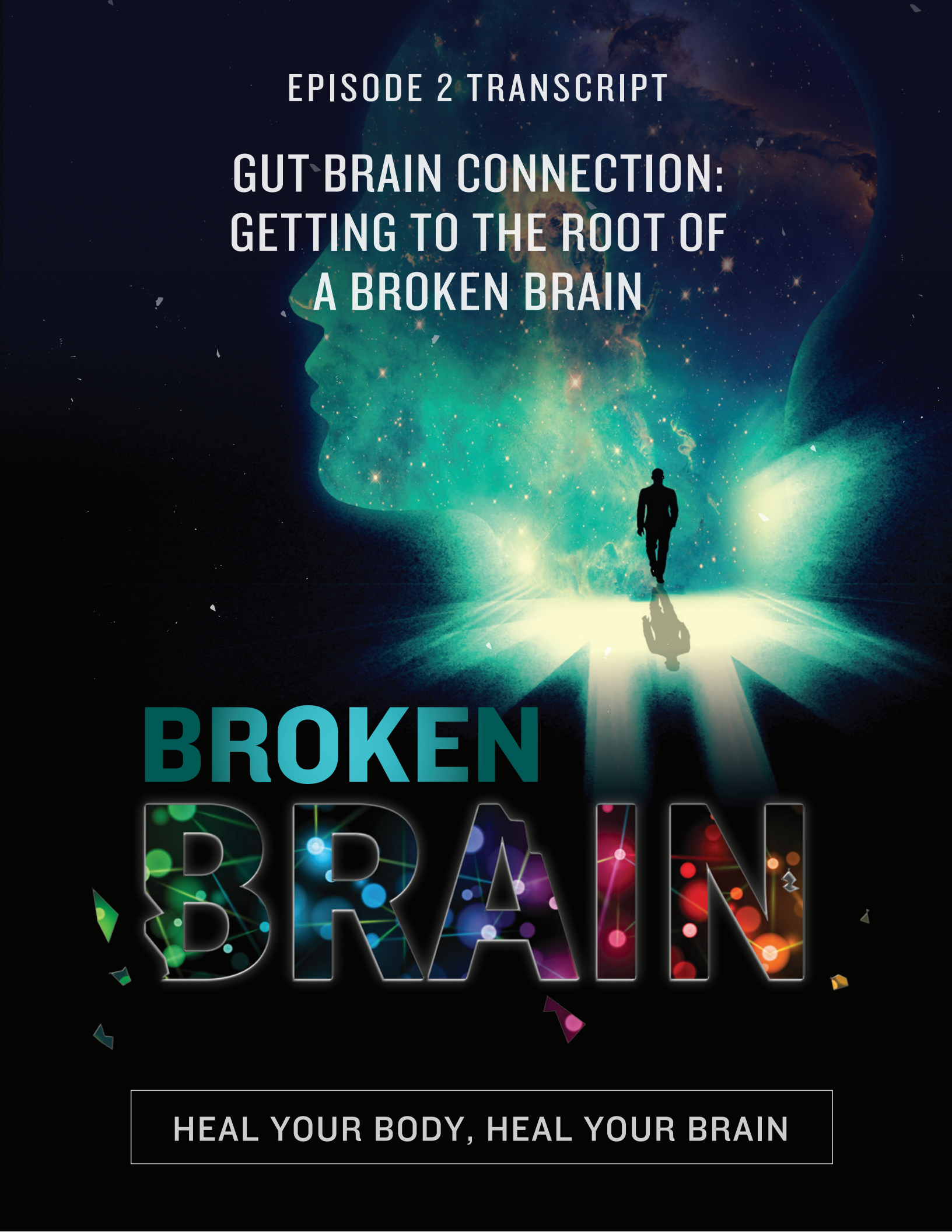


EPISODE 2 TRANSCRIPT

GUT BRAIN CONNECTION: GETTING TO THE ROOT OF A BROKEN BRAIN

BROKEN BRAIN

HEAL YOUR BODY, HEAL YOUR BRAIN

Dr. Mark Hyman: What if I told you that your mood problems, your memory problems, your trouble focusing, your ADD or depression, are not all in your head but instead in your body? In Episode Two of the *Broken Brain* docuseries, we talk about the mind-body connection, or more specifically, the gut-brain connection. The truth is, most diseases that impact our brain don't always start in the brain. In fact, they often start in the gut. This discovery completely changes our understanding of brain health and how to treat brain disorders. Has your doctor every told you about the gut-brain connection? I'm guessing not. How is it that we've so missed the mark when it comes to one of the most important pieces of this puzzle?

You know, most of us have heard of mind-body medicine, which means the mind affects the body, and that stress can impact almost any illness. We know that and it's well accepted. What we don't know or think about very often is that the body can affect the mind. Everything from depression, anxiety, ADD, dementia, all these things, can be affected by what's happening in your body. That's pretty much ignored by most psychiatry. There's this whole field of psychiatry, which is very descriptive but it's not talking about causes. Basically, they think your body is disconnected from your head, except for the stress response, and that we shouldn't be looking for treatment for depression in your gut or treatment for autism in your immune system. We have a very different way of thinking in Functional Medicine, which is actually looking at how the body affects the brain. We're now learning that your microbiome, this ecosystem of bugs in your gut has been linked to depression, to ADD, to autism, even to Alzheimer's. We always thought the gut and brain were disconnected. Maybe if you're stressed you'll get diarrhea. But the fact that your whole gut environment is driving changes in your brain is a very new discovery.

Dr. Raphael Kellman: When I think of the brain, I automatically think of the microbiome. To me, the microbiome and the brain are really part of one whole—they're really inseparable. In fact, I believe that the whole brain is not just what we find from our neck up, but it's really also what's in our gut. I like to think of them as one unit, as one whole. Embryologically, the gut and the brain start out at the same point, and then one goes up and one goes down. When two cells start from the same place, they always retain a memory for each other. The microbiome and the gut, the gastrointestinal system is the housing for the microbiome, the trillions of bacteria, the friendly bacteria. They have direct communication to the brain via a bidirectional highway. They're constantly speaking to each other in so many different ways. They're communicating messages to each other. These messages are part of a communication system that really outshines any type of communication system that we know of today with our modern technology. It's really staggering. This communication actually mostly originates from the microbiome up to the brain. There are 400 times the amount of messages coming from the microbiome to the brain than from the brain to the body. We now have the ability to significantly bolster, enhance, and improve that flow of communication, both improving the gut and the microbiome, and most importantly, improving the brain.

Dr. Frank Lipman: Gut bacteria are really interesting because they affect much more than the gut. One of the areas they affect is the brain. There's this direct highway between the gut and the brain, called the vagus nerve. What's going on in the gut is going to affect your brain. Gut bacteria are affected by so many things that we do in our lives, even by the water we drink. We have chlorinated water, and that's going to affect our gut bacteria. The antibiotics in our food are going to affect our gut bacteria. What we eat is going to affect our gut bacteria. How you treat your gut bacteria is going to affect not only your gut but your brain and the rest of your body.

Dr. Mark Hyman: Many of us are starting to understand the significance of the gut as it relates to our overall health, including the brain. In fact, many scientists and physicians have begun to refer to the gut as our second brain.

Speaking of the brain, we're talking about a bacterial brain that lives in your gut. There's also kind of a second nervous system called "the second brain" in the gut. Talk about how that influences your health, Alzheimer's, and brain function, what people can do about it, and what causes it.

Dr. David Perlmutter: It doesn't really make sense anymore to differentiate between the gut and the brain because they really are functionally very, very similar. I think that the relationship of the gut to the brain is both physical and chemical. We talk about serotonin and dopamine and so-called neurotransmitters, while failing to recognize that the lion's share of these chemicals are not made in the brain, they're made in the gut.

Dr. Mark Hyman: Yes.

Dr. David Perlmutter: And they are made at levels that lead to mood stabilization when the gut is healthy. Intriguingly, we now look upon, for example, depression and inflammatory disorder as possibly having its genesis in the gut. How do we know that? Because markers of gut leakiness or permeability are dramatically elevated in correlation with depression, as they are in Alzheimer's disease, autism, and even Lou Gehrig's disease (ALS). We mentioned earlier that we need to pull away from being so cerebro-centric, and look at the body as a whole, particularly the gut, for reasons that you described: the number of organisms, their metabolic products and their genetic component with regards to being hugely relevant in health and longevity.

Dr. Mark Hyman: Yes, it's pretty stunning when you think about the way we sort of missed the boat and blamed all kinds of other factors like bad parenting or emotional trauma or stress or mental illness on the brain as opposed to the gut. I'm not a researcher, although now we're doing research at Cleveland Clinic. For most of my career, I've been a practicing physician and I just noticed this phenomenon. I wasn't even trying to treat the brain, and the brain would get better from all sorts of conditions by simply fixing the gut.

Carolyn: I've always had anxiety and the anxiety was located in my stomach. It was like a certain sensation that I associated with different thoughts or feelings. I'm a little bit of a introvert and so if I was going to go to a party or something, I would get this feeling in my gut that was like being nervous about going to the party. That feeling is something that subsequently has gone away since I've been working with the UltraWellness Center. I remember one day, maybe two or three weeks later, standing in my kitchen opening the refrigerator and all of sudden I realized that that feeling of anxiety that I used to have a couple times a day was gone. It was miraculous really. I'd had that feeling my whole life. Honestly, in the three years since then I haven't had that sensation at all.

Dr. Elizabeth Boham: The gut-brain connection really shows us that there's an absolute connection between all the different systems in our body so that our digestive system is impacting our brain health and our brain is impacting our digestive system. We know that. When we get anxious, we have digestive symptoms like maybe some people get more constipated or other people may rush to the bathroom more often. When there are imbalances in this gut flora, people can have more anxiety. We see that often. When we treat it, those imbalances, with changes in diet, good bacteria like probiotics, adding fiber, sometimes even with medications to lower those imbalances, we see improvements in brain health like we see improvements in anxiety.

Dr. Mark Hyman: Having a healthy gut is central to your entire health and connected to everything that happens in your body. That's why I almost always start treating patients with chronic health problems by fixing their gut first. You can begin to understand the importance of gut health when you consider there are over a thousand species, and three pounds of bacteria—trillions of bacteria in your gut. In fact, they contain at least a hundred times as many genes as you do. The bacterial DNA in your gut outnumbers your own DNA by a hundred times. You have about 20,000 genes but there are 2 million or more bacterial genes.

Dr. Raphael Kellman: We've been taught by science, colleges, universities, and medical schools that bacteria are bad. They're disease-causing, virulent, pathogenic, and something that we just have to obliterate and get rid of. It was the big enemy. With the discovery of the incredible staggering numbers of bacteria in the US in the microbiome, it was the greatest turnaround in medicine, in science, in 150 years. From bacteria being disease-oriented, virulent, pathogenic, now all of a sudden they're our greatest allies. In fact, research is showing that bacteria on Earth and within us have one primary

goal—to promote healing and life. Outside of us in the world at large and within us, there's bacteria.

Dr. Frank Lipman: I'm obsessed with our gut bacteria. It's interesting that we have more gut bacteria in our gut than we have cells in our body, so we're actually more bacterial than human. We as a culture are obsessed with killing bacteria. We see bacteria as the bad guys. Even in the holistic world or the Functional Medicine world, we see it as good and bad, but I see it a little bit differently. I see it as this inner ecosystem. We have an ecosystem in our gut and we have to balance it.

Dr. Mark Hyman: Over the years, I have seen emotional, psychiatric, and behavioral symptoms triggered by problems in the gut. Your gut, in fact, contains more neurotransmitters than your brain. It is highly wired back to your brain and messages travel back and forth all the time. When those messages are altered for any reason in any direction—from the brain to the gut or the gut to the brain—your health will suffer.

Dr. Raphael Kellman: Our bacteria in the microbiome are producing dopamine, serotonin, norepinephrine, GABA, and these messages are going to the brain, sending signals to the brain and are part of this incredible communication system in the brain. These messenger molecules are also sending messages to our stress system, what we call the HPA Axis (the hypothalamus pituitary adrenal axis). The microbiome—the bacteria—are also sending signals to the gut cells. We're talking about an interconnection of bacteria and brain cells. It's so complex and such an incredible web that you can't really separate bacteria from neurons in the brain.

Dr. Datis Kharrazian: Dopamine is the main motivation neurotransmitter. Your ability to want to do things and to be excited and push yourself to do things is associated with dopamine. The person who can never finish tasks or even initiate tasks has patterns of low dopamine activity. If you look at all the research, one of the most profound ways to raise dopamine is physical activity. When people exercise, their brain gets flooded with dopamine. You have to have the initial motivation to start but if that pathway gets started then you can really flood the brain with dopamine.

The other main neurotransmitter is serotonin. In a sense, your mood is strongly involved with serotonin. People that typically have low serotonin, nothing really brings them joy. It's not that they're depressed necessarily, it's just that the things that would normally make them happy are no longer making them happy. They don't really have a favorite song anymore or they don't have a favorite food or a favorite TV show. Everything is there but nothing really excites them.

When you look at the main neurotransmitter acetylcholine, that's your memory neurotransmitter. Your ability to recall things in your life and to find words and to remember events, to have photographic memory, those are all involved with acetylcholine.

And then GABA is the calming down inhibitory neurotransmitter. If GABA levels are imbalanced, you may have symptoms like anxiety as a key thing or a restless mind. Those are the most common patterns with these four common neurotransmitters.

John Mekrut: Anxiety is an expression of stress. Anxiety's not a thing—it's a symptom. Depression is a symptom. Mental illness, in its largest frame, could easily be viewed as symptoms of something going on. This is an alert mechanism. You're depressed not for some esoteric reason. Your body is telling you that there is something you need to do. You're anxious because your body and your brain together are telling you you need to do something. This is intolerable. I make no judgment about the toleration level of somebody's anxiety. By altering the brain's electrical capacities, by allowing it to witness that better self-regulation place, that better stasis point, the anxiety starts to diminish. The connection to the gut brain is: when stress is reduced, all of those chemicals that are being released start to abate. You're anxious, what happens? Your stomach tightens up. Some people vomit.

There's clearly a body reaction to this that's being driven by a perception in the brain. It's all about the perception of the brain in many ways, as to what's happening here that's out of whack. Why do people get hives? You can go down the list of body expressions. You sweat, all kinds of things can happen to you physically. That connection is clearly there, that perception on the part of the brain to drive a response in the body is clearly obvious.

90% of your serotonin is produced in your stomach so I'm not sure why we're injecting it into our brains. It makes much more sense to solve the stomach problem, don't you think? That bidirectionality I think is important to know. It's the next step. We're slowly putting this together. The gut biome people fixing a gut dysbiosis is vital. You cannot function if you're consuming the wrong foods, if you've got gut flora that don't make sense. Have it tested, get it checked out, and fix that. Take your probiotics, do the things that you're supposed to do to fix it.

Dr. Mark Hyman: All together, your gut is a huge chemical factory that helps to produce vitamins, digest your food, regulates hormones, excretes toxins, produces healing compounds, and keeps your gut healthy. Intestinal health could be defined as the optimal digestion, absorption, and assimilation of food. That is a big job and it depends on many other factors. The bugs in your gut are like a rainforest, a diverse and interdependent ecosystem. They must be in balance for you to be healthy. Unfortunately, many of us are living with a damaged gut microbiome. What damages our guts? Many things. Our SAD diet—the Standard American Diet. This has led to a nation that is overfed and undernourished. Most of the country is eating too much food but not getting enough nutrients.

Dr. Drew Ramsey: The MAD diet is the Modern American Diet. You also hear it called the SAD diet. I'm for MAD because it makes me personally mad that we got here. I grew up on a farm. I was standing out back in one of our big gardens with one of my buddies and he's like, "Man, how are people going hungry in this country, all this food growing?" It's an incredible amount of food. I left the farm on Monday after dropping in a bunch of sunflower seeds and a bunch of squash seedlings. I came back on Thursday, and by Friday, we're eating sunflower sprouts and the squash is up. That's not the MAD diet. The MAD diet is not food that we grow in the ground on our great small American farms and share with each other.

The MAD diet was created for efficiency and created on bad, bad science. That now is 100% clear. We moved from living in rural America eating food from small farms, and eating a lot of plants, to eating highly processed foods that consist of very few ingredients. They get mixed together all kinds of different ways but you're talking about cheap vegetable oils, so soybean oil, corn oil, lots and lots of sugars every single way you can say it. Sugars from corn, sugarcane, or beets. And then a variety of things to make that more palatable, fake colors and fake flavorings. What then gets created is a diet that is missing the most important nutrients for the brain.

Dr. Mark Hyman: Nutritional deficiencies such as magnesium, zinc, or vitamin D deficiency can wreak havoc on our health.

Dr. Tom Sult: Nutritional deficiencies can manifest in a lot of ways. There's a big difference between what's in your blood and what's inside your cells. In fact, the idea of deficiency comes from blood levels. You may very well have totally normal blood levels of a nutrient but you may be intracellularly deficient of that nutrient. As an example, in dementia you may have normal B12 in your blood but when we measure methylmalonic acid or homocysteine, those may be abnormal. And that tells us that the utilization of B12 inside your cells is abnormal. The old idea of checking for nutritional deficiency is drawing your blood and seeing if you have enough of that vitamin in your blood. As I mentioned earlier, there are hundreds of times more nutrients inside our cells than in our blood so we're really now becoming aware that we have to be concerned about intracellular nutrition much more than blood nutrition. If you have a nutrient insufficiency inside your cells it turns out that you can't do normal machinery. The normal machinery of the cell won't work right. It's going to have wide ranging effects.

In the most extreme cases, we know that if you have protein deficiency you can have a disease called kwashiorkor. If you have insufficient vitamin C, you get scurvy. Long before you get those extreme cases of nutritional deficiency, the machinery just doesn't work well. When your machinery doesn't work well, you get these generalized vague symptoms of the walking well. "I just don't feel good. I'm just tired. I sleep all night, but I wake up and I'm still tired. I have brain fog. I just can't think as clearly as I used to." These kinds of general symptoms are usually associated with intracellular nutritional deficiencies.

Dr. Mark Hyman: Nutrition is probably the most important fundamental thing that's driving brain disorders including sugar, which is a potent brain neurotoxin. It's addictive. In fact it may be more addictive than cocaine. It's deliberately pushed into our society where we're eating 152 pounds of sugar and 142 pounds of flour which acts just like sugar in your body. That's been linked to everything from depression to ADD to even dementia, which is now called Type 3 diabetes. We have to take this very seriously. Our high-sugar, high-starch diet is key.

Dr. Maggie Ney: I think that sugar is talked about a lot and we eat way too much of it. You can have a healthy relationship with it. There's not one health benefit to having sugar besides it tasting good, but you can still have sugar without sugar having you. The problem in our society is that people are just craving it and eating so much of it. A meal doesn't feel like a meal until there's sugar at the end of it. When they're feeling down or tired, they reach for that sugar. That's an unhealthy relationship and where we're seeing a lot of the toxic effects in the brain.

Maggie Ward: I think the other major area of food that can be really harmful for the brain is processed food in general, but a lot of the processed grains, sugars, and added sugars, especially sugars that have been altered from their natural state—corn syrups, and high fructose corn syrup. A lot of information is now coming out on artificial sweeteners and how damaging that is to the brain. I think that's a really big category of foods that we want to be careful with. It's for a lot of reasons. You could be eating wheat or whole grain bread, but once it's in that bread form, it's been stripped of a lot of its nutrients. You're getting food that's missing some of its really important nutrients, its fiber, and you're also getting food that your body's going to convert a little bit quicker into sugar. What we're realizing is that the more glucose and the rapid rise of glucose in your blood, and therefore also insulin, has very damaging effects on the brain.

Dr. David Perlmutter: What are people now doing? They're getting the low sugar message and they're drinking and eating artificially sweetened foods. That is about the worst thing you could do.

Dr. Mark Hyman: For your gut microbiome.

Dr. David Perlmutter: For your gut microbiome. We didn't understand why artificially-sweetened beverages were associated with diabetes, for example, even more so than drinking sugar sweetened beverages. People who drink artificially sweetened beverages with no calories and no sugar, and yet they're more than doubling their risk for diabetes. How in the world could that be? It was counterintuitive. We came up with all kinds of ideas but now Israeli researchers have shown us it is straightforward because of changes in the gut bacteria. Last month, a study came out showing a dramatic over 44% increased risk of getting Alzheimer's disease or dementia in people drinking soda. And again, what could be the mechanism? The authors hit it on the head. It's because of changes in the gut bacteria, which then code for increased inflammation, the cornerstone of every brain disease that you don't want to get.

JJ Virgin: Dr. Hyman says the phrase I'm going to steal here because I love it so much: “sugar is our number one recreational drug of choice.” It is the worst for your brain. It's going to create inflammation. What do you not want to happen? Inflammation. Also, eating a high sugar impact diet causes insulin resistance and that really causes problems in the brain. You need insulin to come up to trigger all the communication and all the firing in the brain. Without that it's like your brain just got slow, old, inflamed and angry. The other part that sugar does is it triggers the reward center in

your brain. This is how we create a drug-of-choice situation: it triggers dopamine and so you just keep coming back for more and more and more.

In fact, they did this rat study where they gave the rats a choice between ... First, they gave them some kind of an opiate. I think it was morphine and let them have as much as they wanted. Then they had Oreo cookies. And then they got to choose between the opiates and the cookies, and they chose the Oreos for their reward. It triggers the reward center in the brain and that's what they saw in that study is they both lit up the same reward center in the brain. The other thing that it does, besides triggering the reward center in the brain so you want to keep going back for that dopamine hit, is that it will drive up serotonin and then deplete it. It creates this really bad situation where you just keep needing more and needing more and needing more. You're creating inflammation in the brain and then you're creating insulin resistance, so now you don't have the insulin you need up in the brain for the communication process. So again, slowing you down, making you inflamed and making you angry. Nothing you want your brain to be.

You know the big challenge we have with sugar is that we've really been looking at it all wrong. You just don't see that many people nowadays going out and getting a candy bar. We know better than that, but yet they'll get one of those energy bars and they're still loaded with sugar. The ones that kill me are where it's hiding or disguised as something healthy like a lot of these smoothies or green drinks that are just a big sugar load. The big challenge there is that they're a fructose load, which is the worst sugar of all for the brain, and for the body overall. It's used a lot because it's sweeter than glucose is, but the challenge is it makes you more insulin resistant. It actually can make your gut more permeable so you're more sensitive to foods and you become food intolerant. It's more aging and it makes you fat. It goes straight to the liver and starts turning into fat.

Dr. Mark Hyman: The other problem with our diet is we've been told for decades to eat a low-fat diet, which essentially is really bad for your brain because your brain is made up of mostly fat. In fact, 60% of it is omega-3 fats. It's rich in cholesterol. It's rich in saturated fat. Without adequate fat, you have trouble with your brain. We also know that all the chemicals in our food—additives, preservatives—also potentially have negative brain effects. They've studied this in children where they give kids colored water with additives and coloring versus colored water from pomegranate and the kids who have the colored water from the additives all get ADD and hyperactive. So we have really good evidence that these chemicals are having a negative effect on our brain. Our high-sugar, high-starch, low-fat diet along with all the processing in our diet is extremely harmful. In fact, we now know that omega-6 fats, refined omega-6 fats from processed oils, not naturally found in nuts and seeds and food but processed oils, have been linked to depression, homicide, suicide, violence, and even poverty in very well-done studies by the NIH. I think we underestimate the impact of food on our mood.

Dr. Drew Ramsey: If you look at what happened, for example, to long-chained omega-3 fats, and these are really a great example of one of the most important things that I tell my patients to focus on eating. That's what I focus on. I look at my week, how do I judge it? Did I eat fatty fish that has long-chained omega-3 fats? Omega-3 fats are one of my top criteria for eaters who are looking to support brain health. Omega-3 fats just got entirely stripped from our diet. We actually moved from having an omega-3 fat-based grass-based diet to a diet that's based much more in seed oils and what are also essential fats but are thought to be much more inflammatory.

Dave Asprey: Each mitochondria inside the cell (there's tens of thousands of them) are made of tiny droplets of fat. It's no wonder that if you eat the wrong fats like vegetable oil, canola oil, corn oil, soybean oil, hydrogenated fat or anything deep-fried, even if it's fried in good oil, you get the wrong fats built in to your mitochondria and into your cells. And then they constantly cause free radicals and inflammation. It takes awhile to rebuild the system. It took me about three years of super high fat, only undamaged fats, before I finally just lost the desire. I couldn't get enough grass-fed butter. It was like it saved me. I'd been a raw vegan, I was deficient. But after three years I backed off because I just didn't need as much as I did before.

Dr. Mark Hyman: If this is true, how do you reconcile the statements by the American Heart Association that we should reduce our saturated fat consumption to less than 10%, even 5% and eat more of these refined oils? That's their recommendations and everybody hears that and they say, "Coconut oil's bad, saturated fat's bad."

Dave Asprey: I almost laughed when they published that rehash of studies, the last of which was done in 1973. Every study on fat since 1973 was rejected by the American Heart Association so they could keep pushing the agenda of the American Canola Oil Manufacturers Association that funds the American Heart Association.

Dr. Mark Hyman: Follow the money is what you're saying.

Dave Asprey: It's a corrupt organization and when real doctors and scientists looked at the data from the 1970's studies that the American Heart Association relies on, it turns out that the biggest of those studies, the one that ended in 1973, when you look at all the data it actually found the opposite of what the American Heart Association says. What we're dealing with here is pure marketing and propaganda from a company, a nonprofit company, that is backed with an agenda. And the agenda appears to be to keep people sick.

Dr. Mark Hyman: Many of these factors, too many antibiotics, stress, eating a lot of sugar and processed food, could lead to an overgrowth of bad bugs in your gut, like yeast, which can cause serious damage not only to your gut but also to your brain.

Dr. Todd LePine: There's a huge connection between the gut and the brain. When the gut is out of balance, when the bacteria, yeast and/or parasites get out of balance, those things can trigger systemic inflammation. That systemic inflammation in turn can trigger withdrawal behavior. It can increase molecules in the body called cytokines. It's sort of like when you get the flu and you're really sick and you want to sort of just withdraw. That's what you do and that's what depression is.

Dr. Ann Hathaway: We now know that two-thirds of our immune system is embedded in our gastrointestinal (GI) tract, and when you have an inflamed, irritated GI tract, the lymphatic system and immune system is inflamed also sending all kinds of cytokine messages (inflammatory messages) to the entire rest of your body including to your brain. And guess what your brain has? Your brain has an immune system, the microglia, the astroglia. Those cells respond to cytokines. Guess what they do? When they get a message from the gut, "Hey, we're under attack. We have a lot of invasion going on of something. We don't know what but we have a lot of invasion going on in the immune system that's embedded in the gut." Then the brain immune system also gets overactive and starts producing cytokines. Inflammatory cytokines in the brain can interfere with mood, with cognition, and with everything that's going on in the brain.

Dr. Mark Hyman: Food allergies are one of the biggest causes of a compromised gut microbiome. What are food allergies anyway? There are two main types of food allergies, acute and delayed. Everybody knows about the acute form because it happens immediately and in a big way. If you eat a peanut and your throat closes, you get hives and you can't breathe, you'll never eat a peanut again. You know you're allergic to them. Delayed allergies or sensitivities are sneaky. You may eat a piece of bread on Monday and be depressed on Wednesday, or have a piece of cheese today and get a migraine tomorrow. You'll never make the connection because you don't even realize food can have this kind of impact on you.

This type of allergy or sensitivity is ignored by most conventional doctors, and yet addressing this in my practice is one of the most powerful things I do to help people recover from nearly almost any problem. Allergic diseases of both types—acute and delayed—are on the rise for many reasons. We are becoming hypersensitive to our environments, perhaps because we live in an over-sterilized environment and our immune systems don't mature properly, or because we're eating hybridized and genetically modified foods full of hormones, antibiotics, pesticides, and additives unknown to our immune systems just a generation or two ago. The result: our immune

system becomes unable to recognize friend from foe, to distinguish between foreign molecular invaders we truly need to protect against or the foods we eat, or in some cases, our own cells.

Delayed allergies or sensitivities occur because many of our 21st century habits lead to a breakdown of the normal barrier that protects our immune system from the outside world of foods, bugs, and toxins. That barrier is our gut. 60% of your immune system is right under that barrier and when the lining of your gut breaks down, your immune system is activated by food particles that it misinterprets as foreign invaders and this sets off a chain reaction leading to inflammation throughout your body, including your brain. The most common food allergies or sensitivities that I see in my practice are dairy, corn, soy, and the biggest beast of them all gluten.

Dr. Sidney Baker: Don't eat gluten. Gluten is bad for everybody. This comes not from me, this comes from way up there at the top of the totem pole. Alessio Fasano is a professor at Harvard and when he came from Italy to be a professor at University of Maryland Medical School, he received $2 million of funding because he's a brilliant guy. He learned from the gastroenterologists that this thing about gluten was very funny. "A lot of people think gluten is bad for you, but the gastroenterologists really don't buy this, except for people with the particular disease that has to do with having gluten not agree with you. And you have to do a biopsy for that and special tests and then, 'Okay, now you shouldn't eat gluten.' but for the rest of us it's not a problem." So he looked into it with his scholarly eyes and it turns out that gluten is bad for everybody.

It opens up what we call the tight junctions, which is like the mortar between the flagstones on the sidewalk. If the mortar gets loose, the rain can go right through. If it's the sidewalk of your digestive tract, then things that are supposed to stay in your intestine get into your blood without going through customs, so to speak. You don't want to have poppy stuff going straight into your blood or even undigested tomato juice. If it does, then it is bad. These same junctions are what keeps the dirtiness of the blood, because the blood is still not that clean. It's pretty good, but it's transporting a lot of molecules that came from your food that got through customs. They're still not what you'd want to have in your brain. The same type of junctions stay closed when the blood circulates through your brain so that you don't get stuff in your brain. That's called the blood brain barrier. The one for your bowel is the bowel blood barrier. They don't use that expression much but those are the same thing. If gluten opens the tight junctions in the gut, it's going to open up the tight junctions in the brain to some extent.

Say Dr. Fasano is lecturing and I'm the moderator, and I'm looking at the audience and he says to these doctors, all my colleagues, he says, "And the tight junctions are opened by gluten in everybody." and the audience has some pretty stunned faces in it. They go, "Not me. No, not me." So then when the time for questioning comes up at the end, they're passing in the slips of paper with questions on it and I'm waiting for that. I'm the moderator so I get to ask the first question. I say, "Dr. Fasano, you said tight junctions are opened in everybody by gluten and everyone in the audience was kind of shocked. Could you elaborate on this?" He says, "Yes, they're opened by everybody." I said, "What's the difference between the person who has some awful thing happening from gluten and the person who seems to be fine eating a loaf of bread every day?" He said, "Well, it's just how long the tight junctions stay open."

He's not saying nobody should ever eat gluten because he's a professor at Harvard and they can't say things like that because their funding would go away. The idea from the practitioner's side of what people shouldn't eat, so that takes gluten and sugar and maybe soy. Those are things that I would expect people to latch onto. Many people who come to me they've already gotten there.

Dr. Tom O'Bryan: We all cut our teeth in studying the pros and cons of wheat by learning about Celiac disease. Unfortunately, so many doctors think if you don't have a problem with Celiac you do not have a problem with wheat, but that's not true. Celiac is one manifestation of a sensitivity to wheat. We know about 1% of the population has Celiac disease in the US and in Europe. In clinical practice, the studies say 30% of people have Celiac disease. In my practice, I look more deeply and I can find

as many as 60% of the people that come in have an immune reaction saying they have a sensitivity to wheat. They don't have Celiac disease, but they have a sensitivity to wheat. That concept birthed the term non-Celiac gluten sensitivity, which has become much more known in the last eight to ten years.

Celiac is really important as an autoimmune disease. An autoimmune disease means your immune system is attacking your own tissue. For some reason, when you eat wheat (if you have this genetic vulnerability) you attack the tissue of your gut. We know a lot of the mechanisms of what causes that. That's the autoimmune component of it. There are many other manifestations of a sensitivity to wheat outside of Celiac disease. It can be fatigue, brain fog, numbness and tingling (peripheral neuropathies), hormone imbalances, recurrent miscarriages. The list goes on and on and on. Not just Celiac but wheat sensitivity.

Dr. Mark Hyman: Yes. It's fascinating when you're talking about it. As a doctor, I learned you had it or you didn't.

Dr. Tom O'Bryan: Right.

Dr. Mark Hyman: You had Celiac disease that was demonstrated by an abnormal biopsy and if that was negative it was fine to eat wheat. We know that while Celiac can cause literally dozens of different diseases (everything from osteoporosis to colitis to schizophrenia to autism to depression and on and on), most doctors just dismiss any reaction that's not full-blown Celiac. If the gut is weakened by a nutrient-poor diet high in sugar and low in fiber by nutritional deficiencies of zinc and omega-3 fats, by the overuse of antibiotics and hormones, by exposure to environmental toxins and by unprecedented levels of mental and emotional stressors, then the outside environment leaks into your body and your brain, and you develop allergies and systemic immune issues. This is called a leaky gut. In fact, much of what we see go wrong in this epidemic of mood and brain disorders is because of a leaky brain. If you think allergies to food don't affect your brain like your body, you are sadly mistaken. Every part of your body and every cell in your body communicates with every other part of your body and every other cell. Everybody's talking at the same time, and making sense of all that conversation—it's called health. Good communication is good health. There's a lot of talking going on amongst your brain, immune system, gut, and hormonal system. We call this PNEI or psycho-neuro-endocrine immunology.

In fact, the gut is called the second brain because it has its own nervous system and many transmitters like the brain. It is through this system that your gut and immune systems talk to each other and talk to your brain. It governs how food cures a cascade of events throughout the body and the brain. The immune system and the brain have much in common. They're responsible for perceiving or "seeing" our world and for remembering those perceptions. They sense things and remember things. The nervous system sees the big world through our five senses and remembers things in the memory cells, also known as the neurons, of the brain. The immune system sees the microscopic world of little particles from food, microbes, pollens, and dust, and remember their unique identity in the immune cells. As you can see, they have a very similar job. Problems arise when the immune system or the nervous system overreacts to normally innocuous substances like food proteins or microbes that normally live in harmony with us.

Three basic abnormal reactions to foods can trigger brain injury. First, they can cause inflammation, which in turn inflames the brain. Second, small partially-digested food proteins called peptides from gluten and casing can act to disturb the normal neurotransmitter function in the brain. And third, they can act as excitotoxins increasing glutamate, an excitatory neurotransmitter, and creating a chain reaction that over excites, injures, inflames, and ultimately kills brain cells.

Dr. Tom Sult: Inflammation is the body's attempt to warn the rest of the system. If almost any bad thing is happening to the cells at the site of the irritation, they will send out alarm chemicals, or alarm messenger molecules. These alarm molecules are generally inflammatory. If you happen to have a ragweed allergy and you inhale ragweed pollen, that will, through a series of biochemical steps,

cause your mast cells to release histamine. Histamine causes all the symptoms that we know of as an allergy, but it also is telling the rest of the immune system that there's something happening that it should be paying attention to. Fundamentally, inflammation is simply the body's attempt to communicate with the rest of the immune system and the rest of the body that there's something going on that should be paid attention to.

A depressed individual will have inflammation of their brain. Just like if you hit your thumb with a hammer, the moment the hammer bounces off of your thumb the injury is over but your thumb swells for the next week probably and it takes another two weeks before your thumb is normal again. The same thing happens with your brain. Your brain is inflamed. Your thumb isn't going to work particularly well when it's inflamed. Neither is your brain. When you have an inflamed brain, something is not going to work right. If you have the flu and you have an inflamed brain, you just feel foggy and feel awful, but you also feel depressed. People with acute viral illnesses will say things like, "I feel so awful. I just want to die." Well, that sounds a little bit like somebody in a deep depression, doesn't it? It's the same kind of process.

How do you reduce inflammation? The first thing you want to do is take away the thing that's causing inflammation. If we go back to our ragweed allergy, you want to try to avoid ragweed, right? You want to get away from the thing that is causing inflammation. Next, there are many nutritional things that reduce inflammation. Eating a diet that has lots of color, and I don't mean Skittles, I mean lots of natural color. The great thing about fast food or candy is that every single bite has a full day's supply of food coloring because we don't need any. Deep colorful vegetables are anti-inflammatory. You'd think something like peppers that are super hot would be inflammatory, but actually peppers are anti-inflammatory. The flavors are not what we're talking about, it's actually the biochemical reactions of these foods.

The best medicine always starts with a variety of foods. I tell people, "You've heard about get your five-a-day, which stands for three vegetables and two fruits, but that comes from get your three to five vegetables and two to three fruits." Nobody talks about get your eight-a-day. If you're unwell, you should be getting your eight to ten a day, and a variety. People eat peas, carrots, corn, and then the next day maybe they have peas, carrots and corn. And after that, they probably have peas, carrots and corn. If you really think about it, there are 21 meals in a week, three times seven. If you thought about 21 different fruits and vegetables every week, that's variety. And that's going to give you lots of different nutrients.

Dr. Mark Hyman: The bottom line is that an unhappy, chaotic, disorganized, disengaged, forgetful brain is an inflamed brain. The trail of scientific clues leads us to a few final common pathways for all illness. And inflammation is a key pathway. What inflames the brain is what inflames the gut. Doctors of the future will become experts not only in identifying inflammation (which we are already becoming increasingly good at) but at navigating the ultimate causes of that inflammation and putting out the fire instead of just dealing with the smoke.

My personal road to a broken brain was rooted in heavy metal toxicity from mercury. All of my exposure to this heavy metal combined with genes that prevented me from effectively detoxifying the metals in my body led to a slow and significant poisoning of my cells and mitochondria. The effects were obvious. I felt weak, tired, couldn't think, had muscle pain and twitches, insomnia, digestive problems, food allergies, depression, and anxiety. It was only by discovering high levels of mercury in my hair and urine and slowly detoxifying myself that I was able to get better. I've seen this over and over in my patients too. From chronic fatigue and fibromyalgia to depression, anxiety, obesity, dementia, Parkinson's disease, cancer, heart failure, and heart disease, the message is clear. We are being poisoned by heavy metals. We're exposed to astounding amounts of brain pollution. According to the US Environmental Protection Agency (EPA), about 2.5 billion pounds of toxic chemicals are released yearly by large industrial facilities. Even common medications contain heavy metals. For example, aluminum, which has been linked to high risk of Alzheimer's, is found in antacids such as Gaviscon, Maalox, and Mylanta that people swig like

orange juice for heartburn. It is also found in our water, cookware, foil wrap, and many underarm deodorants. Until recently, mercury in the form of thimerosal, was the most common disinfectant placed in vaccines and contact lens fluid.

Let's talk about metals for a minute because I think that in medicine we sort of ignored them unless if you have an acute toxicity. In other words, when you're poisoned by lead, you have heavy metals that you're exposed to in an occupational way, or you're in an occupational environment that has other metals, then, okay, we acknowledge it although we don't have a great way of treating it except avoidance. But in Functional Medicine, we understand that there's a low-level impact of these things that can happen over decades for smaller levels.

Dave Asprey: Heavy metals (mercury, lead, cadmium, and arsenic, which is really not a heavy metal but it is a toxic element) at low levels produce chronic symptomatologies and have neurotoxic effects that are very complex that are often missed, as you're pointing out.

Dr. Mark Hyman: We don't even know how to test for it.

Dave Asprey: That's exactly right. What we're starting to see, and in fact I met a woman by the name of Vera Stejskal. She was at Astra. She's an immunologist and was able to save one of their important drugs from being not approved because she found a way of studying its toxicity and showing that it was actually not toxic to the immune system as some people had thought. It wasn't going to be approved. The leadership of the company was so pleased she made that discovery that they said, "Dr. Stejskal, you can study whatever you want. We're going to give you your own laboratory in Stockholm at Karolinska and you can do whatever you want." She said, "I want to study heavy metal low-level toxicity." And they said, "Go for it. We're giving you millions of dollars and you can do whatever you want." She developed methods using whole white cell assays to evaluate low-level toxicity to cadmium, mercury, lead, and arsenic in different individuals. It was unbelievable what she found.

She found that the level that was producing adverse effects on the immune system in some of these individuals (she also looked at nickel, palladium and platinum, some of these things that are found in dental materials or found even in replacement joints that were considered inert and were not at inert at all) in some individuals at part per trillion levels they were producing immunological adverse effects in these individuals. She published a whole series of papers on this over the course of 10 years and she developed a laboratory method for assessment using white cell analysis for looking at heavy metal toxicity that's revolutionized the concept of chronic toxicity—immunotoxicity from heavy metals. Well below (a million or more levels lower) than had ever been previously recognized to have adverse effects. She showed that this effect could vary from person to person by orders of magnitude. One person might have no adverse effect, another person at a much lower level had a significant effect. This is a whole new frontier as to where Functional Medicine would see itself versus pathological toxicology.

Dr. Mark Hyman: Yes, I think that's a very great point. I just want to examine it clinically for a minute. The idea that your immune system is driving brain dysfunction was really never a medical concept. We're seeing neuroinflammation being a central concept now as so many diseases across the spectrum (Alzheimer's to Parkinson's to autism) have tremendous amounts of inflammation in their brain. Depression, which we thought was more of a psychological issue, may be driven by inflammatory factors from your gut, from infections and toxins. It was revolutionizing our way of thinking about it but it hasn't really revolutionized our practice of medicine. In Functional Medicine, I've treated all those conditions with extraordinary success by using this concept of neuroinflammation and neurotoxicology from this emergent research. It's pretty compelling. I think we don't really understand that. Genetics are really critical, too. We know that they did a study looking at the cohort of patients who, as children, were given fillings (and plastic fillings) which is mercury fillings. They followed these kids for a long period of time in a study and when you actually tested the genetics of these kids, the ones who had good detoxification genetics weren't really impacted by

the mercury. The kids who had poor detox genetics, they had a seven-year developmental delay in their brain function compared to the kids who didn't have the mercury fillings.

Environmental toxins place a huge burden on our guts and our brains. We live in an environment steeped in chemicals that our bodies were not designed to process.

Dr. Joe Pizzorno: As I started noticing more of my patients suffering from disease because of toxins, I since started looking at what percent of chronic disease is due to toxins. I hired a couple of really bright graduate students of mine and we spent a year looking at the research. I would now assert that the primary driver of chronic disease in the industrialized world is environmental toxins. I want to be real clear: I'm not saying that nutritional deficiencies or nutritional excesses are no longer a problem, what I'm saying is that we've actually added an even bigger problem and we're poisoning ourselves with metals and chemicals.

If you look at what happens to the brain when it's exposed to things like arsenic, cadmium, bisphenol A, or things of this nature, what it does is it causes the neurons to become damaged. As neurons become damaged, they're no longer able to work as well. At the early stages, people don't really recognize that because we have a lot of extra functioning in our brains. As you start causing more and more damage, the first thing people will notice is that they don't remember a person's name quite as quickly or they're talking and they had a word they know they want to use but they have trouble finding the word. They may start noticing that things seem kind of fuzzy sometimes. Maybe there are sensations in the world as though it seems like maybe they're a little distant from the world. What's happening is kind of the early stages of the brain not being able to function as effectively as it should. It's not dementia, it's not old age, but the brain is no longer quite as good as it was.

One of my big surprises in looking at the research was how common environmental toxicity is. For example, most people don't realize that 10% of the water supplies in the US (public water supplies, the ones where you expect the government would be paying attention to them) have levels of arsenic known to induce disease in humans. Look at things like health and beauty aids—did you put lotion on this morning? Did you put sunscreen on to protect yourself from the sun? Well, those things have what are called phthalates, and the phthalates are actually pretty toxic to the body. They do things like bind to the insulin receptor sites so that you can't get sugars into the cells and eventually cause you to have diabetes. Phthalates also cause trouble in the brain because they impair the functioning of the neurons. There are so many toxins I could talk about. Mercury, for example. If a person has so-called silver fillings, what they don't realize is that those silver fillings are actually 55% mercury. The mercury leaks into the body and it leaks into the brain.

The CDC (Center for Disease Control) of the US government has put as their top five heavy metals: arsenic, lead, cadmium, mercury, vinyl chloride, and things of this nature. When I was looking at the research, I was looking at which toxins have the strongest disease correlations or causations and I also agreed arsenic is number one. But then I looked at DDT (dichlorodiphenyltrichloro-ethane). You might say, "Wait, DDT was banned 47 years ago." DDT is something called a persistent organic pollutant (POP), which means that it's very difficult to break down in the environment. Once it gets into our body, it's very difficult to break down. The half-life and the amount of time it takes for a body to get rid of one-half of the DDT that we're being exposed to is between two and ten years. What happens is DDT builds up in the body and DDT is a neurotoxin. It causes oxidative stress in the neurons and the neurons degenerate more quickly. I would say my top metals/chemicals are mercury, arsenic, DDT, organophosphate pesticides. They are very, very neurotoxic.

There are questions you can ask yourself to determine if you're likely to have toxins and there are some ways you can measure the amount of damage being done to your body by toxins. Let's do the latter one first. There's a standard laboratory test called GGTP, which is a liver enzyme. Normally, it's only measured when we're looking for people with hepatitis because what happens

when the liver gets inflammation from hepatitis, whether it's a virus or what else may be going on, the cells start leaking enzymes, they show up in the blood, and now you know a person has hepatitis.

It turns out that the body increases this production of GGT in the liver in response to oxidative stress and to environmental toxins. The reason it does that is that GGT recycles glutathione in the body. It turns out glutathione is one of the most important molecules to protect us from oxidative stress and also to get toxins out of the body. Our really smart bodies, when we're exposed to toxins, increase GGT. The normal range for GGT is between 10 and 60. Anybody with a GGT above 20 actually has a toxic load. Within the normal range, GGT goes up a proportionate toxic load. For example, look at things like diabetes. Someone with a GGT between 30 and 50, well within the normal range, has an eight-times higher risk of diabetes because they have so many toxins going on.

There's another molecule called AOHDG that we can measure and that's in the urine. GGT is measured in the blood. AOHDG is a measure of the amount of DNA damage that's going on in a person's body. The more toxins they're being exposed to, the more AOHDG shows up in the urine. If you want to look at, well who is most likely toxic? It's pretty straightforward. If you are eating conventionally grown foods, and in particular eating foods that have been prepared in plastic, you're getting tons of toxins in your body. Unfortunately, you're getting pesticides, like organochlorine and organophosphate pesticides, from the foods that are being grown. If you store them in plastic, now you're getting bisphenol A from the plastic. If you're eating soybeans that have been grown conventionally, you're getting cadmium. One of the best predictors of how toxic a person is: are they eating conventionally grown foods or are they eating organically grown foods that are stored in safe packaging?

Another way to determine how toxic a person is: do you use health and beauty aids? If you use standard health and beauty aids, they have a lot of phthalates. There’s even lead in some types of lipstick. It's a pretty significant source of toxins by using standard health and beauty aids. Another area to consider is are you living in an area with high levels of arsenic? You have to look at how a person is living: are they being consciously aware of toxins in their environment? Are they working to avoid those toxins? If you're not working to avoid the toxins, you've got toxins.

BPA (Bisphenol A): we now know there are huge disease associations with BPA. Now people say, "Well, we'll use BPS and BPF instead." However, if you look in the cells and look at animal studies, BPS and BPF are just as toxic as BPA, but because they're more recently being used, the human data for damage has not shown up yet. I'll guarantee you that in five to ten years from now, we'll find they're just as toxic as BPA.

Let me be clear. I'm very, very aware of the huge problem with toxins, but I don't want to go live in a cave somewhere. I enjoy modern civilization. I like my computer. I like my motorcycle. What I want to say is we need to put pressure on the manufacturers to produce these products in a way that they're not poisoning us. That's all possible and we can make choices. We make choices by only buying prepared foods that are in glass for example. Only buying foods that are organically grown. Only buying health and beauty aids that have low toxins. It’s not the manufacturers’ intent to poison us. Their intent is to make a profit. If you stop buying their products and start buying products made by safe manufacturers, they'll get the message and we'll have safer products.

Dr. Mark Hyman: We're also living in a country that is over-prescribed medication. 81% of Americans take at least one medication per week. Are you one of those people popping antacid blockers for indigestion or a cholesterol-lowering medication or acetaminophen for your joint pain, or a birth control pill or getting the flu vaccine every year? We know that drugs have many, many effects and many of these effects damage your brain if they're not addressed. I have some big concerns regarding some of the most common medications. What concerns me as much as what we do know now, is what we don't know. The past decade has seen a litany of fallen heroes: Vioxx, Avandia, Rezulin,

Seldane, Baycol, CETP inhibitors, Premarin, and more. Which of the drugs that millions consume today will be the fallen heroes of tomorrow?

Dr. Robin Berzin: I do think that we are overprescribing antidepressants for mental health issues. I see over and over again patients coming to me who have been prescribed antidepressants often for a variety of off-label uses that aren't mood disorders. All sorts of specialists are using them, frankly, in ways that they haven't been researched at all. In addition, I often see really well-meaning primary care doctors and psychiatrists who aren't sure what else to do or aren't sure how to help somebody and so they just prescribe an antidepressant. That's problematic because we know that in many cases exercise actually goes head-to-head in the literature with antidepressants and it's just as effective. We know that some of these antidepressants aren't much more effective than a placebo. We know that some of these antidepressants actually have really concerning side effects and can lead to higher rates of suicidality. There are certainly cases where antidepressants and medications of the like are absolutely appropriate and can be really helpful, but they shouldn't be a first-line treatment. They should not be our go-to, but they are.

We have millions of people who are prescribed antidepressants and now, more and more I see, stimulants for conditions that aren't pathologies, a disease, or even a mental health imbalance, but are just the result of their lifestyle. It's the result of not sleeping, having too much caffeine, eating too much sugar, being inflamed, having poor digestion. We know that there's a big brain-gut connection. Having even infections going on that haven't been detected. Why aren't we looking for these things before we prescribe a drug that then ends up being a lifelong drug because people are afraid to get off of a drug that they didn't even need in the first place.

We're actually really effective at Parsley Health in some cases in helping people safely get off of these medications that they didn't need, and we use genetic testing often to help us do that because there's genomics that teach us which drug is more appropriate for a certain person, whether or not that person would have responded just as well to exercise. We can use this information that's truly cutting edge to help people get off of unnecessary medications. I also think we need to sound an alarm about the number of stimulants that are being prescribed. These stimulants are speed, effectively, and they are drugs of abuse and are addictive. What I'm seeing is that while patients are able to get off of some of the antidepressants, they are not able to get off of some of the stimulants. And so telling someone who's just tired and having trouble focusing, because they're looking at their mobile phones too much and they're not sleeping well and eating poorly, that they need a stimulant that they're then going to be addicted to for life is really problematic. I think we've sounded the alarm amongst physicians for the opioid epidemic, that physicians in part created, and we're really addressing that as a field today. I think that's incredibly powerful. I think we need to sound the same alarm for stimulant medications that are being overprescribed.

Dr. Mark Hyman: I am certainly not against medication. Sometimes they're absolutely necessary. But they should be used carefully, with full awareness of all their effects.

I wrote *UltraMind Solution* almost 10 years ago and it was a result the extraordinary results I was seeing by accident, nothing I had read in any journal. By treating people's gut, their brain would get better.

Dr. David Perlmutter: That's right.

Dr. Mark Hyman: And I was like, "What's going on here?"

Dr. David Perlmutter: That shouldn't happen.

Dr. Mark Hyman: No.

Dr. David Perlmutter: And it does happen.

Dr. Mark Hyman: It does.

Dr. David Perlmutter: We work on the gut and the brain gets better, the skin gets better, and the joint pain goes away. These are all issues that are based upon inflammation. And guess what? Alzheimer's is a prototypic inflammatory disorder—the same sort of inflammation, markers, and same mediators as are involved in heart disease, as diabetes or even cancer.

Dr. Mark Hyman: It's almost like a few common pathways.

Dr. David Perlmutter: That's right.

Dr. Mark Hyman: Depending on the person, it can hit different organs, whether it's autoimmune disease, dementia, heart disease, diabetes, or cancer. At Cleveland Clinic, there are scientists now discovering that the microbiome plays a role in the development of cancer.

Dr. David Perlmutter: Oh that's right and we call these the broad strokes. There is this real push for us to be super specialized these days and to develop protocols that are so specifically targeted for the individual. We call this personalized medicine. I think that's great. At the same time, we know that taking a step back and looking at the broad strokes about what really are the general dietary recommendations, what people are doing wrong in terms of their medications, over-the-counter as well as prescription, that are affecting the microbiome, the gut bacteria, and are then amplifying the gut permeability, enhancing inflammation, and ultimately, in my area of interest, leading to death of brain cells.

Dr. Mark Hyman: Yes, you're basically talking about a revolution in our thinking because we didn't even talk about the gut microbiome a few years ago. We didn't understand how it was connected to all these diseases, including brain disorders: not just Alzheimer's but depression, autism, ADD, and Parkinson's. These conditions we thought were in the brain but you're talking about the microbiome as this new organ that we have to actually investigate, learn about, and treat. Tell us more about this discovery you made about how this all works, which you wrote about in your book *Brain Maker* that led you to revolutionize your thinking.

Dr. David Perlmutter: Well again, it was because of lack of tools in the toolbox. Neurologists are working under the premise of “diagnose and adios,” meaning that, boy, we'll come up with a great name for a disease and that sounds great. Aren't we smart? But then there's nothing to do. We're left empty-handed and I wasn't going to spend the rest of my career doing that and have people walk out of the office without something to do. I endeavored to discover what were these relationships. Granted, inflammation is an underlying mechanism of Parkinson's, MS, autism, Alzheimer's, which are inflammatory disorders. Okay, then where is this inflammation coming from? Not a bad question to ask. And it turns out that when you look at the literature ...

Dr. Mark Hyman: It's sort of self-evident, right? But it's not something we do in medicine.

Dr. David Perlmutter: Really it's coming from the gut. That means this neurologist is going to start paying attention to gastroenterology. Oh no, you can't go there. That's the turf of the gastroenterologist. I went to my gastroenterologist friends and began discussing this. There was no interest. It became very evident to me one day when I worked on a patient with migraine headaches by changing her diet and putting her on, get this, a gluten-free diet and her migraine headaches went away. This is something she had for 25 years, was taking narcotics for her pain. She went back to the gastroenterologist who said, "I've scoped you, you don't have Celiac disease. Why on earth would you go gluten-free? Go back on gluten, you need it." And she refused. Had she done so, we know her headaches would have recurred. That said, there is such pushback on anything nutritional. As you well know, recently there was an innuendo based upon a study that came out saying that if you go gluten-free you're going to be at a higher risk for heart disease. That is not the conclusion that the authors (Harvard researchers) actually reached. The conclusion was if you go gluten-free,

which means likely cut back on dietary fiber, that's not a good thing. I am totally in for that. I agree with him.

Dr. Mark Hyman: Most people don't eat gluten in dietary fiber, it's white flour.

Dr. David Perlmutter: Right. But the point is that the fundamentals are that the brain is not able to deal with inflammation very well. Inflammation happens when we disrupt the gut bacteria by a diet that's inappropriate and by taking medications that are disfavorable.

Dr. Mark Hyman: What are the medications that screw up your gut microbiome?

Dr. David Perlmutter: Well, the obvious ones are antibiotics. When you disrupt the gut bacteria by taking antibiotics, understand that it is a lifelong change in your microbiome that is never the same again. Antibiotic exposure is strongly related to diabetes risk—as much as a 50% increase risk from one course of antibiotic. A very large Danish study demonstrated that. The non-steroid anti-inflammatory medications are notorious for disrupting the gut bacteria and that likely explains why clostridium difficile (C. diff) is higher in people who generally take these non-steroid anti-inflammatories. I think the biggest issue is going to turn out to be, oddly enough, these acid-blocking drugs called proton pump inhibitors (PPIs).

Dr. Mark Hyman: Which you can buy over-the-counter.

Dr. David Perlmutter: They are generally bought over-the-counter. One study out of Stanford indicated about a 16% increase risk of heart attack in people taking these PPIs. If you have that heart attack, your risk of dying from it is doubled basically. That happens because of changes in the pH of the gut. Why would you be surprised that these drugs would change the acidity of the gut? Because that's what they're designed to do.

Dr. Mark Hyman: Designed to do, right.

Dr. David Perlmutter: When you change the acid level, acid-base balance of the gut, it changes the environment in which the bacteria live. Certain species will thrive, certain species will be suppressed. You have this loss of diversity of gut bacteria that leads to leakiness of the gut and the brain, and it sets the stage for disaster.

Dr. Mark Hyman: One of the most common overlooked reasons for a damaged gut is stress. Have you ever wondered why most animals in the wild don't get ulcers? They don't live in a state of chronic stress. We humans do. We stew in our own stress juices like cortisol, which kills brain cells, shrinks the brain and leads to dementia. It also causes crippling depression and other mood disorders.

Dr. Robin Berzin: Cortisol is one of our main stress hormones and it's produced by the adrenals, which are two little glands that sit on top of your kidneys in the body. When you make cortisol in response to stress, that's your body working. We developed a fight-or-flight response so that we could run away from a lion or survive, right? But today in our worlds that we're living in, what I see is patients living in emergency all day long. They're feeling like they're in emergency from the moment they wake up to the moment they go to sleep—they're running, running, running from work to exercise to taking care of family. They're eating too much sugar and living on caffeine, so both of those things are stimulants, and therefore they're constantly hyperstimulated. As a result, their body stays in fight-or-flight mode and never gets to go into the opposite of fight-or-flight mode, which is rest, digest, relax, and heal. That side of your nervous system needs to take over so that your body can rest, digest, relax, and heal. What I see is that a lot of people are never actually getting to heal. They're living in a state where their fight-or-flight hormones, like cortisol, are always elevated or are constantly spiking.

High cortisol leads to blood sugar spikes, which leads to insulin spikes. That leads to insulin resistance and metabolic syndrome, and ultimately diabetes. That can also imbalance some of your sex hormones, testosterone and the like, so we see hormone imbalances as a result of those

chronic high cortisol states. We see imbalances in sleep. When you don't sleep, your brain doesn't get to take out the metabolic trash that it creates during the day through regular metabolism. It's literally like your brain doesn't get to clean up its house overnight, which is one of the reasons sleep is so important. What we see is then people are chronically sleep-deprived, exhausted, gaining weight, and their blood sugar is imbalanced. That is the beginning of disease, of disfunction, and many of the huge, chronic diseases that we see that are crippling our healthcare system.

Dr. Mark Hyman: Stress also has a negative impact on the brain. We know that physical stresses will cause emotional stress. We know that emotional stress will have physical effects. And we know, for example, that if you're having an infection, if you have heavy metals, if your gut isn't working, or if you have infections with Lyme disease, this all affects your brain and can lead to all these broken brain issues. We also know that stress itself, psychological stress, can have a serious impact on the body but also on the brain. We know that when you have high levels of sustained cortisol, which is the stress hormone, shrinks the memory center in your brain, and you literally have an increased risk of dementia and cognitive issues the more stressed you are.

We know the opposite is true: when you meditate or do yoga, these practices actually reform connections in the brain. We call that neuroplasticity. They help re-create new brain cells. We call that neurogenesis. We know that they increase stem cells and decrease inflammation. Learning how to regulate stress is really important. All of us are exposed to stress, and sadly most of us have far more stress than we ever did a thousand years ago with the advent of TV, Internet, all of our devices, and on our constant workload. All of these things are pretty abnormal. In fact, the average hunter-gatherer tribe spent about 20 hours a week actually working, trying to get food, the rest of the time they just hung out and chilled. We don't do that. We just go all day long and all night long sometimes. And this creates really serious consequences for our health and our brain.

To treat depression, autism, and Alzheimer's, or any disease that affects mood, behavior or the brain, we must learn how to get rid of the causes of inflammation, such as leaky gut, and also to restore the normal immune balances through the food we eat, nutrients, exercise, sleep, and stress management. You can impact your brain through your diet and heal your body. In fact, your body and your mind are not two separate systems. They're one elegant, continuous ecosystem. What you do to the body affects the brain and what you do to the brain affects the body.

In Episodes seven and eight, our experts will provide you with practical steps that you can take today to start healing your gut and brain. In our next Episode, we will dive deep into devastating brain disorders that rob many of the elderly, and even a few young people, of a healthy and joyful life. Stay tuned for discussion around Alzheimer's, dementia, multiple sclerosis, and Parkinson's disease.

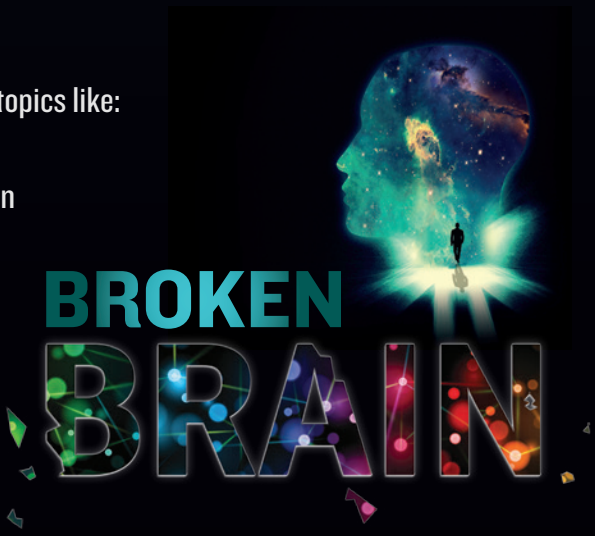
"I first began to discover the mysteries of the brain when I personally got sick. I went from being very healthy, riding my bike 100 miles a day, being able to memorize 30 patients & charts to a scary version of myself I didn't recognize. I suddenly was barely able to walk up the stairs and hardly able to finish a sentence. It happened almost overnight, and it happened, as I realized, because my whole system broke down from a number of insults that I wasn't aware of. The main one was from being in China where I was exposed to huge amounts of pollution from coal burning, which releases mercury and lead and many other toxins.

That's when I took a deep dive into healing myself by using the roadmap of Functional Medicine and peeling away the layers of what was wrong with me. And, incrementally, I got better. The Functional Medicine approach doesn't focus only on the symptoms. We understand that the body is a dynamic, integrated system where everything affects everything and is connected. We search for the causes to understand the symptoms. Just because my brain was affected didn't mean my brain was the problem. The problem was my body, and all the inflammation and the toxicity and the gut dysfunction, it was then feeding back up to my brain. Once I understood that, I was able to apply the principles of Functional Medicine and get myself better." – Mark Hyman, MD

Dr. Mark Hyman is a multi-time *New York Times* bestselling author including *The UltraMind Solution, The Blood Sugar Solution 10-Day Detox Diet, Eat Fat, Get Thin,* and more.

You'll have access to transcripts for all eight episodes covering topics like:

1. The Broken Brain Epidemic / My Story
2. Gut Brain Connection: Getting to The Root of a Broken Brain
3. Losing Our Minds (Alzheimer's, Dementia & MS)
4. ADHD & Autism
5. Depression & Anxiety
6. Traumatic Brain Injury (Accidents, Sports & More)
7. 7 Steps to An UltraMind (Part I)
8. 7 Steps to An UltraMind (Part 2)



As you delve into this information, you'll see that you, too, can heal from a broken brain and have more mental clarity, become more sharp, and focused and live a life full of joy and purpose.

YOU DON'T HAVE TO SUFFER WITH A BROKEN BRAIN ANYMORE!