About Functional GI Disorders, Microbes, and Brain-Gut Interactions: A Conversation with Emeran Mayer, MD

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There are many exciting developments and discoveries being made about the connection between our gut (digestive system) and our brain and how it affects our health, as well as the role microbes play in this connection. Emeran Mayer, MD explores these developments and their implications in his new book *The Mind-Gut Connection: How the Hidden Conversation Within Our Bodies Impacts Our Mood, Our Choice, and Our Overall Health.*

We sat down for a conversation with Dr. Mayer at the 2016 Gut Microbiota for Health World Summit® and talked briefly about what these developments mean for people with functional gastrointestinal (GI) disorders.

**Q. Dr. Mayer, what does the term “microbiota” mean?**

**A.** The microbiota (or the microbiome if we include their functional capacities as well) refers to the collective community of microorganisms, or microbes, that live on or within different parts of our bodies, like the skin, mouth, and the gut. The gut microbiota is made up of trillions of bacteria and other microorganisms that play important roles in helping maintain our health. Among other things, a healthy gut microbiota helps with digestion, with maintaining our immune system, and with protecting us from dangerous microbes. Conversely, an imbalance or a loss of diversity of species may open us up to a range of symptoms. An obvious example is diarrhea associated with antibiotics.

**Q. We have heard at this conference about the growth of knowledge of brain-gut connections and the role of microbes, but still there is caution expressed about relying on much of this information until more and better science backs it up. What can we reliably tell people about developments in this area?**

**A.** There are three things I would point out. One, there is definitely some connection between what the gut microbes produce and brain activity, function, and structure.

Secondly, the most important phase of establishing this connection in people likely begins early in life, prenatally in pregnant women and postnatally for the first 3 years of life, when the pattern and content of gut microbes in an individual are set. An imbalance of the microbiome in early life may have long lasting effects and could influence brain-gut interactions that make a person more vulnerable to a functional gastrointestinal (GI) disorder.

The third thing is that in adults, diet has an effect on an individual’s gut microbes. The microbes produce different *metabolites* in response to what they are fed. These metabolites may have an effect on the nervous system both in the gut (the enteric nervous system) and in the brain. Diet becomes an important factor, not only for its direct effect on us, but also for what it does to the microbes, what they produce, and how these metabolites affect the nervous system.

**Microbial metabolites** are substances produced by our gut microbes by fermenting food components that the human intestine cannot process or absorb. It is estimated that there are hundreds of thousands of these metabolites produced in the gut, and that up to 40% of the metabolites measurable in our blood originate from the gut microbiota.

**Q. So then our diet can have either a positive or a negative effect on our gut microbiota. There was some concern expressed at this conference about the low FODMAP diet. Can you explain the concern?**

**A.** The low FODMAP diet reduces consumption of dietary fibers that support beneficial microbes in our gut. In the short term a diet like this may alleviate symptoms for some IBS patients, as the bacteria produce less gas as a product of digestion, but in the long term these diets are difficult to maintain, and they may even have negative effects on our gut microbiota and their diversity. This would be a particular concern if such diets are prescribed for pediatric patients. Moreover, it appears that a healthy balanced microbiota also can alleviate symptoms.
Looking ahead for people with functional GI disorders, like IBS or dyspepsia, it will be important to find out what the optimal diet for individual patients should be. There is new evidence, which suggests that the benefits to a particular diet depend on the individual gut microbial composition of the person. We need a better understanding of what a particular diet does to our gut microbes, to the metabolites and how do these substances affect the nervous system in the gut and at the level of the brain.

Q. How will we find that out?

A. There are now studies going on with a technique called metabolomics, which is able to analyze stool, blood, and urine samples to identify the thousands of molecules that come from the bacteria. This approach will make it possible to study how the metabolomic profile of a person changes when he or she is put on a particular diet, and to determine if these changes are associated with an improvement in symptoms. I believe this is going to be a renaissance of serious science about food and nutrition for health, but we are just beginning.

Q. Is there any diet advice you can pass on to people now?

A. In my book, I don’t give any advice in terms of diets for weight loss but focus on the published evidence regarding the benefits of diets for brain health. This advice involves a diet with an optimal composition of complex carbohydrates, and protein and fats. I think the Mediterranean or similar diets probably comes closest with a high proportion of complex carbohydrates from plant-based foods, minimal animal fat, a relatively small amount of protein mainly from fish and chicken, and little refined sugars. Interestingly, studies have shown there are also regional differences of the health benefits of this diet, suggesting that other lifestyle and social factors may play a role.

Stress or state of mind is a factor as well. So, for example, we know that feeling anxious or angry or sad while eating affects various gut functions such as contractions and secretion. In addition, we know that stress can affect the behavior of gut microbiota directly. You will have a different set of microbes if you are acutely stressed or chronically affected by these emotions. It seems that a balanced mind and a reasonable diet go hand in hand, because if you always feel stressed, no matter what you eat, you will not have the same benefits.

Q. How would you summarize what each of us can do now on our own to take steps aimed at optimizing our own health?

A. It is important to know that functional GI disorders are not psychological diseases; but we also have to realize that the brain plays an important role. The brain communicates constantly with the microorganisms inside each of us. These microbes have a cooperative relationship with us, not only playing a role in digestion, but also interacting and communicating with our own cells, with our gut and our brain. Gut microbes may provide a link to helping maintain a balance between the brain and the gut.

We can each take care with what, when, and how we eat to promote healthy diversity in our gut microbiome. We can seek to maintain a positive emotional state and as much as possible, relax and enjoy mealtimes. There are many simple forms of stress reduction that can be employed such as regular exercise, abdominal breathing, or progressive muscle relaxation.

The workings of the gut can be disturbed by altered states of mind or by extreme or unhealthy diets. Eating a reasonable diet, reducing stress, and working toward a balanced body and mind are steps we can all take to improve well-being.

*The 2016 Gut Microbiota for Health World Summit, organized by the American Gastroenterological Association (AGA) and the European Society of Neurogastroenterology & Motility (ESNM), took place in Miami, FL from March 5–6, 2016.

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