



Brad Lemley's

Natural Health Solutions

Interview with Dr. David Perlmutter, Author of *Brain Maker*

Brad Lemley: Hello everyone. I'm Brad Lemley. I'm the editor of *Brad Lemley's Natural Health Solutions* and I am really honestly excited to be speaking to the guest I have on the phone right now. He's Dr. David Perlmutter, MD. He is a board-certified neurologist. He's a Fellow of the American College of Nutrition. Along with his many publications in many medical journals, he's probably best known to the public through his books such as *The Better Brain Book* and the No. 1 *New York Times* bestseller *Grain Brain: The Surprising Truth About Wheat, Carbs and Sugar, Your Brain's Silent Killers*. His most recent book is a *New York Times* bestseller *Brain Maker: The Power of Gut Microbes to Heal and Protect Your Brain for Life*.

He's recognized internationally as a leader in the field of nutritional influences in neurological disorders. And what I love about these books is they're not abstract. They're not inaccessible. There are a lot of specific recommendations in these books that you can start implementing today to protect and improve your brain and the brains of the people you love. So, Dr. Perlmutter, it is an honor to speak with you.

Dr. Perlmutter: Well, I am absolutely delighted to be here with you today, Brad, and I would just say in terms of that introduction you hit the nail on the head. That's the mission here. The mission is really empowering people to make those changes because, frankly, when we talk about things like autism and Alzheimer's and Parkinson's, et cetera, these are situations for which there really is no effective treatment. And yet we know that the very lifestyle choices that you just mentioned have a huge role to play in determining who does and who doesn't get those problems.

Brad Lemley: Absolutely. Well, I want to discuss both *Grain Brain* and *Brain Maker* because they really sort of work synergistically together in terms of the information. Before I even do that, what I want to establish with you is the reason that you wrote these books, in other words, the health problems that beset America today. You've noticed — you've pointed out that in the US today we have an unprecedented incidence and severity of physical and mental problems. Can you kind of characterize the state of American health today as you see it?

Dr. Perlmutter: In a word, poor.

Brad Lemley: You can use a few words.

Dr. Perlmutter: And I think the issue is that we've not changed genetically in tens of thousands of years, so this is not as if suddenly we're seeing a genetic issue manifesting itself. It's obviously an epigenetic or influences upon our genomes — of genome or above the genome, which means for the most part nutrition. So I think that the field of preventive medicine or the notion of preventive medicine as it relates to the brain has been sorely neglected. We hear about a heart smart lifestyle and weight-bearing exercises for women, et cetera, to help reduce the risk of osteoporosis. But the brain got left out of that discussion and not for lack of supportive science because our most well-respected peer review literature is replete with citation after citation clearly connecting various lifestyle choices to risk for the very diseases of the brain that we don't want to get.

And let me be really clear right at the opening with you and that is that the very same processes that are involved in the other degenerative conditions of our bodies — be it coronary artery diseases, diabetes or even cancer, if you will — are all relevant as they relate to the brain. These are all inflammatory disorders so in both *Grain Brain*, obviously the relationship of inflammation to the process of consuming grains, higher carbohydrates and sugars, as well as the new book *Brain Maker* that looks at the role of gut bacteria, the human microbiome, in terms of regulating inflammation. Both of these books have gained their traction because they relate lifestyle choices to the process of inflammation, which is the cornerstone of all the bad stuff you just don't want to get.

Brad Lemley: This is fascinating to me because I think if you talk to a lot of people, there's been enough good health information out there that a lot of people can wrap their minds around — Type 2 diabetes, various cancers having — you can impact them through lifestyle choices. But it's funny how I think in the popular conception — and I don't know if you agree or not — people continue to think that things like dementia and Alzheimer's are sort of the luck of the draw, that these are influenced by lifestyle, doesn't really seem to be popularly understood. Would you agree with that?

Dr. Perlmutter: Exactly and I think you led this section off by asking — by prefacing it by you were gonna ask me why. Why do you write these books? You know, why is *Brain Maker*, my new book, why are there 47 pages of peer-reviewed references? Because it's time the public become aware of this dirty little secret that no one wants to talk about. And that is that we are, to a very significant degree, responsible for our health as it relates to the brain but you're exactly right. The major — the public gestalt is one that would have you believe that we will live our lives come whatever may, eat whatever we want, and then suddenly when, as I say, one taco short of a combo platter, we'll take a magic pill. There is no pill. There is no effective treatment for Alzheimer's, which has been diagnosed in 5.4 million Americans. It's now ranked as the No. 3 cause of death in America, and it's costing us around \$230 billion each year to ultimately care for individuals with this preventable problem.

And is it just your guest today on your program who's saying it's preventable? No, it's countless peer-reviewed research studies. Dr. Deborah Barnes at the University of California writing in the journal *Lancet*, perhaps one of the most well-regarded peer-reviewed medical journals on the planet, indicated that about 53 to 54 percent of patients with Alzheimer's didn't have to get that disease had they understood the valuable role of modifying lifestyle factors in terms of preserving and protecting the human brain. But then, again, that's not what we learn when we watch the evening news. We watch commercials that show an elderly man having trouble tying his necktie and fortunately his daughter gives him a pill. That pill doesn't work. There are no studies indicating that it is effective and, yet, that's the way of Western medicine. Take a pill and hope for the best.

Brad Lemley: Now in *Grain Brain* and, like I say, we'll move ahead to *Brain Maker* soon, but in *Grain Brain* you have a pretty specific recommendation, sort of the umbrella recommendation which is a diet that is very low in carbohydrates. I believe your recommendation is below 60 grams/day?

Dr. Perlmutter: Well, 60 to 80 grams a day. That's correct.

Brad Lemley: Okay. What does that look like in terms of how a person eats in the course of a day versus how people actually eat in American in the course of the day?

Dr. Perlmutter: Well, dramatically different. I mean, people are eating 200, 300, 400 grams of carbs a day not recognizing that whether the bread is whole grain or processed grain, it's still a very, very powerful sugar surge for your body, a very powerful source of sugar. That a 12-ounce glass of orange juice has 9 teaspoons of sugar just the same as a can of cola. These are hidden sources of carbohydrates that people aren't wanting to talk about. Who doesn't want to have a couple glasses of orange juice? That's already 18 teaspoons of sugar. That's 68 grams of carbs and you're already busted and you haven't even eaten your breakfast yet, which is the short stack of pancakes with corn syrup.

Brad Lemley: That's right.

Dr. Perlmutter: But that said, what does it look like? Breakfast is a couple of nice eggs, three eggs if you like, with some sautéed spinach and olive oil poured all over it. Maybe what I like is I'm a real fan of onions and also toast pumpkin seeds, one of my favorite but whatever, however you want to do that. And then that's a good — now, hear me clearly — higher fat breakfast and, gee, that goes against the grain quite literally. Yes, we're saying that we've got to eat more fat. We've got to treat the human body as it expects to be treated, how it's been treated for tens of thousands of years. Humans have never eaten carbohydrates, certainly not to the extent that we're consuming them now. How do I say that? Well, we've never had carbs. There were never wheat fields and apple orchards and cartons of orange juice hanging from the trees, much less cans of soda and the rest of the ridiculous sources of carbs.

But we need to look at carbohydrates and sugars from various perspectives, first of all, from the perspective of right off the bat they're gonna raise your blood sugar and that's a bad thing. We'll get to that in just a moment. But in addition we know that other more fundamental changes happen when our foods are higher in carbs. There are actually changes in the expression of the human genome based upon higher consumption of carbs and higher blood sugar. And beyond that, there are even changes in the array of the various bacteria that live in the

gut that control things like inflammation, again, the cornerstone of all those degenerative situations you don't want to get.

And these are various what we call “lenses” that we can look through as we look at diet, not just what is the percentage of fats, carbs, protein, micronutrients that you're taking in but how are those nutrients — macro or micro — affecting gene expression in your body? And more importantly, how are they affecting the gene expression of the gut bacteria?

Brad Lemley: Right.

Dr. Perlmutter: When you understand that the gut bacterial represent 99 percent of the genetic material in your body, then your dietary choices take on a whole new meaning.

Brad Lemley: Exactly and this gets into the question of the microbiome, which is a term that has not been around for a long time, and I think many people are not familiar with it. What's your definition of the microbiome?

Dr. Perlmutter: The microbiome is a term that is used to describe the array of bacteria that live within us as well as their genetic material. So within each of us, mostly concentrated within the gut, is an array of bacteria, of viruses, of fungi, et cetera, that actually dramatically outnumber our own cells. Just the bacteria in your body, Brad, outnumber your body cells by a factor of 10 to 1. And as I mentioned, 99 percent of the bacteria within your body or rather, 99 percent of the genetic material in your body is bacterial. So we're just beginning to understand that this three-pound organ in the body called the microbiome, a brand new organ — weighs about the same as the human brain — is controlling any manner of our physiology, our metabolism, helping determine the set point of inflammation, the functionality of the immune system, whether we are fat or lean, even controlling blood sugar and, even more importantly, having an effect on the expression of our own 23,000 genes that we inherited from Mom and Dad. So it is very, very exciting. It's brand new. Ninety percent of all the peer reviewed publications dealing with the microbiome have come out in the last five years only so it's a very, very new science.

Brad Lemley: Right and one of the leading researchers is a guy named Justin Sonnenburg, and one of the things he likes to talk about is there's tremendous variability. In a sense, people are more similar to each other in terms of the genes within their flesh than they are when it comes to the constituents, the populations, of their microbiomes. Is that right?

Dr. Perlmutter: Well, he's absolutely right and we do see that in about half of people who you might look at there is about a 40 percent concordance of the microbiome genetically. In other words, there is what appears to be amongst at least half the people that you look at a pretty solid foundational core. But beyond that, every person on the planet has a different microbiome, and that microbiome is so rich in information in the gut. I mean, one gram of fecal material contains 100,000 terabytes of information.

Brad Lemley: Wow.

Dr. Perlmutter: So that is at least in order of magnitude greater than your home computer that you're all excited about, 100,000 terabytes of information in just one gram of fecal material. So it's highly variable between people and it's highly variable in you during the various seasons of the year. It changes in you moment to moment depending on the foods that you consume, your level of stress, your level of other issues in your life. It's a very adaptable dynamic organ in the body. It responds in a very balance homeostatic way based upon what you need to keep you healthy because keep in mind these bacterial want to stay alive. So they want to keep you going because you've given them a nice place to live and you're feeding them every day.

Brad Lemley: Right. Sonnenburg says we are just fancy vessels for transporting our microbial hosts.

Dr. Perlmutter: Well, it's a very humbling notion but I love the idea because when you conceive of that, it makes you realize you darn well better take care of these guys because they are playing a huge role in you in terms of how you feel moment to moment, in terms of your mood, your hungry — your hunger rather — your satiety, your activities, brain function and even health of the brain in terms of its functionality today as well as long-term risk of brain disease so he's exactly right. We're carrying these guys around. It is by ever definition a symbiotic relationship. They're helping us and we're helping them.

The problems arise when we do things to our gut bacteria that change their array, that reduce their diversity, that allow unfavorable bacterial organisms to overgrow. Then we set the stage for problems. We understand that one of the roles of bacterial in the gut is to maintain the gut lining so that only certain things can get through the gut lining. When we damage our gut bacteria, then the gut becomes a little bit more leaky, and that is the cornerstone of changes in our immune function as well as inflammation. We're just beginning to understand that there are fingerprints, if you will, that help identify certain disease processes, and we're just beginning to make those correlations. A certain array of bacteria has now been correlated with autism. There are certain bacteria that when they are not present in abundance are seen in association with Crohn's disease. So we're just beginning to draw these correlations between imbalances of gut bacteria and the possibility of having a specific disease.

Brad Lemley: Now how does what people term “the second brain” fit into the activity of the microbiome and what's your definition for what some people call the second brain?

Dr. Perlmutter: I think that a reductionist mentality would say that the gut is here in Cleveland and the brain is here in Naples, Florida, where I am so that these are two disparate seeming systems that have nothing to do with each other. And, as a matter of fact, that is a completely wrong way of looking at the human body. Every organ in the body is interfacing in a way that is designed — designed or that mutually assists each other organ in terms of being healthy and functional. So the gut-brain connection has gotten a lot of traction in terms of a term as of late that somehow there is this newly discovered connection between the gut and the brain. Well, we need to look upon them as acting together almost in tandem as a unified system. The gut-brain axis it's looked upon. They are physically connected through a nerve called the vagus nerve, a nerve that wanders from the brain all the way through the intestines. That's where the name comes from, vagus from the Latin vag meaning “wanderer” or “vagabond”. That's where that term comes from.

So the gut itself is deeply enriched with nerves through what's called the “enteric nervous system” so the gut is highly populated by nervous tissue that then gives information immediately back to the brain in terms of what's going on in the gut and at the same time allows the brain to specifically influence moment-to-moment things that are going on in the gut. So there's this really beautiful physical connection through then central nervous system and the brain and spinal cord and the enteric nervous system. That is the nervous system that is within the gut itself.

But beyond that even more exciting, I think, is the chemical connection between these two seemingly disparate areas of the body that the gut bacteria, for example, are moment to moment manufacturing chemicals that directly influence the brain function right now as well as the brain's long-term health: things like short-chain fatty acids and even neurotransmitters and B vitamins and a whole host of what are called “small molecules” that influence organs and organ systems and cells throughout the human body. I mean, there are a heck of a lot —

Brad Lemley: Sure, people have heard of serotonin is now a pretty common term. A lot of people know that and that's the source, right?

Dr. Perlmutter: Ninety percent of the serotonin in the human body is made in the gut. The gut makes things like dopamine and serotonin. These are really very powerful chemicals in terms of modulating brain activity. GABA, G-A-B-A, is a very strong inhibitory chemical, tends to calm things down in the brain. And there are GABA issues that relate to things, for example, like ADHD. And, again, GABA is primarily a gut-related chemical so I think the question that you'd asked me was how can we talk about the gut and being the second brain? Now you see there is a lot of connections.

Brad Lemley: Yeah, absolutely. Well, one of the things I want to be sure to do while we're talking is get into some very specific actionable steps that people can take to protect the health of their own brain and the brains of the people that they love. In *Brain Maker* you talk about some I think it's six steps and I've got them here. And I wondered if I could sort of go through them one at a time so people know just what we're talking about.

Dr. Perlmutter: Yes, sir.

Brad Lemley: The first thing you recommend is choose foods that are rich in probiotics including live cultured yogurt, kefir, kombucha, tempe, kim chee, sauerkraut, pickles and pickled fruits and vegetables. Now, why is that a good idea?

Dr. Perlmutter: Who knew? The reason being is that these are foods that are teeming with bugs, that are colonized with bacteria. Now, doesn't that just sound awful? But in point of fact, humans have been actively fermenting food as a way of preserving food for at least 7,000 years. And prior to that, we would eat food that would be not refrigerated that would be fermenting anyway. So it's a good way of boosting good bacteria within the body, so I recommend eating fermented foods throughout the course of the day. Kim chee is a spicy traditional Korean dish that I have with every meal. It's a terrific way of boosting your good gut bacteria.

And then another thing I think people need to keep in mind is, yeah, you're nurturing your gut with good gut bacterial but what do we do to feed them because they don't eat everything that comes down the pike but they do eat certain things. And one of the main things that you can give yourself to nurture your good bacteria is what is called "prebiotic fiber". Now, people have talked a lot time about how fiber is good for our health, especially for our GI health, and it is. But there's a unique type of fiber called prebiotic fiber and that is fiber that by definition is not digested in the small intestine or absorbed but makes its way to the large intestine where it services as fuel for the good gut bacteria and it has health benefits.

So that's the definition of what's called a prebiotic. And various foods actually have high levels of prebiotic fiber and there are things like Mexican yam or jicama, Jerusalem artichoke, dandelion greens, onions, leeks, garlic, asparagus. These are foods that have high levels of inulin and even beyond that, you can go to the health food store and buy prebiotic in a bag as a supplement to add to your food made with inulin and now we see being made from acacia gum. Acacia gum from Africa is a really terrific prebiotic fiber that does tend to dramatically enhance the growth of two groups of bacteria: the bifidobacteria and the lactobacilli, primarily the bifidobacteria. These are really so you've got them within you and you want to nurture their health and that's how you do it. So when we look at the historical evidence, it looks like our ancestors were consuming as much as 135 grams of prebiotic fiber on a daily basis whereas the average human today is consuming only five grams, so that's why that's so darn important.

Brad Lemley: Yeah, these are relatively unfamiliar foods, some of these anyway, to Americans. Which prebiotic do you recommend people get started with or focus on?

Dr. Perlmutter: Well, everybody can add a little raw onion to their salad. That's a good start, some garlic, leeks. I think we're all gonna hopefully soon embrace the beauty of jicama, which I'm now seeing in grocery stores. I had to give a lecture last week and stayed in a hotel in Orlando, Florida, and there was a jicama salad, and spelled with a J by the way, J-I-C-A-M-A, jicama salad on the menu in the in-room dining. Who knew so —

Brad Lemley: Oh, yeah. I live in Phoenix. Believe me, we eat it all the time. It's terrific.

Dr. Perlmutter: Yeah, I mean, you ask — and you see exactly what I'm talking about. This is gaining more and more traction. Hey, you can go to almost any health food store and maybe even some regular grocery stores and find dandelion greens. They're everywhere now and, again, they're a bit bitter so you might want to sauté them. You're not gonna damage the prebiotic fiber by sautéing these foods at all, and that takes the edge off with a little lemon juice or I just put them I salad, chop it up and put it in salad. I like that little bit of a bite and people, many people, have been using dandelion greens for a long time.

Brad Lemley: Now, a third recommendation you have is to go low carb and embrace high-quality fat.

Dr. Perlmutter: Who knew?

Brad Lemley: And then there's a list of brain maker foods under this particular bullet point: leafy greens, low sugar fruits, healthy fat, protein and herbs. I don't know that we have time to go through all those. I think people have a sense of what those are, but the one that I wanted to be sure to focus on was healthy fat because healthy fat means different things to different people, and it's a very controversial and contentious area of nutrition science at the moment. What's your definition of healthy fats?

Dr. Perlmutter: Any fat that has not been modified, that hasn't been processed, that people haven't gotten their hands on. So some people might think healthy fat is an oxymoron, but as a matter of fact, fat is something people have been eating for a long, long time. I don't know when — how far back you want to go but at least a couple million years. Fat's been an important part of our diet and is it good for the brain? Well, a really wonderful report was published in the *Journal of Alzheimer's Disease* on January 1, 2012, by Mayo Clinic researchers headed by Dr. Rosebud Roberts. And it looked at a cohort of individuals in terms of elderly individuals. What did they eat? And

it followed these individuals for a couple of years, 3.7 years. The average age was 80. And they determined based upon what people ate who got dementia. And those individuals whose diets were higher in carbohydrates had about an 88 percent increased risk of become demented. And those folks who ate the most fat, the dreaded fat, had a 44 percent risk reduction in developing dementia.

So I don't think you're gonna argue with the Mayo Clinic and the *Journal of Alzheimer's Disease*. You know, pretty well respected. This is available at the National Institutes of Health Public Access. So this had been peer reviewed and studied and published so it's telling us that fat is good for the brain. You know, the choices are extra virgin olive oil, nuts, seeds, grass-fed beef, free range chicken and the eggs that they lay, coconut oil. What a great notion: eating coconut, which is more than 90 percent saturated fat. Doesn't that just give you the willies so we've known for quite some time that saturated fat is actually something very, very good.

And how incredible it is that in the *Annals of Internal Medicine* an incredible report came out in March, March 18, 2014, matter of fact, just last year. And it was a study, what's called a meta-analysis of more than 500,000 people demonstrating no increased risk of heart disease in those folks who at the very highest level of saturated fat. But, yet, we've been told that we've got to avoid saturated fat or something horrible is going to happen. Turns out that's not true. That was wrong information. It was the largest study ever and, again, published it the *Annals of Internal Medicine*. That's important for people to know.

You know, 50 percent of the fat in human breast milk is saturated fat. So if you're telling me saturated fat is a bad thing, then somebody — either Mother Nature or somebody upstairs made a big mistake in the content of human breast milk, and I have a tough time accepting that.

Brad Lemley: Well, if your body is putting fat away, it puts it away in that form for when the fast comes and you need to call on it. So if it's such a difficult thing to metabolize, why is that the fat storage form of choice?

Dr. Perlmutter: Exactly right and when we do ultimately call upon our fat storage and we burn that fat for energy as opposed to burning carbohydrates, the brain is as happy as the day is long. What I'm saying is when you've cut your carbs and your diet is deriving more of its calories from fat, you get into a mild state of what is called ketosis and the brain and the heart and the immune system are thrilled. Humans have been in a mild state of ketosis for almost as long as we've been walking the planet.

Suddenly we've pushed ourselves out of ketosis because of this abundance of carbohydrates that have worked their way into our diets because they're cheap and they don't spoil. And we are told start your day with the whole grain this and that and nine servings of that and this and extra servings of fruit and it's just really not great advice. Am I saying we shouldn't be eating fruit? No, I'm not saying that at all. But I am saying that six to eight servings of high sugar fruit each day is not a good thing, that you want to have an apple a day? Fine. Have a handful of blueberries or blackberries, no problem. But the notion of having fruit with every meal and then a couple glasses of orange juice, that creates an issue. We talked about it earlier.

Brad Lemley: Right, okay. We've got another one here which is drink red wine. That I think you'll be able to get some compliance, coffee in moderation and eat dark chocolate. Now, all of these things I'm guessing we're talking about moderation. And tea I guess is perhaps the only one of this list of beverages that is not necessarily required to be consumed in moderation. Is that right?

Dr. Perlmutter: Well, let's go back first to the coffee, the chocolate and the red wine. So, again, the reason here is that we now understand that polyphenols that are contained in these foods are in and of themselves antioxidants, but in addition that there are some positive effects on the microbiome, on the gut bacteria that are imparted by these polyphenols and these foods themselves so there's a real plus side. I think the operative word here is moderation. We have a tendency, myself included, to think if some is good, more is better. I get that way with exercise and we can overdo things. If a glass of red wine or two for males is good, that doesn't mean four is better.

Brad Lemley: Right.

Dr. Perlmutter: Same thing with the chocolate. A couple of squares of 85 percent or greater chocolate I think is fine. That doesn't mean sucking down three or four other brand — I'm not gonna say but higher in sugar — is necessarily gonna be good for you. Similarly, 8 to 10 cups of coffee in a day is gonna cause you to have diuresis. You'll pee a lot. You'll lose a lot of minerals and it has some cardiostimulatory issues, too, that can lead to rhythm

disturbances. Tea, especially green tea, again we're talking about polyphenols. There is a caffeine issue with lots and lots of tea as there is with coffee so you do have to be — again, moderation is important.

Brad Lemley: Now, on the issue of beverages the fifth recommendation here is to drink filtered water because chlorinated water can have a negative effect on the gut bacteria. Can you talk about that a little bit?

Dr. Perlmutter: Well, the reason that there's chlorine in municipal water supplies, although very minimal, is to keep the lines sterile not only coming from the water source, but even as these lines make their way to your grid and ultimately into your home. The low level of chlorine is put there to keep the bacterial count down, as you will. And as such when you're consuming water like that, you're consuming chlorine that is antibacterial and it's acting like an antibacterial antibiotic, if you will, in your body so not necessarily doing you any good.

Now, I'm not saying that we shouldn't have ways of sterilizing our water. Obviously, we should. If you take water and put it in a container and leave it out for a day or two, much of the chlorine will outgas and so now you have water that doesn't have bacteria in it and then you're able to drink that. Or you pass your water through a filter that does — that is rated for reducing and removing chlorine, install a reverse osmosis system in your home or drink bottled water that is chlorine-free.

Brad Lemley: That's terrific and terrific advice and I'm also a huge fan of No. 6 here, which is intermittent fasting, and I see this becoming more popularly known, and I think it's one of the best things people can do for health. Can you define it for us and maybe tell us a little bit about you — your experience and the optimal way to go about it?

Dr. Perlmutter: Well so fasting means by definition not eating and not consuming calories essentially. And first let's just ask the question who — and it's a rhetorical question. Who ever determined that we have to have three meals a day? Where was that written? And it turns out that as hunter-gatherers, our recent forebears, there was plenty of time when things were not working out so well and we weren't able to have calories throughout the course of the day. So our systems evolved in such a way that we had a great backup plan, and that was that we're able to ultimately turn on our fat stores, utilize our fat stores as a calorie depot in a very efficient way.

Fat is twice the calories gram for gram compared to carbohydrate storage and protein storage. And you sure don't want to be breaking down your protein in your muscles of your arms and legs if you're hunting. That's not gonna do you any good. So the main thing we needed to be able to do is power our bodies as hunter-gatherers and remain smart so power the brain as well, allow us figure out how to find food, track an animal and survive and it worked. I mean, we're here today having this conversation because of the evolution of the human physiology that allows to burn fat.

And when we cut our calories, it is basically a stress on the body. It's a bit of a stress that actually induces good things to happen. We call that process "hormesis" and there's been a lot of work, a lot of research that's been done. One of the pioneers is a Dr. Mark Mattson, M-A-T-T-S-O-N, who is published in a variety of journals showing how calorie restriction and intermittent fasting actually is brain-protective, actually is neuroprotective. It gets to the heart of the energetics of brain cells and what causes brain cells to ultimately die. And we now know that you can write a prescription for a prescription food, a medical food that's available in the pharmacy that's basically turns on this pathway, the same pathway to allow the brain to have fat to metabolize as you would get when you're caloric restricted because it's been shown to improve brain function in people like that.

So I think one of the main things, at least from my perspective as a neurologist, that fasting does is it actually changes the expression of our DNA. It puts our DNA into preservation mode, survival mode. And as far as the brain goes, it causes the body to secrete a chemical called BDNF — that means brain derive neurotrophic factor — which basically is a very protective hormone for the brain, puts the brain into a very highly protected state and even beyond that, enhances the way brain cells connect in the process of forming memory. In other words, it allows your brain to work better and even — get this — causes your brain to grow new brain cells. That's what happens when your body is in a situation of not starvation but in a situation where calories are not abundant. It says, "Hey, we've got to smarten up and we've got to preserve calories and we've got to survive." And all those genes are activated when you fast so it mimics what humans have been experiencing for a couple million years.

Brad Lemley: Now, what's fascinating to me is there have been some people who are critical of a high-fat, low-carb diet and they're quite vocal. And what you hear is there are traditional societies in which people do derive a

significant percentage of their calories from carbohydrates: the Okinawans or the Hadza or the Kuna of Panama. And they look at these traditional — or the Kitava in the Pacific islands — these traditional societies where people, according to the researchers, are eating a relatively high percentage of carbohydrates, anywhere from 70 to 85 percent of their calories from carbs, and yet they seem to be relatively free from the diseases that plague the West. What's your response to those sorts of statements that people make?

Dr. Perlmutter: I think it's a very good question. It doesn't really require a huge debate because when you look at these ancient cultures — you mentioned, I think, the Hadza. And I think when you find in the Hadza is yes, overall their consumption of carbohydrate is high but what are they eating? This is carbohydrate in the form of dense, dense fiber that's high in prebiotics so it's changing their gut bacteria.

Brad Lemley: Exactly.

Dr. Perlmutter: So they're able to do it. They have all kinds of somewhat unique bacteria that you don't find in other cultures, and they also have something called "bacterial diversity" that's far more evident than what we have.

Brad Lemley: Right.

Dr. Perlmutter: So they have what are called "spirochete bacteria" which are extremely rare and typically characterized, seen in diseases like syphilis, not that the type that they have is that exact type. But I think the big thing, especially when dealing — looking at the Hadza as was published in the *Journal of Science* is that there are massive changes in comparing their microbiome to that seen in Western cultures and therein lies the difference. So it isn't to say that we might not be healthier if we in fact ate their diet. But their diet is one that caters to their microbiome. They have far more intense diversity of their gut bacteria in comparison to what we have and this is now, as we say, playing a huge role in their health.

Brad Lemley: Right and these are relatively intact. I remember writing a piece about a researcher who made a distinction between cellular and acellular carbohydrates, in other words, carbohydrates that are so processed they're acellular like sugar and flour, and they're sort of something that would evolutionarily we've never encountered before.

Dr. Perlmutter: Never and yet we see that those calories make up such a huge part of what we consume in Western cultures, bad right off the bat because of their effects on insulin spiking because of the blood sugar spiking but also bad because of how they are dealt with by the gut bacteria, significantly changing the gut bacteria. You know, Americans of all people on the planet have the least diversity of bacteria living within us. So we're least able to be adaptable as opposed to these hunter-gatherer cultures, ancient hunter-gatherer types of individuals. And frankly, we have the technology now to determine what our ancestors' microbiomes looked like. We do have the ability to characterize their microbiome based upon DNA analysis of fossilized fecal material for one and now actually looking at the fossilized plaque in the jaw specimens of our ancestors containing a rich amount of information in terms of the DNA complexion of what that part of the microbiome looked like.

Brad Lemley: Now, I'm really fascinated because here you are, a modern American who presumably takes his own medicine, and do you monitor the diversity of your microbiome and have you been able to get it up to the levels of some of these other societies with the diverse microbiomes?

Dr. Perlmutter: Well, I'd say the answer to that is yes and no. The no is I've not done any specific analysis of my microbiome per se because I frankly don't know what it would mean and I don't think we yet know. We talk about something called "dysbiosis" which means a disruption of the normal array of bacteria being responsible for things like inflammatory disorders, gingivitis, et cetera. But if there's dysbiosis, then what is eubiosis? What is the normal bacteria that we should all have that will code for health? And I don't think anybody has any clue as to what that means because it's not just trying to determine what array of bacteria would be healthy for people. What array of bacteria would be healthy for me based upon my pedigree, based upon my 23,000 genes that I inherited from Mom and Dad because there is this incredibly powerful interplay that goes on between the gut bacteria and my personal genome?

So I think it's all interesting but I think that to take a step back there are tests that can be done, some of which I have done, that don't specifically look at the gut bacteria but look at a downstream marker in terms of the health of the gut bacteria. And these are things that measure, for example, the leakiness of the gut, the permeability

of the gut. So there's a very simple test that we can all take. It's a blood test. It measures something called "LPS" which is initials for lipopolysaccharide and that really shouldn't be elevated in the bloodstream to any significant degree. If it is, it's a marker that your gut bacteria may be perturbed to such a degree that they have allowed leakiness to occur.

But here's what I tell patients who want to be tested. I ask them a series of 20 questions that sort of let me know based upon their answers is there a good likelihood that their gut bacteria are in disarray. So some of these questions are, for example, did your mother take antibiotics when she was pregnant with you? And we'll talk about that in just a little bit. Did she take steroids like prednisone when she pregnant? Were you born by C-section? Were you breastfed for less than a month? When you were a kid, did you have a lot of ear infections and throat infections, in other words, take antibiotics? Did you have ear tubes placed as a kid, tonsils removed?

Have you ever needed steroid medications for more than one week, even those that are for your nose or for breathing? Do you take antibiotics every one or two years? Do you take acid-blocking drugs, so common in Western cultures that we think for indigestion we're supposed to block stomach acid. I mean, these are over the counter. Are you gluten-sensitive? Do you have food allergies? Have you ever been told you have an autoimmune condition? Do you have Type 2 diabetes? You mentioned that earlier. Are you more than 20 pounds overweight? Do you have irritable bowel? Are you depressed? Do you have diarrhea or loose bowel movements at least once a month? Do you require a laxative?

So these are questions that then allow me or the reader of *Brain Maker* to be more inclined to realize that yes, there has been some change in the gut bacteria and you need to rehab it.

Brad Lemley: Right. That's fascinating to me. You know, one of the other things that I really wanted to get, and I know I kept you awhile, but I could talk to you all day is... [laughs]

Dr. Perlmutter: Not a problem.

Brad Lemley: ... what kinds of conditions can be helped? One of the things you talk about in these books, relatively remarkable turnarounds in people's health from various conditions. What have you seen in terms of a specific condition that's been helped through an intervention in this way?

Dr. Perlmutter: So let me answer that question by first indicating what I've seen and what I believe can be helped and then we'll I think to be fair talk about what peer-reviewed science currently, as you and I have this conversation, is confirming can be helped by approaches that deal with the microbiome. So I've seen dramatic improvements in patients who've suffered with obesity or being overweight for years and years despite their attempts and their exercise and dietary changes, dramatic changes in mood, improvements in depression, dramatic changes in people with all sorts of inflammatory bowel conditions, dramatic —it's about the fifth time I've used the term— dramatic changes in children with autism. I've seen individuals have improvements in their cognitive function, in memory, joint pain, skin conditions, dramatic improvements in people with skin conditions by targeting their diet and therefore targeting their gut bacteria.

So where we are in terms of peer reviewed literature, there are a couple of citations dating back to 2010, actually the *British Journal of Nutrition* although they were French researchers, demonstrated significant changes in mood in individuals who were given two species of a probiotic over a 31-day period of time so that's been published, one study. The patients with multiple sclerosis who had dramatic improvements in their symptoms having undergone a process called fecal transplantation, in other words taking fecal material from a healthy individual and putting in their colon — wow — for a brain disorder. That was published in the journal *Gastroenterology* by a Dr. Thomas Borody several years ago. Autism being treated by fecal transplantation — have I seen it? Yes. Has there been any peer reviewed study as yet demonstrating that it's effective? No. But I will say that that study is now underway at the University of Arizona.

So we're right at the beginning. Again, 90 percent of the peer reviewed literature on the microbiome has been published only in the last five years, so we're in the very primordial stages of understanding this very, very empowering organ that lives within us, and we just need to learn how to treat it right.

Brad Lemley: Well, Dr. Perlmutter, that's a terrific place to end this. It's been an absolute pleasure and a joy. I feel like I've learned a great deal even though I'm a huge fan of your books and I've read them all. I've probably heard this in some context but some of this is new and it's all fascinating so thank you very much.

Dr. Perlmutter: Oh, great.

Brad Lemley: And we'll be in touch.

Dr. Perlmutter: Okay. Thanks, Brad. Talk to you later.

Brad Lemley: Thank you.