, while it may still be effective, may not be as efficient in the learning process. A combined approach is what I have found to be the most impressive as we address

conditions of the brain, ranging from neurodegeneration of Alzheimer's and Parkinson's to behavioral abnormalities, opposition defiant disorder, and ADHD, to mood disorders, anxiety, depression, OCD, seizure disorders, and migraine headaches. Neurofeedback can also be used to maximize performance for those people who want the best brain possible—I train professional athletes, professional musicians, and CEO/entrepreneurs for peak performance with slightly different methods, but with the same underlying tools. It has been astounding to witness the miracle that is everyday brain function.

***IMCJ*:** When you say *combined approach*, you are combining the neuro- and biofeedback with what types of therapies?

Dr Haase: Certainly dietary and bowel investigations—certainly understanding what is going on in the bowel via comprehensive digestive stool analysis; small intestinal bacterial overgrowth, or SIBO breath testing; and organic acid analysis to understand what may be the underlying dysfunction. A hallmark of brain-supportive therapy is a diet that is low antigen, low simple carbohydrate, high nutrient density, and high in essential fatty acids. Nutritional supplementation is used to build the wall of the bowel or augment the healing capacity of the surface of the bowel. All such interventions are highly customized according to that person's need as assessed through history, exam, and laboratory findings. Interventions may include *Sacharomycin Boulardii,* which encourages the expression of secretory immunoglobulin A; omega-3 fatty acids, which influence the production of anti-inflammatory prostaglandins; curcumin, which influences inflammatory gene expression; oral immunoglobulins, which serve as passive immune support for gut function; vitamin D; and even controlled-release 5-hydroxy tryptophan, which has been shown to promote the density of small intestinal villi formation.

It was very interesting to me when I learned that the bowel has 5-HTP receptors that are separate entirely from serotonin receptors, and those 5-HTP receptors are influential in villus architecture. It gives one a deep appreciation for the intricacies between our diet, our inflammatory state, our neurotransmitters, and the ecology of the bowel.

***IMCJ*:** So, by attending your talk at the gut-brain conference in November, what more are people going to learn about this?

Dr Haase: So much more will be presented … how much more will they learn? That depends on how healthy their brain is and how healthy their gut is! In part, that does not have anything to do with me. But, I will be discussing how to implement brain assessment in a primary-care functional-medicine office and give examples of how such assessment can improve care.