

TRANSCRIPTS
EPISODES 1-8

BROKEN

BRAIN

HEAL YOUR BODY, HEAL YOUR BRAIN



Dr. Mark Hyman, Host

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BROKEN BRAIN

EPISODE 1

THE BROKEN BRAIN EPIDEMIC / MY STORY

Dr. Mark Hyman:

I want to ask you some questions. How do you feel today? Seriously, how do you feel? Does your mood and energy levels swing up and down? Are you depressed? Do you sleep poorly? Do you feel tired but wired? Do you depend on coffee in the morning just to wake up and maybe a few glasses of wine at night to calm down every day? Do you feel frustrated, because you misplace objects or forget names? Do you suffer from brain fog? Do you find it hard to focus on tasks? Do you feel your energy diminishing as the days go on? If you do, you're not alone. This is how most Americans feel. In fact, I'd say we have an epidemic on our hands.

Psychiatric disorders affect 26% of our adult population. That's over 60 million Americans. Over 20% of children have some type of psychiatric disorder. Over 40 million people have anxiety and more than 20 million people have depression. 1 in 10 Americans takes an antidepressant. The use of antidepressants has tripled in the last decade. Alzheimer's disease will affect 30% and some experts say up to 50% of the people over 85, which is the fastest growing segment of our population, and will affect 106 million people by 2050. Attention deficit hyperactivity disorder, or ADHD, is a label we now give to almost 9% of children between the ages of 8 and 15. Autism rates have increased in children from 3 in 10,000 to 1 in 166 and more. That's an 11-fold increase in the last decade. Learning disabilities affect between 5 and 10% of school-age children.

These statistics are grim and the indirect cost to society, for these brain disorders, are mammoth. They include loss of productivity at school, at home, or in the workplace, accounting for loss of over \$80 billion a year. I call this an epidemic of broken brains. I'm Dr. Mark Hyman. I'm a practicing Functional Medicine Physician. I'm also the director of the Cleveland Clinic Center for Functional Medicine, Founder and Director of The UltraWellness Center, and Chairman of the Board of the Institute for Functional Medicine. I'm also a 10-time *New York Times* best selling author.

Brain health is an important topic and a personal topic for me. I'd like to take you on a journey to help you understand why. You know, 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 patient's charts, and dictate them all flawlessly the end of the day, to barely being able to walk up the stairs and not remembering where I was at the end of a sentence when I got there. It happened almost overnight. It happened, as I realized, because my whole system broke down from a number of insults, that I wasn't aware of; it was pretty startling. To be highly functional, highly capable of operating in the world, to being almost debilitated.

I was really unable to function in any real way and my brain wasn't working. I had trouble remembering things. I had severe ADD. I couldn't focus on anything and had memory issues. Because no one had really figured out what it was, I sort of struggled from doctor to doctor to doctor and I went to see the psychiatrist who wanted to give me antidepressants. I saw that neurologist who wanted to give me other drugs. It was just like a whole series of different doctors and a whole series of different drugs. I realized that I wasn't really depressed, I wasn't really demented, I wasn't really having ADD, that something was wrong and that I needed to figure it out.

I was told I had chronic fatigue syndrome which means nothing other than you're tired and feel lousy all the time. I was told I had depression. I was told I was stressed and was recommended to take anti-anxiety medications. So, I was given antidepressants and anxiety medications, ADD medications, and none of them really helped because I didn't deal with the root cause. I was very frustrated because they gave me all these labels, but they didn't actually tell me what was wrong with me. It was like, I knew that something was real and it wasn't just depression or stress, because I was fine one minute and I wasn't the next minute.

So, when physicians said that to me, when my doctors told me I was depressed or I had ADD or I needed medication or I was anxious, it made me angry, because I felt that I was given these labels, but I was given no road map to get better. I realized that, as physicians, we're trained to actually label people and often tell them it's psychological when it's very physical. Because we don't know what to do and we don't know how to find the answer and we don't know the questions to ask. So, we just assume, well, if you're having all these vague symptoms, it must be in your head. I knew it wasn't. Although it was affecting my head, it wasn't in my head.

Our broken brains cause many problems, such as anxiety, depression, bipolar disease, personality disorders, addictions, obsessive compulsive disorder, attention deficit disorder, autism, Asperger syndrome, learning difficulties, and dyslexia. They take many shapes, including psychotic disorders such as schizophrenia. And all the neurodegenerative disorders of aging, especially Alzheimer's, dementia, and Parkinson's disease.

In Episode One, of the *Broken Brain* docuseries, I brought together some of the world's leading brain and health experts to talk about the increase of broken brain syndrome. Just how bad is this epidemic? Let's find out.

- Dr. Datis Kharrazian: Well, for the most part, when you look at statistics for all types of neurodegenerative diseases, they're all on the rise. We know that all developmental disorders are on the rise. If you look at childhood developmental disorders, I mean, there's some stats that are saying that 1 out of 8 children in the US have some type of developmental delay. Whether it's dyslexia, or autism, or attention deficit, or hyperactivity disorder. So, it's really an epidemic, and it's really growing. And we're not really doing anything to change that.
- Dr. Mark Hyman: In addition, there are brain problems that fall on the lighter side of the broken brain continuum. While many psychiatrists and neurologists wouldn't qualify these problems as treatable diseases, they still cause unnecessary suffering for so many. These problems include chronic stress, lack of focus, poor concentration, brain fog, anger, mood swings, sleep problems, or just feeling a little bit anxious or depressed most of the time.
- Dr. Drew Ramsey: The statistics are grim no matter what way you slice them. In terms of disability, depression is the top cause of disability worldwide. It is going to be, or already is, the top cause of disability in America. When you look at the most common mental health disorders in America, it's been like 40 million Americans have a diagnosis of an anxiety disorder. Then just look at things like... what... there's now 60,000 overdoses in the opioid crisis. There were 40,000 suicides last year. These numbers are growing.
- Dr. Mark Hyman: Have you ever wondered if you had a broken brain? Sometimes it's not obvious and doesn't show up in the form of dementia, ADHD, or depression. Maybe you fear losing your job because you're tired, unfocused, and inattentive and your memory is failing, so you can't properly perform your tasks at work. Do you see your relationships breaking down because you're mentally or emotionally absent or numb? Perhaps you struggle to focus, to help your children with their homework, and guide them through life, but end up feeling as though you aren't living up to your duties as a parent.
- Do you lay awake at night, tormented by the grief and pain of living half a life and then worry about how you'll find a way to wake up early in the morning, just so you can get your kids to school? Do you forget to meet your friends or go to appointments and then you can't figure out how in the world you forgot? These are symptoms of a broken brain that many of us are familiar with.
- Dr. Raphael Kellman: The symptoms of poor brain function, to a great degree, depends on the person. So, for example, if someone had an incredible memory two years ago and now their memory is just average, that's a brain dysfunction, right? If someone now is feeling anxiety that they've never felt before and there's a change, well there's a change in the brain. So, all of these factors have

to be taken into account in a very individualized, personalized way. But in general, you know if your brain is functioning well if you have a sense of vitality and optimism and your cognition is clear. You don't have to be the most brilliant person in the world. You don't have to have a memory that's just amazing.

You just have to feel that everything is falling into groove; that all parts of the brain are focused in the same direction. There's just the right amount of resistance, right amount of stress, and the brain, kind of, is nourished by it; that everything falls into place. The ability to overcome a certain degree of stress in a healthy way. That's the way the brain really should work.

Dr. Mark Hyman:

For so long, we thought the brain was unchangeable. That once our brain starts to break down, we were stuck with it. Even worse, we thought that once the brain started to deteriorate, it was all downhill from there. We now know that this is not true and that our brains are indeed changeable. This is the revolutionary idea of neuroplasticity.

Max Lugavere:

So, neuroplasticity is the ability of the brain to change throughout life. It was once believed that, you know, the human adult brain reached its peak level of performance at around age 25, only to begin sort of a slow decline until death. If you were a person that developed dementia or had a learning disability, there's not a whole lot that you could do to improve the way your brain worked. As of the early 90s, if I recall correctly, we now know that the human brain is able to grow new brain cells in the memory center of the brain throughout life.

This is something that was previously considered impossible. You know, we're able to make new connections; we're able to "rewire the brain" under certain circumstances. You know, this is something that I think is profoundly empowering. That our brains are actually plastic. Neuroplasticity really, what that implies, is that the brain, rather than being like to sort of static thing carved out of stone that we really inherited and couldn't do much to change, is actually more like plastic; it's malleable. The way that we can sort of change the way it functions and manipulate it is through our diets and through our lifestyles. Eating a brain healthy diet really promotes the neuroplasticity of your brain.

You know, neuroplasticity tends to decline with age, but it's not necessarily inevitable. We can really have a positive impact on our brain health and our neuroplasticity at any age and the research really shows this thankfully now. So, you know, again, it's a profoundly important idea. I think, you know, at the end of the day, in real human terms, what that means, is that we're no longer helpless. You know, we no longer have to settle for the brain that we think we have. We can transform our brains, at any age, into our biological best, whatever that means for you, whatever that means for me. It's different for everybody, but at least at this point, we don't have to sit on our hands.

John Mekrut:

Probably 15, 20 years ago, I think most neurologists would have probably concluded, you're born with X and that's sort of what you got until you die. Oh boy, is that not true! Your brain learns and it takes in and gathers new information and learns new tasks and skill, until, literally, the moment you die. It's always ever-changing, always growing, always trying to take care of its best self. It's always in action.

Dr. Mark Hyman:

In your career, you've been focused on brain healing. You wrote a book about brain healing. The question I have is what are the advances in our thinking and practice around brain healing that can help people recover their brain function?

Dr. Norman Doidge:

Sure. Well, the first one is that it's okay for you to say brain healing, because for about four hundred years, the words "brain" and "healing" really weren't used in the same sentence. That's because a neuroscientist, going all the way back to Descartes, always conceived of the brain as some kind of complex machine. He saw it as a hydraulic machine. The discovery of electricity led people to start talking about the brain as though it was hardwired; a hardwired

machine, with circuits. We still talk about circuits. The development of the computer has led people to talk about the brain as though it's a computer and it's a form of computer hardware.

Now, the problem with this machine metaphor is: people forget it's a metaphor. Machines do many glorious things, but they don't grow new parts, they don't change or reorganize themselves, they don't heal. And this metaphor-

Dr. Mark Hyman: I wish my computer healed when it wasn't working.

Dr. Norman Doidge: Yeah. So, this metaphor, basically, gave rise to what I've called the doctrine of the unchanging brain. Clinically, it gave rise to a neurological nihilism, just a belief that when something's broken, there's nothing that can be done. I can't emphasize how powerful that's been, even though we've discovered that the brain is neuroplastic now. In everyday mainstream, clinical practice, people still frequently behave as though it's a machine. So first of all, just attacking, undermining, exposing the impoverished nature of that metaphor has led us to be able to stand back and try new things. So, what have we learned about the brain?

Literally thousands of experiments have now shown that it's a use-it-or-lose-it brain. The circuitry develops and has to be maintained to some degree. We've learned that plasticity, within the brain, is competitive. Meaning that if you develop a certain area for a particular mental function and then you don't use it for a long period of time, other mental functions will start taking over that cortical real estate, if you will, and using it.

Dr. Mark Hyman: To learn how to fix your brain, you're going to have to accept a radically new way of thinking about health. One that most doctors today still struggle to understand. It's the idea that everything is connected. This means everything we do, everything we eat and think, how we sleep and live, can actually change our brain at any given moment. Your entire body, including all of the core systems within it, interact as this single, sophisticated symphony. You are one whole person and all the pieces of your biology and your unique genetic code interact with your environment, to determine how sick or well you are in this moment.

This means your body and mind are connected as well. The body and the mind are a single dynamic bi-directional system. What you do to one has an enormous impact on the other. What you do to your body, you do to your brain. That means it is possible to heal your body and thereby heal your brain. We know that your thoughts, beliefs, your attitudes, traumas, life experiences, directly influence your biology. We know that stress and other psychological factors can have a major impact on your health. We now understand that 95% of all illness is either caused by, or worsened, by stress. What you think can influence how sick or well you are. The mind influences the body. This is known as mind-body medicine, and sadly most physicians do not apply this knowledge in their practices, even though they're aware of it.

They understand that the connection is there, but rather than using the power of the mind to heal, most conventional practitioners feel that people with psychological influences on their health have psychosomatic illness, meaning that their physical symptoms are all in their head. The practice of somatopsychic medicine, or understanding how the body affects the mind, is hardly on the radar. The body directly, and powerfully, influences the brain. That means that nutritional status, hormonal imbalances, food allergies, toxins, digestive, and immune and metabolic imbalances, all influence our mood, our behavior, our attention, and our attitude. You already know about this body-mind connection, even if you've never consciously considered it. Just take a moment to think about how your own body has affected your mind over your lifetime.

Have you ever felt anxious, irritable, jittery, fearful, or even had a panic attack for no apparent reason? Then quickly reached for a can of soda or a chocolate chip muffin and then felt better right away? Why were you so anxious in the first place? Probably because your blood sugar was plummeting and when the blood sugar plummets, your body's programmed to respond as

though it's in a life-threatening situation. Have you ever felt stressed or anxious and then taking a long walk or ridden your bike a few miles, only to feel calm and relaxed afterwards? Ever wonder why this happens? When you are feeling stressed, your body produces adrenaline and cortisol, the stress chemicals that make you feel anxious. When you exercise, you burn those stress chemicals off and your body returns to its normal state. Have you ever felt angry and irritable because you've been deprived of sleep? Have you ever felt happier and that you had fewer health problems after a great night sleep? Can't say enough about eight hours of solid, restful, sleep.

Lea:

I had a life which was one of extreme stress. I have, I think, lifelong high cortisol levels. My main symptom that brought me to Dr. Hyman, was the extreme fatigue, but it did... but there was a certain amount of memory loss going on that I felt was probably connected to whatever was happening to me. Not only do I feel that that has reversed, but because I had... there's been some Alzheimer's in the family, therefore I signed up with the NYU Langone Center, to be part of their... they have an aging and dementia center where you join their brain study. I did that so should I have that particular kind of deterioration, I would have resources to advise me. I thought it was good precaution and so I go yearly to be tested. At one point they told me that I had actually improved.

The change was absolutely in weeks. I mean like, maybe even within a two, three weeks I was feeling much, much better. I have to say that I have tremendous gratitude because it wasn't like I underwent heart surgery or something like that. But on the other hand, I had no life and I was in a really quite bad shape. Dr. Hyman gave me back that life. I'm 68, I work full time, I'm not expecting to retire, and I can do that because I have my health.

Dr. Mark Hyman:

These are basic examples of the body-mind connection that many of us have experienced. But there are so many other things, that occur inside of you, that affect your brain and your mind. So now, let's bring this back to the importance of somatopsychic medicine, something I've experienced the power of, both as a doctor and as a patient. For a number of years, going to doctor after doctor, specialist after specialist, at Columbia, to Harvard, to the all the greatest minds in the country, who I thought specialized in what I have, and I got no answers.

Then one day a nutritionist, at Canyon Ranch, invited me to a lecture by a doctor, Jeffrey Bland, who's a nutritional biochemist, studied with Linus Pauling. I listened to him speak and he painted an entire new view of medicine, an entirely new view of disease. I said to myself, either this guy's crazy or he's a genius and if what he's saying is true, then I owe it to myself, and my patients, to learn about it.

That's when I took a deep dive, first applying everything to myself and incrementally I got better. Peel the layers of what was wrong with me, using the road map of functional medicine, which doesn't really just look at symptoms but looks at causes and understands the body as a whole dynamic integrated system, where everything affects everything, and everything is connected. Because my brain was affected, the problem wasn't my brain; the problem was in my body and all that 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.

This series tells the story, not only of my own healing, but also the stories of numerous experts, and patients, who are able to make miraculous recoveries from a broken brain.

Annie Hopper:

I moved into an office building where my office actually was right next door to the janitor supply room. So, I actually had an adjoining wall with the janitor supply room where they had all the cleaning chemicals for the building. Slowly, over a course of five months I started to get just more sensitive and more sick. I went to a lot of well-meaning practitioners, both in the medical field and alternative practitioners, and I was diagnosed with toxic overload. I started to do

whatever I could to detoxify and clean my system. Yet, unfortunately, even though I did every protocol that was a recommended, I continued to get more sick.

In the beginning, I just became sensitive to perfumes and colognes and things like that. Then it escalated to cleaning products. Then it escalated to chronic pain. Then it escalated to depression. Then, at one point, I couldn't actually walk down my street anymore because if someone was doing their laundry and I was walking outside and walking by someone's laundry fumes, I might go into seizures. It became really difficult to navigate my life because I couldn't actually go anywhere anymore. Illness is a really good motivator. I recognize that, of all the well-meaning physicians and people that I went to for answers, that no one actually had an answer for me. I started to research the brain, because intuitively, I knew that I had some form of brain injury.

Dr. Titus Chiu:

I didn't want to really study medicine because I didn't really agree with the philosophies and the framework of conventional medicine. I didn't want to study in a lab, I studied biology. So, I did what any confused 20-year-old would do, I moved to Japan. It was in Japan, I was teaching English to little kids. One day I was driving home from work, I was on my scooter, and out of nowhere, this lady hit me and it was very traumatic. Like, I flew 10 feet through the air and I ended up breaking three ribs, dislocating my shoulder, I had road rash, and I suffered a mild concussion. But at the time I actually didn't even know that because I didn't know what a concussion was.

I tried everything. You know, I was in chronic pain. I tried conventional medicine. I tried painkillers. I tried physical therapy. Nothing worked. So, I was at a point where I was pretty much giving up hope, because I couldn't do any of the things that I loved doing anymore. Thankfully, at that time, my brother, he was already practicing natural medicine. So, I went home for vacation and before that point, it's just like, you know, you hear natural medicine or functional medicine or chiropractic. You're like, well I was like, I don't really trust those quacks, you know? It's just what we're taught. I came from a family of medical doctors and nurses and so that was the paradigm. But I was at this point where, and it's funny now, because patients come to me all the time, and they're just like, "I'll try anything."

So, I was at that point and I went. After a few treatments with him, and some lifestyle recommendations, you know, dietary changes, supplements, like... my pain was gone. It was like three sessions. Yeah! I was just like blown away. It's in my nature; I'm a curious person. When something happens like that, I want to figure out why. Like, how did that happen, number one, and how can I take this information and share it with others?

Jim Kwik:

I had head trauma, a brain injury, and that left me with learning challenges all through school. All through elementary school, middle school, and high school. So how did that manifest? I couldn't understand things like everybody else did. Teachers would have to repeat themselves four or five times and then I would just have to pretend I understood. I had no focus, I had a very horrible memory; it actually took me an extra three years to learn how to read. So, I grew up with these learning challenges. I remember a few years after that, when I was about nine years old, I overheard one of my teachers talk to another adult, thinking I wasn't paying attention, pointing to me saying, "That's the boy with the broken brain."

That's where I, you know... and when you're a child, that really leaves an impression. So that was my identity growing up.

Dr. Terry Wahls:

I'm an academic internal medicine doc. In 2000, I was diagnosed with relapsing meridian multiple sclerosis. Being an academic doc, I thought I should treat my disease aggressively, so I sought out the best MS center I could find, The Cleveland Clinic. Took the newest drugs and still within three years, my disease had converted to secondary progressive MS.

Dr. Mark Hyman:

Which is not good?

- Dr. Terry Wahls: Which is not good at all, because that means you're going to go steadily downhill; that functions, once lost, are gone forever. So, that is when I took mitoxantrone, a form of chemotherapy. Then I took Tysabri, the new biologic agent in-
- Dr. Mark Hyman: To suppress your immune system?
- Dr. Terry Wahls: To suppress my immune system. I continued to decline. That is when I realized, you know, conventional medicine is not stopping this decline. I was on track to, quite potentially, becoming bedridden by my illness; quite potentially demented by my illness. MS-related pain was a big part of my illness. That was getting more and more difficult to control, so I was worried that refractory pain was going to be a big factor. That's when I went back to reading the medical literature and would discover the ancestral health movement. I would discover vitamins and supplements, I would discover the Institute for Functional Medicine and I would integrate all that into a comprehensive diet and lifestyle program that not only stopped my decline-which was pretty incredible- but to my amazement, and the amazement of my physicians, was associated with a remarkable return of function.
- Dr. Mark Hyman: I'm so grateful to all of my amazing friends, and colleagues, and patients, who've joined forces with me to get this important information out to you. On behalf of all of us, I have a sincere hope that this *Broken Brain* docuseries will bring you the life-altering information you need to take back your health. We know that the information we are sharing can change your life. We love hearing from you and we want to know about your own experiences with brain health. Make sure to let us know how much insight you're getting by leaving a comment and sharing your experiences.
- I want you to ponder these questions: Can lifelong depression be cured? Can children completely recover from autism? Can dementia be reversed? Conventional medical wisdom says no. We don't see many cases in the medical literature where people recover from autism, reverse dementia, or are cured from lifelong depression. But just because psychiatrists and neurologists aren't reporting the dramatic recoveries like these by employing normal methods used to treat these disorders, does not mean that disorders, like these, are not treatable. In conventional approaches, partial relief of symptoms is sometimes possible.
- Conventional medicine often likes to use a pill for every ill. As long as we can name it and blame it, then they can treat it with medication. But really, they're just covering over symptoms temporarily instead of treating the cause. The emphasis on naming diseases is pervasive throughout medicine, not just in psychology and neurology. It is the single biggest obstacle to changing the way we do things and finding the answers to our health problems. Conventional treatment for mental disorders goes like this: You have depression, so you need an antidepressant. You are anxious, so you need an anti-anxiety medication. You have bi-polar disease or mood swings, so you need a mood stabilizer.
- Erika: I was diagnosed with ADD and depression. It was like, oh my God, it was just everything all at once. I had to sort of reassess, and say, "okay, how do I start over again, learn how to be healthy, piece my life together?" I tried to address my health issues, but honestly, most of the doctors that I saw, didn't ... You know, it's the old thing of, they'll take a symptom, and they'll give you a pill for the symptom. They didn't know how to sort of say, "what's the overall picture of this human being." You know? I began to realize, I had to sort this out for myself, because I never got a clear answer. If I went to see a mental health counselor they didn't know anything about weight loss. If I went to see a doctor about weight loss, they didn't know anything about mental health and they would just put me on antidepressants, which they did.
- Dr. Mark Hyman: Institutions gain from this model. The question becomes; why does the healthcare industry separate diseases into specialties? The answer: our medical institutions and our financial reimbursement systems, are founded on outdated ideas of separate diseases and medical specialties. Abandoning these ideas threatens their economic viability and perhaps even their

existence. Our medical training reinforces the illusion of separate body systems by training doctors in specialties and subspecialties. There are doctors for every inch of your body, but very few understand the whole body and how it works is one complete ecosystem.

Dr. Jay Faber:

Medicine, from my perspective, because of some of the changes with HMO's and the insurance industry, has gone to more of an algorithmic approach to taking care of people. Now, when I say that, what exactly do I mean? You come in with a problem with depression, and so I say, "okay, here, try this antidepressant." It doesn't work, so what do we do, "well, here's the next antidepressant on the list." If that doesn't work, "well let's try the third, or the fourth, or the fifth." Maybe after the fourth time it's not working, maybe we switch to a mood stabilizer or something else." So, there's not so much a lot of thinking about what's going on and what's causing this person to feel, or think, the way they are; it's more if something doesn't help, then try the next medication on a list.

In contrast, the functional approach, really asks more deeper, probing, and from my perspective, thinking questions - which most doctors have spent a lot of time learning - and we might as well get the best out of their brains to help people get better.

Dr. Frank Lipman:

The biggest challenge with our medical system, and the way they see brain disorders, is they think brain disorders are separate departments. So, you go to the neurologist or the psychiatrist in his own separate category, in this own separate department in the hospital. You can't separate what's going on in the brain with what's going on in the body. In fact, most of the problems I see that affect us emotionally, psychologically, or in the brain per se, the problem is actually not coming from the brain, the problems often coming from the gut or somewhere else.

So, we have a system where a symptom effects one organ system, and you go to that specialist for that particular organ, when the problem is not originating with that particular organ system. You get given a drug for that particular organ system, but you're not treating the underlying imbalance or dysfunction and ultimately, you're not treating the cause, which is usually not where the problem presents.

Dr. Dale Bredesen:

What has happened is that we are practicing medicine that's a century out-of-date, basically. While things have moved forward in Silicon Valley and things move forward with iPhones and look what you can do today that you couldn't do even 10 or 15 years ago. Medicine is still being practiced an old-fashioned way, where we look for a specific diagnosis. We ask what, what is it? Is it measles? Is it a broken bone? You know, is it rheumatic fever? What is it? Then, for each thing what it is, we get the right prescription, we give them the right thing to do it.

That's not the way physiology works. What we need to do then, is to ask, in 21st century medicine, instead of to ask what it is, to ask why it is; what are all the contributors? So, we need to close, what I call the complexity gap. For example, you have a computer that can fly a plane, for example, you have to match the program with what is required for the plane. With the complexity of what it takes. Now in medicine we have a tremendous gap. We have human organisms that are incredibly complex. They have complex chronic illnesses, like neurodegeneration and what do we ask? Serum sodium, serum potassium, a few things like this. It doesn't come close to addressing it.

Therefore, what do we come away with? The idea that these diseases, that are complex chronic illnesses, are ineluctable, that you can't stop them, you can't see them coming, there's nothing you can do, but that is wrong. If we use larger data sets, if you look further at what is actually driving the problem, we can see this from the laboratory research here are the things that actually drive the problem. Then you can see that, in fact, there are specific contributors and it's virtually never one. It's a combination of contributors that add up to an overall change that leads to a complex chronic illness like one we would call Alzheimer's disease.

- Dr. Mark Hyman: Traditional medicine is a single intervention of drug or treatment?
- Dr. Norman Doidge: Yeah.
- Dr. Mark Hyman: Or a single outcome? You give this drug, you give this therapy, it works for autism. That's failed miserably for everything, including Alzheimer's.
- Dr. Norman Doidge: For many reasons. Yeah.
- Dr. Mark Hyman: So, you're talking about multiple interventions, working on different aspects of brain dysfunction. Whether it's diet and exercise, sleep, light, sound, taste.
- Dr. Norman Doidge: Yeah.
- Dr. Mark Hyman: Movement. All these things are ways of accessing the brain that have really been neglected and almost ignored in conventional medicine.
- Dr. Norman Doidge: Well, I think it's fair to say *ignored* would be a polite way to talk about it, the kinds of dismissals, because it doesn't fit with certain models. One is the machine, or -
- Dr. Mark Hyman: Or randomized controlled trials?
- Dr. Norman Doidge: The issue here is this: that much of modern medicine is taught as though these problems are all linear. Like, one billiard ball hits another, which hits another, which hits another, which hits another. But these systems are not linear systems; they're constantly reciprocally interacting. There is emergent orders, and so on, and so forth. Then, the other thing is we have our genetic variation, but neuroplasticity shows us that our brains all wire up slightly differently, so we're all very different. The idea, I mean, you say you have a brain, but of course, you could easily say in your skull, or 150 different organs. I mean, that would be a more reasonable way of talking about the brain, because there's so many different functional sort of parts and they can all link up and de-link,
- Dr. Mark Hyman: To network?
- Dr. Norman Doidge: Yes, but it's the most dynamic network that we know about.
- Dr. Mark Hyman: Yeah.
- Dr. Norman Doidge: Because it can constantly reformulate itself, so that's another very important point. For all of medicine, of course, but particularly for dealing with something as sophisticated as the brain, which is these linear models are not the appropriate model, you need complexity theory to address these things and you need to understand that every brain injury is different. I mean, two brain injuries have as much in common, for instance, as two bombed-out sites do from 30,000 feet. But, you know, in one city they took out the electrical grid and the harbor, and the other city they took out the residential areas and the financial district. Like, up close, brain injuries are different.
- So, the idea of, let's say we wanted to study an intervention for a brain injury. Not only is the damage different, in other words, two different people in two car accidents are hit in different parts of the head. Neuroplastically, they're wired up, so they perform function in different parts. One person was an alcoholic, does lots of drugs, hasn't exercised for 25 years, has a low IQ, and never completes anything. The other person has none of those things. The same intervention, to put those different people, to put together apples, oranges, figs, rotten figs, pomegranates, together and just say what they all have brain injury, and we're going to do one thing for all these people. I mean that's just a fiction. That's not science.
- Dr. Mark Hyman: How do we find the cause of this epidemic? Are we, as humans, defectively designed? Or is it our toxic environment, our nutrient depleted diet, and unremitting stress affecting our sensitive

brains? Is it the result of imbalances in our body? Are more drugs really the answer or is there a way to address the underlying causes of this epidemic so that we can regain our mental health and live whole, functional, fulfilling lives?

Dr. Todd LePine: So, functional medicine is not a sexy term, but I like to tell patients that it's really about creating health, as opposed to treating disease. Because when patients come to doctors, they come in, usually, with some kind of symptom. I have pain, I'm tired, I'm overweight, I can't remember, whatever. Then, you sort of, you know, say, here, take this pill, try this, see if it works without asking a question. Well, what kinds of things are you doing? Or what kind of things are you not doing that's causing you to go down this path of ill health? Because our bodies are really incredibly designed to have resiliency and we also have health built into it.

Dr. Elizabeth Boham: There was a lot of time, in medical school and right after medical school, where I was really questioning my decision. I was doing a lot of acute care medicine and we weren't really focusing on nutrition and prevention. I was frustrated. I was absolutely frustrated with medicine. Questioning, significantly, what I got myself into. When I found functional medicine, it was great because I could say, okay, I can do this type of medicine. I really appreciate this type of medicine. I see how this type of medicine works and it was that great map, so I could continue to practice medicine, in a way that I felt fulfilled.

Dr. Tom Sult: I like to say to my patients when they ask what is functional medicine, I tell them, "I do what the Lipitor commercial says to do, and that is, after a trial of diet and lifestyle, consider Lipitor." Well, if you do the diet and lifestyle right, you rarely need the Lipitor. Functional medicine is asking a fundamentally different question. In conventional medicine, we're asking "what?" You know, what's the diagnosis? So, once you have the diagnosis, there is sort of a prescribed set of treatments based on algorithms. In functional medicine, we're asking "why?" So, an individual might have heart disease. Okay, so how do you treat heart disease conventionally? Well, you might use some kind of cholesterol lowering medicine. You might send them to a cath lab and they get a stent, or whatever.

But in functional medicine, the question is why do you have heart disease and someone else doesn't. We know that more than half of people with heart disease have normal cholesterol, so clearly it's not just cholesterol. So, asking these why questions gets underneath the symptoms and underneath the conventional diagnosis, to more personalized medicine. One person with heart disease might have a problem with the way they process folic acid, and they have a high homocysteine that causes a problem. Another person might have high inflammatory markers, and so on. Interestingly enough, if you have four people with heart disease, they might all four have different underlying "why's", whereas four people with four different diagnoses might have the same underlying why.

So, it becomes less about the diagnosis, and much more about the individual's relationship with their environment. By environment, I mean their diet, their lifestyle, their thoughts, their beliefs, their community, their purpose, their sense of belonging. All of those things impact our health. So, in thinking about neurological conditions, whether it's autism, Parkinson's, or even MS, or dementias of various kinds, there are clearly many different causes. Trying to ferret out the underlying cause and managing that cause, is really a much more powerful intervention. Sometimes infectious disease can be an underlying cause.

There's evidence that a significant fraction of people with dementia actually have some tick-borne illness. Like Lyme, or Bartonella, or some other tick-borne disease. Treating that can be helpful. Other people have abnormalities of their intracellular metabolism. So, we measure their B12 in their blood, but when we measure markers that tell us how well B12 works inside the cells, it turns out to be abnormal. So, looking broader than just the diagnosis, is often a much more powerful way to intervene.

Dr. Sid Baker:

Now, medical thinking is what I call, name it, blame it, tame it, prescription pad medicine. Patient comes in, says, I have this for a couple of years now. Oh, you have such and such. That disease is the cause of your problem. Right away, that's stupid, because the diseases don't cause the problem; the problem simply needs a name, but the problem is the details. You blame the name for the problem. Like, you come in, and you say, you feel sad. Well, you have depression. Depression is the cause. Now we have a pill for your depression. So, you tame it with a prescription. So, we call it, name it, blame it, tame it, prescription pad medicine. That's my snide way of describing the medicine that I was trained to do, back at Yale, in the 1960's.

Whereas, the functional medicine that I practice now is, we call, principle-based medicine. It's based on a few fundamental principles, really quite simple. They are that everybody is an individual. That's so important. That every living thing on the planet is an individual. I mean, that's the way it was created. If it was God who created it, that was God's design. If evolution created it, that's the way evolution did it. To make everything unique. Then, if that's the case, then your approach has to be toward the individual.

Dr. Mark Hyman:

So, we have a very different way of thinking in functional medicine, which is actually looking at how the body affects the brain. That is really a fundamental insight that I had. Once I started treating patients for their physical problems, their mental problems got better. Their ADD went away, their autism improved, their depression went away, their anxiety went away, their panic attacks went away. I thought, wow, this is something that nobody is talking about. How our body affects our brain. The first thing to do, when you have mental illness, when you have ADD, when you have depression, dementia, any of these things is to start to treat the foundation. There may be psychological issues, there may be trauma and stress, but those things are much easier to deal with once you build the foundation of health.

Our approach to disease, in general, and to brain disorders, is descriptive. So, we say, oh, you have memory loss, you failed these neurocognitive testing; you have these symptoms, you must have dementia. Or, you can't focus, pay attention, and you're distractible and have all these symptoms: that means you have ADD. Our entire diagnostic and statistical manual, which is what's used by psychiatry, is descriptive. It's basically, here's the symptoms you have, here's what you have. But just because you know the name of the disease doesn't mean you know what's causing it. You can have 10 people with depression, or 10 people with autism, or 10 people with dementia and all of them have different reasons for those symptoms. I would say your brain has only so many ways of saying ouch, but there are a lot of things that can hurt it, and if we identify those, we can really help people. So, the fundamental problem with conventional medicine is that we describe disease by symptoms and not causes.

This eight-part docuseries dives deep into some of our biggest brain disorders, including ADHD - or attention deficit disorder, autism, dementia, Alzheimer's, depression, anxiety, MS, and much more. You'll hear from over 50 experts in medicine and brain health who will talk about the root causes of these devastating disorders and discuss a revolutionary new method for treating our broken brains that is based on cutting-edge science and medicine. This method marks a radical departure from classic psychology and neurology and the outdated methods that those fields typically use to treat their patients.

Dr. Daniel Amen:

Food is one of the most important interventions, but whenever we think of people here at Amen Clinics, we always think of people in four circles, so we look at their biology. That's where diet comes in. It's also where the scans come in. Also, if you had a head injury, that comes in there. We look at their psychology, how they think. We look at their social circle, who do you hang with, because people are contagious. You become like the people you spend time with. And there's a spiritual circle, which is why are you on the planet. What is your deepest sense of meaning and purpose?

So, whenever we intervene with someone, we have biological interventions - food, exercise, nutrients. Psychological interventions - learn to not believe every stupid thing you think. Thoughts lie; they lie a lot. There are social interventions - who do you hang out with? Let's assess that. And there's spiritual interventions - why do you care? When we use those four circles, people get better.

Dr. Mark Hyman:

The broken brain docuseries will show you the new landscape of how brain function, mind, mood, and behavior are created by changes in your body and your biology. I want to show you how I use that information, to cure, or dramatically improve the rising tide of broken brains, including conditions like depression, anxiety, bipolar disease, psychosis, attention deficit disorder, autism, dementia, Parkinson's disease, and much more. If you don't have one of these diseases and feel, "fine", that is still less than what you could feel. You should, and can, feel alert, focused, happy, energetic, unstressed, and mentally sharp. That is if you know how to care for your brain.

That is what we will teach you in this docuseries. My goal for all of you to live your life as if you are meant to live it: a life full of energy, vitality, pleasure, and happiness. Brain function is directly influenced by what you eat, by nutritional deficiencies, and allergens, hormonal imbalances, infections, toxins, and stress. In episodes seven and eight, we will go through each of the reasons for a broken brain, to create what I call the 7 Steps to an UltraMind. The solution to this is getting to the root of the problems by explaining how our ancient genes interact with our modern environment to create systemic imbalances that affect our most prized and sensitive organ, our brains.

Dr. Titus Chiu:

We are at the forefront of the evolution of neurology. Like, what is possible with healing in the brain? I am so excited for that. Everybody should be doing these things, because we don't want to wait until someone develops Alzheimer's or dementia, because that's kind of like the end game, right? We want to make sure we catch those things earlier on, but the exciting this is, even if it is end game, there's things we can do to reverse that. So, there's things we can do early on to just make sure we have brain health. Because everyone talks about cardiovascular health, right? We want to make sure that our hearts healthy, so we exercise, we change our diets, and we do all these wonderful things. But the brain, same thing. The brain can respond to those things as well.

There's this radical new field, it's been around in the scientific communities, for a long time, called epigenetics. That just speaks to our ability to take control of our health. That applies to the brain, as well. We can do things like change our diet, we could change the way we think about things, our mindset. We can make changes in lifestyle. We can exercise more. We can connect more with our loved ones. All those things have been proven to actually slow, stop, and even reverse any type of neurodegeneration. Things that are good for the heart are also good for the brain, right? Things such as exercise and diet, lifestyle, specific supplements, stress management. But the brain is unique; not only does it respond and require nutrition to thrive, but it also needs exercise and activation.

Dr. Mark Hyman:

The last 20 years of scientific research in the field of the brain and what makes it happy or sad, anxious or calm, focused or inattentive, remember or forget, has uncovered a few simple underlying factors that explain why things go wrong and how to fix them. But it can take more than 20 years for scientific findings like these to be incorporated into most physicians practices. It may take even longer, since they threaten the very foundation of our scientific paradigm of disease. You don't have to wait another 20 years to take advantage of what we know now. What the last 20 years of scientific research has revealed is that our troubles with mood, behavior, attention and memory don't come from bad luck, or bad parenting, or bad genes, but from imbalances in a few key underlying systems in the body.

Helping people balance these key systems is the foundation of my medical practice. It is what I did to fix my broken brain and it is how I have helped thousands of patients, from all walks of life, achieve a state of health they never dreamed possible.

Roopa:

About two years ago, I had just finished a series of fertility treatments and the last treatment wasn't successful, and I was upset, and decided to go visit my parents in Canada. I lived in India at the time, fully with the intention of going back to India. But after about two weeks, I started getting debilitating anxiety. The anxiety was so bad that I couldn't get out of bed. I would have panic attacks. I would sweat profusely. I was scared for my life. My parents, obviously, were concerned of my state. They took me to a doctor, my local family doctor, and she asked me a series of questions and she prescribed me an anti-anxiety medicine which was Effexor.

Started at a very low dose. Started at .25 milligrams and went up to 225 milligrams. Each day for me was excruciating. I used to beg my parents to do something. It was almost like I was suicidal. I used to go to the doctor on a daily basis, because she kept increasing the dose, but she was only able to increase it every week, or every 10 days. I had no relief. I was lucky one day; I was watching TV and I came across Dr. Mark Hyman's clinic. So, I went online and did some research, and that's it. I don't know what happened, something just hit me and I said, "This is going to help me."

Dr. Mark Hyman:

I witness miracles every day. I want those miracles to occur for you, too. So, join me for the next seven episodes of the *Broken Brain* docuseries and reclaim your health and your brain. 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 that most diseases that impact our brain don't always start in the brain. In fact, in they often start in the gut. This discovery completely changes our understanding of brain health and how to treat brain disorders. We'll show you how optimizing your gut function can actually change your brain. I'll see you there.

BROKEN BRAIN

EPISODE 2

GUT BRAIN CONNECTION: GETTING TO THE ROOT OF A BROKEN 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 an 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 symptomatology 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 (dichlorodiphenyltrichloroethane). 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, CPT 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 unfavorable.

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.

BROKEN BRAIN

EPISODE 3

LOSING OUR MINDS (ALZHEIMER'S, DEMENTIA & MS)

Dr. Mark Hyman: The statistics are grim. 10% of 65-year-olds, 25% of 75-year-olds, and 50% of 85-year-olds will develop dementia or Alzheimer's disease, and the fastest growing segment of our population is the 85-year-olds. Alzheimer's is now the seventh leading cause of death and the most common form of dementia. Dementia is a brain disease that may affect cognitive function, language, attention, memory, personality, and abstract reasoning. In severe forms, peoples' memories disappear. They forget their history, stop talking, and their personality evaporates. A terrifying progressive irreversible process, dementia does not have a good medical treatment except for toxic medications with many side effects that at best may delay entry into a nursing home by a few months. Dementia is a big problem, and it's growing every single day. For so long, we believed that Alzheimer's was a predestined disease or that a diagnosis was a death sentence, but we now know that this is not necessarily the case.

In this Episode, experts will discuss myths, prevention methods, and treatment plans for this devastating disease. I promise, if you watch and read this Episode, you'll leave with a much better understanding of how to protect your brain health. Let's start by talking to Dr. David Perlmutter about the role that our genes play in creating disease. You might be surprised to hear that our genes do not dictate our destiny.

We often thought Alzheimer's as driving a bad car, your parents got Alzheimer's, you had bad genes, and there are genes that predispose you to Alzheimer's. We know that ApoE4 (Apolipoprotein E), which is a gene that is involved in lipid metabolism, has a big impact, and can increase your risk up to 75% if you have a double four gene, but what you're saying is that doesn't necessarily predestine you to getting Alzheimer's.

Dr. David Perlmutter: A very good word. It is a predisposition, not a determinant, meaning that while some people have a higher risk for Alzheimer's by virtue of their genetics, that isn't written in stone. There are plenty of people that carry the ApoE4 gene who do just fine cognitively, and there are plenty of people who don't carry it and end up with full blown Alzheimer's.

Dr. Mark Hyman: There are very few genes that will lead to a specific disorder. There have been 30-something genes identified that relate to obesity, and if you had all of them, your weight gain would only be 22 pounds, right? There are genes connected to Alzheimer's, but they don't predestine you to Alzheimer's, they are risk genes. Now, there are some that are very strong, like the PSEN1 (presenilin) gene, that is linked to early Alzheimer's when you get into your 50s, but that's a different condition. There is later-onset Alzheimer's, which you might be predisposed to by certain genes like ApoE4, but these genes are not going to determine that you get it 100%.

That's the good news. We know now that you can't change your genes, but you can change your gene expression. You can change which genes are turned on or off, and how they affect health or disease. The way we do that is what we call the exposome. The exposome is the sum total of things we're exposed to—primarily our diet, exercise, sleep, stress, environmental toxins, and our gut flora. These are the things that influence our gene expression, and turn them all on or off, up or down every single day, literally minute by minute. We have tremendous capacity to change from being predetermined, which many of us think we are, or being predestined to get something, to actually being able to change that and not have to get those conditions.

Dr. David Perlmutter: I think genetics are important. I probably am at a significantly increased risk for that disease by virtue of the fact that my own father died of Alzheimer's. We really have to get the word out that we may be able to cut our risk in half by adding aerobic exercise on a daily basis, and that not becoming a type 2 diabetic may also cut our risk in half. I think it's critical that the word gets out because no one is talking about it. When you watch the news in the evening, all you see are advertisements for Alzheimer's drugs that do not work. I think the message is to embrace the notion of preventive medicine as it relates to the brain. That's the message everyone has to get.

- Dr. Mark Hyman: Yes, it seems like we've done so much research, billions and billions of dollars of research on Alzheimer's for over 400 published studies on reversal trials on drugs, and 99.6% of them don't work. The ones that work delay progression of Alzheimer's such that you'll spend three months more at home before you go to the nursing home.
- Dr. David Perlmutter: That's right.
- Dr. Mark Hyman: So what you're suggesting is that this is not inevitable, that there's actually a possibility of stopping or preventing the course.
- Dr. David Perlmutter: It is. The cynic in me, and I'll admit it, is that this is the dirty little secret that shouldn't get out. What has to happen is a miracle drug needs to be developed so that it can be monetized. That's how the system works. The idea that our lifestyle choices, which don't cost anything, can prevent the very disease that's costing us \$230 billion a year in this country, that message can't get out.
- Dr. Mark Hyman: It reminds me of a story from Dr. Dale Bredesen, who told me that he got funding for \$2 million to do research on Alzheimer's by using multiple approaches: diet, exercise, sleep, nutritional supplements, and things that help support health. He was told by the institutional review board that reviews the safety and efficacy of studies, that it wasn't okay to use all these inventions because how would you know what worked. Was it safe to actually eat better, exercise, sleep, deal with stress reduction, and take a bunch of supplements? I'm thinking, this is ridiculous.
- Dr. David Perlmutter: It's the type of medicine that you and I have been practicing for years and years. When our Alzheimer's patients stabilize or actually improve and they want to know, "which part of the program do you think is doing it?" and I tell them, "I don't care." It doesn't matter to me, we're only interested in the result, and unfortunately that's not how science in the western world works. We want to know what is that variable, what is that factor, because then it can be monetized.
- Dr. Dale Bredesen: I became interested in the brain when I was a college student and read a book called *Machinery of the Brain* by Dean E. Wooldridge, and I got very excited about the brain and how it worked. I began to be interested in the neuroscience of the brain. How does it actually work? What actually goes wrong? I went to medical school and trained in neurology. In neurology, there are a lot of diseases that we can't do much about, in particular, the neurodegenerative diseases—Alzheimer's, Parkinson's, Lewy body, frontotemporal dementia, progressive supranuclear palsy (PSP), etc., where we have not been successful. You can argue that it's the area of greatest biomedical failure for the successes that we've had in HIV and in cancer. We've not had successes in neurodegeneration, so I went back to the lab after clinical training so that we could understand the mechanisms that actually drive these diseases. Why do people get neurodegeneration?
- Over the years, with the collection of information, we began to see a pattern for what Alzheimer's disease actually is, why specific molecules are involved, and why they actually feed into a specific set of pathways. We realized that Alzheimer's disease is really about a critical balance that has dozens and dozens of different inputs to it, not from what we can see thousands and thousands, but many, many inputs that we had to address. What happened was, when we started look at what are actually the inputs, we tell patients to imagine 36 holes in a roof—you can cover one hole but it doesn't really help you that much. We wanted to be able to address all of the different holes, and when we started doing that, we realized it actually fits in very nicely with what Functional Medicine has been doing in terms of approaches to many different things.
- Dr. Mark Hyman: Scientists now call it Alzheimer's disease, type 3 diabetes. What's the link between Alzheimer's and diabetes? New research shows that insulin resistance is one of the major factors that starts the brain damage cascade, which robs the memory of over half of people heading into their 80s,

leading to the diagnosis of Alzheimer's disease. Here's the bad news and the good news. Eating sugar and refined carbs can cause pre-dementia and also dementia. But, cutting out sugar and refined carbs and adding lots of good fats can prevent and even reverse pre-dementia and early dementia.

More recent studies show that people with type 2 diabetes have a four-fold risk of developing Alzheimer's—that's a 400% increased risk. People with prediabetes or metabolic syndrome have an increased risk of having pre-dementia or mild cognitive impairment. You don't have to have full-blown type 2 diabetes to develop brain damage and memory loss from high insulin levels and insulin resistance.

Max Lugavere:

The type 3 diabetes hypothesis, I think, is really compelling. When you look at the research that's coming out by the day, showing the link between our diets, lifestyles, and brain health, it seems to be a really strong hypothesis.

There are really interesting associations made between blood sugar and brain health. Depending on the marker of brain health that we use, there have been associations made between even slight elevations of blood sugar, both fasting blood sugar and a marker called the A1c, the hemoglobin A1c (HbA1c), which is basically a three-month average of your blood sugar and brain shrinkage. The higher your blood sugar, the smaller your brain. What hasn't really been known up until I think recently is the direction of causality. Do we have smaller brains and that causes us to reach out for more sugary foods, or do more sugary foods actually shrink our brains? There is a lot of research and science tying various dietary patterns that are higher in fat to better brain health.

The Mediterranean diet, for one, is a dietary pattern that's inherently higher in fat—it's rich in extra virgin olive oil, fat cuts of meat, fatty fish, etc., and people from this region tend to have a significantly reduced risk for developing Alzheimer's disease, dementia, and also cardiovascular disease. There have been randomized control trials with hard data showing that when you consume more fat in the form of nuts or extra virgin olive oil, it actually leads to improved brain health outcomes. In terms of cognitive function, this has improved, and similar findings.

We're trying to figure out this direction of causality. Does having a higher blood sugar make our brains work less efficiently? There have been very large trials, which have shown that by improving metabolic health, we can actually significantly delay cognitive decline. When we talk about improving metabolic health, which is a really complex topic, the best way is, without question, to avoid sugar and processed carbohydrates.

Dr. Mark Hyman:

You mentioned sugar and you mentioned sugar in the brain. We talked about Alzheimer's type 3 diabetes and it's such a manifest problem in this country. The average person has 22 teaspoons of sugar a day when the American Heart Association says eat six. For some, it's much more, including children. We eat 152 pounds of sugar and 146 pounds of flour a year—that's a pound of sugar and flour a day for every man, woman, and child in America. How is this impacting the brain and what should we do about it? We're also going to touch on the title of your book, *Grain Brain*, and are grains included in this, or is it just sugar, and should we be eating any grains?

Dr. David Perlmutter:

These are a lot of questions. I'd say, first of all, there are some grains that I think are not necessarily threatening—non-GMO corn, or quinoa, which by definition is not necessarily a grain, but everybody talks about it as if it were. The issues with grain are two-fold. It's their carb content, and the fact that they contain gluten, in my opinion. There are other issues as well, we know that wheat is. Although wheat is not genetically modified in America, it is still sprayed with an herbicide called glyphosate, which is powerfully threatening to the gut bacteria, as the work of Dr. Stephanie Seneff has made very clear to us.

Dr. Mark Hyman:

Roundup.

Dr. David Perlmutter: Roundup, you got it. That's a powerful threat to the microbiome. It has insinuated itself into so many foods, it is the largest global herbicide in terms of its use, 1.35 million metric tons are sprayed on our food and animals' food around the globe threatening the soil microbiome and the microbiome in you and me, and it needs to stop. The World Health Organization has characterized glyphosate, the active ingredient in Roundup, as a probable human carcinogen that was published in the well-respected journal *The Lancet*.

As for sugar, you're right. I want to take a step back a little bit on sugar because as we've learned from one of our mentors Dr. Jeffrey Bland, food is information. It means that the foods we eat are changing the expression of our DNA. That's a heady notion, but the food we eat changes the expression of our DNA from moment to moment. Our DNA has been honed to make us the best we can be over a couple of million years—to make us the most able to respond to changing environments, and to be the smartest, or some might argue these days how smart we really are.

The point is, we have this wonderful relationship with our genome, with our DNA. When I say we got our 23,000 or 22,000, genes from our parents, yeah, but who did they get it from? They've been passed down from generation to generation. Food is information. Suddenly, 200 years ago, we developed the technology to overwhelm this information paradigm with sugar. Now we're sending signals to our DNA, the likes of which it has never seen, and our genome is freaking out and doesn't know what to do with the signals that are coming into the body.

There are many things that we can talk about: diabetes, glycation protein, leakiness of the bowel, and inflammation with reference to sugar, but I think it's good to, every once in a while, take a step back to look at the genetics of what this has done to us. We know that diets higher in sugar enhance that very process that we have to do everything to avoid—inflammation. You're right, the statistics on what we're doing in terms of sugar consumption are overwhelming and what so many people don't recognize is that they're consuming sugar though they don't spoon it out onto their food. A 12 oz. glass of orange juice is nine teaspoons that you didn't even add in, and that's before the croissant or whatever wonderful language it arrived in: because it's a croissant from France, it's gotta be good for me, or the bagel, you name it. More sugar, more carbs, and the problem is that we're in this mindset that fat is what we should've eaten but we stopped eating fat in favor of sugar, and that choice has amplified diabetes, cancer, heart disease, you name it.

The good news is that through books like you've written, fat has been really validated as an integral part of our diet. It's the sugar, it's been the sugar. Like Gary Taubes, Robert Lustig, and Dr. Mark Hyman have talked about, it's the sugar.

Dr. Mark Hyman: It's the sugar stupid, right?

Dr. David Perlmutter: You know, old habits die hard. We have a sweet tooth—it's a survival mechanism.

Dr. Mark Hyman: Of course.

Dr. David Perlmutter: We love our sugar, there's no one who is going to read this who doesn't like sugar. I would eat sugar if it wasn't harmful. What did we do? We said, "Well, sugar's bad, I'll take the diet drink." Now, we look at the data I talked about on diet soda and we're digging the hole even deeper.

Dr. Mark Hyman: The flip side of this, sugar is the driver of a lot of health issues, including Alzheimer's, depression, ADD, autism, and all through the ways that we described. The flip side of that is fat has been exonerated. You wrote a lot about that in your book, and even saturated fat, which still is demonized. I think you talk in your book about ketogenic diets as a strategy for brain health, and we see this being used in treating Alzheimer's, epilepsy, and brain cancer.

Don't think too much insulin affects only older folks' memories. It doesn't just suddenly occur once you're older. Dementia actually begins when you're younger and takes decades to develop and worsen.

Dr. Titus Chiu:

Some early warning signs of Alzheimer's and dementia are forgetfulness, like when you're in an interview on the spot and you don't remember a question that you practiced 30 minutes ago. Or when you walk into a room and you're like, "What? Why did I come into this room? Or where are my keys?" Or even things like just a slowing of overall processing speed, like your thoughts aren't as sharp or as clear as they used to be, or even your movements, your reaction time. You might have issues of balance or coordination. These are all very significant because they're early warning signs for potential neurodegeneration: like Alzheimer's and dementia.

One of my missions is to share with the world why the brain is so important and relevant to everyone. It allows us to think, feel, move, have dreams, and to create. If your brain is not working well, you can experience things like forgetfulness, brain fog or just ... You're not feeling sharp and it's really subjective, so it's hard and if it gets bad enough, you might go to a doctor. They run all the tests, and everything's normal, and they're just like, it's in your head, right? But they were right. It actually is in their head, but not in the sense that they thought because it's the specific neural network, specific areas of the brain when not as strong as they were maybe five to 10 years prior, you can experience those symptoms.

Max Lugavere:

A lot of people consider millennials as the caregivers on deck and that is why millennials should be interested in this topic, but I see millennials as patients on deck because I know, based on my research, that changes begin in the brain decades before the first symptom of memory loss—20 to 30 years by some estimates, and even longer by others. What will ultimately manifest as the clinical presentation of Alzheimer's disease and dementia really is a lifelong cascade of events that builds up in the brain. It's something that young people really should be conscious of their whole lives, the same way that we want to do certain things so that we look better come summer time, and we're at the beach in our bathing suits.

Dr. Mark Hyman:

Cognitive decline and memory loss can be prevented and even reversed. We simply have to optimize brain function and then we can see miracles. I've seen this happen many times in my medical practice.

I first began to realize that dementia was not a fixed problem when I had a patient named Bud come to see me. Bud was about 70 years old, he ran a large corporation of his own family business, and his wife said he was increasingly dysfunctional. He had to stop working, he was highly depressed, and couldn't remember anything. He was told he had dementia, was on a slippery slope to death, and should get his affairs in order. I said, "Well, maybe there's something else going on," and it was really the first case of dementia I'd seen. I said, "Let me try some of the principles based on a theory of how the body actually works."

We started looking for problems. First, he had prediabetes, which no one had diagnosed. We know sugar and prediabetes are linked to dementia. If you're diabetic, you have four times the risk of getting dementia. We also found out he had high levels of mercury. He lived in Pittsburgh, which is a terrible place to live because they coat the streets with coal ash, fertilize the fields with coal ash, and they have all the residue from the steel plants in the environment, which produced a lot of mercury. We also found out he had a number of genetic issues that affected his brain leading to less likelihood of getting rid of mercury, and a higher risk of B vitamin issues, called methylation problems. He also had problems with glutathione, which is detoxification hormones, and also terrible gut issues. For 30 years, his gut was not working properly and he had severe irritable bowel syndrome (IBS).

We addressed all these factors, not just one thing. We addressed his nutrition, the sugar in his diet, we made sure he had adequate levels of B vitamins, and we got rid of the mercury in his body by getting rid of his fillings and getting the mercury out of his system circulation and IV

therapy. We also gave him treatment for his gut and got his gut functioning again. All these things were dynamically interacting and we corrected all of them. It was like Rip Van Winkle—he came back to work, he was functional, happy, and he has memory back. It wasn't 100%, but he was really back into a normal functioning life, and you wouldn't know anything had been wrong if you talked to him.

That case inspired me to really ask the questions: if that's true for one person, could it be true for more? What else could we learn about this pathway that people go on towards dementia, without actually having to give them all these drugs? What's really frightening is, we've spent billions of dollars on over 400 studies on dementia, and really none of them have worked. A couple of studies have had some slight benefit, but what I mean benefit is I mean they delay their entrance into a nursing home by three to six months, which is not really a benefit. We have to completely rethink our approach and that's what's exciting about what we're doing at the Cleveland clinic, what people like Dr. Dale Bredesen are doing to reverse dementia. All these things are really key, and are what we're doing here at The UltraWellness Center to help reverse chronic disease, including dementia.

The underlying causes of Alzheimer's disease begin with too much sugar on the brain. The cycle starts when we overconsume sugar and starch, and don't eat enough good fat, which leads to insulin resistance or prediabetes. This is what I call diabetesity. Diabetesity leads to inflammation, which creates a vicious cycle that wreaks havoc on your brain. If you looked at an autopsy of the brain of a patient with Alzheimer's, you'd see a brain on fire. This inflammation occurs over and over again in every chronic disease, and very dramatically with the aging brain and the overall aging process.

Dr. Daniel Amen: Carbohydrates are really important, they're essential to life, but we call them, smart carbs. These are carbs that are loaded with nutrients and fiber, but low glycemic carbs, which means carbs that don't raise your blood sugar. High blood sugar levels are a terrible predictor of premature aging and Alzheimer's disease. Think colorful carbs, berries, red bell peppers, orange bell peppers, carrots, and kill the sugar before the sugar kills you.

Dr. Dale Bredesen: The reality is, we did not evolve as human beings to have a high simple carbohydrate diet, but we are awash in simple carbohydrates now. There are maybe a number of links between leaky gut and Alzheimer's, but an obvious one, is that with leaky gut, you produce a state of chronic inflammation. Inflammation unquestionably is pro-Alzheimer's. For example, just the activation of NF-kappaB (NF-kB), one of the inflammatory mediators ... Some of the genes that this affects, turn out to be the very ones that cleave the amyloid precursor protein to produce the amyloid, so you are putting yourself in a pro-Alzheimer's state if you have chronic inflammation. Leaky gut is a great way to produce chronic inflammation. You also get fragments of bacteria that actually end up in the brain. You can see them sticking literally at the site of the amyloid plaques.

Dr. Ann Hathaway: I have been working for the last year and a half or so with something called the Bredesen Protocol for reversal of cognitive decline. That's a very intensive program where we work with people with mild cognitive decline, but we also work with people with moderately advanced Alzheimer's disease. It is a very multifactorial project to reverse someone's cognitive decline. The very first thing on the list that we address is diet. We want people to have a low insulin, a low blood sugar, and a low hemoglobin A1c. All those things help reverse cognitive decline.

Alzheimer's has been called prediabetes of the brain. Certainly, if you have diabetes, you're at an increased risk for Alzheimer's disease. When your blood sugar is high, it pumps your insulin high, and insulin is inflammatory. Inflammation is a major factor in cognitive impairment and Alzheimer's disease. Also, high blood sugar causes something called glycation, where the proteins throughout your body, including in your brain, get a sugar molecule added to them. That addition of a sugar molecule to a protein is damaging—that's actual damage to that

particular molecule in your brain. If you picture a loaf of bread baking, when the top of the bread turns that darker brown color, that's glycation. That part of the bread is very hard, right? It's damage, or glycation, and the more that glycation happens in our brain, the more prone we are to neurodegeneration and Alzheimer's disease.

Dr. Mark Hyman:

When I work with patients who are suffering from dementia, I stress that it's important for us to look under the hood to see what dirt and poisons we may find, and then clean up the metabolic, immunological, and biochemical mess. Few topics are as politically and scientifically charged, yet have such enormous implications for our health and our economy. We avoid them, such as the impact of heavy metals and mercury, in particular, on our health. Like nutrition, poisoning with heavy metals such as mercury, and other toxins, and the importance of detoxification is not something we learn about in medical school. We have very few tools to address this toxic exposure, which is contributing to many of the health epidemics we see in today's world. Once we start looking a little deeper, the effects of toxins are not hard to document.

Thankfully though, the human organism has an extraordinary capacity for resiliency, for regeneration, recovery, and renewal. I've seen this over and over, not only in relation to my own mercury toxic brain and its recovery, but also in the recovery of many patients with depression, behavior problems, ADHD, autism, dementia, and Parkinson's disease. Even if you haven't been treated for toxins that you have certainly been exposed to, there is still hope even in extreme cases.

Most toxins are also neurotoxins, and we pretty much ignored their effect or, if we haven't ignored it, we don't do anything about it. We know, for example, that there have been links between various environmental toxins and dementia. We also know very well that environmental toxins are linked to Parkinson's. In fact, conventional doctors all accept this because the data is so strong. We know that farmers have a much higher risk of dementia than the average person because they're exposed to pesticides. We know that if you work in tannery factories that tan leather, you are also exposed to toxic chemicals. We know that all these things are driving brain dysfunction. We have to be very serious about identifying these toxins and helping people eliminate these toxins as a treatment, not just saying, "Oh well, you've been exposed to toxins, tough luck."

I recall a patient who came in with early Parkinson's who was 50 years old, which is very young to get Parkinson's. I listened to her history and story: she grew up in the Bronx, and she had cockroaches and rats crawling all over her in her bed every night, and she had a terrible pest phobia. When she moved to the suburbs in Long Island, she was obsessive about getting the exterminator to come every month inside and out spraying her house and her garden. She was so terrified, she also had a big vat of Clorogene, which is actually a banned pesticide from decades ago, which was in her garage for decades. She was exposed to very high levels of these pesticides and ended up getting Parkinson's. We were able to treat her by helping her body detoxify. When you actually deal with the root causes and then you optimize the body's function with Parkinson's, people can have dramatic improvements in their well-being.

I just talked to a patient today who had Parkinson's and he was exposed at a very young age to all sorts of pesticides. When you're a kid, they used to have the pesticide trucks spraying the neighborhoods, and kids would run through the pesticide fog. He had exposure, occupational exposures, and many, many other exposures. We found he had exposures to organophosphate pesticides in his urine, we found DDE, which has been banned for decades for DDT, and still he had these in his system. We were able to treat him using saunas, mitochondrial nutrients, and things to help him detoxify. Within a few days, he said he was very much improved.

What we see as aging in our culture is really abnormal aging. It's really preclinical disease, or a breakdown of the system of the body. We see people declining and having memory issues as they get older, but that's not normal aging. In fact, we now know that you can maintain a healthy cognitive status well into your 90s and 100s. I have a friend whose dad is 105, still sharp as a tack, and lives by himself. The body's capable of that, the question is why are some people able to do that and others not? It's because of the number of insults, stresses, and toxins that we're all exposed to, as well as poor diet, that affects our brain function dramatically.

When it comes to dementia specifically, and keep in mind this is just an example about how all disease works, many genes have been found to contribute to the condition. Chronic diseases like these are usually multigene disorders. No one gene is responsible, but the interaction between many genes. There are variations and the way these genetic variations interact with the environment can put someone at risk for chronic disease such as dementia. That is why we will never find the gene for Alzheimer's, heart disease, cancer, autism, or depression. There isn't one but many genes that influence our predisposition to certain systemic imbalances, and many others that determine how these systemic imbalances show up in each one of us as a disease.

This is the loaded gun each of us lives with, but we don't have to pull the trigger. It's our environmental influences, our diet, our stress levels, toxic exposures, the amount we exercise, etc., doing that for all of us. Even if we've predisposed to certain illnesses, that doesn't mean we are destined to have them. This is the concept of epigenetics—most people know that you can change your environment to reduce toxins by eating organic food, filtering your water, avoiding mercury containing fish and vaccines, avoiding dental fillings with mercury, and much more. But most people don't think you can change your genes. Well, you can.

In fact, you influence your genes with every bite of food you eat and every thought you think. If you were born with genes that make you predisposed to this or that problem, you can work around them. You can help your genes do a better job and prevent disease or other health problems. You can boost your ability to detoxify by turning on the right genes and turning off the wrong genes. You can help by giving them everything they need to do a good job, such as the right vitamins, minerals, and phytonutrients.

For example, eating two cups of kale or cabbage will supercharge your detox system and the genes that control it. You may have been dealt a certain genetic hand—it is what you do with that hand that determines the course of your life and your health.

Dr. Joe Pizzorno:

A 67-year-old woman, one of the wealthiest women in Canada, was in the early stages of dementia: brain fog, spotty memory, dry skin, trouble sleeping, all these problems going on, and she was very worried. She thought she was basically losing her mind and her life was going away. She came to see me and I tested her, showing super high levels of mercury. I put her on my mercury detox program.

The detox program I used with her is a slow protocol. You can do intravenous (IV) circulation therapy, it goes faster, but some people have side effects from the IVs, I decided on a safer, more natural approach. I gave her a gentle drug called DMSA (dimercaptosuccinic acid), only 250mg every third night, so not often enough to get a toxin from the drug. In addition, I gave her 2.5g of fiber a day, in this case it was PGX (PolyGlycopleX). I gave her 2.5 grams of fiber twice a day to help improve the absorptions of the toxins, and then every day I had her take 500mg of acetylcysteine (NAC).

The reason I gave her NAC is that increases glutathione production in the body. Glutathione is our most important antioxidant for protection from toxins and for getting toxins out of the body. I gave her the fiber so it will absorb the toxins that are being dumped from the gut. I gave her the DMSA because it very effectually binds to mercury and lead, and gets them out of the body both through the urine and through the gut.

So what happened? Six months later, she said, "You know, I'm starting to feel better. My brain's starting to work better." One year later, she said, "Wow, I think I can get over this." A year and a half later, her mercury went from 50, which is super high, to 33.5, which is very low, and all her symptoms were gone. It took a year and a half. People need to realize that when they're damaged by toxins, it takes time to clean up the mess.

First off, you have to get the toxins out, and that can take months. Then, all those enzymes that have been poisoned by the toxins have to be replaced—it takes months to replace and get new enzymes. After that's all done, the body has to repair the damage, and that takes time.

Dr. Mark Hyman: With Functional Medicine, we look upstream. What's the cause? What's the cause of the amyloid? It's not just the genes because genes can be turned on or off, genes can be expressed in different ways depending on the inputs of the environment, diet, lifestyle, and toxins. What is driving the production of all these amyloids in the patients?

Dr. Rudy Tanzi: In rare cases of early-onset familial Alzheimer's where we found those first mutant genes, in maybe one or two percent of all cases, we know that the gene mutations caused a production of a longer version of the amyloid beta protein and is more likely to drive amyloid plaque formation. It's almost like, picture those old chemistry experiments. You have liquid, and then you add something to the liquid and get an instant crystallization—that's called a nucleating event or a seeding event—you seed the crystal.

In the brain, amyloid has to get seeded. Those rare cases of early-onset Alzheimer's, the mutations cause a longer version of that amyloid protein that seeds amyloid more rapidly.

Dr. Mark Hyman: That's like a genetic cause.

Dr. Rudy Tanzi: That's a genetic cause, and it's one or two percent of cases. But that's not happening in 98%, 99% of cases, so you have to ask... I say, based on that, you then have to ask logically, what's seeding this crystallization event, right? What's seeding amyloid when you don't have more of that longer form of amyloid protein like they have in the rare early-onset genetic cases? What we figured out over the last 10 years is that pathogenic microbes, bacteria, yeast, viruses, are maybe doing the seeding of the plaques, where the plaques are actually forming to protect the brain against those microbes.

Dr. Mark Hyman: So what you're saying is really heresy, right?

Dr. Rudy Tanzi: It's pure heresy, yes.

Dr. Mark Hyman: Heresy. One, we know that there's a blood brain barrier that stuff can't get through. Two, we know that the brain is sterile.

Dr. Rudy Tanzi: Of course, yes.

Dr. Mark Hyman: And...

Dr. Rudy Tanzi: Tell the brain that.

Dr. Mark Hyman: Three, you're discovering something radical, which is this idea about a microbiome of the brain and that there's really a trigger. This infection in the brain is subtle but is actually driving this chronic long-term process of inflammation, which is causing the symptoms of Alzheimer's.

Dr. Rudy Tanzi: Well, yes. In essence, what we've figured out is, first of all, the brain is not sterile. If you try to look for bacteria, yeast, and viruses, you do find them in the brain, and when it comes to certain viruses, we see more of them in Alzheimer's brain, and we think that might be a major culprit. We used to believe that the brain didn't have a lymphatic system, right? Now we believe it does. Everything that we believed about the brain: no lymphatic system, completely sterile, wrong, right? And the way the brain accumulates microbes is, yeah, you could have the blood

brain barrier integrity go down, so they come in from the blood. That can happen with age—the blood brain barrier integrity starts to go downhill. In fact, the gut microbiome is what helps to keep that blood brain barrier integrity.

- Dr. Mark Hyman: There's more heresy, right? How the gut flora is affecting the brain.
- Dr. Rudy Tanzi: The gut flora is protecting the brain through the blood brain barrier, and it helps stop inflammation, so more heresy.
- Dr. Mark Hyman: If it's the right gut microbiome.
- Dr. Rudy Tanzi: If it's the gut, right. In fact, in our Alzheimer's mice where they're getting inflammation, downstream of the amyloid, it's a two way street. You start to see that the gut actually starts losing bacteria, like bifida and lactobacillus you get in yogurt and probiotics, so you get this vicious cycle.
- Dr. Mark Hyman: The news is you actually can modify your risk by doing something before you get Alzheimer's. You make a big point of that, where we're often dealing with things after-the-fact, like you said. Like having a heart attack and then treating it, as opposed to going into prevention mode, and you said that it takes 20 years before you get Alzheimer's symptoms, your brain has already started to deteriorate.
- Dr. Rudy Tanzi: We have to back everything up, so what we used to call treating plaques, let's call prevention, because we didn't say you have the disease until you get symptoms. Now, we want to back that up and say that treating plaques is treating the disease. If we have too many plaques early on, and you're perfectly fine, start treating those plaques, just like you treat plaques around the heart so you don't have congestive heart failure later on. If you have HIV, you don't wait for AIDS to get rid of HIV—it's a similar idea. Now, treatment of Alzheimer's is backed up to pre-symptomatic treatment. When you see plaques, that's going to be the future and the FDA needs to play along with us on this, and we're not sure.
- Dr. Mark Hyman: Because of testing or because...
- Dr. Rudy Tanzi: The FDA wants you to use an amyloid drug and make people cognitively better who already have the disease. That's like having someone with congestive heart failure...
- Dr. Mark Hyman: It's hard to already fail.
- Dr. Rudy Tanzi: And say, "Make them better with Lipitor." Alright? As if someone has a two inch tumor and organ failure, and you say, "Make them live longer with a tumor suppressant." The FDA has to get that. That's an ongoing dialogue that we have to have with them. If they make us show that amyloid drugs used 20 years before prevent you from getting to the symptoms, how are we going to do 20, 10, even five-year trials? Who's going to do that? They would cost tens of billions of dollars.
- Dr. Mark Hyman: A billion dollars.
- Dr. Rudy Tanzi: Right. And by the time they're done, say to the pharmaceutical company, "Thanks very much, but now your drug is off-patent too. Thanks for spending 20 million dollars on this new drug, and it's about to go generic because it took this long." So who's going to do it?
- Dr. Mark Hyman: You said that 40% of people over 85 have symptoms of dementia and that's the biggest fastest growing segment of our population. The costs are 200 plus billion dollars and it's only getting worse. It's affecting 50 million people around the world. This is an epidemic.
- Dr. Rudy Tanzi: One in five dollars already of Medicare or Medicaid goes to Alzheimer's.
- Dr. Mark Hyman: Yes, it's more expensive than heart disease and cancer treatment.

- Dr. Rudy Tanzi: 71 million baby boomers within five years. You're looking at three out of five dollars of Medicare or Medicaid going to Alzheimer's.
- Dr. Datis Kharratian: One of the things that happens in a neurodegenerative model, is people don't always develop a neurodegenerative disease like Alzheimer's or dementia. They start to have degeneration in local areas of their brain. Then, as those areas of the brain degenerate, they tend to lose function and most people obviously blame it on aging, but it's really neurodegeneration.
- The most common sign of brain inflammation is really slowness in function in general. If we talk about cognitive function, recall, or mental focusing and concentration, we tend to see it slow down. One of the things people commonly use as the term brain fog, they just can't find the word that they're speaking of. Inflammation: what it does to the brain and to neurons is that it slows down what is called nerve conductance. Nerve conductance is how fast neurons fire from one neuron to the next. When a neuron is inflamed, the speed of nerve conductance goes down, and the most common symptom of neuron inflammation, especially in the frontal lobe, is having a hard time finding words, or feeling like their brain is slow that day.
- Unfortunately, for some people, that becomes an everyday routine-type of event. We've all, I think, experienced having a sluggish brain. There are days when we're not functioning that day or something, those are probably days where there's some degree of excess neuron inflammation that's taking place, or something that's impacting brain bioenergetics. The target site for inflammation isn't really a specific lobe of the brain. There are cells called glial cells, and glial cells are found throughout the entire brain. The goal was to try to dampen the messenger pathways that activate the glial cells. Research is showing us that it's really systemic inflammation, that any inflammation in the body turns on brain inflammation.
- For people that have chronic inflammatory diseases, like irritable bowel syndrome or some type of autoimmune disease, that chronic inflammation releases inflammatory messengers and they actually turn on brain inflammation. When you look at brain inflammation, it's really susceptible to anything that triggers an inflammatory response, whether it's chemical exposures, food reactions and inflammatory disease, or blood sugar elevations (like diabetes). All those things tend to turn on the inflammatory cascade in the brain.
- Dr. Mark Hyman: Remember, genetics load the gun, but the environment, what we eat, what toxins we're exposed to, and our lifestyle is what pulls the trigger.
- You talk in your book about ketogenic diets as a strategy for brain health, and we see this being used in Alzheimer's, epilepsy, and brain cancer.
- Dr. David Perlmutter: That's right.
- Dr. Mark Hyman: Tell us about that flip and also the extreme version, which is eating like 80% fat.
- Dr. David Perlmutter: Well, first I'll say that when *Grain Brain* was written, did I ever take the heat for that, for saying, we should be eating less carbs and more fat. That was back in the ancient times of 2013. The Amazon online comments, "Oh, this is a guy who's gonna kill you." I'm not dead yet, Monty Python, "Not quite dead yet." So I took my lumps and continued to do so, which is good because if you're not an outlier, no one's going to say bad things about you, so that's a good thing.
- Dr. Mark Hyman: The pioneers have arrows in their back.
- Dr. David Perlmutter: Yes. The basics of choosing to power our bodies with fat versus carbohydrates was looked at in the *Journal of Alzheimer's Disease*, the study was published by researchers at the Mayo Clinic and they demonstrated that those individuals who favored a higher fat source for calories for their bodies had about a 44% reduction in risk for dementia as opposed to about an 86%

increased risk for dementia if you chose to go the carb route, eating more healthy carbs, and healthy grains that have, as you say, been debunked.

Taking it to the extreme, when you really restrict your carbs and sugars, and really add in not just dietary fat but other unique types of fat like coconut oil, or even more effectively what is called MCT (medium chain triglyceride oil), you ultimately shift your metabolism to a point where your cells are saying, "You know what? I'm not going to be burning sugar all the time because it's not around." We are flex-fuel organisms—we can burn other things. We can shift and adapt to burning fat, not just dietary fat, but fat that we harvest from our own bellies, or wherever we're storing fat. Through the liver, these free fatty acids are then metabolized into what are called ketone bodies. These ketone bodies are an incredibly efficient power fuel—powerful fuel.

Dr. Mark Hyman: They're a power fuel.

Dr. David Perlmutter: Power fuel. I had better get the .com before you do. The URL powerfuel.com. That said, it's a terrific way to power your brain and pharmaceuticals have known this for a long time to the extent that they actually developed a powdered product years ago that they were marketing, and still are marketing, as a way to power the brain and get results in terms of memory. It turns out that powering your brain with fat is a better way of augmenting brain function, preserving the brain, and preventing brain decline. It's been used therapeutically since the late 1920s to treat epilepsy. In 2005, *The Journal of Neurology* published a powerful article showing incredible improvement in Parkinson's patients by going on what we're describing as a ketogenic diet, a diet that makes ketones, which is more powerful than any medication in terms of reducing the ratings scale that's used to rate how bad Parkinson's patients are doing.

Dr. Mark Hyman: That's amazing.

Dr. David Perlmutter: Just dietary and yet, all that neurologists do generally is treat the symptoms of Parkinson's. I think there's merit to using those drugs, I write the prescriptions, but you have to treat the fire, not just the smoke. We do that in Parkinson's by suggesting things like coenzyme Q10 and NAC, and putting patients on a ketogenic diet. Why? Because it makes sense, but beyond that, it's what the science tells us we should be doing.

Dr. Mark Hyman: It's the most absent for medical care, right? Doctors treating patients with Alzheimer's and Parkinson's never mention diet and never talk about it.

Dr. David Perlmutter: It's true. I'm not going to curse the darkness, but my mission is to light the flame and that is to ... For any people who want this information, that's what this is all about. That's why we do these presentations. For those people who want to learn that there's more out there, I'm here to say there is a lot more out there and there are a few people who are going through the literature, published in the most well-respected peer review journals. What did I just quote? *The Journal of Alzheimer's Disease*. What did *The New England Journal of Medicine* tell us in September of 2013? They made a very simple statement.

Here's the study, with several thousand individuals, they said, "Hello, how are you? We're going to do two tests on you today. We're going to measure your blood sugar, and then we will measure how well your brain is working." They followed these people for about seven years, they came back and they only did one test. How's your brain working? They did an examination of brain function, didn't measure the blood sugar at that examination, and what they found was a dramatic correlation between their original blood sugar and whether or not they became demented. What they found was really quite startling, and that is that even having a blood sugar of 105...

Dr. Mark Hyman: Which is "normal."

- Dr. David Perlmutter: Which is so-called normal, was dramatically associated with risk for dementia. You just put the word normal in quotes because we need to challenge that, and that is not go with what is the “normal” value, but what is optimal. A blood sugar of 100 is...
- Dr. Mark Hyman: Not optimal.
- Dr. David Perlmutter: Not optimal, and yet, go to the doctor, you'll get a pat on the back or who knows where, but they'll say it's fine, you're in the normal range. For people like you and me who are helping to get better information out there, we want optimal range, we want the best information. Blood sugar 85 to 90, for example, that's what you want. You want your A1c not at six because you're still not diabetic, you want your A1c at 5.3 or 5.4, that's ideal, and what's associated with brain preservation. These are things that are based upon sugar versus fat.
- Chris Kresser: A couple of years ago, I had an 86-year-old woman who had a diagnosis of dementia and early-onset Alzheimer's. Her family members brought her in, she was living with her daughter and her daughter's husband, and they had reached the end of their rope. They went through what most patients with Alzheimer's go through, they have a really expensive battery of tests and then the doctors says, "I'm sorry there's nothing we can do, here's a drug, and by the way, that drug has not been proven to even slow the progression of Alzheimer's, much less reverse it, and good luck." Not to...
- Dr. Mark Hyman: Get your affairs in order.
- Chris Kresser: Yes, get your affairs in order and seek out some help for the family members and that's it. These people didn't want to accept that, and understandably, so they were seeking out other approaches and came to see me.
- The first thing I did was I put her on a ketogenic diet, which is what I often do for patients with neurodegenerative disorders. She was eating a pretty standard American diet—a lot of flour and bread. She loved cookies and cakes and things like that. It was difficult for her to make that transition, but since she was living with her family, they made that easier. I got a call from her daughter a couple weeks later saying, "I don't even recognize her, this is like my mom used to be. I haven't seen this person in 10 years," Her memory was better, her short term memory improved, she was able to function in a way that she hadn't been able to, she was able to take care of herself, and this was just by doing a ketogenic diet.
- Then, we started to add some additional cognitive supports and some of the things that we talked about earlier as well as some herbs like ginkgo, bacopa, and ashwagandha, that increased glutathione levels in the brain, are neuroprotective, and can actually reverse amyloid, and get rid of some amyloid formation, and then she started to improve further. She was already fairly far along in the progression. She didn't recover completely but she's still doing well years later, she's still doing that program and she hasn't progressed any further.
- Dr. Mark Hyman: Which is unheard of.
- Chris Kresser: Unheard of.
- Dr. Ann Hathaway: We want people to be at least part of the day in ketosis. What that means is that your body is burning a lot of fat, right? We move people from a good diet or a terrible diet, to a diet that's high in low carb vegetables, no grains in general, or very, very low grains, no sugar, low fruit, high in certain kinds of fats, the beneficial fats.
- What are the beneficial fats? Obviously olive oil, avocado oil, avocados, high-quality nuts and seeds, even high-quality animal protein in moderate amounts, chicken, fish, lamb, etc., is an important part of the diet, eggs too. In most people, we're really increasing the fat content in their diet. We often add something called medium-chain triglycerides (MCTs), one to two tablespoons a day to their diet because MCTs help them get into and stay in ketosis. MCTs are

absorbed really easily from the gastrointestinal tract into our bodies, and also our mitochondria, which can either burn a molecule of sugar, or a molecule of fat, right? They will suck up these MCTs easily and burn them very efficiently for fuel. So a paleo high-vegetable, high-fat, ketogenic diet is where we go with diet.

Exercise: people have to exercise every day. We will accept six days a week, but we tell them every day, right? It's vigorous, they have to do either interval training, or some kind of vigorous exercise and we also highly recommend that they do strength core training so that you don't get injured doing your intensive kind of workout.

Dr. Daniel Amen: Low blood flow is the number one predictor of Alzheimer's disease. If you have symptoms like hypertension, heart disease, or erectile dysfunction, and you're not exercising, that's a predictor of trouble. Ginkgo and vinpocetine are two supplements I like a lot. Also, eating things like beets can be really helpful.

Dr. Wendy Suzuki: Exercise does really profound things to the brain. I think one of the secrets of exercise is that it is affecting so many different systems. It affects heart rate and blood flow, it affects oxygen levels and one of the things that we know that is really key is that it affects the levels of growth factors that are, in particular, very important parts of the brain.

Two key parts of the brain are: an area critical for long-term memory called the hippocampus, we know that there's increase growth factors there.

The second key brain area important for focusing and shifting your attention, that is the prefrontal cortex. There are many different effects, and I have to say that I don't think we understand the full range of all the different physiological changes that happen in our brain with exercise—causing things like changes in your transmitter levels, that improve your mood, and changes in these growth factors that actually improve the function of both long term memory as well as attention.

One of the most exciting findings in recent neuroscience research is finding that if you give rats access to a running wheel, you can show that they are running significantly more than their brothers and sisters that don't have the running wheel. What happens is you stimulate the birth of brand new brain cells. These are adult rats, and brand new brain cells are born in the hippocampus, a key area important for long term memory.

In those rats that have access to the running wheel, they not only have more hippocampal brain cells, but they actually learn and remember better than those brothers and sisters that are in the cage with no running wheel. They are essentially strengthening the function of the hippocampus, which is to allow you to form and retain your long term memories for facts and events. There's some evidence in humans that this is the case as well. This has actually been demonstrated much more clearly and more extensively in rodents, but my studies looking at the effects of aerobic exercise in healthy young adults are starting to show the first evidence that recognition memory, that is memory that allows you to say, "Yes, I've seen you before," or "I haven't seen you before," is actually significantly improved after three months of increased aerobic exercise.

Max Lugavere: Exercise is one of those things. The body of evidence right now is so strong that your average neurologist really should write exercise on a prescription pad before he writes anything else. It's unlike any drug that's on the market. Exercise actually has a disease-modifying ability. It can slow the progression of many of these neurodegenerative diseases that we're talking about.

I like to incorporate movement into nearly everything I'm doing. In general, I like to keep my workouts either low and slow, or hard and fast—none of this middle ground stuff, which doesn't really accomplish anything very well, in my opinion. I like to just move more and do aerobic exercise throughout the day, whether it's taking the stairs instead of using the elevator,

biking to work, or walking around more. Just walking was shown recently in a trial, a randomized control trial, to improve cognitive function and vascular risk factors in people with vascular dementia. Walking is truly medicine, and it's very simple and something that we can all do.

At the other end of the spectrum, I'm obsessed with high-intensity interval training—exercise that really pushes your body to the limits. That limit is going to be different for me than it is for you. Everybody has a different threshold of what constitutes high intensity, but whatever that means for you, you really want to make sure that you're pushing your body to that threshold. When you workout at that level of intensity where you can really only sustain 20, 30, maybe 40 seconds of exercise, you're literally sending a text message to your genome to adapt, to cause your cells to adapt and grow stronger, and that's not something that we get with a lower intensity exercise. That adaptation, that stress response occurs both in our muscles and in our brains, so high-intensity exercise is profoundly important.

Dr. Ann Hathaway: By the way, these are things that if people take them on early, I think they're very preventative of cognitive impairment, so it's good to know early on if you're ApoE4 carrier and are at increased risk. I test every single patient who comes through my door for ApoE4.

Dr. Dale Bredesen: We recommend, just as everyone should get a colonoscopy when they turn 50, everyone should get a cognoscopy when they turn 45 or over. If you're 55, 60, whatever, check out where you stand. You can do this with genetic testing, blood testing, functional testing, and if you're already symptomatic, then include imaging in that, but if you're not, you don't necessarily need to include the imaging. You should know where you stand, and definitely, if you have one copy of ApoE4, you have an increased risk for Alzheimer's disease over someone who has zero copies. If you have two copies, of course, that's increased further, and it's very likely that you will develop it during your lifetime.

The reality is, Alzheimer's disease should be a rare illness because if everyone simply checked ahead of time, and got on the appropriate program, we would not see such a high incidence of Alzheimer's disease. We do recommend that anyone, especially people who know that they're ApoE4 positive or have a family history of Alzheimer's disease, get their cognoscopy, get checked out, and get on an appropriate program that will minimize your risk for developing full-blown Alzheimer's disease.

Dr. Ann Hathaway: If I were going to be advising on preventing cognitive decline, or to optimize your own cognitive function for as long as possible, I would say that it's very important to eat well and to lower your stress. What are all the things that lower stress? Make sure you have a good support system in your life, have a good social life, get out in the world and do things that you enjoy, and do stress reduction techniques whenever you need to. If you're in a terrible situation at your job, get out of it, if at all possible, right? These are obvious things.

Dr. Mark Hyman: You've found all kinds of extraordinary things that actually help to optimize, heal, and renew the brain, and also prevent problems down the road. Can you tell us a little bit about that research?

Dr. Rudy Tanzi: Yes, we did a clinical trial where you had 30 people learning to meditate, 30 expert meditators who were teaching them, and then another 30 people who were just staying at the same resort having fun, but eating the same food. So we had a control for the diet, right?

Dr. Mark Hyman: Yes.

Dr. Rudy Tanzi: What we found was that the folks who were learning to meditate had changes in the right direction for genes involved with inflammation. We looked at the whole expression of all the genes and the genome. We built maps, and they were very different from the meditation group

versus the resort group. In both cases, the resort was good for you, you saw nice changes in genes involved with inflammation.

Dr. Mark Hyman: So having a vacation is good.

Dr. Rudy Tanzi: Yes, a vacation is good, but meditation is much better. With meditation, you saw changes in the anti-aging enzyme, telomerase, which grows the ends of your chromosomes that keep your cells dividing longer. There's a 40% increase in telomerase activity in expert meditators who are meditating intensively all week. There were changes in the genes that are involved with Alzheimer's and how amyloid protein is cleared from the brain, that were also in the right direction. When I looked at all the data, if I was writing a science fiction novel, where you had to write about the future and the effects of meditation, I would not have gone as far as the results that I saw.

Dr. Mark Hyman: It's pretty amazing. Even in the novice meditators, it's not like you have to be in a cave in Tibet for 20 years to see these changes, the changes happen within days or weeks.

Dr. Rudy Tanzi: This is one week.

Dr. Mark Hyman: One week.

Dr. Rudy Tanzi: This is all in one week.

Dr. Mark Hyman: Yes, that's extraordinary. I found personally that applying it in my practice, and in myself, it's just extraordinary in how it works in the brain and reduces anxiety, helps with sleep, and improves mood.

Dr. Rudy Tanzi: Stress affects your microbiome, which then affects your brain, which then affects your gut microbiome, and stress ties into sleep. You're stressed out, so you can't sleep and then because you can't sleep, you get stressed and because you're stressed, you eat junk food, and comfort foods.

Dr. Mark Hyman: Sounds like a prescription for Alzheimer's.

Dr. Rudy Tanzi: Yes.

Dr. Daniel Amen: As humans, we're a social species, we're not polar bears. Polar bears do just fine by themselves. That's not us—the more isolated we are, it's actually one of the risk factors for Alzheimer's disease. When we're together, we have to work our brains. Like, what's she thinking? What am I going to do? There's that dance that goes on, and we also get feedback on how we're doing and whether or not our thoughts are helpful, rational, and so on. But, who you're connected to really does matter. The longest longevity study ever done found the health habits of the people you spent time with was as good a predictor as anything else as to how long you would live. I always tell people, you want to be healthy? Find the healthiest person you can stand, and then spend as much time around him or her as possible.

We know that if you have depression in females, it doubles their risk of Alzheimer's disease, so the chronic stress hormones associated with depression, with negativity, sadness, and tearfulness can actually damage some of the circuits in your brain. If you're a guy and you have depression, you have four times the risk of Alzheimer's disease. Some people actually think it's a precursor to dementia. The quality of your thoughts really matter.

We did a study here on appreciation. I scanned a psychologist who was writing a book called *The Power of Appreciation*, and she focused on what she loved about her life. Her brain looked awesome. I tell her, you have to do the opposite so that we can compare. I had her think about what she was afraid of, what was negative in her life, and it completely deactivated her frontal lobes, the judgment center of her brain, which is where Alzheimer's disease starts, and it her cerebellum dropped out, which is the processor in the brain.

- Dr. Ann Hathaway: Sleep is very important. People need to get eight hours of sleep. If they're not getting good sleep, we need to work very hard to change that. We make sure everyone who comes through our program does not have sleep apnea. Many, many people who are overweight, of course, have sleep apnea. The sleep apnea that often gets missed is people who are the skinny-sleep-apnea people. Central sleep apnea or just a configuration of their mouth in the back of their throat where they have an upper airway spasm, and unbeknownst to them, are having episodes of low oxygen throughout the night. Those people tend to be tired throughout the day, even though they think they're getting plenty of sleep.
- Dr. Daniel Amen: Sleep apnea triples the risk of Alzheimer's disease. On scans, your brain looks like you have Alzheimer's disease because your brain is the most oxygen-hungry organ in the body.
- Max Lugavere: Attaining an optimal brain is not just about diet either—it's about making sure that you're sleeping well. I'm not just talking about getting more sleep, I'm talking about higher quality sleep. We really want to cut down our use of smart phones and technology at night because the blue light from those devices, whether we perceive blue light or not, tells our brains that it's day time. Our brains are operating on operating system 1.0, and when we're looking at bright light, whether it's from our TV screens, smart phones, or laptops, it sends a signal to our brains that it's daytime, and our brains don't want to wind down when it's daytime. Our brains want to forage for food and procure a safer environment for our tribe. Making sure that we're sleeping better, I think, is really important because many of the brain's custodial efforts occur while we're sleeping.
- Dr. Ann Hathaway: Those are the four important lifestyle premises: diet, exercise, stress, and sleep. After that, we go into the biomarkers. There's a huge battery of blood and urine testing that we do on folks who are coming through this protocol. We look at lots of inflammatory markers and infectious markers. Are they carrying one of the herpes viruses? Are they carrying Lyme disease? Are they carrying the Lyme co-infections? Do they suffer from mold biotoxin illness?
- Dr. Dale Bredesen: We've all heard a lot about the gut microbiome, and its importance in various diseases. It is true that the rhino sinal microbiome is also critically important. In fact, neuropathologists have been telling us for many years that whatever causes this pathology of Alzheimer's disease, if you look at the neuropathology of it, looks as if it comes from the nose. It is the rhinencephalon, the nose brain, that is typically affected in this illness.
- As I've said over the years, we just don't know what that agent or agents are. In some ways, Alzheimer's disease is the neurosyphilis of the 21st century. If you look at what happened in neurosyphilis, you had a single organism, treponema pallidum, which set up a chronic inflammation in the brain for years and years that led to and could lead to dementia, and frequently did.
- With Alzheimer's, it's different. What we see as Alzheimer's the amyloid, the tau, the changes pathology, are the result of a protective response and that's 180 degrees from what people have claimed. This is a protective response to three fundamental insults and one of them is infection, chronic infection, or inflammation.
- When you look at the brains of Alzheimer's patients, what has been reported? Organisms from the mouth, like *P. gingivalis*, organisms from the lip like herpes simplex virus type 1 (HSV-1), and then various fungi and molds that are actually living in your sinus. In fact, your rhino sinal microbiome is going to turn out to be very important. For example, I'm looking at bio-films, looking at so-called Marcons that actually secrete specific factors that reduce the trophic support to your brain and enhance cognitive decline. This supports the idea that ultimately you want to have an optimized rhino sinal microbiome, which is not terribly surprising from what we're seeing with the gut, of the oral and skin microbiomes. These microbiomes are turning out to be critical for complex chronic illnesses like Alzheimer's disease.

Dr. Ann Hathaway: All those things need to be looked at. If the patient has those symptoms, they need to be treated. If they have a high homocysteine, we need to correct that—their B12 needs to be corrected and their thyroid needs to be optimized. We don't look at the numbers and say, "Okay, are they in the so-called "normal range" on the lab tests?" No, we have a particular optimal range that we're looking for. Is their vitamin D optimal? Are all their B vitamins in an optimal state? Are all their minerals in an optimal state? Do they have heavy metal toxicity? Do they have high mercury? A high lead? High cadmium? If they do, we need to treat it. We need to get rid of it because any of those things can be a cause.

It's important to have a lot of detox foods in your diet. What are detox foods? Well, the cruciferous vegetables are very important detox foods. In fact, all vegetables are important in one way or another for detox. As far as volume, when you look at your plate, we want two thirds of what you put into your body to be vegetables. We want a variety of colors and a variety of types of vegetables, right? We want non-GMO and organic as much as possible, because pesticides and insecticides are potential toxins.

Dr. Mark Hyman: Toxins must be excreted through the body's liver detoxification system. Detoxification happens in two phases, both dependent on different sets of enzymes to do the job. As we now know, the effectiveness of these enzymes you produce depends on the genes that have a code for that type of enzyme. It might be hard to imagine, but nature has given us the ability, the remarkable ability, to detoxify compounds, which were not around at the time humans evolved, such as medications and environmental toxins.

Drugs are metabolized or detoxified by enzymes, which are produced by ancient genes. Some of us are better detoxifiers than others, and have an easier time getting rid of drugs or toxins. Environmental factors interact with susceptible genes to trigger this injury in the brain, and at each point of injury, there are things we can do to stop or reverse the process. Free radicals from toxins lead to oxidative stress, or rusting, which damages our mitochondria, the cell's energy factory. This leads to the overexcitation of cells and inflammation. Ultimately, all this results in cell death and the symptoms we see as mood disorders, behavior problems, as well as Parkinson's and Alzheimer's.

We can use antioxidants, energy boosters, and anti-inflammatory treatments, along with compounds that reduce the overexcitation or cytotoxicity of the brain cells, which leads to cell death. We can protect the brain and prevent, stop, or even reverse this process, and maximizing our body's ability to detox from toxic chemicals is an important part of protecting our brains. What we are discussing here is a different approach to disease, and it's called Functional Medicine. The power of Functional Medicine has transformed the lives of many, including my friend and colleague, Dr. Terry Wahls.

You were in a wheelchair and it was only a one-way street.

Dr. Terry Wahls: In a wheelchair, I couldn't sit up anymore. I was in a zero gravity chair when I was fully reclined, knees higher than my nose. I struggled to walk 10 feet using two walking sticks. I was losing my keys and my phone. I had severe MS pain, was having to go to the pain clinic and take frequent solumedrol to try and control the pain.

Dr. Mark Hyman: Powerful steroids.

Dr. Terry Wahls: Life was very tough. That's where I was in 2007. I was still doing my little tiny workouts, like a 10-minute very simple little stomach curl—if I did 12 minutes, I couldn't function for a day and half, but I could do 10 minutes and go to work. In 2008, after doing my diet and lifestyle protocol, I was able to do a 20-mile bike ride with my family. That's how much transformation had happened in that 12-month period. That, of course, changes how I think about disease and health. It changes the way I practice medicine, and it started me on this new path and ultimately would change the folks at my clinical research.

- Dr. Mark Hyman: Extraordinary. One of the things you discovered was that there's a part of ourselves that's required for energy. By the way, you had terrible energy, that's a classic feature of MS, it's just you're fatigued all the time. You discovered that these little parts of the cells called mitochondria, the energy powerhouse of the cell, were critically important and they are a part of the therapy that you use to treat the mitochondria, through diet and other things. Tell us, why are the mitochondria so important in neurodegenerative disease?
- Dr. Terry Wahls: The mitochondria are the little bacteria that were engulfed by bigger bacteria about a billion and a half years ago, and they were very efficient at converting energy from the food we ate into biochemical energy that our cells use. That would allow cells to become multicellular—to develop organs, tissues, and locomotion. It would let us develop brains, hearts, retinas, etc. The cells that need the most energy, which are brain cells, retina, and heart cells, have 10,000 mitochondria per cell.
- Dr. Mark Hyman: Yes, and the heart I think 17,000, right?
- Dr. Terry Wahls: It's just so critical. If your mitochondria are not working very well, then that organ doesn't work very well. In the brain, that means that you begin to have problems with fatigue, pain, irritability, and cognitive decline. Actually, that's one of the first things I discovered when I'd gone back to start reading the science, was that mitochondria were at the heart of neurodegeneration for Alzheimer's, Parkinson's, ALS, Lou Gehrig's. No one was yet writing about that for MS, but I thought, you know what? I bet it's the same, so I'm going to learn everything I can about what I can do to tune up my mitochondria. That was my initial inventions that I did, which was a variety of vitamins and supplements to support my mitochondria.
- When I was first reading about that, I took this supplement cocktail of creatine, lipoic acid, carnitine, B vitamins, CoQ10, and after about six months, I thought, it's not helping and I'm wasting my money, so I quit and I couldn't get out of bed. I was just completely exhausted, and three days later my spouse comes in, says, "Honey, I think you have to take these again." I took them, and I could get up and function again. That was very interesting to me, so two weeks later I did the same thing, stopped all my supplements, couldn't function, and three days later, I started them and I could function again.
- My conclusion was, you know what? They may not be helping me recover, but they're clearly doing something for my fatigue and that was very energizing, very exciting because this also taught me that the mitochondria are important. My neurologist and my primary care doctor were not telling me stuff like this, so I taught myself by using PubMed and reading the literature, and beginning to do self experimentation. It was very big discovery.
- Dr. Mark Hyman: So great. How do you take care of your mitochondria? The fact that they're responsible for contributing to these symptoms of the neurodegenerative state, and even with things like autism, and many other diseases. The mitochondria may not be the cause, but the damage is a big factor when you have ... So how do you recover your mitochondria?
- Dr. Terry Wahls: There are three things that I think about. The first one is what's a nutritional need for that mitochondria? The mitochondria, if you remember from ninth grade biology, there's the little oval with a lot of squiggles in the middle, and that's the cell membrane. The mitochondria has a lot of cell membrane, which means it has a lot of fat, and you need the right fats—a lot of omega-3 and omega-6 fats to make healthy membranes. You need a lot of B vitamins, essentially the whole B vitamin family to support some of those enzymatic steps, and you need a bunch of minerals like zinc, magnesium as co-factors for a lot of those B vitamins, some sulfur amino acids as well, and antioxidants. There's really important nutrition that you need for those mitochondria.

The next thing you need to think about is why did the mitochondria begin to not function very well? The most common reason is that they've been poisoned by things like heavy metals, lead, mercury, arsenic, pesticides, insecticides, and some plastics and solvents. Poisoning is the most common thing.

Then the third category would be some of the stealth infections where an infectious particle has hijacked the mitochondria and taken it away from manufacturing energy to manufacturing viral particles. Address those three factors and they will go far in restoring that mitochondrial health.

Dr. Mark Hyman: That's so great. I had a patient with MS many years ago, and I found I learned the most from just listening to my patients, more than any textbook. This woman said, "You know, when my gut symptoms get worse, my MS gets worse." I was like, "Oh, that's interesting." I began to work on the gut and people would get better. I'm curious what you think about the role of the gut in MS and also neurodegenerative disease and how it affects the mitochondria.

Dr. Terry Wahls: The evidence about the link between the gut and brain just continues to grow, and grow, and grow. You can go into PubMed.gov and put in microbiota and MS, and there are more papers coming out. You could put in microbiota and autoimmune conditions, and you'll find that there are more and more papers identifying that you have a different mix of bacteria living in your gut if you've got an autoimmune condition, than if you're healthy.

As they eat our food and each other's byproducts, they're secreting compounds that cross over into the blood and then into the blood brain barrier and can increase inflammation. They can shift behavior, they can shift our mood and our cognition. That's clearly having an impact on the brain.

In terms of the mitochondria, one thing that they can do is, I believe, about 25% of our detoxification capabilities are managed by our gut microbiome. If you have a healthy, vigorous microbiome, the health-promoting bacteria, you'll have improved detoxification and you'll have less poisoning of your mitochondria.

Dr. Mark Hyman: Amazing, you had both an autoimmune, and a neurological condition. You still had to tag it from both ways. A lot of the therapies we use in autoimmune disease in this country are problematic, and you talked a lot about how there's a hidden cost to the therapy. Can you tell us more about why physicians are just stuck on that, and not telling the full story that you're telling?

Dr. Terry Wahls: There's a really interesting lecture by George Ebers, an MS researcher out of the United Kingdom in London. He reviews that when we're looking at the development of drugs for MS, there was a big question conference with the MS researchers. What measures should we monitor to decide that an MS drug is useful? It's time to: the diagnosis of secondary progressive, needing a cane, needing a walker, be bedridden, being dead, because those are the things that really drive cost and suffering. In that research meeting, MRI findings and number of relapses, were numbers 18 and 19 on the list of 20. They were not thought to be important.

Dr. Mark Hyman: Because they just assume that these were going to progress.

Dr. Terry Wahls: When you look at the epidemiological literature, number of relapses do not predict time to cane, walker, wheelchair, or death, nor do they predict time to secondary progressive MS. The number of relapses are slight, very slightly protective. MR lesions come and go, and they don't appear to have a very clear relationship to whether or not you are going to become disabled. Are you going to develop secondary progressive? Are you going to need a cane? Are you going to need a wheelchair? Are you going to become bedridden?

You know what? I'm not surprised because what I think is likely going on is that neurodegeneration is probably driven by mitochondria. It's probably driven by nutritional status and nutritional deficiencies. Now, of course, none of that is going to be treated by suppressing the immune cells, because immune cells are trying their hardest to repair my brain, they are

trying their hardest to come in and quiet that inflammation and to begin to remyelinate, so it's interesting when we looked at our studies, we saw that the people who were the least likely to have improvements in gait for the folks on taking disease-modifying drugs.

Dr. Mark Hyman: So the drugs that are supposed to help you actually didn't help you?

Dr. Terry Wahls: They may not be so helpful. You can turn off these acute lesions, yes, you can do that. The drugs are very effective at that, but we don't know if they will really change the time to wheelchair or the time to bedridden.

Dr. Mark Hyman: Yes, and you got from almost bedridden, to riding your bike 20 miles.-

Dr. Terry Wahls: To biking 20 miles.

Dr. Mark Hyman: Remember, these conditions are not a normal part of aging. Taking preventative measures is absolutely key, and even if you're currently dealing with any of these neurodegenerative diseases, I encourage you to dig deeper, and to explore your options. In many cases, there's something that can be done to improve your condition.

Dr. Dale Bredesen: One of the most exciting things is to see people get better, because I was taught that these people don't get better. I thought that I would die still studying transgenic mice and cells in culture and things like that. So, to see people changing their lives has been very exciting.

For example, we had one person who got much, much better and still had three and a half years doing very, very well. He had PET scan proven, ApoE4 positive, repeated neuropsych evaluation, Alzheimer's disease, and has done extremely well. One of the things he said is, "I've allowed myself to talk to my grandchildren about the future once again." He had given up on talking about the future because he knew that the future didn't include him, and he's gone back to doing that.

Another person said that for her husband, the nuances in his guitar playing has come back, which is really exciting to hear. Another person who was going to commit suicide before first being evaluated and treated, has done very, very well and, of course, did not commit suicide. She actually said to her family member after, "Did you know I had Alzheimer's disease?" The family member said, "Well, of course I did. It was obvious from your symptoms, but I didn't want to say anything to you about it." Another person said that it has allowed her to enjoy life again and to get out and do the things that she always enjoyed doing.

Another one said that she went back to playing golf and she was able to remember what everyone was doing and her own strokes on the course. I think it's now a little harder for people to cheat, because she is actually seeing who's doing what on the golf course. We had another young woman who said, "My mother is back and interacting with the family again." These sorts of things are really exciting to hear.

Max Lugavere: If you're like me and you have a parent that has dementia, I think what I've learned is that you really have to be vigilant in your own self-education, learn what you can about the ways in which diet and lifestyle can modulate brain health, and do your best to lead your parents to a healthier lifestyle—a lifestyle that includes more exercise, better sleep, and less stress. Maybe sign them up for a meditation course, go through their kitchen with them, explain to them why certain foods are bad for their brains and why others are really good for their brains.

At the end of the day, and this might seem counterintuitive, I think at a certain point you have to detach because stressing yourself out over what your parent is doing can compromise your own brain health. Again, stress is the enemy of the hippocampus, which is the vulnerable memory processing center of the brain. To use a line that everybody knows, you can lead a horse to water, but you can't make it drink.

Ultimately everybody is going to live the life that they want to live, whether or not they have dementia. I think it's really important to do your best to get your parents on a track that promotes brain health no matter what age. But then also realize that if for whatever reason they don't listen to you, or they don't take as much of a proactive approach as you, that you have to separate yourself. What I found is that it can be really stressful to the caregiver. Again, stress is very damaging and I'm all about that prevention. I think we have to do as much as we can to inform our loved ones, but then there's a certain level at which we have to detach, know that we've done our best, we've given the information, we've been teachers to those that matter in our lives. At the end of the day, people live the way they want to live.

Dr. Mark Hyman: For people reading all this, they're both probably enraged and enthused about what they can do and what's been happening to them. What would be the things you'd wanna say to help them become empowered about their brain? What are the take-homes?

Dr. David Perlmutter: I love the word, empowered. That is, having the knowledge to make change. Let me just say that we live in a world where we are told to live our lives, come what may, and when the shoe drops, and we are given a diagnosis, we hope there's a magic pill. There is no effective treatment for Alzheimer's and yet, Dr. Hyman, it is a preventable disease. That's the message: it's a dietary issue, exercise is fundamentally important for growing new brain cells and staving off Alzheimer's. The diet has to restrict sugars dramatically. I think vitamin D is also critically important. These are things that we're covering in this series. I'm sure that many of your other speakers are going to cover these issues, but the message is embrace this information, and make these changes. Don't wait for a cure because once the diagnosis happens, it happens very, very quickly. The changes happen quickly, and those changes happen far more quickly than there's going to be any pharmaceutical intervention that's going help somebody.

Dr. Mark Hyman: It makes me think of that Leonard Cohen song, "*There ain't no cure for love.*" It's like there ain't no cure for diabetes or anything, for Alzheimer's in a pill—it's all the things that we can do ourselves to change our biology, to affect our brain.

In our next Episode, we'll talk to experts about ADHD and autism. We'll discuss why conventional approaches to these brain disorders are often failing us, and we'll also talk about the root causes of ADHD and autism, and what we can do about them.

BROKEN BRAIN

BROKEN BRAIN

EPISODE 4

ADHD & AUTISM

- Dr. Mark Hyman: Until the late 1960s, the medical community believed that autism was caused by bad mothering. Today, most people and most of the medical community believe that autism is a genetic brain disorder. I'm here to tell you that neither one of these statements is true. Think about it. Rates of autism have skyrocketed over the years. Now, 1 in 68 United States kids has an autism spectrum disorder. Sure, wider criteria for diagnosis and better detection might explain some of it, but not an increase of this magnitude. The real reason we are seeing an increasing rate of autism is simply because autism is a systemic body disorder that affects the brain and the body. A toxic environment triggers certain genes in people susceptible to autism. Researchers have been searching for the one autism gene, or the one location in the brain that is damaged that leads to autism. Looking for these kinds of answers implies that the changes which cause autism, or other brain disorders, are genetically hardwired and therefore treatment is hopeless. These researchers are looking in the wrong place for the source of the problem.
- Dr. Suzanne Goh: Autism has been misunderstood from the time that it was first described in the 1940s. Until now, it's really been misunderstood. It's thought to be primarily psychological and in some parts of the world still thought to be psychological, not neurological. We've come a really long way. We know that it's not due to bad parenting or refrigerator mothers. We know that it's not static. We know that it has a lot to do with the body's biochemistry, which is impacted by the environment. We know that it has to do with the brain's metabolism and that a lot of it can be influenced and changed.
- Dr. Martha Herbert: I see autism as what can be called an emergent property. Underneath the behaviors—autism is defined purely behaviorally—there are things that are going awry. What you see on the surface, like the bubbles on top of the waves in the ocean, are the behaviors. They're the way the brain acts when it has certain kinds of stressors. There are so many different underlying genes, just in the ones which are associated with syndromes in autism that are well over 100 different genes, and the mechanisms don't overlap. What I think of as the behaviors that emerge in autism or in other psychiatric conditions are common pathways in the way the brain acts that you can get at through many different genetic and molecular and systems challenges. It feeds out through the brain waves in certain channels that create behaviors that a psychologist can classify, but the way you get there is many to few: many different kinds of causal things to many fewer kinds of behaviors.
- That's why we can label it, but it doesn't help us to understand how it was caused or what we can do about reducing this severity, or even if people can recover from some of these conditions. If you understand it this way, you understand that we can go in in many places and help a little bit here, a little bit there, a little bit somewhere else and that adds up to the brain system getting some relief and can organize itself with a fuller set of flexible options.
- Dr. Mark Hyman: We must ask ourselves, why do 95 to 100% of autistic children have gastrointestinal dysfunction? Why do 70% of them have immune system abnormalities? Experts who have studied autism spectrum disorders and work with autistic patients have seen time after time that these patients suffer from allergies, toxic exposures, infections, and nutritional deficiencies. But where do problems like these come from, how do they affect the brain, and are they in the brain to begin with? It has long been known that children with autism not only have misfiring and wiring of their brain, but that 95% of autistic children have gastrointestinal problems and swollen bellies. It has also been noted that autistic children have frequent infections and allergies, and have often had multiple courses of antibiotics.
- I do recall a number of my patients who had the same story. One beautiful little 9-year-old girl was violent. She would attack her sister, would get kicked out of class 10 times a day, and if she was on the bus home from school they'd have to stop the bus. She would cut her family out of pictures that she was in—it was just really powerful. She didn't have any gut symptoms and I found that she had this terrible bacterial overgrowth like you mentioned. I treated her gut and

she became sweet, loving, kind, never disrupted school anymore, could ride on the bus home. How many of these kids are struggling who we can impact through these doorways to the brain?

Chris Kresser: I think you raise a great point that all parents should be aware of. The problems in the gut don't always cause obvious gut symptoms. That's tricky because when a parent or doctor sees the behavioral problems, they don't think about the gut automatically. They don't think it could be a gut issue. That's the message that we need to get out there.

Dr. Mark Hyman: They just think it's some troubled kid or some bad kid.

Chris Kresser: Exactly. Consider the fact that the kid spends their whole life thinking there's something wrong with them, they're bad, they don't fit in, and there's some fundamental defect, which is just horrible for their child's development and self-esteem. When they understand that there is actually something physiological that's contributing to and causing this, it doesn't just improve their symptoms. It totally shifts their awareness, self-awareness, self-concept, and can really dramatically change the outcome of their life for that reason.

Dr. Mark Hyman: Most doctors assume that these are annoying but secondary problems, meaning they have nothing to do with why autistic children's brains are not working properly or why their brains are swollen and inflamed, but many experts believe that the opposite is true.

Dr. Martha Herbert: As I came more and more to think of autism as a whole body condition that arises from environmental-nutritional-stress-related conditions, I realized that that's what's going on with everything else too. It's better for us to look at it more generally in the context of an epidemic of chronic illness. Even in autism, there are so many medical conditions and it's not like they have these separate diagnosis: here's the autism, and here's the epilepsy, and here's the irritable bowel syndrome, and here's the rashes. These are all emanations of some kind of underlying set of imbalances, and that's true across the board. Let's look at the underlying imbalances, where they come from, what we can do about it.

In academia or on television, when people talk about the brain, you get a picture of neurons in space. They're firing signals at each other and they're just suspended in space. Actually in the brain, the neurons are outnumbered by glial cells from 4:1 to 10:1 in different parts of the brain. Glial cells do so much of the metabolic work that keeps the brain alive. There are fluids, flows, and all kinds of things—the brain is a living wet organ.

Dr. Mark Hyman: We don't treat autism. We don't treat Alzheimer's. We treat humans who have bodies that are out of balance, and that strategy works to help reverse this brain dysfunction. 95% of autistic kids have gut dysfunction.

Dr. Suzanne Goh: Yes, and maybe more.

Dr. Mark Hyman: Right, maybe more.

Dr. Suzanne Goh: Maybe more.

Dr. Mark Hyman: Maybe all.

Dr. Suzanne Goh: It's hard to imagine that they wouldn't given how the abnormal brain development affects the gut and the bidirectionality of that. I think a basic way to think about the mechanism by which the gut is impacting the brain and autism is that when there is gut inflammation, it impacts the integrity of the intestinal lining. Things enter into the systemic circulation that stimulate inflammation, as well as inflammation in the brain. We know that there's microglial activation.

Dr. Mark Hyman: In other words, the brains of autistic kids are inflamed.

Dr. Suzanne Goh: Right.

- Dr. Mark Hyman: These gut immune and toxicity problems are integrally related to and often the cause of what happens in the brain. The brain and body function as a whole system, and multiple chronic triggers can throw the brain into chaos. Is autism a brain disorder or a systemic disorder that affects the brain?
- Dr. Nancy O'Hara: With autism, I think we look at it as a neurologic or a brain disorder, and for me autism is a brain disorder that happens downstream from several other medical problems. Kids with autism often have immune, gut, and metabolic problems, and those are being missed because we say this child has autism. If we look at the underlying mineral deficiencies, their dietary problems, or their gut problems, we can actually help them to be not just more available for their therapy but possibly recover. There's a great saying, "Genetics loads the gun but environment pulls the trigger." Autism is a genetic susceptibility, but we have to look at all the environmental factors that may be affecting the child's development and act on those.
- I think that all brain disorders, whether it be anxiety, depression, possibly even schizophrenia, are due also to immune disorders. In the womb, the neurological and immune systems are very closely linked. When we have an immune disorder—inflammation, an autoimmune disease, or an immune dysregulation—we can also have neurological dysregulation. We see that with all kinds of brain disorders—if we treat the body, we can help the brain to get better.
- Dr. Robert Melillo: People automatically think that a disorder, especially autism, is genetic. Most people don't really understand what that means and I think they get it wrong in the media a lot. When somebody says that it's genetic when a research study or a paper comes out, the implication is that there's some sort of genetic mutation, that there's something wrong with the DNA, and that it's actually been physically altered in some way. For many years, people believed that the only way you could pass a trait on through different generations was if you literally had a physical alteration of DNA.
- In autism, going back to the 70s I believe, the first study was done looking at twins. They looked at identical and fraternal twins. What they found in that study was there was a very high rate (80% to 90%) of identical twins that had autism as a diagnosis, and there was a much, much lower rate for fraternal twins. This was a very small study, I think there was only 10 or 12 people involved. At that point, the idea was that autism must be genetic because there's such a difference between identical and fraternal twins. There's been about 25 different studies over the years, and all of them kind of correlated that, until a study in 2011 out of Stanford, where they looked at the largest study, which was about 162 different pairs of twins with autism.
- What they found was very different from previous studies. They found that there was actually a higher rate with fraternal twins than there was with identical twins. What they stated in that study was that 60% or more of the factors that contributed to autism were environmental and only about 38% or 40% were actually genetic. This really speaks to the concept of epigenetics, which is what we now know really governs most of what happens, is that there isn't actual physical damage to genes but rather segments of genes are turned off and inhibited usually by different chemicals and molecules in our body, methyl molecules in particular, that basically cover up and prevent those from being read.
- Now, in the old days, before the 1990s when epigenetics started to come out and really in 2000 when a landmark study emerged, we used to believe that during the period of conception, these epigenetic marks that basically cover up our genes and prevent them from being read, can really cause many different types of disorders or issues. We believed that during conception, all of those marks were wiped clean and then a baby would start with a clean genetic slate. We now know that's not the case, that many of those marks, let's say the sins of the parents, can actually be passed on to the children. Different studies have shown that that can go for at least up to 11 generations. In practical terms, what does that mean?

It means that if someone smokes and they have children, it's possible that some of those chemicals may actually block some genes that may not affect the adults who are smoking, but actually may affect the genes of their children and their children's children. 85% of our genes are actually there to build our brain, so the genes that are most commonly affected are the ones that actually have to do with brain development. The good news is there are environmental factors that we can modify gene expression in the womb and even after the child is born, and even into adulthood, or at least we're pretty sure we can so that it's never over. It's never too late but it's also never too early. The way we know it, if somebody has a functional disconnection or a brain imbalance, there are a number of different clues throughout our life. Like I said, most of these start in development. They really start in the womb, or maybe even in preconception.

Vicki Koblinger:

It's interesting. A lot of people think about when they're going to have a baby, the most important thing to them is what is the nursery going to look like. They worry about is it going to be decorated beautifully, are they going to have the right toys to spark their child's neurological development, but they don't think about the womb, which is actually the child's first home. When it comes to neurological and prenatal development as a whole, the most important place you really want to start working is in the womb. That's the child's first exposure and the placenta is not as strong a barrier as we think it is. Many things can cross the placenta. In fact, there was a study done by the Environmental Working Group in 2005, which is one that I talk about in almost every lecture I give.

They took a number of women and checked the cord blood after they gave birth. They found over 280 different toxic chemicals in the cord blood of newborn babies. We think that babies are protected from all of the toxins that we may be exposed to, but this clearly showed us that it's just not true. What happens, what we take in, is absolutely critical for what our children and our babies are exposed to in utero. That can be toxic chemicals, pesticides, BPA, and other endocrine disruptors. Children can also be affected by what they don't get. They can be affected by a lack of vitamin D. We know that there are studies showing that maternal deficiencies of vitamin D actually increased the risk of autism. We know that selenium is linked to depression when there's a deficiency in utero. As I said, vitamin D is another one that's very, very important.

Gluten enteropathy and high sugar diets actually are linked to inflammation. Inflammation is one of the things we're going to talk about a lot today because high levels of inflammation are linked to lots of neurological disorders. When a mom has a high sugar diet that's low in some of the nutrients she needs for development, that's going to impact babies for life. There's a study that looked at famine and its effect on development over time, and what they found was that babies who were born in times of famine, who had poor nutrition, actually had a higher incidence of Alzheimer's and cognitive decline later in life. We see that intake at the very early stages can impact life for decades.

One of the things that we struggle with in the United States is what we call the SAD diet. It's the Standard American Diet, and it is really very sad. It's generally really high in processed foods, especially foods that are grain-based: lots of white flour and sugar. These kinds of diets are what we call pro-inflammatory. Sugar is very pro-inflammatory and one of the things we are learning more and more every day is how much sugar and inflammation are linked to chronic illness, whether it be heart disease or diabetes, but also linked to neurological problems including depression, anxiety, and autism.

Dr. Robert Melillo:

With regards to epigenetics and what can turn genes on and off, almost anything. In my book *Autism: The Scientific Truth*, I identified around 50 different really well-documented, well-researched environmental risk factors that may elevate the risk of a couple having a child with autism or some other developmental issue. We know things like age are a factor. We know things like diabetes, hypertension, and obesity are significant factors. We know stress and how

someone metabolizes or how the stress affects their body is something. We know if they have different vitamin or mineral deficiencies, not enough folic acid, or iron, or things like that are a factor. We know if they have activation of their immune system, so if they have things like a gluten sensitivity or autoimmunity, or if the mother gets a flu virus, we know that that elevates the risk significantly.

The fact is all of these risk factors really do primarily one thing to the body. They contribute to causing inflammation, increasing production of stress hormones and all of those chemicals that are released during the production of stress hormones, or activation of the immune system and inflammatory immune regulators, as they are the ones that primarily interact with genes and can alter them. All of the different factors really do for the most part the same thing. In my experience, one of the biggest risk factors that nobody really talks about is if the adults have imbalances or functional disconnections in their own brain, if there are areas of their brain that haven't been as active, and haven't developed as well as they should, those imbalances create imbalances in their body. Those imbalances in their body are more likely to lead to an activation of their fight-or-flight system and cause inflammation, production of cortisol, all of those different chemicals in their body that may then block the expression of genes in their own children.

There's one study, a really good study out of California, that shows that people and mothers in particular that live near highways and were exposed to pollution, exhaust fumes, mercury, and heavy metals, that the risk of having a child with autism went up significantly. Then there was another study that showed if you live on farms and you're exposed to pesticides and fungicides and things like that, that your risk of having a child with autism goes up dramatically. That's why probably the most important thing is not only looking at your environment, but being able to really understand what's going in your own body and measure those things.

The good news is that almost all of these risk factors are modifiable or avoidable and can be eliminated, but what we need to start thinking more about preconception, more than what we've been doing. Obviously, giving prenatal vitamins and trying to make somebody healthy, but really being more specific and looking at all of these different factors and trying to get them into a good functional range before you get pregnant. If the genes are already turned off in the parents, then when you get pregnant it's already there.

Vicki Koblinger:

People look at prenatal diets and think it should be different than a typical diet. In most cases it should be the same. A prenatal diet should be clean. It should be free of artificial ingredients, such as sweeteners, colorings, and preservatives. It should be rich in organic produce, good sources of pasture-fed proteins or vegetarian sources of protein, some nutrients that, in the past, weren't thought of as especially important for pregnant women, one of which is iron. We now know that iron or low iron in utero can lead to cognitive challenges later in life. We see that there are IQ changes in areas where there's chronic iron deficiency. Selenium and lycopene, lycopene is something that we find in tomatoes, those are actually really helpful for promoting normal mood.

Pregnant women really have to focus on iron. They also need zinc because zinc is very, very important for cell replication, which is obviously critical in that prenatal time. Things like iron and zinc are not found in very high quantities in processed food unless they're supplemented. Again, getting the natural form of the food is really important. Another nutrient that's critical in the prenatal period is folate, and we know that deficiencies of folate can lead to things like neural tube defects. We actually add higher levels of folate to a lot of prenatal supplements and we also fortify that folate in grains, which is not necessarily the area that we really want to promote lots of high intake. The other thing is the form of folate is important, because folic acid is the form that is supplemented. However, there is some research that shows that there are certain genetic mutations that make some women and children less able to move that folate

(folic acid is synthetic and not the active form). The active form is the one your body uses to do its work and is called MTHF.

When you can't process that folate and activate it, it's not as beneficial. For some people, it's much more important to get that active form and make sure that that's the form they're eating or consuming. Supplementation with the active form is actually often more helpful for women who are pregnant than supplementing simply with folic acid. One of the things that you can do to know if you have this defect is to get tested for something called MTHFR. The MTHFR defect may reduce your metabolism and your ability to activate the folic acid. Knowing that in advance can help you effectively support your own folate status.

One of the things that I've seen in my career is an epidemic of chronic illnesses in America's children. In fact I wrote a nutrition chapter for a book called *A Compromised Generation: The Epidemic of Chronic Illness in America's Children*. It's such an important topic for me. I'm also on the board of 2 organizations: the Neurological Health Foundation and Epidemic Answers, and their missions are to help reduce this epidemic of neurological and other chronic diseases in children.

Dr. Mark Hyman:

I've had many, many patients with autism. One comes to mind: a little two or three-year-old boy, who was quite dramatically affected. He had regressive autism. He had a number of insults, antibiotics, infections, and vaccines, and all these things affected his capacity to develop normally. By the way, his mother worked for a large pharma company. They were told by the doctors, "You need occupational therapy. You need behavioral therapy. Good luck. He'll probably end up in an institution, and we're sorry." That message unfortunately is something that parents get all the time and it makes me angry because I know there's so much we can do. Autism is not a brain disorder—t's a disorder that affects the brain.

We now see dramatic amounts of inflammation in these children. We see exposure to toxins. We see all these gut dysfunctions in these kids and dysbiosis we call it, imbalances in the gut flora. All these things drive brain dysfunctions, so by fixing those things, often the brain will recover. They all have stinky, smelly stools, gas, diarrhea, and horrible bowel movements. I saw this one young boy come in and he had terrible gut issues. He had severe nutritional deficiencies, and a lack of B vitamins, folate, B6, and B12. He also had mercury in his body. We were able to fix all these things, one at a time, and he recovered. He went from not being able to speak to being fluent, from being in an autistic class to being a normal kid in mainstream school. Now, he's about 10 years old and he completely lost his diagnosis—he's a happy, normal, well-adjusted kid, and is not even on the spectrum at all.

Vicki Koblinger:

One of the things that's important to remember is that growing babies and children are so much smaller than we are, that the impact of the same dose of some sort of toxin is going to be much greater on them. They're also developing their brains at that time. The same amount that we may be exposed to as adults, is generally more toxic for them. Most studies aren't done in children of that size so when we say something may be safe, we really don't know if it's safe in utero because we really haven't tested it that way. The other thing that we haven't tested is combinations of chemicals. We may test a chemical in isolation, but we don't test the synergy of how a combination of chemicals impacts our children, especially in utero, and that's an area where we really need to err on the side of caution because we really have no idea.

Dr. Sidney Baker:

I was asked to be director at the Gesell Institute, which focused on child development. When I was there, naturally, my patients who belonged to CHCP had to stay there, but some of them would come and ask me questions. One of them said, "My neighbor's kid developed this horrible eczema and she's really suffering from it and the doctors are not sure." I said, "What was the story?" My old patient knew what the story was because she knew me and what my belief system is. She had taken antibiotics for a strep throat and a couple of weeks later she broke out in eczema. She knew the connection between taking antibiotics and the eczema was

something Sid would know about. She asked me if I could just talk to her friend and give her a curbside free consultation. I said, "Of course. It's simple."

I talked to the mom and saw the child for just a few minutes to say, "What you need is a prescription for Nystatin," which is a medicine that kills yeasts or fungi, and it's the growth of the fungi after the penicillin that caused the mischief. The child took it and then a few weeks later, the mom called me and said, "She's all better," and her autism went away. I didn't even know the child was autistic. It wasn't on the menu, but the autism went away like that.

Well that's what made a big impression on me in my development as a physician because at that time, autism was something way out there in terms of different diseases. It was way off campus, so to speak, and it had this strange history of having been blamed on mothers. For years, it was your mother's fault, "You have a cold mother, that's why you have autism." That was being debunked, but during my education at Yale that was the belief system.

- Dr. Mark Hyman: These are just a few stories, but if autism can be reversed or improved in one child, if there's any possibility of an effective treatment or a potential cure, it forces us to ask critical questions: how did this happen? Can it happen in other children? What biological patterns were found and how are they treated? The emotional and financial costs of autism for families and societies is staggering. Now, one in five or 20% of children have some type of neurodevelopmental disorder. If inflammation starts in the belly, and so many autistic children have swollen bellies, then it spreads to the brain, and it can literally lead to a swollen brain—the effects can be disastrous. The take-home message here is that the answer to autism and other neurodevelopmental disorders will not be found in one of these factors but in all of them taken together in varying degrees in each individual. There is no such thing as autism, rather there are autisms—different patterns of biological dysfunction unique to each child that result in multiple insults to the brain, that all manifest with the symptoms we call autism.
- Dr. Suzanne Goh: We do a comprehensive evaluation initially to get a better understanding, because there can be many different factors, many different causes.
- Dr. Mark Hyman: There's no such thing as autism, there are autisms.
- Dr. Suzanne Goh: That's right. It's an umbrella label that we've developed, but actually within that there are so many unique types, and it's important to identify. If you can help identify early on with the right testing, you can target the therapy and be much more successful.
- Dr. Mark Hyman: What are the different types?
- Dr. Suzanne Goh: There are a subset of children for whom epilepsy is one of the main causes of their developmental problems, and therefore the cause of their autism symptoms, their language delay, and maybe cognitive disability. Identifying the epilepsy and treating it properly can lead to dramatic improvements. That's one example. There are some individuals who have difficulty in the stabilization and formation of synapses. They have gene mutations that affect that specific process. There are supplements and medications now available that affect and can help with the process of synapse formation and stabilization. If you identified that you could then target therapies in that way.
- Dr. Mark Hyman: This is going where the rest of medicine is going, which is personalized medicine. There's no such thing as autism, it's a whole series of different insults that can cause the same symptoms.
- Dr. Suzanne Goh: That's right.
- Dr. Mark Hyman: We've been coming out through the symptoms instead of the causes.
- Dr. Suzanne Goh: That's right. Identifying the autism is not the end, it's just the beginning.

- Dr. Mark Hyman: Right. I always say, in medicine we call what we do naming and blaming: we name the disease and we blame it. "The reason for your symptoms is you have autism." It's not the cause, it's just the name of the symptoms.
- Dr. Suzanne Goh: Right.
- Dr. Mark Hyman: Instead, I like to practice what I call thinking and linking. In Functional Medicine, the thinking starts when you make the diagnosis. It doesn't end, and that's a huge shift in our approach in medicine.
- Dr. Suzanne Goh: Isn't that amazing?
- Dr. Mark Hyman: I call it the medicine of why, not what. Not what disease you have and what drug do I get, but why is this happening and how do I deal with that.
- Dr. Suzanne Goh: Yes. I see too often that once the label of autism is given...
- Dr. Mark Hyman: Incurable disease with no real treatment, yes. It's such a discouraging message. Those of us in the front line, you have to believe what you see and not see what you believe. A lot of physicians just see what they believe instead of believing what they see, which is—you've seen it and I've seen it—a case of autism regressing or reversing. Not all the kids get 100% better but they can be functional, they can have better lives, and some get cured—it's really extreme. You're right, the younger you diagnose them, the better it is.
- Dr. Suzanne Goh: Yes.
- Dr. Sidney Baker: Autism is just a label, and a rather weak label. If you trusted things at the grocery store with just a name on it without the fine print, you wouldn't want it. Nowadays people are sophisticated. They say, "Well, let's see what's in here," if they're shopping for something. Just a label doesn't cut it. A few years ago, the word "spectrum" came along—meaning that a person belongs to a collection of people who represent a broad set of different colors, as in the color spectrum. It goes on really in both directions forever. This was very helpful for doctors because they could feel more comfortable with a label where there was a lot of give and take, and a lot of flexibility.
- It was not as good for patients in the sense that when the doctor says, "You have myasthenia gravis," it's bad news but they know what I've got, and so you must know what to do about it. If they say, "You're in a spectrum," you feel kind of lost, like, "What do you mean, I'm in a spectrum?" The fact is that while it's been a blessing because it's an accurate description of reality, and there's this wide range of different manifestations of this problem called autism, it is a little bit troublesome to parents who feel, "Well now, how do we navigate in here?" Of course, coming back to the question of the child being the expert, the navigation is done by paying attention to the details, which I'd like to talk about more as I go along here.
- There's a certain set of rules called the tacks rules. If you're sitting on a tack, it takes a lot of aspirin to make it feel better. The treatment for tack sitting is tack removal. If you have a headache, where is the tack? Do you take the aspirin? Well sure, you can. That's for an acute illness, so I'm not going to quibble about that. For a chronic illness, it's a different landscape. There's something chronically wrong with you and tack removal is better than taking the aspirin. I'm not saying that drugs don't work. I have to leave here and go see the aunt of a boy who's been taking a medicine called Galantamine for Alzheimer's disease—he's an autistic boy. Galantamine has to do with blocking or the disappearance of a certain brain chemical.
- I tried all kinds of things for him years ago and it was the one thing that made a big difference, even though he's taking close to three times the adult dose, but it didn't hurt him at all. Now I'm interested because he's gotten so much better, maybe he doesn't need it anymore, so we can take it away. In general, we're trying to find something that is part of a person's experience inside and in the environment that needs to be adjusted, as in removing a tack.

The second tacks rule is if you're sitting on two tacks, removing just one doesn't give you a 50% improvement. That's helpful for people to understand that chronic illness is complex. The idea that one drug is going to do it and the idea that just one intervention is going to do it works sometimes very well, but sometimes it means that you're caught in an environment or a system in which everything is connected. The good thing about a system is sometimes if you hit a part of the system which has a good influence, that influence spreads through the system and healing takes place. On the other hand, sometimes the system is difficult because if you have something bad happen, that also can spread through the system and then make for mischief. The drugs are important sometimes for acute illness and for killing bugs, but they create a lot of mischief, and that's something that we in Integrative and Functional Medicine are especially aware of.

Dr. Mark Hyman: Rather than studying drugs that affect the brain to treat autism, the better path may be to study treatments that target inflammation, toxins, allergens, microbes, and infections, or fixing biochemical train wrecks like the problems with methylation and sulfation, as well as gut problems and mitochondrial dysfunction. Dr. Goh, you've been looking at the world through a different lens since you saw this patient, Jake. Tell us how he changed your thinking about autism and how the body responds to various insults.

Dr. Suzanne Goh: Sure. This young boy was eight years old when I met him. At the time, I was the co-director of the autism program at Columbia University in New York City. I remember being so moved by him and his mother because of how much they had done along their journey with autism. He was first diagnosed young around 18 months and had received a lot of very important therapies like behavior intervention and speech-language therapy, but it wasn't until he started to receive mitochondrial therapy at the age of three and a half that things really started to change. At that time he wasn't speaking, he had difficulty walking, and wasn't able to run.

His mother took him to Johns Hopkins University in Maryland to have additional testing, mainly metabolic and mitochondrial testing. It was there that a diagnosis of mitochondrial dysfunction with autism was made and he started on a series of vitamins and supplements that over the course of weeks and months radically changed his developmental trajectory. He began to speak, began to interact socially, his gross and fine motor skills improved dramatically. He continued those therapies up until when I met him, which was at age eight, and at that point he had been doing well, he was mainstreamed in school, but he was beginning to refuse to take the large quantity of vitamins and supplements. He'd been inconsistent with that and he was having a period of regression, so his symptoms were worsening. He'd made dramatic progress and now he was struggling again.

He was struggling with social interaction, high levels of anxiety, headaches, daily migraine headaches, and obsessive compulsive behaviors, so severe that he had trouble walking down a sidewalk because he was retracing his steps. It was hard to get out of the house in the morning and so this was, of course, alarming to his parents. With resuming mitochondrial therapy through L-carnitine, CoQ10, B vitamins, and some very basic supplements, he began to improve again. Now, he's a thriving junior high school student, plays competitive travel soccer, is in a mainstream school, and is doing incredibly well.

Dr. Mark Hyman: Extraordinary story. Yet when you go to the doctor, most of the time they don't know how to diagnose mitochondrial dysfunction and probably never heard of mitochondrial therapies.

Dr. Suzanne Goh: That's right.

Dr. Mark Hyman: Tell us about your work in mitochondrial discovery and how this is connected to autism. Mitochondria is the place where we make energy and it seems like a lot of his symptoms were energy deficit.

- Dr. Suzanne Goh: Yes. He had very low tone fatigue and delayed milestones, all of which are associated with mitochondrial impairment.
- Dr. Mark Hyman: What are mitochondria anyway?
- Dr. Suzanne Goh: If you think about the cells of the body, nearly all the cells of the body have mitochondria inside of them. Mitochondria are classified as a subcellular organelle, so they're tiny structures inside of cells.
- Dr. Mark Hyman: Like a cell within a cell.
- Dr. Suzanne Goh: Yes, and a cell can have dozens or up to thousands of mitochondria. Mitochondria are sometimes called the powerhouse of the cell because one of their main functions is to generate energy, and they do that in the form of ATP, which is thought of as the energy currency or the fuel for the body. Mitochondria do a lot of other things. It's interesting that they're called the powerhouse because in fact they're actually very delicate structures and are very sensitive to environmental factors: stress, toxins, and oxidative stress.
- Dr. Mark Hyman: They're easily damaged.
- Dr. Suzanne Goh: They're easily damaged, but they're so important for all of the body's functions and the brain is particularly dependent on the function of mitochondria because it has such a high energy demand. The developing brain is hugely impacted by mitochondrial function.
- Dr. Mark Hyman: Looks like you run out of gas, right?
- Dr. Suzanne Goh: Mm-hmm (affirmative).
- Dr. Mark Hyman: Your brain doesn't work and so the brain doesn't have a lot of ways of responding to insults. When you lose mitochondria, you get all sorts of problems. There's Parkinson's, Alzheimer's, autism. You said that mitochondria are really sensitive to insults. What have you found are the worst offenders in damaging the mitochondria?
- Dr. Suzanne Goh: There's a term that's sometimes used called secondary mitochondrial dysfunction, meaning it's not due to a genetic cause but due to other factors like inflammation, physiological stressors, and medications. There are some medications that are known to be toxic to mitochondria.
- Dr. Mark Hyman: Like statins.
- Dr. Suzanne Goh: Yes—very widely used medications. Some antibiotics, some psychiatric medications that are commonly used on children and young children with autism, like risperidone.
- Dr. Mark Hyman: That's an antipsychotic.
- Dr. Suzanne Goh: Yes, and it's very, very widely used in the treatment of autism. Mitochondria can be impacted by so many different factors.
- Dr. Mark Hyman: You mentioned toxins in your work. You talked about the work of Phil Landrigan who is an amazing scientist connecting the dots between environmental insults, autism, ADD, and behavioral issues.
- Dr. Suzanne Goh: So important—there are many industrial chemicals and pesticides that are widely used that we know clearly have toxicity to the developing brain. Many of those chemicals impact the function of mitochondria, so it's very likely that at least one mechanism by which they harm the brain is by impairing the mitochondria.
- Dr. Mark Hyman: Also, the mitochondria essentially are the processing factories for the food we eat, and they respond differently to different foods. One of the big insults we know is that sugar is a

mitochondrial toxin and it's ubiquitous. The average kid has 34 teaspoons of sugar a day. How does that impact mitochondria?

Dr. Suzanne Goh: Nutrient intake or the lack of certain key nutrients is probably one of the biggest factors that affect mitochondria. We know a lot about the delicate machinery inside mitochondria and that a lot of that is impacted by oxidative stress. When there are these molecules in excess called free radicals, they can do damage to mitochondria.

Dr. Mark Hyman: It's like rusting?

Dr. Suzanne Goh: Yes.

Dr. Mark Hyman: It's like a car rusting or an apple turning brown, and that process is happening inside of us.

Dr. Suzanne Goh: Yes, and the things that we eat day-to-day, even within the course of the day, impact it. It's that dynamic. The system is that impactful.

Dr. Mark Hyman: What are the kinds of foods that actually hurt the mitochondria, and what are those that help the mitochondria?

Dr. Suzanne Goh: We think that the foods that are helpful to the mitochondria are foods that are rich in antioxidants, that have a natural source of, for example, B vitamins. There are foods that are natural sources of CoQ10. CoQ10 is key in one aspect of the mitochondria called the respiratory chain that is directly involved in the generation of ATP.

Dr. Mark Hyman: What's an example of a food that has CoQ10 in it?

Dr. Suzanne Goh: A lot of foods do...but liver...

Dr. Mark Hyman: Yes. Liver is good. Liver has B vitamins and is a mitochondrial food.

Dr. Suzanne Goh: Carnitine also, which is in high concentration in meat products.

Dr. Mark Hyman: Particularly lamb.

Dr. Suzanne Goh: Mm-hmm (affirmative), it's important for shuttling fats into mitochondria where they can then be metabolized into energy.

Dr. Mark Hyman: Let's talk about fats, because you mentioned fats. We've seen a lot of literature come out that fats really are an important fuel for the mitochondria. Certain kinds of fats actually help the mitochondria work better, like MCT oil. What do you have to say about that research?

Dr. Suzanne Goh: Lipids are important in cell membrane integrity, and since mitochondria have their own membrane, the integrity of that membrane is very important for the function of mitochondria. In fact many of the key processes happen along the inner mitochondrial membrane, so lipids from fats are important for those types of things. We understand that mitochondria are very sensitive to inflammation and that healthy lipids can help regulate the body's inflammation.

Dr. Nancy O'Hara: We have an integrative practice that tries to integrate all of the therapies to treat autism. I started my career as a teacher so I'm very invested in behavioral therapy and other therapies for kids with autism, but we have to look at what's going on for them medically. First and foremost diet. The gut is not the second brain, I think it's the first brain. If we're not giving our kids a good anti-inflammatory, whole foods, non-processed diet, we're not doing the right thing by them. Then we look at what supplements, minerals, and vitamins they may be needing. Then we look at other illnesses like Alzheimer's, Parkinson's, NMDA encephalitis, and see what we can learn from those diseases and what medications or supplements help those people that may also help our kids with autism.

Then we also look at homeopathy, intuitive therapy, and other therapies that may help them in general. One of those may be hyperbaric oxygen therapy (HBOT). We don't use it in every kid but in those with inflammation, Lyme disease, cerebral palsy, traumatic brain injuries, and concussions, it may be an adjunct to the other therapies that we use. Hyperbaric oxygen is where you give oxygen at a higher percentage. What we're breathing is 21% oxygen. Depending on the unit, you can give concentrated oxygen anywhere from 28% to 35%, to up to 100% oxygen. More importantly, you give it at an increased pressure, helping that oxygen to get into the cells and decrease the inflammation, as well as improve the mitochondrial function, because that's something else that's affected in a lot of our kids.

The mitochondria are the energy cells of all of our body and so when our energy cells are not working, our energy is dysregulated. That doesn't mean we may be lethargic, we may behave with symptoms like chronic fatigue, but we may also be revved, like we see in our kids with autism. It's sort of like that car idling with the engine revving without us pressing on the gas. That's what our kids with autism are like, and HBOT can also help that.

Dr. Mark Hyman: Treating the gut, and supplementing with B12, B6, folate, omega-3 fats, vitamin D, vitamin A, magnesium, and zinc, and eliminating gluten and casein from the diet, detoxifying mercury and lead from their bodies, may be the best way to get autistic childrens' brain connections working again.

Dr. Robert Melillo: When we look at which nutrients are important for the brain, it really depends on what that individual needs. To a certain extent that's the whole point of Functional Medicine and Functional Neurology, is that it's really directed towards the individual. It's based on measuring what their individual needs are, but certainly there are some basic things that I tell just about everybody. Omega-3s and in particular DHA are very important for the brain, for the membrane of the brain itself, so that it remains fluid and doesn't start to break down and that we can get a proper exchange of nutrients and ions—that's really important.

Vitamin D, I think, is hugely important because it helps to balance out the immune system and helps to really support a lot of our digestive functions, and might limit our food sensitivities. I think it's probably the most important immune factor and if we have an imbalance in the immune system, like I said, that can really cause a lot of problems, a breakdown of our blood-brain barrier, or a breakdown of our gut, and really lead to some big issues. We've discussed folic acid and B12—I think a lot of the B vitamins are very important for the brain itself. I think that CoQ10, and looking at things that help support mitochondrial function, are really important. We know that a lot of the issues that we see is when the mitochondria (they are the energy source of the brain cells) start to breakdown and become dysfunctional, that's when all hell breaks loose in our brain. It probably ends up leading to many chronic neurodegenerative issues, what we call excitotoxicity.

Magnesium can be helpful to aid in diminishing that. It helps to lower the fight-or-flight response in our body and helps to improve blood flow. I think probiotics because the gut health is really important, especially for the brain, so the brain and the gut interact with one another. Therefore, if the brain isn't working properly, we get a breakdown of that gut biome, but being able to try to reestablish and restore it is very important. At the most basic level, I look at the omega-3s, vitamin D, probiotics, vitamin A, and vitamin K. Then I like to look at the individual person and see what they need.

I do recommend that if you can, try to eat foods that are rich in those particular nutrients, but if the person has this high fight-or-flight system on, you can give them a lot of vitamins and you can have them eat food and they're not going to digest it properly. When kids are in this fight-or-flight, which is anybody with a developmental issue, we're born with our sympathetic fight-or-flight system more active, and we've actually shown that kids with autism and ADHD have a persistence of that through their life, meaning they're always more in this fight-or-flight state.

The most effective thing you can do is actually to create balance in their brain and stimulate brain growth and development. You can do other things like eliminating foods or eliminating triggers, but if the digestive problems, inflammation, or the things that are also triggering some of this fight-or-flight, are from the brain, then all you're doing is really just putting out fires. You ultimately need to deal with the brain issues, but it's also important to identify foods or different environmental triggers that might lead to inflammation, activation of the immune system, or toxins in our body. Those are also very, very important to help reduce that fight-or-flight system.

Basically, using a bottom-up or a top-down approach or both is really what we do for every child that we work with. We have centers all across the country and we'll work with thousands of kids this year. We've worked with tens of thousands of kids and families, and with everyone I developed a way of really assessing their development and looking at if their bottom-up processes, and the maturity and development of their brain happen the way they were supposed to, or did they get stuck somewhere along the way. If it did get stuck, taking a look at if it affected more right brain or left brain development, and then looking at what we need to do to try to stimulate growth at that level. It's very important to identify where in the development the problem came about, and then we need to go back to that and build the bridge again. Looking at primitive reflexes is really important.

Dr. Mark Hyman:

There are so many people out there who are suffering from a broken brain. Help us get this important information to them by sharing this docuseries with your community. Attention Deficit Disorder (ADD) today also referred to as Attention Deficit Hyperactivity Disorder (ADHD) is not a ritalin deficiency, yet the use of these drugs is skyrocketing. One in ten American kids are on stimulant medication. In fact, the global use of ADHD medication rose 300% from 1993 to 2000.

Daniel:

I think I was eight years old when I was first prescribed ADD medication, Ritalin. I remember I would have to go to the school nurse and take it in the middle of the day. I thought it was special for me. I was on and off those ADD medications. Throughout school, my earliest prescription was age eight in third grade, and then the last time I took it was in March of 2012—that's about 15 years. The better part of 15 years, I was regularly taking ADD medication and using that to get by. The side effects of ADD medication are, I don't even know what to say. Knowing now, having been off of ADD medication for about four or five years now, looking back on how I felt every day on ADD medication, especially in college and in high school, is astounding to recall. I could just list things.

The first thing that I remember ADD medication really messing with is my sleep. In college I was at the point my senior year where I would sleep in two hour blocks, because that was how I could manage getting my homework done. I would take the Adderall and it would keep me awake. Then eventually I'd start to crash, so I'd try and take a nap. I'd go home and close the blinds and put a blanket over my head and wake up a couple of hours later. Then take another dose of Adderall and start studying again. Sleep was majorly affected by the Adderall. Another thing is that I felt the Adderall could enrage me. I think Adderall causes more emotional extremes. If you're frustrated by something, you're more likely to become a little enraged when you're on Adderall. The same thing goes for maybe sadness, if something happens with a friend, you feel more down, like a low afterward. I felt more ups and downs emotionally on Adderall.

I remember pretty distinctly the moment that I decided I should not be taking these ADD drugs anymore. It was like the day I finished my last final exam of college. I have a degree in physics, I love to tell people that, but I scraped by in college. I was getting Ds, I failed a couple of classes and had to retake them. It was the last day of my final exams. I had finished, I was so relieved and so sleep-deprived. I had used Adderall to keep myself awake. I probably slept six hours in the last 48 or 72 hours. I was doing something around the house and had this feeling of

sickness, I can still remember, in my stomach and my head, a physical sensation of illness from being so sleep-deprived as a result of taking Adderall.

I think I went to go close the trunk door on my car and my shoulder did this weird thing and I realized had limited control over my body because of how sleep-deprived I was physically. I lacked physical control and I said, "Man, something's wrong with me. This feels so terrible. I need to find another way." I ended up googling something like alternative remedies for ADD treatment. I stumbled upon a book, *The UltraMind Solution* by Dr. Hyman, and it had good Amazon reviews. I had never seen anything like it before but I ordered it. I think I got through it over the next month or so. Of course, at the time I needed Adderall to even think about reading a book. It's ironic because I was using Adderall at that time, the only way I knew how to get through a book was on these drugs.

I'm reading *The UltraMind Solution*, and it was a little far out to me at the time. I'm thinking like, "Food changes the way I feel? I eat bread every day." I remember my regular lunch in college was a baguette and cheese. I had a lot of skepticism when I read the book, and I was thinking like, "Is this true? Could this really be true?" It's just coming from this one book but the thing that got me is that there were many references to scientific studies from very established institutions, like universities. The works were all cited in the back of the book and I said, "Okay. This is pretty convincing. Maybe I should try some of these things." That was the beginning from my first exposure to it.

Dr. Daniel Amen:

ADD or Attention Deficit Disorder, also called ADHD, Attention Deficit Hyperactivity Disorder, they're just different names for the same thing. It affects probably 10% of the population. Most people who have it don't actually know that they have it: short attention span, distractibility, restlessness, and disorganization for things like time and space. Their rooms tend to be a mess, they tend to be late, and they have impulse control issues. ADD, from our research and many others, is lower activity in the front part of the brain. The front part of the brain is the brain's break. It stops you from saying every stupid thought you have. When it's low, people with ADD get themselves into trouble because they say things that might hurt someone else's feelings, they do things without thinking it all the way through.

All of us do that at some point in life. We didn't sleep, we had a bad day, but people who have ADD, it's been part of their life for most of their existence. People who have ADD, and anyone who is struggling with their mind, should seek help when their symptoms are interfering with their life. Their symptoms are interfering with reaching their potential at school, at work, in relationships, or with their health. The thing I love about what we do here at Amen Clinics is we actually look at people's brains. Yes, you can change them. That's the coolest thing, but when you optimize someone's brain, their schoolwork is better, their work is better, their relationships are better, and people begin to move towards their potential, which makes them happy.

When I first started looking at the brain in 1991, I thought ADD was one thing. There was already published research then that ADD was low activity in the frontal lobes. The more ADD people I saw, the more I realized it wasn't one thing in the brain. Initially, I made four subtypes based on the imaging work and then it was five and then it was six and recently we added a seventh type. The important thing about that is, if you give everybody Ritalin, two of the types get better, five of them get worse, which is why Ritalin has a bad reputation. For the right type it's amazing. For the wrong type, it's a nightmare.

Daniel:

After making *The UltraMind Solution* lifestyle changes, the first things that I saw were changes in my exercise habits. Within about three or four years after that, I had completed three marathons. In 2015, I ran the New York Marathon, and my wife and I ran the Chicago Marathon together. It's a pretty stark contrast to having no interest in running half a lap when I was growing up, but now I can call myself an endurance athlete if I want to. I had gotten a job out of

college at the end of 2012, and of course to even feel comfortable in my first professional environment, I was still dependent on the Adderall. I wanted to show up to work and have all the focus I could, but I started slowly, maybe skipping it a day and seeing how that felt.

Besides my hunger changing from not having amphetamines in my system, it was definitely a rough period of change. I remember it was about three weeks of me feeling like I had to be sneaky and get away with things at work. I had to hide the fact that I was not nearly as attentive on the Adderall. It was about a three-week transition period after totally stopping the Adderall to feeling normal, like I could actually think. Even with the lifestyle changes that allowed me to wean myself off of Adderall, it still took at least three weeks of pretty heavy withdrawal just to feel comfortable and competent in a professional setting.

Kids who are growing up now with ADD or who take ADD medication to feel comfortable achieving their goals, I would say that you have to trust me. I was there and there is a better way. If you think that Adderall is the only way you can think clearly right now, you're dead wrong because once you adopt the right lifestyle changes, you will be miles, miles, and miles ahead of where you are right now.

- Dr. Mark Hyman: Since when did this become a normal consequence of being a child. Back in the day, it wasn't that long ago, we had maybe one troubled kid in the classroom. How did we go from that to one in ten kids with ADHD today? The real question becomes, what causes ADHD and why is it so prevalent? ADHD is just a name that we give to people who share a collection of symptoms: they can't focus or pay attention, they're inattentive, and they're hyperactive. These are symptoms. What are the causes? It could be many things: nutritional deficiencies, bacterial intestinal overgrowth, detox imbalances, leaky gut, or chronic inflammation.
- Kristin: Colin suffered from behavioral issues at home as well as some learning difficulties at school. He was very unfocused at school and he also had some digestive issues that were unresolved with conventional medications, so we were looking for a solution for him. I would say from a very early age, like maybe around two, we had behavioral issues at home. From there, once he entered school is when we noticed the learning disabilities and problems with focus. Around that time, he also had stomach issues. We sought alternative options by around like five and a half years old. Towards the end of kindergarten is when we went to see Dr. Boham.
- Colin: I used to feel a little out of control. I used to have stomach problems and then rage sometimes, but once I turned my diet around, I felt a lot better about myself.
- Kristin: Colin's behavior was really unpredictable with the ADHD. Sometimes he would be okay and then at other times he could have an explosive outburst that I would feel difficult to control, especially with my other children around. It was hard. It really impacted all of us because his behavior was so unpredictable. There was one day I remember he had went to a camp and they had fed him a lot of ice cream, candy, and drinks that had artificial colorings in it. He came home and had the biggest meltdown he had ever had. That's where I started to think possibly the diet was related, even though regular doctors told me no, and I just couldn't control him in front of my other kids. I was actually crying, I was so upset, and it was my low point. I couldn't have my other kids seeing me not be able to help Collin.
- I had seen psychological counselors for him, starting at age two, to try to help with the behavior issues. They gave me some tactical advice, but nothing that really seemed to make a big difference. Dr. Boham was amazing. She really looked at Colin as a whole person and did some testing that we had never thought to try. We worked with a nutritional counselor up at UltraWellness and she was really helpful with giving us advice on how to change our diets to something that was better for Colin.
- It was definitely a little bit hard to change the diet at first. It's a lot of undertaking, but we felt it was necessary to really help Colin, and our whole family adopted the diet as well so that made

it easier. I think, given Colin's young age, he was more willing to adapt. Our old diet was, I would say, a typical Standard American Diet. We would eat things like whole wheat bread. Now our diet is gluten-free and almost 100% organic, and our meat is pasture-raised and grass-fed. We really cut back on the packaged foods that we used to eat, and if we do eat packaged goods, we check the labels to make sure they're low in sugar. We certainly don't eat anything with high fructose corn syrup or things like that. Those are things that I didn't know were not good for brain health.

Dr. Elizabeth Boham: It's important for all of us, and especially for our children, to keep the junk food away. Junk food is high in additives and food coloring, and there have been multiple studies to show that these food colorings and additives can have an impact on our children's attention and focus. We can see good improvements in kids' attention and focus when we take them off of these processed foods and foods that have food coloring added to them. One of the most important things for improving your children's diet is to have good healthy food available. We know that when there's good healthy food around, kids will choose healthy food. You want to get the junk food and processed food out of the house. Have vegetables cut up so kids can snack on them, have fruit available.

In addition, get your children involved in cooking. When children are involved in food preparation, they're much more excited to try new and different foods. It's really a great thing that you can do for your kids. Get them cutting up the vegetables, and preparing the foods because they're more likely to choose and eat them.

Kristin: Dr. Boham was interested in what we were eating. She was wanted to see what our diet looked like. She also was interested in Colin's overall blood work and she did some testing. We found out that he was not absorbing B12 properly, which would be a huge thing for brain health. She had him take a sublingual B12 supplement. She had a lot of supplements to recommend whereas the regular doctor just recommended over-the-counter medications. I would say we tried to start them right away, but it's a bit of a slow process when you're learning a new way of cooking eating, so it took us some time. I would say we saw changes in Colin right away and pretty much within a couple of months we saw dramatic changes. We didn't see as many outbursts with Colin. His behavior seemed calmer, he seemed more focused. He really just seemed happier overall.

Colin now is such a different kid. He is more confident, doing so well in school, and he just finished third grade. He's reading on reading level. He got into the accelerated math group this year. It's been such a game changer for him. The lifestyle changes were huge. I would suggest that other parents look at the diet their children are eating. We've been told for so long that the standard American diet is a healthy option but I really think we need to look further and make sure that we're eating more organic and also balancing meals, with protein and fat in each meal. It's really important for Colin to keep his blood sugar stable. I would say that there are other options than just medication.

Colin: I would say they should change from the diet and eat a little bit healthier from a diet they might be eating. That's one of the things that I think they should change actively.

Kristin: I would definitely recommend Dr. Boham and The UltraWellness Center. They have such a personalized medicine approach. They take the time to really listen to you and will really get to the root cause of your problems.

Dr. Arsalan Dermal: One of my biggest challenge in my practice is how to convince a child to avoid sugar and food coloring. They get exposed to a lot of toxic red dye and food colors—all the snacks almost always have food coloring added. Sugar is a big challenge. I almost always recommend an elimination diet for the parents and spend quite a bit of time in teaching them how to eliminate the food and then reintroduce, and then develop trials insight into how that particular food is affecting. It's a big challenge. It's very difficult to control the diet of a 10, 11, 12-year-old child,

because if they don't get it at home they can get it from outside, and so it becomes a real big challenge. Once the child develops some insight and they know their diet is causing this kind of problem, they will avoid it.

Sometimes, the parents know themselves, but it's hard for them to implement the diet. We give them different strategies. I myself felt more successful when the child agreed with me. Most of the work is to educate the child and the parents. Here's an example elimination diet of gluten, for example. I tell kids and the parents to not eat gluten for two weeks, avoiding anything that has gluten going to a gluten-free diet for two weeks. Then, after two weeks, for lunch eat gluten-containing food, pasta or whatever it may be. In an hour or two, observe your behavior. Most kids will say they feel sluggish and tired or say they feel awful and then you're successful. Some kids will not even notice that. Even if they notice, they'll probably minimize it. It almost always depends on the intensity of the presentation. The intensity and the severity of the symptoms are a very important determinant.

Maggie Ward:

For parents with a child who is a limited eater (I don't like to say picky), it's challenging. I think all children go through phases, and until I was a parent I didn't really understand the whole dynamic that's involved and how much of a role food plays for people in asserting their independence. I always encourage parents, and this is how I think a lot of us were raised way back when, but what's provided is provided. The parents decide what's going to be eaten and when it's going to be provided, then you leave it up to the children to decide whether they're going to eat it. It's a little bit uncomfortable because none of us want our children to go hungry, but very few children will do that.

Learning to eat is such a life skill that I think a lot of parents unfortunately either didn't learn it or they're just worried about whether their child is going to eat enough that they don't allow them to navigate and learn on their own. I think it's really important to expose children to new foods and let them try things or not try, and just get comfortable. It takes a little time for them to adapt to new foods or new ways of eating. Good role modeling plays a huge part, not putting pressure on the kids to necessarily eat that food, and most children come around to eventually eating some of the new foods and getting more comfortable. They may grow into adults that have better eating skills and cooking skills.

A lot of our families choose to make dietary changes together so other siblings might be involved in the family. It's a really supportive impact to that child. They don't feel as isolated making some of these dietary changes. Again, it can be challenging with school activities, parties, and all of that. There are a lot of products out there and we work with our patients to find some things that work for them that they can put together, trying to have them stay low sugar and offset certain foods that might be bothering them. I really try to focus on what to eat. For these children it's critical. A lot of them need support with their detoxification system, so getting in vegetables in any way we can and into smoothies and juices, green juices, things like that can be really, really supportive for their detoxification system, and good quality fats.

Pretty much all of our children get on a good quality fish oil. Very few of them are eating fish. We find their omega-3 fatty acids to be very low. We were talking before about the development in the brain. These children's brains are developing and they need those building blocks. Getting a good quality fish oil and some of the oils that you get from some seeds and things are really important too. I would put that at top of the list of what to give your child who might be dealing with some of the cognitive issues.

Dr. Mark Hyman:

If you or your child, or someone you know and love is dealing with ADHD, there are things you can do starting today to minimize your symptoms and get back your life.

Dr. Robert Melillo:

Any parent that is struggling with a child with any of the labels: learning disabilities, ADHD, and autism. Quite honestly, in our centers, up to 50% of the people that come in don't even have a label, but they know they're struggling. There are two things that parents should really be

aware of and will give them a clue if the problem is primarily a brain imbalance. Did they meet all their developmental milestones and also does the child have a real unevenness of skills? This is something that we see that parents come in with all the time, that their child is really good at certain things, they're really good at playing with LEGOs, or they're really good remembering directions, or they have great eye contact, but yet they can't read can't remember something. Most parents are aware and that's confusing to them because they see these really great skills that their child has, and the teacher may even see that, but the child struggles so much in other areas.

The important thing to understand is what you're looking at is a developmental imbalance. The good news is that those things are changeable at any point. Many parents out there, and it really kills me, believe that their child is broken or that their family is broken. Over 80% of families end up in divorce if they have children with developmental issues, like autism. It's so important for parents to understand that the child is never broken, that you can change these things at almost any stage, and not only change them but most of the kids that I work with are really gifted. They're so gifted in certain areas of their brain. Certain areas of their brain are so strong, certain networks are so good relative to other people, that they're more susceptible to an imbalance because if the environment doesn't properly stimulate the growth and development during one stage, they're more likely to develop an imbalance because they're so good in certain areas.

Never give up on the child—there's always hope. I think people really need to educate themselves and stay away from anybody that tells you, "There's nothing you can do. Just accept it. Just be happy with the small stuff." Anybody that's saying that to you, just run away from them as fast as you can and educate yourself. I think my books are a really good source of where to start. My books give them a different perspective on what actually is out there: about exercises, diet, and nutrition. There are so many great people doing so many great innovative things, that I think they can learn how to change their life and get their children to be who they always knew they would be.

I think it's the greatest thing when parents come up to me and say, "You really gave us the child that we always knew was there that couldn't get out, and now here he is," or here she is. Usually, of course, they're crying and I'm crying at that point, but to me there's nothing more important. There's nothing more important than being able to help a child that's struggling, to be able to help a family, and restore their hopes and dreams. That's my main message: never give up and always keep hope and you'll find the answers.

Dr. Nancy O'Hara:

We often use the analogy of an onion: onions make me cry, but if we look at our children as a gift, when they have autism they may be wrapped in many layers of wrapping paper. What we do as integrative physicians is try to unwrap those many layers of wrapping paper to get to the true gift inside. Whether we get to that true gift or they have several layers of wrapping paper, seeing that child as a gift can help them to see themselves as a gift. That's number one. The second thing is look for somebody else that's been through this. There's a great group of parents Talk About Curing Autism (TACA) and they have many mentors that can be very helpful to parents. Looking at other SPED-NET groups, NAA, finding other parents that have been through this and can help lead you down the right path.

Look at your child's total body. I always say kids crave that which they're most sensitive to. If your child is craving a certain food like milk, for instance, take it out 100% for three weeks and see what happens. You may see a different child at the end of those three weeks, if they don't then pig out on it at the end of the three weeks, and see if you see any regression. Just start with one thing—ind one thing that may make a difference for your child and try that, and don't give up.

Dr. John Ratey:

ADD or ADHD is definitely something that we're seeing a lot of and perhaps a lot more of these days. Our culture is ADD-ogenic, meaning it produces people with short attention spans. That's because of our wonderful little gadgets that we are addicted to. From our cell phone to TV to video games to all the wonderful things we have that make life very easy, we're not training frustration tolerance in our kids because all they have to do is start again in a video game or start over. This means they don't have to really pay attention for that long and we're now used to the six-second commercials and videos, and even TV and movies are quick to get us into a novel situation or a novel scene because that's what holds people's attention.

It's such a tough call as to what to tell parents about technology because it's ever-present. If the parents say to their kids, "You can't have a cell phone or you can't use the iPad," and they're constantly on it, which is the case most of the time, it falls on deaf ears. One has to be a family that says, "Okay. We're going to limit our screen time," which is now about nine hours a day on average for all of us. That means our kids are seeing this. I have two grandchildren and one of the things that we've learned by getting them to do things like crawl forward rather than backwards, what was the object of excitement and interest that she crawled towards? It wasn't the teddy bear. It wasn't her little dolly at the age of one. What was it? The cell phone. That was what she wanted and what she crawled to. That's indicative of our society.

Dr. Mona Karimpour:

Also, in current day society we're dealing with a lot of social media and little kids now are playing video games instead of going out and playing football and interacting. There's a lot more isolation, whatever TV channel or video game they're on, that's also affecting their relationships and their mental health. I mentioned social media, but social media can go both positive and negative. For example, if someone is a bipolar parent, they're concerned maybe their child will develop bipolar, then they have that opportunity to seek out support groups online. They could look to see if there's a local group, or educational resources out there. Luckily, going online isn't as expensive as it used to be, so if someone is concerned they can go online, read from sources, get educated, and further seek help. Sometimes people can actually soothe themselves with, instead of proper medications, substances and that could actually take them down a worse path.

I'm not sure if social media, per se, is training our kids and adults to have ADHD, but I am aware. I was watching CNN the other day and a lot of the apps create an addictive type of drive. Especially a lot of the video games, even with the way we text and the incentives that it provides, emojis, all of that, we're getting used to the stimulation of the TV, iPad, or iPhone, and it's kind of a rewarding system. It does create a lot of, depending on what apps kids are looking at, mental health issues, such as it can create anxiety, addiction, ADHD, and things like that. How do I prevent that from happening?

I think it needs to happen from a young age. You need to limit your kids from playing video games, be aware of what video games they're playing, and monitor them. I think monitoring is a huge effort of being aware of what your children are doing because that's what's going to create good habits or poor habits. Instead of having your child be on, sticking an iPad in front of them so that you don't have to worry about calming them down. I mean, are you going to stick that iPad for five hours in front of them and get them hooked on to that game, or are you going to limit their usage to something more educational and have them be there for half an hour, learn something, and then bring them to the dinner table without the iPad and say, "Okay. Let's have a family dinner. Let's communicate," where we have the emotional warmth instead of this cold iPad in front of us.

Dr. Jennifer Love:

I think that one of the reasons psychiatrists have been so put on the forefront in the last several years is this increase in rate of diagnosis of ADD. There's been a big pushback from people saying, "Why is there suddenly ..." we're overdiagnosing everything. My personal thought for years has been the way that we live in real life. When we go to school or to a job where you sit in a cubicle at a desk and not move, it's so completely different to the speed at which

information comes when we're not at work and kids aren't in school. They can get on the Internet and everything is fast. They play these video games that go really fast, and then they have to go to school and just sit and listen to someone speak, and we're surprised that they can't pay attention. It's an interesting question to look at because why would we give all these people stimulants? Why would we give everyone medication to treat something that comes from overstimulation and change in environments.

John Mekrut:

I spent 25 years in show business. Retrospectively, when I think about it, I was working with dysregulated brains for a really long time. I just didn't know exactly what I could do about it other than try to manage their behaviors. That career waned in its interest for me and somewhere towards the end of it I had a daughter, who was clearly a little different. She's our first child and her interactions to the world were a little behind. Nothing overt, nothing that would sound an alarm, but we observed as parents that there was something a little developmentally delayed in her. We got her into kindergarten, first grade, and all of a sudden the demands of life became much more apparent. Her interactions with the world became more obvious to us, not so much when she was just hanging out with us at home.

We went on a journey to find out what this was all about. We found several different sensory processing disorders. There was attention deficit disorder, and I think there was one more in there, I can't even remember what it was, but we finally ended up with an autism diagnosis, the subset of which was PDD-NOS, which is frankly very evocative of my daughter. Pervasively Developmentally Delayed, Not Otherwise Specified, and I was like, "Yes. That sounds about right." It set us on a journey of trying to figure out what we could do to help this kid. She had behaviors that were really challenging, she'd scream and run out across the street through traffic, it was stuff that was really dangerous at times.

In an effort to try to find out how we could help manage these behaviors, we visited doctors like you, "What's wrong with my kid?" We went to a developmental pediatrician who sent us to UCLA and we got this diagnosis, and we got into the system, which is designed by and large to manage behaviors, into the psychopharmacological arena. She must have done 15 or 20 major medications over a couple of year period: anticonvulsants, antipsychotics, you get on the list. We tried just about everything to try to get some of these things to work for her so that she could at least calm herself down to the point where she could have a meaningful interaction with the world. To an extent they worked. She wasn't as destructive, she wasn't as rageful, she wasn't a lot of things. She also wasn't my daughter.

It became very clear to us when we were at a holiday party at school, and all the kids are singing in their little hats on and doing all that stuff, and my daughter was oddly enough right in the center and was staring vacantly out into space. Not singing, she could have been on the moon, it was unimportant where she was. She was not interacting with her world. We said, "Okay. This is not going to happen. I can't live like this. I can't live with what I'm doing to this child," the guilt, you saw me choke up a second ago, that's from my own guilt of what I did, with the best of intentions. I mean no disrespect to anybody we were involved with, everybody is trying to find a solution for these kids and trying to find what we can put together that's going to make them functional.

I said, "Okay. This road of pharmacology clearly is not happening for us. The side effects are too profound, weight gains, lethargy, and excessive sleep." Mostly, it was that vacantness that distressed my wife and I so much. A friend told us about this thing called neurofeedback and I'm like, "What's that?"

"Well it's this thing where they put these things on your head and it trains the brain."

"Okay. Well sure, we'll try it," I mean, we were trying anything.

I went to a couple of different practitioners. Joy Lunt, who's a veteran, has been doing this for

30 years, shoutout to Joy. We did traditional neurofeedback, QEEG-guided neurofeedback. We also fortuitously ran into another practitioner who did this different form of neurofeedback, an Infra-Low frequency training, which is how I ended up getting involved with it. The brain is an amazing organ. It seeks information, it seeks homeostasis, it seeks to find calm, and I think it needs to reduce fear. It strategizes ways to manage its own behavior. Any information you give it it will take it in and will try to do something with it. Through this process of neurofeedback, we got her to the point where we could get her off all of her medications. If it did nothing other than that, I would have been thrilled. If it just got her off her meds I would have been happy, but we noticed an increase in her ability to interact with people, to the skillsets. I mean, silly things. Not silly in a sense if you're struggling with this.

One of the symptoms we look for in clients coming to us, we ask them about their handwriting. People go, "Why are you asking about my handwriting?" It is remarkable across ADD, autism spectrum disorder, any number of conditions, handwriting is a huge marker. My daughter's handwriting was indecipherable. It had this really strange pattern, big letters, little letters, it was crazy. She now has the best handwriting in our family, it's almost calligraphic. It's so gorgeous. The point is, she started to gain function over her body, her emotions, her socialization, her interactions with others, be it family or friends. That increase in her ability to interact with strangers, which is always a challenge in the spectrum disorder children, all started to improve. We were like, "This is magical," and I agreed and said, "Yes, it is magical. This is something I want to be a part of."

Dr. Jennifer Love:

A huge study came out a few years ago from UC Irvine. They were taking a look at the best ways to treat ADD. They looked at medications, and pharmacotherapy tends to work for about three years and then you get the poop-out effect. The medications and stimulants just don't work as well, and people try to escalate the doses but they just can't get the same response. They were trying to look at what has better long-term effects on focus and concentration than just relying on these medications, and they actually found that mindfulness and relaxation had better effect. I wanted to call them up immediately and try to find who on earth was the person who was training these people with ADD how to do mindfulness, because I want his number. All my patients need to see him. The reality is, it's one of the number one treatments not only for attention issues but for treating anxiety disorders, as well as helping with mood.

John Mekrut:

Neurofeedback works. You can think of any system or any organism—they all are dependent upon feedback. One-celled amoeba have feedback. They reach out to something either good or bad, it doesn't even have a brain, and it makes a decision organically to move forward or to retreat. Go all the way up to higher animals like ourselves, and we're making much more complicated decisions about what's interesting, not interesting, fear making, what's appropriate response behavior in our system. We're always dealing with feedback. Feedback is the nature of life. We couldn't exist without it.

Some of you are familiar with mood rings, which was the first biofeedback device. It actually was measuring your skin temperature, and would change the color of the stone in the mood ring. That's biofeedback. You're getting a witness of something that's actually going on internally—you're getting a visible manifestation of it. There's heart rate variability training, skin conductivity, measuring sweat glands—all kinds of biofeedback. Neurofeedback is a subset of biofeedback in a sense, but we're using electroencephalography (EEG) signaling as the feedback mechanism for understanding what's going on inside the brain. We're measuring amplitude by putting tiny sensors on your head. It's very traditional stuff that's been going on for 75, 80 years now. This is not anything that just happened yesterday.

The amplitude of the signal is interesting because we want to find out what those variations are. What is the pattern observed here on the brain by the brain, and how can it readjust to get a better pattern. By providing feedback in whatever manner you choose to provide it, you're giving information to that organ, the brain, so it can make best decision; how do I approach

that? The brain is sitting in the dark, it's reading digital information coming from your ears or your eyes or whatever. It isn't really interacting with reality as we perceive it, it's processing information. What we do in neurofeedback is give it specific in-the-moment targeted information on its function: what are you doing right now? Is that useful information for you or not? If it's not useful information, stop doing it. What we mean by that is what we present to the client, is a change of pattern on a video screen.

There'll be some flickering of a screen, a screen will get bigger and smaller, it's very obvious to the person sitting in the chair what's happening, but more importantly it's obvious to the brain. "Oh my gosh. That's me." The brain recognizes over a period of time, that's why the training takes a while. Now, let's characterize this, by the way, that it's not a therapy. It's a training tool. This trains the brain in self-awareness and self-regulation, the second being derived from the first. It has to become aware of its own signal and then it will organically strategize a way to regulate, because that is it's evolutionarily designed outcome. We're presenting variations in electrical signaling to the client sitting in the chair for their observation.

Over a course of a few sessions the brain finally recognizes, "Oh my goodness. That's me. The television isn't blowing up. That's actually my circuitry doing that. What do I need to do? What's the management I'm going to put in here so that'll stop, because I'm spending energy, I don't want to every time, it's a pattern. I have to discern it. I have to make a judgment about it." Tying into that is a dangerous concept.

Dr. Elizabeth Boham:

There are a lot of new therapies out there that can be really helpful for some people with brain disorders. In autism we've been using helminth therapy for some children. Helminths are a worm that are parasites but they are non-parasitic to humans. People will consume these helminths and they impact their brain health. For some children, the helminths will decrease the immune response in their body, will lower inflammation in their body, and they can have improvements in their symptoms. That's an interesting treatment that some people will benefit from, and really causes no harm to try.

Another area we've been really excited about looking for and detecting are these folate receptor antibodies. A very high percentage of kids on the autistic spectrum have antibodies against these folate receptors. Folate receptors are in your brain and you need folate, which comes from your all your green leafy vegetables. You need folate to bind to these receptors for proper brain development to occur. Unfortunately, a lot of children with these folate receptor antibodies are having changes or decrease in brain development. When we check for folate receptor antibodies, we see a high percentage of children on the autistic spectrum with these antibodies. There are ways that we can treat that.

We can treat that by giving higher doses of folate and also by removing dairy from their diet, because dairy often will cause these folate receptor antibodies to occur. Sleep is absolutely underrated especially in our current culture. Sleep is critical for brain health. Sleep deficiency has been seen time and time again within multiple studies to be linked with decreased cognition, lower mood, mood disorders, having a harder time with memory and focus and attention. Sleep is really critical for our brain and we need to focus on it all the time. As our children and all of us are using more and more technology, unfortunately that often leads to less and less sleep and a lot of issues in terms of attention and focus and ADHD and memory problems.

Dr. Mark Hyman:

We've seen a revolution in brain science in the last 20 years. We went from believing that the brain was fixed, that you had a certain number of brain cells at birth and if you damaged them that was your tough luck, to now understanding that even at the moment of death, you are creating new brain cells and new connections at any age. This revolutionized our view of what the brain is capable. We know that these brain disorders are not fixed. This is one of the most powerful discoveries of the last 20 years, is that we can actually modify these, what we thought

were fixed brain disorders like depression, autism, ADD, and even things like dementia and Parkinson's. The body has the capacity to repair, the brain has the capacity to repair and heal when the insults are taken away and the right ingredients are put in the system.

It's really a revolutionary time in brain science and sadly, conventional medicine has just not caught up yet. We are now at Cleveland Clinic doing a research program looking at how we can impact early dementia by using all these approaches and dealing with the root causes: infections, toxins, diet, and then helping put in the right ingredients for health. It's a very powerful model and we're seeing people actually starting to reverse dementia and reverse common problems that we thought were not possible like autism and ADD. We have a very different way of thinking in Functional Medicine, which is actually looking at how the body affects the brain. That is a really fundamental insight that I had.

Once I started treating patients for their physical problems, their mental problems got better, their ADD went away, their autism improved, their depression went away, their anxiety went away, their panic attacks went away, and I thought, "Wow. This is something that nobody's talking about," how our body affects our brain. The first thing to do when you have mental illness, ADD, depression, dementia, any of these things, is to start to treat the foundation. There may be psychological issues, trauma, and stress, but those things are much easier to deal with once you've built the foundation of health.

Up next, we'll talk about what many believe to be the leading cause of disability in America, depression. We'll also discuss anxiety, fears, and ways to optimize your brain health. I hope this docuseries is giving you a deeper understanding of our most precious and dynamic organ, our brain. Having optimal brain health can transform your life. For me, my best brain means that I can have more time with my family and friends and I can pursue all of my dreams with a great sense of joy. I want that for you too.

BROKEN BRAIN

EPISODE 5

DEPRESSION & ANXIETY

- Dr. Mark Hyman: If you struggle with feeling hopeless, sad, or otherwise mentally fragile, you're not alone. More than 100 million Americans, that's literally 1 in 3, struggle through life with a depression.
- Pharmaceutical companies are quick to pick up on this broken brain problem, but the conventional medicine we use cannot cure it. In this Episode, we will talk about key reasons for anxiety and depression and how we can take steps to manage and even eliminate those disorders from our lives.
- Our experts will discuss the role of our hormones, food, sleep, relationships, stress levels, the health of our guts, and we'll also discuss the importance of one key tool that works as good as or even better than antidepressants.
- Roopa: The anxiety was so bad that I couldn't get out of bed. I would have panic attacks, sweat profusely, and I was scared for my life.
- Jill: At my worst point through this ordeal, I was actually pretty much bedridden. I had to have help getting across the room to my bathroom, I needed help pulling up covers, I had to have help getting dressed. I couldn't drive, and I was pretty much a mess. It was a dark place and a very rough time in my life.
- Dr. Mark Hyman: When depression hits, it hits hard, and our entire world can feel like it's been turned upside down. Look around. Chances are you might know someone who's dealing with depression or anxiety, maybe it's even you. It's time to reclaim control of our mental health by understanding what steps we can take to manage and even eliminate these disorders from our lives. Before we learn what those changes are, let's understand just how big a problem depression and anxiety diagnoses truly are, and how conventional medicine is not giving us the complete picture.
- Dr. Drew Ramsey: Depression is the top cause of disability worldwide. It is going to be or already is the top cause of disability in America. When you look at the most common mental health disorders in America, about 40 million Americans have a diagnosable anxiety disorder. Also, there's now 60,000 overdoses in the opioid crisis. There were 40,000 suicides last year. When I look at those numbers, which are growing, I feel like there's a wave of mental health disorders crashing on our country, which are rooted in brain health.
- Dr. Mark Hyman: With its symptom-based medicine approach, conventional medicine tackles depression completely wrong. Rather than determine what actually creates that depression, many doctors immediately reach for their prescription pad. That explains why 1 in 6 Americans take some kind of psychiatric drug, mostly antidepressants. This is not normal.
- Dr. Jennifer Love: Conventional psychiatry is largely driven by the pharmaceutical industry and managed care. Physicians are under time constraints to only spend a certain amount of time with patients. The reimbursements are for very short visits and it's difficult to be able to spend the time you need to really get at the heart of the issue. I think that's true not just in psychiatry, but in every discipline. Some of the challenges with conventional psychiatry is that it's really based on symptom management. There's not a lot of research that isn't funded by pharmacologic companies and therefore it's really medication based. Physicians are expected to prescribe medication and the insurance companies want therapy to be done by therapists because it's less expensive. You have this division of prescribers and then people coming in and trying to use therapy to get at the underlying issues. There's a disconnect.
- My first job out of my fellowship training was with a big HMO company—if I said the name you'd recognize them. I used to get in trouble for spending too much time with my patients. I would have patients who would come in and they were alcoholic or having a major depressive episode and had never seen a physician to discuss it before. I was expected to do their entire evaluation and treatment in 20 minutes. It just didn't make sense to me that someone who is suffering from an alcohol-use disorder, my supervisor told me that I need to give them Prozac

and Trazodone for sleep and then you're done and send them out. It just wasn't a good fit for me at all.

When I fell into the practice and the group I'm with now, I think the biggest draw was the ability to take time with people to really get to know what's going on with them so we could look beyond treading water and just managing the symptoms of the moment, but get really at the heart of everything.

Dr. Magdolna Saringer: Patients come to the office and the conventional psychiatrist immediately wants to put the patient in a box. The box is man-made categories according to The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), and their mind is constantly working on which category can I put this person into. During this time, they forget to really hear what the patient needs to say and the patient is coming from. On the top of this, you know, limited time with managed care also does not allow for any deep and thorough assessment, or time for listening to the patient.

Dr. Mark Hyman: Let's say you complain to your doctor about chronic feelings of sadness and despair. He or she might say you have a disease called depression. However, depression is not the cause of your sadness and despair, it's just a name we give to a group of people for the purpose of giving them all the same drug therapy. If you feel sad and full of despair, you have depression and you need an antidepressant, case closed, but it isn't. Medications can be life saving and are incredibly useful if given in the right dose for the right person at the right time for the right reason. The problem in medical practice today is that our only tools are medications. The old adage "if all you have is a hammer, everything looks like a nail," applies to medicine today. The best or right treatment for any particular condition may be ignored because all we have are studies and all we have used are medications.

Conventional medicine fails to address what causes those feelings and why they differ from one person to the next. Let me give you an example to drive my point home.

You and another person both have a headache. Your pain is created by drinking too much wine every night, while his results from being hit on the head with an empty bottle every night. It's the same label, but entirely different causes. Obviously, these two chronic headaches can't be cured in the same way, because their root causes are different. Yet that approach is exactly what the current medical community takes to treat depression. Simply label the disease and approach the treatment identically even though the cause of that disease may be radically different from person to person.

Pedram Shojai: Depression is an interesting subject because there's such a huge spectrum. Is it years of frustration that have now collapsed in on themselves to become depression? Is it a food intolerance that's led to years of drain of the vitalistic energy that keeps the body going so you don't have enough juice to be happy? Is it situational? Is it circumstantial? There are a lot of reasons someone would be depressed. Again, when you're looking at a holistic framework, you look at the body in its entirety and you say, okay, well listen, your systems are down, you're not sleeping well. Let's adjust your digestive capacity to draw out more energy from the food you're taking and let's get you moving, let's get the energy in your body flowing, let's get some sunshine, and all of these things become part of a prescription for someone who has depression. Right? It's not that depression isn't a deficiency in a selective serotonin reuptake inhibitor (SSRI), right? It has become a worldview that has been shifted based on some sort of internal locus of control that's been lost or compromised.

It's not always easy, but looking at the whole person and at the situation, and then coming up with solutions that are dealing not just with the biochemistry and the neurochemistry, but also the socioeconomic status. Maybe you're depressed because you're broke all the time, right? There are a lot of reasons why these negative items stack and, as we know, people who have

depression end up stacking more and more depressive items until eventually, there's this feeling where you can't get out from under it all.

Dr. Mark Hyman:

Our goal in medicine should be to find the right medicine for each person without prejudice. Whether it is a drug, a nutrient, a diet change, detoxification, a hormone, exercise or exorcism, we must embrace whatever works and we must inquire into its effectiveness with all our scientific, economic, and political resources.

Do antidepressants such as Prozac, stimulants such as Ritalin, and tranquilizers such as Valium, actually work? Are they safe? What problems are associated with them? Is there a better alternative to medications like these that address the underlying causes of mental illness and brain dysfunction? These mood-altering drugs are the fastest growing segment of the pharmaceutical market, and as a group constitute the second biggest class of medication in total sales and prescriptions. In children alone, over a three-year period from 1997 to 2000, the use of antipsychotic medication increased by 138%, atypical antidepressants by 42%, and SSRIs or antidepressants by 18%. The global use of ADHD medication rose 300% from 1993 to 2000. What's worse is that the use of untested and potentially unsafe combinations of psychotropic drug cocktails has increased 500% in children. Today, modern psychopharmacologists dispense drugs like candy despite their limited effectiveness. Often, these drugs are administered in untested cocktails and in combinations, which may occasionally be helpful but come with more side effects.

Dr. Hyla Cass:

I've seen so many people having terrible, terrible side effects from medication and they can't get off the medication, but staying on it is not helping them either. I've always looked for ways to work differently so they would be able to work, play, and be healthier without all the effects of the medication, all the unwanted effects. Unfortunately, conventional psychiatry is built on treating symptoms. We have to go to the root cause. I love Functional Medicine because we are always looking for the root cause. We have the ability as human beings, as part of nature, to heal ourselves when we're given the right materials.

I think the use of medication is kind of a lazy way. Just treating symptoms is lazy as it's not going to look for what's really going on. Is it a B-12 deficiency? Is it a MTHFR gene defect? Is it a genetic defect? Is it a hormonal issue? These are the things we really, really need to look at as physicians. I'm so glad that I went to medical school and am a physician so I can write prescriptions if I have to. People trust me because they know even though I can write prescriptions, I choose not to much of the time.

There are many side effects to the medications. One of the ones that is particularly bothersome, is people may lose the depths of their depression, but at the same time they also lose their joy. They may not be hideously depressed or, with anti-anxiety medications, they may not be really, really anxious, but they also have kind of a flat chemical brain instead of having the ups and downs of life, feelings, emotion, and experience. They're not thinking right. They're not feeling fully and it really affects relationships. There are also sexual side effects. Another really bad effect is weight gain, particularly with young women, because it affects them so bad psychologically. You put a girl 16/18 or a young adult on an antidepressant and some of the psychotropic meds, and she'll gain 10-30 pounds in no time and it's horrifying. Men too, but it's particularly devastating to girls. And it's just not a good thing.

It's interesting to note that one of the big side effects of medication is something called Akathisia. Akathisia, is defined as "motor restlessness." It's feeling like you're crawling out of your skin, and that you have to do something about it. People become very irritable and they do some really bad things. They start to imagine that they're getting messages to do harm to someone or to themselves. It's almost like it's outside themselves but it feels like it's them and it's hard to explain unless you talk to someone who's experienced it. It's so distressing. I remember speaking to one woman who said she couldn't believe it. She'd been on an SSRI, an

antidepressant, and was having these weird thoughts of hurting someone in her family. And she said, "That's not me. This is crazy." So she stopped the medication. She's someone who had some awareness. She had worked in the health field and had the courage to stop the medication. Immediately that very distressing and dangerous symptom went away.

When people have these bad reactions to medications, all kinds of things are really going on. There's a lot we don't understand about the brain. What we do know is that some people genetically are more prone than others to have these side effects from medication. Some people are more prone to become very agitated. If you can do some genetic testing in advance, you actually can tell who's going to be better suited to a particular medication.

I get a lot of people coming to me because they're dissatisfied with their medication—it's not working, they're having side effects, they just want off it, but they know that when they go off too quickly, they have very bad side effects. Some people become suicidal and it's so scary that they go back on the medication.

Doctors are actually complicit about that because when a patient says, "I want to go off the medication." They'll usually say, "No, you really should be on it for life because you have bla, bla, bla, whatever you have. You have depression, you have bipolar disorder, you need to be on it for life and you should not go off it." But then, "Okay, you want to go off? Do that." And the doctor knows that they're going to have terrible withdrawal. The way to actually do it is very different.

I'll tell you how I approach it. First of all, I explore the issues just like with any other patient. What's going on in them? What is the origin of the issue that made them be on medication? They could be depressed and they're on an antidepressant, but if they have an actual thyroid or an adrenal issue, let's address that. I look at their diet and their nutritional status. I look to see if they have a B-12 deficiency, or have a genetic disorder having to do with how they methylate, which is an important aspect—a chemical reaction in making your neurotransmitters or your brain chemicals. I'm looking a lot of different things as I treat them, even before we start going off meds. I'm building up their body, and building up their own resources. We start to withdraw the medication slowly, really slowly, and reinforcing or supporting the neurotransmitter system with very specific nutritional supplements.

If somebody wants to get off their medication, the first thing they should do is talk to their doctor because he or she is in charge of the prescription. And see what their attitude is. It's also very useful to find an MD or ND doctor, not necessarily a psychiatrist, who can help support you in the process, and to support your biochemistry. For example, if you're getting off of a stimulant, you want to also be on some specific amino acids like Tyrosine, Phenylalanine, B vitamins, and so on. You either want to see somebody like that or have your doctor work in conjunction with a more holistically-oriented practitioner. Or have the psychiatrist or the prescribing doctor take care of the prescribed medication, and at the same time see someone else who really understands the process. It's better if they're actually talking to each other, but that's not always possible.

Dr. Mark Hyman:

Consider the rather astonishing example of antipsychotics or major tranquilizers, including Risperdal, Zyprexa, Seroquel and Geodon. This class of medications is one of the biggest growing sectors in drug sales. Antipsychotic usage has shown a 10-20% rate of increase year over year for the last few years, and today's sales of these drugs total about 12 billion dollars a year.

Traditionally, such medications were reserved for psychosis defined as an inability to distinguish what's real from what's imagined. Hearing voices and thinking that aliens are visiting your bedroom at night are examples of psychosis. But now, with little hesitation or little scientific evidence, antipsychotics are given to children with behavioral problems, autism, ADHD, and adults with depression, anxiety, and OCD, to patients with bipolar disease, Parkinson's, and

dementia. These drugs can lead to serious side effects. Besides acting like a chemical straitjacket and making people dull, slow, and stupid, they increase the risk of obesity, Type 2 diabetes, stroke, blood clots. They also increase the risk of more serious conditions, such as neuroleptic malignant syndrome, where your body literally burns up with fever and your muscles are destroyed, or something called tardive dyskinesia, which involves uncontrolled, repetitive, voluntary, and purposeless movements, such as lip smacking, rapid eye blinking, grimacing, and spasms of the legs.

What most consumers don't understand is that drug testing is often very limited before drug approval. New drugs are tested on a few hundred to a few thousand people, often for a very limited time, which usually means a few weeks or a few months. Ultimately, drugs like antidepressants don't cure the disease, they just mask the symptoms. We don't need to continue using these same drug treatments that don't work, make things worse, with side effects and at best give partial relief. There's got to be a more effective way, and there is.

Dr. Drew Ramsey: The most dangerous illness for you and your family isn't cancer or heart disease. The most dangerous illness for you and your family is depression by far. It's more prevalent, easier to get, and unfortunately, it's more lethal. The good news in that, science is really clear that the biggest factor under your control to influence your risk of depression is in what you eat.

Dr. Mark Hyman: 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 to homicide, suicide, violence and even poverty in very well done studies by the NIH. So I think we underestimate the impact of food on our mood.

Erika: When I started eating right (I was diagnosed with Celiac), the clouds lifted and I thought, wow, okay, this wasn't my fault. The journey is not over and it's never going to be over, but I just feel like it keeps getting better and better and better. I'm not depressed anymore, I'm often happy, which just eluded me for years. At the darkest, I would just have these deep black storms of feeling depressed, angry, and frustrated, and that just doesn't happen anymore because I know what to do.

I feel as though learning to eat a diet that actually supports my brain and my metabolism has been the greatest gift I could get. Literally for 60 years, I struggled with feeling depressed. It's not fun to be that person who can't get up and go because the enthusiasm just isn't there. You know? Nobody ever associated my depression with diet or food before—they just didn't make that connection.

Dr. Drew Ramsey: People get depressed, right? Your brain is made of fat, it needs fat, it needs certain fat soluble nutrients. Certain fats, like the long chain and omega-3 fats, are highly correlated with depression. We actually have a reasonable data signal you can use to treat depression. The Cochrane Group found that there was a statistically significant improvement if you pull all the studies.

Maggie Ward: I think there is a long list of foods that are going to be good for the brain. If you want to put it into more simple categories. I'd put good quality fat up at the top of the list. I mean, our brains are mostly fat so to get the nourishment for your brain and for development, it's really, really critical. There are certain fats that are essential. There's a lot more information now out about it, but omega-3 and omega-6 fats are essential because our bodies don't make them, so we have to eat them.

Dr. Mark Hyman: Do you suffer from depression? If so, I want you to ask yourself these questions.

Do you have a deficiency of omega-3 fats? It's likely, considering 99% of Americans have an omega-3 fat deficiency. In addition to eating these healthy fats, which come from grass-fed

meats and grass-fed butter, coconut oil, avocados, nuts and seeds, you also want to avoid refined vegetable oils, which have been shown to be linked to depression, violence, homicide, suicide, and poverty. These are refined vegetable oils that we've never consumed before in human history. We've gone to a thousand-fold increase in our intake of refined soybean oil, that's 100,000% more of these refined oils than we had 100 years ago and they're not really designed to be consumed in those massive quantities. As long as they're in the form of food, it's fine to eat soybeans, nuts, seeds, but avoid the refined vegetable oils because they're bad for your brain.

Dr. Izabella Wentz:

When I was struggling with Hashimoto's, it was really, really scary for me. I had anxiety attacks and panic attacks that I'd never had before and I started to have new onset anxiety disorders and social anxiety. One of the worst things that happened with Hashimoto's is that I started to have brain fog. The brain fog that comes along with thyroid disease is quite scary because you don't know what's happening to you. You can go from being this really intelligent person who's on top of your game, can tell jokes very quickly, can study and remember things very quickly, to all of a sudden walking into rooms and forgetting why you got there in the first place. That can be very, very scary when you feel like your mind is slipping away from you—where you're slowly losing parts of yourself. I became less funny, less outgoing, less interactive with the world around me, and this was all related to Hashimoto's.

People with thyroid disorders can exhibit a lot of symptoms that affect their brain. Some of the things that I've seen are: fatigue, brain fog, apathy, irritability, anxiety, and panic attacks. We're also going to see times of depression. I've seen people who are misdiagnosed with bipolar disorder, and I've also seen people who are hospitalized for psychotic disorders as a result of Hashimoto's.

Cephalopathy is also a commonly undiagnosed condition, where thyroid antibodies can actually cross-react with brain antibodies or thyroid antibodies cross through to the brain. At that point, a person can actually have a lot of challenges. We might see them having struggles with their gait, their balance, they may have seizures, or they may have symptoms like dementia, delusions and even hallucinations. There's a big spectrum of how Hashimoto's can affect the brain.

There are so many different root causes of mental health issues, brain deterioration, and brain fog, and the thyroid health is actually fairly resolvable. Whenever you have these symptoms, you may have heard that there's nothing you can do about your brain function, that you're just getting older, that this is what happens when you're a mom, but actually the thyroid condition can be a root cause of a lot of your brain symptoms and a reversible reason for them, too.

Unfortunately, there have been many times where people were misdiagnosed and told they had x condition, whether that was a mental health condition or a type of dementia. The conventional medical approach was that this condition wasn't reversible and that this person either had to wait as they deteriorated or take lifelong psychiatric medications. What we've been able to find is that when you actually address somebody's thyroid condition, in many cases, these symptoms can be reversed. There are things that are commonly misdiagnosed, such as bipolar disorder, seizure disorders, panic attacks, anxiety attacks, all these things can stem from thyroid disease and are fairly easily reversed when you get the proper thyroid treatment and when you address the autoimmune component of your thyroid condition.

Dr. Datis Kharrazian:

When we see a lot of chronic patients have hypothyroidism, their chief complaints are depression and fatigue, and most of that is brain-based. As the brain gets inflamed, they can't activate their brain so they have depression. They have no need to do anything and everything they do activates their brain, so their exhaustion and depression is really all brain—it has nothing to do with the thyroid. When they spend all this time trying to figure out the right

thyroid medication dosage, they're usually unsuccessful because they haven't addressed the brain autoimmunity or their autoimmunity in general.

Dr. Izabella Wentz:

For people with Hashimoto's and for thyroid disease, I really like to recommend a focus on eating a whole-food-based diet that's minimally processed. I've seen the most benefit from patients going on a Paleo diet, as well as the Autoimmune Paleo Diet. We've actually been able to see and measure improvement in people's symptoms as well as in their thyroid antibody markers, which can tell us how aggressive the thyroid condition is. We see symptoms like headaches, panic attacks, palpitations, weight gain, fatigue, all these symptoms begin to melt away when we get rid of the reactive foods and focus on eating organic, wild-caught, and real foods. I love to see people eating bone broth, good fats, organic and wild-caught meats.

Dr. Datis Kharrazian:

We published a study four years ago, looking at 400 healthy blood donors in the US. We measured their antibodies to wheat and milk protein, and we found that there was actually close to 15% of the population that had antibodies to different proteins associated with casein and gluten. We found half of them had brain antibodies. The Hashimoto's hypothyroid person is very genetically susceptible to gluten and wheat. When you add in their antibodies from the thyroid that attach to the brain, and being thyroid hormone deficient this turns on brain inflammation. Many that have gluten intolerances, this turns on brain degeneration and brain inflammation.

Dr. Izabella Wentz:

We'll address some of the most important nutrients. The first is selenium. Selenium deficiency has been recognized as an environmental trigger for thyroid disease. We find that 200 to 400 micrograms of Selenomethionine can reduce the attack on the thyroid gland by about half. We also see that it reduces anxiety, hair loss, and a whole host of other thyroid symptoms. I also really love to see people with thyroid disorders on thiamine, especially when they have any types of fatigue or brain fog. Thiamine, around 600 milligrams, has been clinically shown to reverse thyroid fatigue in as little as three to five days. I love the Benfotiamine version as well. This has been very, very effective for many of my clients and readers. A key component to addressing thyroid disease is to address the stress response. If you're dealing with a thyroid disorder, I really, really encourage you to be your own health advocate—learn as much as you can about your thyroid condition so you can take action on getting better.

Some things you can do at own home include going on a gluten-free, dairy-free and soy-free diet. We see transformations in as little as three days where people's symptoms will melt away once they eliminate these. Make sure you're eating a diet that is blood sugar balanced. Eat plenty of good fats and proteins and reduce your carbohydrate intake. You're going to start feeling a lot better. The fatigue and anxiety will melt away, and your brain is going to be functioning much better.

I also encourage you to take on some stress-relieving hobbies. Whatever you can do to put your body into more of that rest-and-digest state is going to really, really help you in the long term.

Dr. Mark Hyman:

Ask your doctor to check for the following blood tests: TSH, Free T3, Free T4, and thyroid antibodies.

Do you have vitamin D deficiency? This is especially likely if you're depressed during the winter, so have your doctor check for 25-Hydroxy Vitamin D. Your level should be at least 50. Vitamin D is a critical brain nutrient that has been linked to improvement in cognitive function, and delay in many chronic brain disorders. Do you have folic acid or B-12 deficiency? Ask your doctor to test your homocysteine and methylmalonic acid levels to check for these deficiencies. Take an extra 800 micrograms of methylated folate and 1000 micrograms of B-12.

Do you have food allergies or sensitivities? Food allergies create a metabolic disorder that can lead to a whole host of mental symptoms, including depression. Gluten and dairy are the major culprits. In fact, partially digested dairy and wheat particles are found in the urine of severely

depressed patients, as well as children with autism, ADHD, and schizophrenia. These proteins change the brain function and can lead to not only depression, but also psychosis and autism.

Do you have inflammation? The standard American (SAD) diet contains a host of pro-inflammatory foods. To treat depression, you need to get rid of the causes of inflammation and restore the normal immune balance through our food and nutrients, as well as exercise, sleep, and stress management habits.

Erika:

Man, the sun came out because I stopped eating gluten and I'd never heard of gluten before. I didn't know anything about it, but after a few weeks of eating paleo, the depression and arthritis pain went away, and I started sleeping better. I had a few crazy experiences where I relapsed. Someone offered me pizza. I was hungry and it was lunch time, I thought, "Oh well, no big deal." I had a slice of pizza and two hours later, I'm in my car weeping feeling as though the whole world has crashed, I'm in a black hole and I thought, "Wow, okay, this gluten thing may have something to it." I thought, "Okay, that's it, I'll go back to the no gluten for a while and see how that goes." And I felt much better. My mood lifted, my clarity of thought improved, the depression went away and then it happened again.

I was with somebody, we were going out shopping, and we decided to have a quick snack before we went. She put out toast and cheese, and I thought, "Well, that would be rude, it can't be that big a deal, no big detour here, let's just have a little snack and then go." And two hours later, this time rather than just a black mood, it was a rage. It's like I blew up. I realized that gluten is like poison for my mind.

Dr. Mark Hyman:

What are the symptoms of gluten sensitivity and what kinds of brain disorders result from gluten sensitivity?

Dr. Tom O'Bryan:

Oh my goodness, it runs the gamut. There are a number of papers on reversing schizophrenia with a wheat-free diet—these are gluten-sensitive people, not celiacs. A year later after reversing schizophrenia, they're still checked out of the treatment centers and not on any meds. They publish a year later, these people are fine now as long as they're wheat free. The most common is depression or anxiety, which are called the affective disorders with wheat sensitivity. Anxiety, depression, schizophrenia, migraines, seizures, and any function of the body, if the tissue is being compromised by inflammation and if wheat is the gasoline on the fire, when you calm down the fire, any symptom my improve.

Dr. Mark Hyman:

One of the emerging concepts in medicine today is this idea of inflammation. Most chronic disease is caused by inflammation, diabetes, obesity, cancer, heart disease, dementia, depression, autism, and ADD, we find are all linked to inflammation.

Dr. Tom O'Bryan:

Yes. Yes.

Dr. Mark Hyman:

You've been involved with development of certain tests that actually help us look at the immune system response that affects the brain. Can you tell us a little more about that?

Dr. Tom O'Bryan:

All degenerative diseases, as far as I know, are diseases of inflammation. At the cellular level, the cells are inflamed. The basic rule is to identify if there's inflammation going on and then, why is it there? And stop throwing gasoline on the fire. That's where the wheat comes in or other toxins. With the brain, we want to look for antibodies to your brain. There's a normal level and reference range of antibodies that are to be expected just to keep having a healthy brain and make new brain cells. When you have elevated antibodies to different parts of your brain, you have a problem. There's some mechanism going on, which may not be causing symptoms yet, or the symptoms are not associated yet with the elevated antibodies, like depression, anxiety, brain fog, migraines, or seizures. It doesn't matter what function you talk about in the brain—if it's inflamed, that may be the trigger causing that dysfunction.

We want to look for elevated antibodies in the brain tissue? There are a few labs that will look at that for you now. They will look to see if you have elevated antibodies to myelin. Do you have elevated antibodies to cerebellum? Do you have elevated antibodies to gangliosides, which is a component of all nerves? The value of looking is that you see, wow, I've got inflammation going on in my brain. I feel fine, but if it's elevated...

Dr. Mark Hyman: You may not know you don't feel fine.

Dr. Tom O'Bryan: That's right.

Dr. Mark Hyman: Often people don't know how badly they feel until they start feeling better.

Dr. Tom O'Bryan: Right. Because they go on an elimination diet and say, "Well, I feel so much better. I'm thinking clearer." They didn't realize they weren't thinking so clear before.

Dr. Mark Hyman: In addition to the brain science of how we can increase our brain connections and build new brain cells, one of the things we've been learning over the last few decades is that inflammation is a common denominator across a whole spectrum of diseases: heart disease, cancer, diabetes, obesity, autoimmune and inflammatory diseases, but also brain disorders. We know that dementia, autism, and depression are inflammation of the brain. In fact, they're recommending anti-inflammatory drugs to treat depression. That's the wrong idea, but it shows you where the science is going.

What causes inflammation? It's the usual culprits. It's our diet—we have a very inflammatory diet: high in sugar and processed foods, low in the good fats that are anti-inflammatory, like omega-3 fats, and low in phytochemicals, which are plant compounds that are anti-inflammatory in our food (like vegetables) and fruits and spices (like turmeric). All of these really promote inflammation of the body. Sugar is probably the worst. There are other insults. We have things like Lyme disease and tick infections, viruses and gut dysfunction, probably the other major driver of inflammation. When your gut is inflamed, like most of our guts are, it creates inflammation not just in your gut but throughout your body and in your brain. Toxins and stress also play a role in driving inflammation. Lack of exercise is inflammatory. All of these insults and factors are driving inflammation in the brain that leads to autism, Alzheimer's, depression, mood disorders, and more.

Are bugs in your gut affecting your brain or your immune system? Work with a Functional Medicine practitioner to determine and eliminate gut issues, including a leaky gut, irritable bowel syndrome, small intestinal bacterial overgrowth, and other gut issues.

Chris Kresser: In the last 10 or 20 years, the gut-brain axis has been a really hot topic in the research literature and in the popular media. I think a lot of people have heard that there's a connection between the microbes that inhabit our gut and our brain. Things like intestinal permeability or leaky gut (when the gut barrier breaks down) can cause problems with our brain and may be connected to conditions like autism, spectrum disorder, and ADHD. The most current theory on what causes depression is known as the Inflammatory Cytokine Model of Depression. That's a fancy way of saying that when our gut becomes inflamed, it produces chemicals that travel through the blood stream, cross our blood-brain barrier and suppress the activity in the frontal cortex. That produces all the tell-tale signs and symptoms of depression.

Dr. Mark Hyman: Should we be taking Advil for depression?

Chris Kresser: Absolutely not, because that's actually going to make the gut worse over the long term. We know that Advil can cause ulcers and a whole bunch of other problems in the gut. We should be attending to our diet, which is a crucial factor for gut health. If we eat a lot of heavily processed and refined foods, that causes a pro-inflammatory microbiota, which means it feeds pathogenic bacteria and bad bugs, and allow them to proliferate and then they produce compounds that can be toxic to the brain.

- Dr. Mark Hyman: Do you have hormonal imbalances? Out-of-balance hormones like insulin and cortisol can detrimentally impact depression. A real, whole, unprocessed-foods diet combined with lifestyle factors like stress control can help balance your hormones.
- Dr. Maggie Ney: Things like parabens and BPAs mimic estrogen in the body and disrupt our own natural hormonal rhythm. High stress is huge and contributes to hormonal imbalances. There are a lot of variables. The symptoms that can manifest from hormonal imbalances for the brain are: fatigue, depression, anxiety, brain fog, not feeling like yourself anymore, it's like you're looking through the world with a different lens, all of those really matter.
- When it comes to hormones and depression, you really need to look at all of them. Sometimes, they're not easily measurable in the blood depending on how old a woman is or where she is in her menstrual cycle. You have to look at all the symptoms. Estrogen, for example, is really a powerful hormone for depression. It helps awaken the serotonin receptors in the brain. When we're not exposed to healthy levels of estrogen, those receptors aren't being activated and we're not getting the benefits of serotonin, which is considered to be our happy hormone. Healthy levels of estrogen yield feeling good, being able to sleep, and less anxiety.
- Progesterone is another one—it's a hormone women are only exposed to from the time of ovulation to our periods, and that level can fluctuate a lot, certainly in perimenopause when we're not ovulating regularly, we're not being exposed to progesterone. Other times, when women's estrogen-progesterone ratio isn't optimal, we can experience the effects of not having optimal progesterone levels. Progesterone helps activate GABA receptors in the brain, which helps with calming and makes us feel relaxed. If we don't have adequate progesterone, then the GABA, that important neurotransmitter, isn't being efficiently used.
- Progesterone also affects dopamine levels. Low progesterone contributes to low dopamine, which is really important for the prefrontal cortex, which controls our higher executive functioning and our mood and behavior. There are a lot of different hormones that affect mood and depression.
- During perimenopause, one of the hallmarks is that hormones just going up and down and not in their normal rhythmic nature. A woman's mood is feeling those effects.
- Dr. Jennifer Love: I remember being in medical school and one of the most ridiculous things I heard was that 50% of women will have a depressive episode at some time in their lives, and maybe only a third of men. Depression has nothing to do with hormones. I just wanted to laugh and say, have you ever met anyone in menopause? Have you ever had a female family friend going through menopause and they have these monthly mood swings? That's not a depressive episode, but there are a lot of things that play a role in our level of mood on a day-to-day basis. Are we getting enough sleep? Are our hormones balanced? What is our stress like?
- Dr. Mark Hyman: Another major cause of depression and anxiety is stress. Constantly feeling stressed out is a surefire way to become depressed or soak the fires of depression.
- Did you know that your phone and computer addiction can also contribute to depression and anxiety? More and more studies have been coming out showing the link between too much Internet usage and screen time, and mental and mood disorders like ADHD, anxiety, depression, and more. In a recent study, people who reported excessive Internet use also reported social anxiety disorders, loneliness, social isolation, and lower quality of life. They also showed that Internet addiction was associated with reduced immune function. Here's what our experts had to say about the link between social media and depression.
- Pedram Shojai: In the modern world, stressors, such as the sound of a screeching car tire, the sound of a helicopter, a text message that might be bringing something stressful, these all start to elicit calls to this emergency system that's not supposed to be used to the extent that it's being used.

We are overusing and abusing this sympathetic nervous system and what's happening is we're starting to become more and more wired for stress. It's starting to break our brains, collapse our adrenal function, which means store more fat, have much worse tempers, and not be able to be present. When you're here, when you're now, when you're present is that parasympathetic feeling. Most of us have this low-grade anxiety because the stress is overwhelming. It's usually just bubbling up, and that has a lot to do with the modern world if you will.

Also, it affects our interpretation of events and our ability to have better boundaries allowing for certain things to come into our life. A lot of it, I've found, is also just calendar and time management, and being able to say no to things when you already have too much on your plate. I think a lot of us have become people pleasers and oftentimes take on more than we should and that our bodies can account for. We're then in time compression and that puts us into sympathetic overdrive again. It becomes a very vicious cycle.

The gentleman who coined the term stress back in the 50s, Hans Selye, talked about distress, which is the negative type and then eustress, which is the positive type. Stress has only a negative connotation really within our culture, but we know there's some peak performance effects. All the modern sciences coming out show that positive stressors that don't break you and keep you on that razor's edge make you better. There are lots of good reasons to have stress.

I mean look, if it weren't for stress, we wouldn't get out of bed. You get stressed when you don't have food and you have to go get it, right? Life brings on stress but then the ability to match that stress with what you need to do to deliver, and render, show up, learn, and grow from that event oftentimes helps you grow. I think the modern human needs to learn to find that line of stress and stay right under the level where it's overwhelming so that it becomes a growth tool in life. You can use stress to continue to grow and then understand how stress works so that when you unplug, I call it "you're drinking from infinity." You stop time. You go hard, work hard, and then you unplug and relax fully and deeply, so that when you come back up, you have the reserves and the resilience to grow again through stress as a tool.

Dr. Rick Hanson:

There has been a lot of research on what stress does to the brain. Small amounts of stress that are managed successfully tend to grow coping resources embedded in our own nervous system—that's good. That's pain with gain. But most pain has no gain. Most stressful experiences, in part because of the brain's evolved negativity bias, which means that it tends to overlearn from stressful, emotionally negative, emotionally painful experiences, and it tends to under learn from beneficial, usually enjoyable experiences.

So to really focus here, outside of mild experiences of stress on the brain that actually make us stronger, when stress is harming the brain, it does so through multiple pathways. One of the primary pathways involves the stress hormone cortisol. The same neurohormonal machinery that evolved to help our ancestors run away from saber-toothed tigers and threats prior to that, that machinery is active today when we're stuck in traffic or having an irritating interaction with our partner or kid, or our boss is coming at us too fast and too hard. We are experiencing releases of cortisol then, just as our ancestors did running for their lives.

In the brain, cortisol has kind of a one-two punch. First, it overstimulates and sensitizes the alarm bell of the brain—the amygdala. (Technically, there are two amygdalae, one on either side of the brain. People speak of them in the singular). We have an alarm bell that reacts more easily and louder. Cortisol also overstimulates and gradually kills neurons in a nearby part of the brain, the hippocampus, which does three important things in terms of managing upsetting experiences.

The hippocampus puts things in context. My boss is not my mother: she looks like my mother, she's authoritative like my mother, but she is not my mother. The hippocampus puts things in context. This is now.

The second thing the hippocampus does is it literally inhibits—it puts the brakes on the alarm bell of the brain, the amygdala. It calms down the amygdala so it's not so intensely sounding the alarm.

And then third, the hippocampus tells the hypothalamus (a very important part of the brain that is at the center of the stress hormone cascade), enough stress hormones already, no more.

That creates a vicious cycle. Stress today overstimulates the amygdala, weakens and damages the hippocampus, and that makes us even a little more irritable, anxious, prickly, or blue tomorrow, a little more vulnerable to stress the next day, which then releases more cortisol sensitizing the amygdala, damaging the hippocampus, which in turn makes us even more vulnerable to stress the day after that.

Emily Fletcher:

Doctors are calling stress the black plague of our century and I don't think that that's an over exaggeration. If we want to understand why the human body reacts to stress in the way that it does, we have to go back in time a few thousand years. Say we're hunting and gathering in the woods and let's say that a saber-toothed tiger jumps out at us with the intent to kill. The first thing that's going to happen is our digestion will flood with acid to shut down digestion because we need all hands on deck to fight or flee this tiger. That same acid will seep onto the skin so that we don't taste very good if we get bitten by that tiger. Our bladder and bowels will evacuate so we can be light on our feet—that's what the nervous poos are before you have a big thing to do.

Your immune system goes to the back burner, because who cares if you're going to get cancer if you're about to be killed by a tiger. Your adrenaline and cortisol levels increase, and those are actually acidic in nature. That can actually accelerate the body's aging. We all know this intuitively: if we're working too hard and not sleeping, we look in the mirror and we look ten years older than we are. We go on vacation and we're like, "Oh, I look amazing." And that's real-time feedback of what stress is doing to the body.

That series of chemical reactions is very useful if your demands are predatory attacks. If your demands are in-laws, kids, deadlines, text messages, or emails, then this fight-or-flight stress reaction has maladapted and it's now disallowing us from performing at the top of our game. This is where meditation really comes into play. Meditation helps get rid of that adrenal and cortisol, and it actually starts to flood the brain with dopamine and serotonin, which are bliss chemicals. Not only does meditation feel amazing and improve your performance, but it also can reverse your body age by somewhere between 8 to 15 years, which I think is nuts.

When I first heard about this I thought, "Well, come on, it's not magic. It's not a fountain of youth. It's not a miracle." It's not, but meditation is actually lengthening your telomeres. Telomeres are like the little plastic thing at the end of your shoelace. If that plastic thing unravels, then your shoelace unravels. Similarly, if your telomeres unravel, then that can impact your actual DNA. It can impact how quickly your DNA unravels.

Dr. Pedram Shojai:

Meditation is a wonderful tool for self-discovery and relaxation, and all these wonderful things that have passed down from the Himalayas. Okay great, it's old it must be true. You look at the data that's coming through and everyone's so excited about what it does to the brain and builds the resilience and all sorts of things, and it helps us with neuroplasticity. I didn't need that data back when I was a monk in the 90s because when you see a seasoned meditator, you see it immediately in their face—they're glowing. There's this feedback loop that's already there because you notice that this is a calm, beautiful person.

When you're meditating, you start to build this part of the brain that says, no, you know what, I don't think you want to have that cheesecake. I know it sounds like a good idea right now, but no cheesecake. That's not on your diet. It's that moment where that voice can come in and stop us from making terrible decisions, whether it's in our marital or business life, or just our everyday diet, that comes from empowering the part of the brain that runs that show. Meditation clearly shows that that's what it can enhance. If all I had was negation of impulses, mediation would be the best drug in town, yet it does way more than just that.

Dr. Mark Hyman:

When you fix your body, you fix your broken brain. Your energy, memory, focus, and your joy will all increase. Depression will fade away like a bad dream. Here are some important steps for managing depression and anxiety today.

First, eat whole real food. Feed your brain and body with a nutrient-dense whole, fresh plant-based diet that includes plenty of protein and healthy fats. Your brain is mostly made up of fat, so it makes sense to eat plenty of healthy fats and include anti-inflammatory omega-3 fatty acids as a supplement, as well as adding good quality protein. All of this can help heal your brain.

Dr. Drew Ramsey:

I think the most exciting statistic that's come out about mental health was from a trial that came out in January 31, 2017. It was the first randomized controlled clinical trial using diet to treat depression. A modified Mediterranean diet was found to put 31% of patients into full remission. These are patients who had pretty severe depression and were already on meds and in psychotherapy, so that's a statistic I like. People getting better using food.

At our nutritional psychiatry here in New York City, we do an eater evaluation. We see eaters fall into a few categories. For example, there's the beige diet, or we call it the 12-year-old-boy diet where it's like, "I eat pasta, pizza, chicken fingers, and martinis. That's my diet." It's like the 12-year-old diet plus alcohol. We look at that and we created a method where we help people find joy in their food. That's really our goal: we accomplish that through enjoying real, whole foods and enjoying them in a simple way and focusing not on singular foods like kale or wild salmon or blueberries, but focusing on food categories. Food categories help people think more broadly and creatively about their diet. If you're only eating kale, what about that great Swiss chard or those amazing sunflower sprouts or some purslane. Those are all wonderful leafy greens and they all have great health benefits. The hope is that the MAD diet will be undone by this new movement we're seeing. By last count, there were 8,144 farmers' markets in America. I don't think there's better medicine for our country.

Dr. Mark Hyman:

Next, cut out sugar. If you've ever eaten something sugary and crashed a little later and felt absolutely miserable, you know how sugar can contribute to depression. Increasingly, research shows that sugar consumption can contribute to depression. Become a detective and find and avoid hidden sources of sugar, which are more prevalent than you think.

Dr. Drew Ramsey:

We're addicted to sugar for a number of reasons. One, it's in everything. A second reason that I think is overlooked is we've shifted our palate. I haven't eaten simple sugars in a long time and when I get something, boy it's so sweet, like a candy bar is out of control. It's super saturated. We've lived in this milieu of very salty, very sugary, very powerfully flavored foods. People's palates have shifted towards craving and desiring that. As we talk about sugar being toxic, part of me feels like people are quite confused. Sugar is a nutrient that our brain is quite dependent on and uses everyday, and maintaining healthy blood sugar is absolutely critical. Cutting out simple sugars from your diet is one of the most important steps I think you to reclaim your eating.

At the same time, when you eat a plant-based diet, you're eating a lot of sugars, but they're a slower burning, lower glycemic index sugar. They also come with all these nutrients. What's really hurting us are the sugars, the empty calories that don't come with any nutrients. It's like having lots of gas and no way to deal with the exhaust.

Dr. Mark Hyman: Next, exercise regularly and intensely. Studies show exercise is as good as and even better than antidepressants and treating depression

I think less than 8% of Americans get their recommended daily exercise. Why is it important? Not only because it prevents heart disease, not only because it helps with weight, but because it has profound effects on the brain. We know that vigorous exercise three times a week is a better treatment for depression than most antidepressant drugs. We know that if you just take a walk everyday you dramatically reduce your risk of Alzheimer's and dementia. We know it's important for kids with ADD (we call that nature deficit disorder where they're not out playing and enjoying their bodies and stimulating their nervous system in a positive way). They're overstimulated through video games and addictive behaviors.

These are really profound effects of exercise across the board. In fact, one of the most powerful things it does is it increases brain derived neurotrophic factor (BDNF), which is like miracle grow for your brain. It increases new brain cells and the connection between brain cells so you can remake your brain at any age. Exercise is one of the most powerful tools to do that.

Adam Cobb: Exercise for our brains lights it up. We talked about exercise sounding like movement, really lighting up the brain. We can be in a state of stuck and we can go from that state of stuck to feeling lit up just by movement, just by exercising. A simple 10-minute walk can start to fire those neurons, wake everything up, and really turn the lights on.

Clients that I've seen with a sedentary lifestyle have a hard time feeling that energy, feeling energized, and are typically on a lot of depression meds, are more pessimists than optimists, and are typically more negative in general.

Dr. Gabrielle Lyon: I practice something called muscle-centric medicine and really the focus of everything is the organ system of muscle. You keep your muscles healthy, then you have a healthy brain. The other important aspect of exercise and the brain is that that muscle is an endocrine organ—when you use resistance training it actually secretes things like growth factor or BDNF. All these things help rejuvenate the brain and they cross the blood-brain barrier, so you're not just training your muscles, but you're also regenerating your brain.

By the time many of these sedentary patients come to me, they are really ready to change. As in the military, there's a crawl, walk, run process. We begin with crawling, not literally. I usually talk about movement and the difference between exercise and physical activity. A lot of people do physical activity, which is just movement-based and not a lot of people do exercise—exercise that is really planned, executed programs with progressions, typically you train with somebody.

Exercises that are good for the brain target large muscle groups. There's been a lot of study on cardiovascular health in the brain. I think that one of the reasons for that is because it's really easy to measure. A big trend was endurance training, the brain, and BDNF, however, emerging data is really looking at resistance training. Resistance training is lifting weights, and lifting weights actually stimulates the muscles and creates situations that are healthy for the brain like those growth factors that we talked about. Also, it helps with mood and cognition. Some examples of great exercises are really heavy, compound movements: the squat, the deadlift, and the bench press.

Dr. Mark Hyman: Also, get enough sleep. Terrible sleep will only contribute to and exacerbate depression. You want to aim for eight hours of solid, uninterrupted sleep every night.

Dr. Pedram Shojai: It doesn't take a neurologist to tell you that lack of sleep makes you crazy. Sleep is incredibly important for the remapping of neurons of consolidation, trimming of thoughts, emotions, and processes that happened all day. It's like, you eat a meal, you have to digest it. You have an experience, your mind has to digest it. When we go down, it's when we shut down the amusement park to clean things up, to test everything out, to pressure test the rides and make

sure tomorrow's going to be another good day. If we don't get that, we start to have issues carrying forth into the next day.

Look at the kind of behavioral fallout, right? I didn't get enough sleep last night because my baby was up. This morning, I had to have that third cup of coffee because Lord knows, I have to show up and still be who I need to be at work. And then by 10 o'clock, my blood sugar has crashed so I'm snacking on things I would otherwise not be snacking on, going back for some more coffee, and now I've thrown off my blood sugar, I've thrown off my adrenals and I'm at this place where I'm wired and tired and by the end of the night, I'm not really as friendly as I should be to my children, right? You see this incredible fallout that carries forward into life that comes from a poor night's sleep. That then becomes behavioral, becomes marital problems, all these sorts of things that we see, it all starts from starting to slow down.

Dr. Mark Hyman: There's something else that you talked about, which is sort of related to this. It's this concept of circadian rhythm and how that plays a role in our brain, hormones, and neurotransmitters, which is basically how we live in rhythm or out of rhythm. Can you talk about that and the brain?

Chris Kresser: Yes, this is really fascinating because it goes way back—way before humans, all the way back to the first single-celled organism that evolved on this planet. We're talking about billions of years ago here. Every organism that ever came to be on this planet evolved in the 24-hour light and dark cycle that we have on planet earth. Every cell of every organism is entrained to that 24/7 light-dark cycle. We now know that in humans, that light-dark cycle affects every aspect of our physiology, from our endocrine system and our hormones to our brain function to our metabolism, everything.

Dr. Mark Hyman: Sleep.

Chris Kresser: Sleep, of course sleep.

Dr. Mark Hyman: Most importantly.

Chris Kresser: Most importantly, sleep. You know essentially our bodies are hard-wired to expect a period of light followed by a period of darkness and when we wake up in the mornings, our bodies start producing cortisol, which is kind of like the get-up-and-go hormone. When night falls, it starts producing melatonin, which helps us to fall asleep and stay asleep. The problem is, now, in the last 150 years, we've developed artificial light, which is awesome. It allows us to be more productive, and entertainment, art, and all kinds of things are possible with artificial light that weren't before. The downside of that is, now we can sit in our bed at 11 pm staring at our iPad, which is emitting blue light, the same spectrum of light that the sun emits, which basically tells your body, "Oh, it's time to wake up. Time to get the cortisol production going." And then the melatonin drops, totally messing with your circadian rhythm. That can have downstream effects like increasing the risk of obesity and metabolic disease, increasing the risk of depression and anxiety, and seasonal affective disorder. We know that even flight personnel and people who do night shift work are at much higher risk for cancer.

Dr. Mark Hyman: And heart disease.

Chris Kresser: And heart disease. This affects our immune system, cardiovascular system, everything. Getting closer to that natural rhythm of light and dark is really important. It doesn't mean we all have to live in a tent in the backyard.

Dr. Mark Hyman: Can we put a mattress in it?

Chris Kresser: You could do that if you want. Actually, it would be really good for you. We can do things like, for example, if we have to use a computer at night, there are now glasses that you can buy that filter out the blue light that comes from those screens. If you came to my house at night, you'd

see my wife and I wearing these funny glasses with kind of an orange tint that filters that light out. You can take steps to try not to use electronic media within an hour or an hour and a half before bedtime because that has that effect that I just described. Get some bright light exposure during the day, so if you work in an office or in an indoor environment, make sure to go outside for a walk at lunchtime or in the morning take a walk with no sunglasses, make sure you let that light hit your retina and stimulate the cortisol production.

Dr. Mark Hyman: It's basically like candle therapy. When the sun goes down, switch to candles and get off your screens.

Chris Kresser: Absolutely.

Dr. Mark Hyman: And if you can't, wear those funny glasses.

Chris Kresser: Yes, turn the lights down, get some mood lighting, and filter out the blue light from your devices at night. It's pretty widely recognized now, which is why even computer operating systems now, like the latest update for Mac (High Sierra) has something called night shift. A lot of people might not even know that this is on their computer, but when you turn night shift on, what happens is, when the sun goes down, the type of light that's emitted from the screen changes, it becomes warmer, which is meant to mimic more of the kind of light that you would be exposed to at night, not during the daytime.

Dr. Mark Hyman: Next, learn how to control and manage your stress. Constantly feeling stressed out becomes a surefire way to become depressed or stoke the fires of depression. Find out what calms you and practice it regularly, whether that includes meditation, yoga, or just walking your dog. Sometimes, we need to find ways to deal with stress or anxiety in the moment. That's when deep breathing can be very helpful.

Dr. Larry Momoya: Meditation doesn't have to necessarily mean that you're sitting under a tree and escaping from the whole world. Sometimes just a few minutes in your office in-between clients could be enough to help recharge your batteries. A lot of the techniques I like in meditation involve breath work, practicing presence, and watching the breath as it goes in and out. That can be done quite simply by using a mantra. As you inhale, say the words "I am," silently in your own mind. And as you exhale, say the word "peace," silently in your own mind. Do that just for a few minutes: I am peace, I am peace. Saying that to yourself silently as you're inhaling and exhaling just for a few moments could bring you some inner peace.

I've used techniques of meditation and hypnosis for my own self-healing and I like to use a complementary approach when I'm working with people. I'm working with the hardware, which is the brain, physiology, neurotransmitters, brain-blood flow, optimization of the brain. At the same time, we're also doing software work. We're working in psychotherapy: cognitive behavioral therapy is one technique I like very much. We're also using other techniques working with the unconscious mind. Practicing presence, working with someone's timelines, and doing work with hypnosis, are other beautiful methods of really learning to be in the present moment.

The mind always wants to take you out of the present moment. The mind wants to talk you into the future or take you into the past, and both of those involve thought. It's impossible to be in the present moment and have thought at the same time. To really be in the present moment will require the mind to turn off. That essentially is meditation. Think about this: the moment your mind goes into the future, the mind has to be turned on. When the mind goes into the past, ruminating, the mind has to be on. You have to be thinking. But to be in the present moment is really turning an off-switch to the mind. The mind will fight you because it doesn't want to be turned off. It wants to stay in the future or in the past and believes it needs to do that. When you are the master of yourself, you can have an off-switch to turn off the noise machine in the head so you can get yourself to the present moment. You can be in a state of no

mind, essentially. Even if it's for a few moments, it's like hitting a reset button and turning the switch off to give you some more restoration for yourself so that when you need to use the mind, it's purposeful and sharp.

Dr. Omid Naim:

If you go down to the level of the nervous system and what I've been talking about so far around being disconnected, which means at the level of the nervous system we've become very disembodied. That term disembodied means that we're not connecting with our emotions as part of our human experience. In the West especially, we're a culture defined by "I think therefore I am." My thoughts, my conscious mind, that's me.

Belief in our own thoughts serves us when it's connected to what's happening in the moment. Our nervous system has many components to it that read and sense the environment, and guide us on how to respond. For example, my stomach is letting me know I'm hungry, pain lets me know that there's some force on my body that's causing drama. Anxiety's primary purpose is to let me know that there's something dangerous, there's something concerning in my environment.

Our emotions, our bodily experiences, are sensations in our body that inform us. We have this capacity for thought and reflection. To reflect and be able to choose, to be able to decide how to handle a situation. What's happened is, as we progress more and more in modern life, we're more and more disconnected from our sensations. We're more and more disconnected from reading the environment and a very common experience in modern man is being stuck in his head.

We can become disconnected, or what we call disembodied.

Dr. Mona Karimpour:

I've seen an increase in depression and anxiety with the use of social media in adolescents 13 and up. The lifestyle changes and developmental stages that they're dealing with, they're dealing with high school, which in general high school there's a lot of peer competition. There's been a lot more bullying. And with the use of Facebook, Instagram, and other forms of social media, they're able to take a picture of someone that they're bullying and it can just go viral. I've seen a lot of misuse of social media, especially in that age group even college, causing a lot of depression and anxiety.

Dr. Omid Naim:

There's a lot of research on this in terms of amount of use and people who spend x number of hours a day on Facebook, that it leads to lower self-esteem and correlates with depression. In terms of the research on whether there's a link, I think that that's not a question really at this point. At the same time, we're not going to get away from technology, and balance is somehow really important.

Jim Kwik:

I talk about superpowers and superheros a lot, right? I think everybody has these innate mental superpowers. A focus, a concentration of creativity, and so on. There are three super villains that are attacking us on a regular basis that have never been here before. One: there's digital overload. We have, they call it information fatigue syndrome, information anxiety. So what's the result? We have higher blood pressure, a compression of leisure time, more stress than ever. Or even if we have leisure time, we can't even enjoy it because our minds are still multitasking and thinking about all these other things. Two: there's an epidemic of sleeplessness. Because of all this overload and overwhelm, there's so much information in the digital age, the amount of information is doubling at dizzying speeds. How many people feel like they buy all these books to help themselves and they sit on the shelf and become shelf help instead of self help, right?

Three: digital overload. There's so much information: emails, social media, app notifications, text messages, newspapers, magazines, and so on. It feels like you're taking a sip of water out of a fire hose. If knowledge is power, then it's not only power but also profit in this day and age, right? The faster you can learn, the faster you can earn. The amount of information is doubling

at dizzying speeds. The president of Google says that the amount of information, from the dawn of humanity to the year 2003, just a little over a decade ago, that amount is now created every two days online. People are drowning in information, but they're starving for practical wisdom, right? If the amount of information is doubling like this, the challenge is how we learn it, remember it, and read is pretty much consistent. That gap creates a lot of stress and anxiety.

Dr. Robin Berzin:

Top neuroscientists around the world have now codified that mobile phone addiction or mobile device addiction is real. These devices that we're using every day are actually addictive. They give us a dopamine rush every time we look at them. Dopamine is the same chemical in the brain that's activated when you eat sugar or when you take cocaine. We know that these phones that are literally attached to us are addictive, and that it's really hard for people to put them down. When dopamine, that important neurochemical that you get this rush from, goes away, how do you feel? You feel dropped, down, and anxious, the same way that you feel when you crash from having too much sugar. People are caught in this cycle of wanting that dopamine rush, feeling that crash when it's not there and then getting it again. And that's creating anxiety.

We know that mobile phones contribute to insomnia through affecting the way that our hippocampus controls our circadian rhythms. We know that the effects of these devices are real and I believe we're literally conducting the largest uncontrolled experiment on humankind that's ever been done, with our use of mobile devices and screens. We don't know how this is going to affect us long term because it's so early. It's 2017 right now and the iPhone came out in 2007. In 10 years, we have radically changed the way we work, the way we shop, the way that we communicate with everyone in our lives, the number of people with whom we're communicating on a regular basis, and that is radical. That is a very fast and quick period of time to change all of these fundamental ways in which we live our lives.

These devices are awesome but they're really affecting our health. We have to change the way that we interact with them and make sure they're serving us, otherwise we're going to be a slave to technology and that's not why we created it.

I always recommend that people avoid social media at key points in their day where they're getting habituated to looking at it just reflexively, right? Typically, that can be in the morning or at night. Make a choice, make a decision to not start your day with social media and to not end it with social media. It doesn't mean you can't check it all day, but I always recommend having some sort of routine in the morning that's screen free. We know that most people are going to spend 8+ hours a day looking at a screen. Don't make that the first 30 minutes of your morning. Get up, take a shower, get dressed, make your breakfast, in my case walk the dogs or take care of the baby, do something that doesn't involve your screen and resist that temptation to look at it and sort of time box it, right? Set that limit and say I'm not going to look at screens for this period of time.

The same thing in the evening when you get home. People go to bed too late, they stay up for an extra 30 minutes to an hour looking at media before they go to bed. Keep your phone out of your bedroom. Remind yourself, you have plenty of time to look at your phone all day, but create this special hiatus time at the bookends of your day where you can get used to not always having it. I think that's really important.

Dr. Mark Hyman:

Finally, take the right nutrients. Many nutrients can alleviate depression and support optimal brain function. The most important is omega-3 fatty acids. You can also use 5-HTP, which is a precursor of serotonin, the feel good chemical. Remember, stress lowers the feel-good neurotransmitter called serotonin. This leads to food cravings, depression, and other mood disorders. 5-HTP naturally replenishes serotonin levels in the brain. Also, vitamin B-6 can help support healthy moods and help reduce food cravings. I suggest working with a Functional Medicine practitioner to customize a nutrient program that works for you. Over the years, I've

found many patients don't connect how they feel with how they eat, how much they rest and sleep, how much they exercise, how much time they make for friends and community, or the media and news to which they expose themselves, which all can be stressful. Once you make these connections, you can change your approach to these important factors and to the other dozens of daily decisions you make every day.

Feeling fully energized and maintaining great brain health ultimately requires taking out the bad stuff and putting in the good stuff, including food and lifestyle choices.

Many of us get too little good food, too few nutrients, not enough good light and air, water, rest, sleep, rhythm, exercise both mental and physical, too little community, love, meaning, and purpose. Getting all of these ingredients for health is absolutely important for an optimally functioning brain.

Many of the experts we interviewed for this docuseries are using cutting-edge technology and alternative therapies for treating depression and other brain disorders. One of these therapies is called transcranial magnetic stimulation (TMS). We talked to a few practitioners about TMS, how it works, how it helps, and here's what they had to say.

Dr. Garrett Halweg:

I do an interventional technique called transcranial magnetic stimulation. I remember one patient in particular who was on several psych meds, and I used this technique. I was able to not only get them into remission but after they wanted to get off of their medications, we used exercise, diet, different lifestyle modifications and brain training, and through these techniques, they actually achieved remission, which means an absence of symptoms. They remained that way for the entirety of the time that I followed them.

Dr. Kimberly Cress:

TMS is an MRI strength magnet. It's 1.5 Tesla, so it's equivalent to a magnet that's used in an MRI machine for helping with imaging for individuals. That strength of magnet is used and pulsed on and off over a 20 to 40 minute period of time. It creates a magnetic field, which then creates electrical current. As the magnetic field comes down about three centimeters in depth within the brain, it then perpendicularly creates electric current. As you create electrical current, nerves fire and release chemicals or neurotransmitters like serotonin, norepinephrine, and dopamine. Those are the neurotransmitters that we provide artificially through medications, and now we're able to facilitate the release utilizing TMS. We're able to target where the magnet is treating. In the treatment of depression, we focus the magnet on what's called the dorsal lateral prefrontal cortex, which is basically the left front portion of the head. It's the area of the brain that's underactive as a result of the depression.

As the magnet pulses on and off, we're not only stimulating the release of those neurotransmitters: serotonin, Norepinephrine, and dopamine, but we're also then facilitating the current and the circuits to then fire, which is a process that's involved in mood regulation. We know that within depression not only do we have a dysfunction in these neurotransmitters but we also have a malfunction in these circuits.

We're able to come back and help facilitate the connectivity of the brain to help treat the illness of depression. We do it in a manner that doesn't have the risks that come with medications. Oftentimes, individuals come in, and part of the difficulty in effectively treating their illness is they can't tolerate medications.

Common complaints will be they have sexual dysfunction, weight gain, tiredness, upset stomach, or other gastrointestinal type symptoms. With TMS, we're facilitating the release of those neurotransmitters within the brain so they're not going throughout the body, creating those physical symptoms and side effects that can occur from medications. It's a treatment that's extremely well-tolerated. The most common complaint individuals might have is a little transient discomfort from the pulsing of the magnet as it's placed against the head. That pulsing—individuals can quickly become desensitized to it. They might have a little bit of

transient headache, but it's nothing that an Advil or a Tylenol can help alleviate. As they continue treatment, which lasts about 20 to 40 minutes, we're able to make these changes in the brain.

Keep in mind with TMS, it's a treatment that is done over multiple days. It's done five days a week for approximately six weeks in duration. Over that course of time as we're facilitating changes in the brain, we're also helping neurons to regenerate. We know within the illness of depression, neurons can shrink or atrophy. We can help facilitate the neurogenesis, the regeneration of neurons again to help provide not only individual's mood getting better but the longevity of the illness being under remission.

TMS has been FDA-cleared for individuals who have failed an antidepressant treatment. The reality is, individuals who come to my practice are individuals who have had decades of depression. They've had multiple medication trials and sometimes they're on multiple medications and still struggling. When we treat individuals sooner within the illness and to the point of remission, meaning the depression is gone, the science tells us that those are the individuals we can more effectively treat.

We can also help individuals who have had long years of depression—that's who I am treating and I'm having great success with them. I've even had individuals who have failed electric compulsive therapy (ECT) or even have VNS (vagal nerve stimulation) implanted within their chest and are still struggling with depression.

Dr. Mark Hyman: Whether it be diet or lifestyle changes, exercise or stress management techniques, alternative therapies, or a combination of all of these, there's almost always something you can do about depression and anxiety. Never lose hope.

Dr. Drew Ramsey: The most important piece of advice I would want people to hear is my message of hope. I've treated thousands of people with clinical depression, and I am shocked at how much people can transform from being on my couch ready to kill themselves with nothing to live for, tearful, not able to sleep, right about to head into the hospital. Some weeks or months later, be there as a bright, vibrant, loving, human being—all of what a human can offer. I think people are frustrated because I don't perfectly know how to get from A to B, but I do know that through engagement, through good clinical treatment for good alliance, that you can get from A to B.

The first thing I would want people to hear is a message of hope, which I know when I've struggled with my mood, that's hard to believe.

Dr. Hyla Cass: What I want to tell anyone with anxiety or depression who is feeling really hopeless, there is hope. Really check out the biochemistry of what's going on. Yes, there are situational things. Yes, bad things happen that make you feel depressed and anxious. Very, very often, once you address the biochemistry, whether it's hormonal, vitamin deficiency, adrenal burnout issue, or a thyroid issue, once you've addressed that and you're supporting the biochemistry, very often that anxiety and depression will clear up. If there are remnants or things to still deal with because we're human beings, then you can get therapy and really apply it. When you're just painfully anxious or depressed, it's really hard to absorb the information in therapy or to apply it because you're just so out of it. You're not working on all cylinders.

The worst thing to do, the advice is always, well go see your physician. I don't know, unless it's a holistic physician or Functional Medicine physician, it's a little tricky because you're going to be prescribed a medication, be told you need to be on it for a very long time, and then once you're on it, it's really hard to get off. You're then in this viscous cycle.

Dr. Mark Hyman: In the world of Functional Medicine, we take a different approach to depression and anxiety by trying to understand what creates it. To call someone depressed or anxious says nothing about the underlying causes that create depression or anxiety. While simple, this approach requires

digging deep and connecting patterns. You might still need therapy or medication, but it's best not to assume that these methods will cure the problems without first addressing the underlying causes.

Using the advice outlined by our experts can create major shifts in your body and brain. In the next Episode, we talk to our experts about traumatic brain injury, which unfortunately is rarely treated properly.

You'll learn how things like diet and supplementation can actually help create dramatic recoveries after a traumatic brain injury.

Doesn't it feel good to know that there's almost always something you can do to reclaim your health? I'm so grateful to all of my colleagues who volunteered their time to share their life's work with us. It is our mission to spread the message about what it takes to get health and stay healthy. The *Broken Brain* docuseries gives us a chance to do that. Spreading the message about brain health is so important right now, especially with all the misinformation and outdated medicine being practiced.

We want to set the record straight and provide you with important steps to take right now so that anyone who is looking to heal can find the answers.

BROKEN BRAIN

EPISODE 6

TRAUMATIC BRAIN INJURY (ACCIDENTS, SPORTS & MORE)

Dr. Mark Hyman: After years of ignoring the science, we finally are beginning to have a nationwide conversation about the impact of traumatic brain injury. Injuring your brain through playing sports, falling down, or getting into an accident is not a small matter. Traumatic brain injuries can have a far deeper impact on our overall health than we ever imagined. Even though there is more awareness than ever about the risk of traumatic brain injury, the truth is the recommended solutions aren't always grounded in the latest research. If you or someone you know is suffering from a brain injury, is there anything you can do about it? Your doctor might tell you just to rest, but you might be surprised to know there is so much more you can do to support your brain during a recovery.

In this Episode, our experts will talk about their personal experience with traumatic brain injury, and what they did to reclaim their vitality and the vitality of the ones they love.

JJ Virgin: When my son was 16, he was crossing the street and was hit by a car. We estimate it was going maybe 40 miles an hour, though no one saw it happen. He was literally left for dead in the street. The woman got out of her car, gasped, and drove off. Thankfully, a neighbor pulled up, called 911, and he was airlifted to the local hospital.

When we got there, the doctors told us that we needed to let him go. He had a torn aorta, and it had to be repaired. The challenge was, they couldn't repair it at that hospital because he had a severe traumatic brain injury. In order to fix it, they had to do it without a blood thinner. They had to airlift him to another hospital, and the doctor said he would never survive another airlift. Even if he did, he wouldn't survive the surgery. Even if he were managing to survive both those things, the chance he'd ever be normal was minuscule. My then-15-year-old other son looked at that doctor and said, "So, maybe like a .25% chance he'd make it." The doctor said, "That sounds about right." He goes, "We'll take those odds." Any parent watching this, I think, would say, "Hey, I'm going to fight. I'm going to fight for my son's life."

We get to the next hospital. He survives the airlift. We have five different surgical teams working on him. He survives the surgery, and then he is in a deep coma. The neurosurgical team says, "You know, we don't know if he'll ever wake up. If he does, we have no idea what his life will be like." I remember standing there hearing this and holding my son's hand. There were two fingers I could hold, everything else was either bandaged or covered with road rash. He had 13 fractures, bones literally sticking through his skin. I said, "Grant, this is going to be the best thing that ever happened to you," which is a ridiculous thing to say. I mean, this was looking so bleak, but I had to have hope. I said, "You're going to be 110%."

From that point, I was scared to death. I mean, this was the worst thing a parent could ever face. Immediately, I put an SOS out to all my friends on Facebook, and I had incredible help coming into the hospital early on. I had Dr. Hyla Cass and Dr. Daniel Amen come in right away. We were able to start doing some things that you wouldn't normally get to do and that the hospital actually wouldn't let us do, but we did sort of circuitously that I really believe are the reason that he's not only here today but he's actually 110%.

Dr. Norman Doidge: We've gone from a state where for decades, mainstream medicine has said to people who have a traumatic brain injury that if you have a concussion or a mild traumatic brain injury, you wait a number of weeks, and 80% of you will get better, but 20% don't. For those who don't get better, what they said they should do is just rest, or rest and restore, or rest and pray that they restore.

Dr. Mark Hyman: Rest and pray, that's a good medical prescription.

Dr. Norman Doidge: Okay. The patients who got better were fine, but there are many, many patients out there who haven't gotten better. In fact, traumatic brain injury is the number one cause of combined death and disability in America if you put them both together. It often affects young people too.

Dr. David Musnick:

The conventional approach is basically, if someone hits their head as a kid, because I have a lot of compassion for children that hit their heads, they usually go to the children's hospital in their area. They're seen by an emergency room doctor or someone like that, and they try to determine if they could have a bleed in their brain. Then, they often will do a CAT scan. The CAT scan often doesn't show very much, if anything at all. Then they tell them to go home and often tell them not to go to sleep or, "Make sure you can wake this person up every couple hours." These people get completely exhausted or sleep deprived, and then they basically tell them about what symptoms they could have, called post-concussion symptoms. They have some follow-up with a neurologist—if they don't find any really gross bad things on the exam, that's it.

These people might actually have headaches, dizziness, or brain fog. The kids or the adults have all kinds of symptoms. They might go to a primary care provider: if a kid, they go to the pediatrician, otherwise they go to their adult doctor. They don't have an approach to it, because they don't have something they can match to it, like, "Okay, you need this drug." There's no drug for it really. Sometimes, they're sent to a speech therapist if they're having problems with speech or with memory. There's only a certain percentage of speech therapists that are actually trained to do much work with, what we call, cognitive rehab. The patients are almost never put on vitamins or supplements. They're almost never given any advice regarding exercise.

The conventional approach is really very deficient and will often leave people with cognitive deficits or, what we call, a decline in brain reserve. We all have a certain amount of brain reserve whether we're a kid or adult, but if there's brain injury and it's not taken care of appropriately, then the person's brain reserve can go down. If it goes down enough, they'll start having symptoms. The conventional approach is very, very limited, and I'm very concerned about it.

That's even true in the NFL (National Football League). I mean, the conventional approach there is more like do initial testing on the field and the sideline, and determine whether the person can go back in. Make sure that someone doesn't go back in when they still have any type of cognitive problems, because there's something called the Second Impact Syndrome, where the brain can go through a part of the skull and the person can die. The approach in the NFL is much more, "Let's make sure you don't have a Second Impact Syndrome," as opposed to healing the brain.

One thing a lot of doctors don't realize is, there are a lot of people who have hit their head or had a head injury and they don't even find out about it. A doctor needs to ask questions like, "Have you ever hit your head? Have you ever fallen down and hit your head? Have you ever fallen off a horse or a mountain bike? Have you ever hit your head while you were skiing?" Oftentimes, people will say, "Yes." Someone can be in a motor vehicle accident with enough force so that their head moves back and forth. Their brain moves inside their skull, and they can actually have a traumatic brain injury without actually hitting their head, like hitting their head on the steering wheel, or the windshield, or something like that.

So then, the doctor should get some more information like, "Well, how did it happen?," and what the forces were. I had a personal experience that I can talk about later involving a mountain bike accident. The forces were pretty significant. "What kind of protective gear were you wearing?," that actually affects the head injury. I've been treating head injuries for a long time. I get head injury referrals from the local emergency room and from other doctors, chiropractors and other doctors. I decided that an approach needs to happen, which is figuring out what stage of the head injury we're at: acute (the first few days or first week), and figuring out, "Okay, is there anything serious going on like real brain damage, or severe brain damage?," and then figuring out what stage they're in and what's going on in that stage. For instance, it's been found that even in football players, if they draw their blood within one or two hours of slamming their head, they can start having antibodies to their own blood-brain barrier.

One of the things that I'll frequently do is get a blood test to see if this person has antibodies to their own blood-brain barrier, which is supposed to keep things out of the brain. If it's increasingly permeable, it will let toxins and things in the brain that shouldn't be getting in there that can damage the brain. One of the Functional Medicine approaches that I've developed is assessing whether the blood-brain barrier has been damaged, or there can actually be antibodies to the blood-brain barrier, and then having a treatment program to heal the blood-brain barrier.

Dr. Daniel Amen: The American Soccer Association just came out and said, "If you're under 11, you cannot hit soccer balls with your head." Right? They realized it's associated with long-term brain damage. You don't like 12 year olds? 13 year olds? 14 year olds? The brain is not finished developing until you're 25, so it's like, "Seriously?" Are we engaged in high-risk behaviors? We need to have more love and respect for the brain. Protect it.

Jim Kwik: I've had many head injuries, traumatic brain injuries, head traumas. How do you overcome and fix that? You wear a helmet. You avoid extreme sports, because your brain is very resilient but it's also very fragile. So, protect your brain.

Dr. Mona Karimpour: With a lot of contact sports, there definitely needs to be a lot more precautions. There needs to be a lot more awareness and education about, not just with traumatic brain injuries, but also what subsequent problems can occur from it.

I have a lot of patients that will come in and say, "I'm a football player. This is my passion. I love it," or skiing, or surfing, and the very first thing I'm going to say is, "Well, use safety precautions. Wear a helmet." I will educate them, because if not, this is what can happen. You can have damaging consequences to it. Am I going to take away a thriving football player's passion, or am I going to look at the entire risk, look at their benefits, educate them, and tell them, "You know what? Well, let's look at prevention. Prevention is to wear a helmet, try not to get tackled or slaughtered on the field. Basically then, let's reassess." If something does happen, "How bad was your brain injury? Did you have a concussion?"

I also like to look at everything from a holistic standpoint. If someone is very happy and passionate about playing football, I'm not going to take that away from them and say, "Hey, no," and get their parents and everyone on board, "Don't play football because you enjoy it." You always have to look at things from a risk-benefit ratio. Inform your patients. Keep reassessing and going step-by-step based on their lifestyle and what makes them happy, and also look at some of the things we can do to prevent traumatic brain injuries.

Dr. Mark Hyman: As with any condition, optimizing nutrition can be a powerful intervention when treating traumatic brain injury.

Dr. David Musnick: In terms of the Functional Medicine approach that I've developed, it's looking at, "Okay, is there a lot of neural inflammation?" There almost always is. How do we find the sources or neural inflammation, like in the GI tract in the gut, and actually treat the gut when we're concerned about the brain and then also treat the brain? There are some things that can actually pass into the brain. There's a form of curcumin that passes in the brain better than some other forms that can actually decrease neural inflammation. There are some other things that can do it too. Then, we want to look at what stage they're at, because there could be all this congestion in the brain.

We want to think at some point, "Okay, do we need to stimulate neural stem cells, like new nerve cells. How do we do that? How do we create brain-derived nerve growth factor? How do we increase it to get more neural stem cells going? How do we increase synaptic connections in the brain?" That's the thing that helps create memory and will help with learning.

I've devised a program that incorporates the right supplements to do these things based on the research, as well as brain training. Brain training is the main thing that will create the synaptic connections, as well as incorporating exercise to increase brain-derived nerve growth factor. In addition, using some modalities like frequency-specific microcurrent application that can actually heal areas of the brain, and also other things. When someone has a brain injury, the hormones can be affected. I want to look at all the hormone levels and make sure they're tuned up, because sometimes the pituitary gets damaged. All the output from the pituitary can go down, and the person may not have the hormones they need. That has to be addressed.

Stress management is also extremely important, because often people are very stressed after this type of injury. It's important to treat the pain they have, because the pain can drive cortisone levels up, and can cause all kinds of problems. Oftentimes, there's a head injury, neck injury, and musculoskeletal injuries at the same time that need to be treated so they're not in constant pain. That's a long answer, and there's a lot more detail to it.

One of the things that's really important after any kind of head injury, whether a kid slips skiing or falls off their bike, or an adult falls off a horse, or an auto accident, or whatever it is, we want to decrease inflammation in the diet. How do you do that? You decrease fried foods, breaded foods, and eliminate all trans fats in the diet. It's also a good idea to have people eat a low-glycemic-index diet where they're not eating a lot of starches and breads. There are some other things they can do. They should go on a gluten-free diet, even if they don't have antibodies to gluten, because some of the molecules in gluten can create an autoimmune process in the brain if the blood-brain barrier is having a problem.

There are some molecular sequences in gluten and dairy that can damage the brain after a brain injury. Everybody with a brain injury needs to go on a completely dairy-free, gluten-free diet for about eight weeks. I always say about eight to ten weeks, which is what's called the critical period after a brain injury when we need to do this kind of dietary intervention in a big way. A lot of these suggestions you can still do after that period. I put everybody on omega-3 fats, especially the DHA part of it. With kids, they won't take capsules, so there's some liquid forms of DHA fish oils that taste like lemon or mango. I know which brands these are, and I just tell the parents to give their kids a teaspoon to a tablespoon twice a day. That will give them the fatty acids that they need.

Dr. Titus Chiu:

My patient had Post Concussion Syndrome and it was horrible. She was a student of mine, and she had suffered a traumatic brain injury. She developed bilateral subdural hematoma (bleeding in the brain). Because of that, she could no longer do what she had set out to do to become a doctor (she was in the midst of medical school). She had brain fog, balance problems, headaches, and when she tried to study and read, she'd just get really tired and crash. I did the workup, and in my experience, a lot of patients with concussions respond really well to what's known as a ketogenic diet, which looks at higher fat but healthy fats, middle/moderate protein, meat and things like that, and really low carbs.

Dr. David Musnick:

I put everybody on wild blueberries. What's really interesting is that there are biochemicals in blueberries that help heal the brain after a brain injury. They're also good to help prevent dementia and other things. Wild blueberries have this purple pigment. If you're ever unwrapping a pack of wild blueberries and you get some on your fingers, it stains your fingers purple because this pigment in there is so strong. Wild blueberries have many times that pigment than a regular blueberry. What's really interesting is, the more stressed out the plant is, the more of this protective pigment it produces. These wild blueberries are often from Canada, Vermont, and New Hampshire.

I had people mix a fourth to a third of a cup, and create a protein smoothie with them twice a day. Wild blueberries have a lot of anthocyanins, which are a certain type of a phytochemical. They're a pigment that helps heal the blood-brain barrier and the brain. I put everybody on

these wild blueberries. Of course, if they want to eat regular blueberries, they can eat blueberries, but I have them go to places like Trader Joe's and Whole Foods that have the wild blueberries in bulk, and then just mix them into their smoothies or put them on foods like oatmeal or other things. I also want them to put protein in their smoothies, a little bit, but not dairy. I don't necessarily want them getting a sugar rush with these blueberries. I want them getting some protein too.

If you're doing this with kids, kids actually like it because they get smoothies twice a day and they're getting this flavored fish oil. Adults seem to like it too, because it tastes good and it's a basic way that people can ingest it. I also put them on a regular diet of a lot of cruciferous vegetables, and a really healthy diet in general. If they're going to eat meat, then eat grass-fed meat. An anti-inflammatory diet, high in certain phytochemicals, and high in omega-3's to help heal the brain.

Dr. Mark Hyman: When treating traumatic brain injury, it's important to consider alternative therapies such as hyperbaric oxygen and neurofeedback.

Dr. Arsalan Darmal: Nuclear medicine technology is a functional brain imaging and determines the activity in the brain. It tests the blood flow in the brain. Based on the blood flow in the brain, we consider metabolic activities. The theory is that those areas of the brain, which are working well, demand more oxygen and nutrients so the blood flow is higher to those areas. The areas that are lazy, damaged, and inflamed are not working well, and therefore do not demand that much oxygen and nutrients, so the blood flow is lower.

What we do is we give you a very reactive isotope called Ceretec. It flows where the blood goes to the brain and then gets absorbed by the brain cells, gets fixed into the mitochondria, and it lights up under the camera. Those areas of the brain that are working too much will absorb most of the isotope. The areas that are lazy or damaged will not absorb the isotope, and in the imaging, those areas look a hole or dark area. Based on the different activity patterns throughout the practice, we have learned to apply that into the diagnostic criteria of the patients.

In the majority of cases, we see a decreased perfusion in the prefrontal cortex area of the brain. The prefrontal cortex is right above the eye socket. It's right at the front part of the brain, which is the executive functioning of the brain. In a normal setting, you should have normal activity. We don't see any kind of a deactivation in that area. In 70% of traumatic brain injury or ADHD cases, we see a deactivation in the prefrontal cortex area. That deactivation by itself means that the executive function area of the brain is not working well. This is the area that we call the breaking mechanism of the brain where it tells you not to do this and allows you to do certain activities.

When that breaking mechanism is impaired, this means that the individual will be impulsive, hyperactive, and will have very limited control of his or her behavior. That's the prefrontal cortex, and when we see a decreased activity in the prefrontal cortex, the treatment approach will be more towards stimulating that area. At times, we see that the brain already is overstimulated, especially in cases where the limbic system and basal ganglia (the alarm center of the brain) are. When the basal ganglia is overactive, it indicates mostly anxiety. When the limbic system is overactive, it indicates more of a mood disorder.

When we see that type of activity, we pay more attention to the mood component or the anxiety component. We target our treatment first towards that type of treatment where you treat the anxiety and the mood first, and then consider other areas. It has been for 25, 30 years. There were several case studies in the 90s from Lu et al., Zeng, et al... Dr. Daniel Amen has a lot of studies. There's another guy Putt et al. who has done a lot of work on traumatic brain injury.

I am especially fascinated with traumatic brain injury and application of SPECT (single photon emission computed tomography) in mild to moderate traumatic brain injuries. In mild to moderate traumatic brain injuries, you cannot determine the extent of the damage by doing an MRI or a regular scan like a CAT scan. Those are structural brain imaging, and in structural brain imaging, you cannot see the impairment.

We did a study on NFL players that had significant traumatic brain injuries. They came in, we did a SPECT scan, developed the protocol of treatment, treated them, and then we did a re-SPECT on them and there was a significant improvement from baseline to post-treatment. In cases of traumatic brain injury, we consider hyperbaric oxygen treatment and we also consider natural supplements.

The first step of treatment is we try to consider natural supplements almost always. In cases that are more severe and refractory to treatment, we almost always get those type of cases where patients have not responded and at the endpoint they come into the clinic. At the time, we are a little more aggressive in our treatment, so we consider medication. In cases of depression or anxiety, we consider transcranial magnetic stimulation.

Dr. Nancy O'Hara: Hyperbaric oxygen is where you give oxygen at a higher percentage. We're breathing 21% oxygen. Depending on the unit, you can give anywhere from concentrated oxygen, which is 28 to 35%, to up to 100% oxygen. More importantly, you give it at an increased pressure, so you help that oxygen to get into the cells, and decrease the inflammation, as well as improve the mitochondrial function, because that's something else that's affected in a lot of our kids. The mitochondria are the energy cells of all of our body. When our energy cells are not working, our energy is dysregulated.

Dr. David Musnick: Hyperbaric oxygen can be a good treatment after a head injury, especially within the first 12 weeks, but it can also be used after that. It's usually used in groups of 10 to 20 treatments at about 1.3 to 1.5 atmospheres. It's a commitment on the part of a person or a family, because they need to go five days a week. Hyperbaric oxygen increases the oxygenation level in the brain. One of the theories is that there's some decrease in oxygenation in the brain because of the damage to blood vessels and the decreased ability to get oxygen in the brain. Oxygen functions in cells help create energy. That's one of the biggest functions.

I don't recommend hyperbaric oxygen to everybody, but if it's a more moderate brain injury, or if they have some significant symptoms I'll say, "You can do this, and it's probably a good idea because studies show that it can help. It can be effective."

Dr. Deborah R. Simkin: I had this one veteran who was formerly with MI6 in England. He had fallen off a tank and hit his head. He couldn't walk or talk for nine months. He did rehab and recovered. He then had a horrible experience with PTSD because his best friend was shot next to him in the head when he was in the Falklands. He was a very resilient guy, though, and he came to the United States to work for the CIA, the FBI, and he was teaching special ops at the Air Force base near me. He was at the top of a staircase and the next thing he knew, he had fallen and he was in the hospital.

Something happened here that was different with this traumatic brain injury. He went into his daughter's room and was tearing up everything in her room, destroying everything. He got very fearful that he would hurt somebody. He started crying, and he would leave the house. His wife called me in desperation, and so I said, "Well, just come in." We did an MRI to make sure there were no gross problems. I couldn't do an elimination diet at that time, but I wanted to calm down his gut. I gave him meditation to learn and I had to settle down his brain a little bit with some Lamictal, which is an anti-seizure drug, so that he could be calm enough to try to take on some of the things I was going to ask him to do.

After that, we did LORETA (Low Resolution Brain Electromagnetic Tomography) neurofeedback on him. After 13 sessions, he was back to normal. He's no longer on the Lamictal and doing very

well. Since then, we've put him on an elimination diet, and he's lost about 30 pounds and feeling much better. These are all the things we do with Functional Medicine. I think that neurofeedback is going to be the one thing in psychiatry that's going to change the way we approach what we do.

The way that we talk about it is in terms of operant conditioning. What is that? Basically, it started because Stermann, one of the researchers who originally discovered this, had a cat. He put an electrode in the cat's head. There was this traditional thing where the cat would hit a bar and food would come out. Well, he paired a noise with that, and so the cat knew as long as the noise was on, if he hit the bar, nothing was going to come out. So, he would sit there very still. Stermann observed through the electrode that when the cat was sitting still and focused, this certain brain wave pattern came up, which was interesting to him because it was a 12- to 15-hertz brain wave pattern that basically kept him very still and focused. Stermann wanted to see if he could get the cat to produce that brain wave pattern on his own without the noise. Lo and behold, the cat learned how to produce the brain wave on his own so the food would be delivered.

That's actually what we're doing in neurofeedback. We put on a 19-channel cap, which has several electrodes on it, and we record all the brain wave patterns with eyes closed and eyes open. Then, we'll compare it to a normal database. For instance, with the veteran who came in with PTSD and traumatic brain injury, we targeted the areas in the brain that we knew would be abnormal for those conditions—the symptoms that would be abnormal for those conditions.

Then, when he came back in, we decided we were going to program it to look at those areas. He would look at a car on a race track, for instance, and every time the right brain wave occurred by chance, the car would move. So, the brain gets excited and goes, "Oh my gosh. Where did that come from?" It looks for it again, and eventually the patient is learning how to make that car move. Once they've done that, we can extend the amount of time that they're holding it until the brain wave patterns go back to normal.

Dr. Mark Hyman:

The power of using all of the interventions described by our experts was powerfully exhibited when my friend, JJ Virgin, devised a plan to treat her son's dramatic and traumatic brain injury. Grant's recovery is an incredible story of hope, determination, and the power of Functional Medicine.

JJ Virgin:

Right away, the very first thing I did was I start taking things to help me with stress. I started doing some stuff to support myself, because I knew that in order to show up for my son in the hospital, I couldn't get sick. He was in the ICU, and we had to go in there fully gowned, masked, and gloved, so I made sure I put my self-care first. I think that's so important for every parent here, because we tend to put ourselves last. I knew that if I was making life-or-death decisions, I had to be totally focused and game-on. Then, one of the first things we were able to do was use essential oils. It wasn't something I was remotely familiar with. Someone came in and started using them with him, and all I knew was that for the first time I started to see some response from him. He wiggled his nose and his fingers, which gave me some hope.

We started using progesterone cream, which we were able to rub on him because it was a cream. There was some research out of Emory University by Dr. Donald Stein showing that progesterone helps reduce inflammation, which is the big thing that you've got to do right now as your brain is just so inflamed. He looked like the Incredible Hulk in the middle of the pediatric ICU. He was blown up from all the swelling from 13 fractures and all of the road rash. The next thing I wanted to do, and this is where it became quite a challenge, was he'd been on five grams of fish oil prior to the accident. I am on a mission to get everybody on fish oil. I know that one of the reasons he's actually with us today was because his brain was protected by the fish oil, which protects your brain from injury.

He was bleeding, and they were afraid that the fish oil was going to increase his bleed time, so they didn't want to do it. I got them to go to two grams, but I knew we needed to be much higher than that. The doses that they do in this situation is anywhere from 10 to 20 grams. I brought them all the research. Dr. Barry Sears actually sent it to me, and I had Dr. Michael Lewis, who wrote *When Brains Collide*, helping me with this. They go, "Nope. We won't do it. It's going to cause increased bleeding," even though there was nothing to show it would.

When he spit out his feeding tube, which he did himself, we started doing it ourselves. First, I got him up to five grams. We would always do it right around when they were going to test his bleeding time so I could check that, and we never saw any change in his bleeding time. We got him up to 10 grams at the first hospital. Then, when we went to the second hospital, we got him up to 20 grams. It was very interesting because as we increased his fish oil, when I went to the higher-dose fish oil, he went from barely speaking to speaking in sentences.

This hasn't been an easy path. He's been suicidal multiple times, which 25% of people with brain injuries are suicidal. This is a major problem out there. We tend to think of it as something that happens to soldiers or football players, but it happens because of domestic violence and is the leading cause of death in children. 1.7 million people a year get a traumatic brain injury. This is a major problem. Over five million people are disabled at any time in the U.S. with it, and we can turn it around. You can turn it around any time. If you hurt your head five years ago, you can still massively improve it, but it has to start with asking the right questions.

For me, it was, "How do I get my son to be 110%?" and then looking at every single thing that's out there that I could bring in to help him. I was looking at preparing for this interview like, "What did we do?" It's this huge, long list of things. Within that, I can tell you the things that were most successful for us, but that's us. It may be different for someone else. It's asking those right questions that made all the difference.

Prior to this, my son had bipolar disorder early on. He still has bipolar disorder, but that led me down the path in the first place and ultimately probably saved his life because he was on high-dose fish oil to start with what we'd done for the bipolar disorder. Here's the thing: we've all got something. Everybody does. I look at some of these things and I go, "What if his bipolar disorder is actually an advantage? What if ADD is actually an advantage? What if there are things about that that are going to be their advantages, and we can deal with the rest?"

The first things we need to start with are cleaning up the diet and helping the gut as much as possible. There's so much we can do to make a major difference. Even if it only made a 10 or 20% difference, hey, that matters. Whether you are a parent of a child with ADD, autism, bipolar disorder, or you are, what we'd call "normal," which I don't know what normal is, you actually still want to do all the same things. Eat a diet that helps you maintain good blood sugar control and blood sugar balance. Eat good healthy fats that help nourish the brain and reduce the inflammation. Exercise, because if you look at the one thing that's probably the most key thing for having a healthy brain, exercise is so key for that.

The research for that is all done on aerobic exercise, but I like to do aerobic exercise in the form of high intensity interval training (HIIT). I've seen some studies showing that HIIT gets you those effects faster and more intensely. That makes sense to me because HIIT gets all of the good from aerobic training and takes out the bad. When you do endurance-style training, you create more oxidative stress. You're breathing heavier over an extended period of time, you create stress on your body, and you lower your immune system. You can still get the benefits of what you would with aerobic training, which is all the blood flow, lowering blood pressure, and increasing blood flow to the brain, with HIIT. You train your Sympathetic Nervous System to handle stress better, because you go hard and then easy and then hard and then easy.

When you do that, you actually raise growth hormones and anabolic hormones, you don't have the oxidative stress that you had from the other exercises, you don't impact your immune

system like you did with the other exercises. The key thing about it is that it doesn't take much time. I started out in this world as a personal trainer 30 years ago, and the number one reason people didn't exercise is because they didn't have time. Back then, we used to tell them you had to do it for at least 30 minutes or it didn't matter, which is ridiculous. The second reason was, they didn't want to go the gym. This is something you can do anywhere and you don't need a gym.

The foundation for exercise is to do aerobic training in the form of HIIT because of the blood flow, the impact that it does to all of the great brain chemicals, and because it also increases your brain volume and your growth factors. It gets everything growing, moving, and communicating in your brain.

When Grant was at the Children's Hospital in LA, they had such an amazing program. One of the first things they started to do with him was take him into this gym. He was still in a wheelchair at the time because he had a crushed heel. There were things we found that we could do. You can use bands. You can use balls. I would say, look for whatever you can do, if you can get the person in the pool. We had Grant early on, when we got him out on furlough and we took him to the pool. We put him in there, and he swam completely coordinated. It was amazing. Things he couldn't do yet on land, he could do in the pool.

What I always say is, look for the way. If there is no way to do that, then the next level would be to go to meditation. It was really difficult to get him out into any kind of social situation, yet he needed that. Isolation was really damaging—it's damaging to everyone. There was a study that showed that social isolation is more damaging than smoking 15 cigarettes a day. He needed that connection, but it would trigger him. What meditation does for him is actually calm down that amygdala and get him out of fight-and-flight. He now can tell when he's getting there, and he goes into his room and meditates.

I was told when he comes out of this brain injury, it's going to be ugly. I had never been around this before. All I'd seen was television shows where people wake up and they go, "Oh, I love you. Hi." I thought Grant would wake up out of his coma, open his eyes, look at me, and say, "Hi mom." That's what I thought. I did not think that he would open his eyes, stare off into space, and move his arm repetitively for days on end. He didn't talk. He couldn't make any eye contact. Nothing. He came out of a coma over time. As he started to become more aware, he started to become super agitated. It was like the Incredible Hulk starting to turn green. When he started to become agitated, we had to shoot him, basically, with tranquilizers to keep him from going berserk.

When I first walked into the hospital when he was starting to get like this, he actually was in a straight jacket. That's when I knew, I was like, "Okay, we have to do something here. This is not how he's going to get better." One of the things that happens as someone comes out of a brain injury is they are in fight-or-flight mode. That's the first thing that starts to wake up. It's happened to us repeatedly because we've been doing stem cell injections into his spine. When we do them, that's the first thing that comes back up online. It's like you lose your filter. You're going to say or do whatever you think. If you think someone's attacking you, you'll hit them. If you feel like you're scared, you'll yell. That doesn't work in society very well.

What he's done to counteract that is meditation and learning how to control his brain. He's also been doing neurofeedback, and that's helped a lot as well because now he can recognize when it's coming and he knows what to do.

You look at anything. I come from weight loss, and there's never one diet that's perfect for everybody. I'm like, "Okay, there isn't one diet for everybody." When you have a brain injury, it's like, "What's the extent of the brain injury? Was this the first brain injury? Was it a vibration brain injury? Was it a hard hit? What else was going on?" With Grant, we knew that I had a son

with bipolar disorder waking up, and bipolar brains are less stable brains to begin with. Brain injuries are unstable brains. I was like, "Who's going to wake up here?" We didn't really know.

There were specific things we needed to do to really help stabilize his brain. Cannabidiol (CBD) has been an amazing thing for him. There are common factors for everybody that we can look at. Number one: you must reduce the inflammation. What things are going to be key there? That's where if I could pull out my key favorite things, fish oil, of course, would be the number one, exercise, CBD (besides helping with brain stability, it also helps with reducing inflammation), and curcumin. Those were some of the key things that we started to do there. Number two: you need to stabilize the brain. In fact, we've had him on medications to start with, because that is so key, they can go into seizures. Ketogenic diet has been a key player here to help, and MCT oil.

I asked, "Okay. What were the pathways? How did we get him off the medication as quickly as possible? What things could we do diet-wise here?" We've got to do stuff to help stabilize the brain quickly. Ketogenic diets have been used for decades for seizures, so that's another one, and MCT oil to help. Then inflammation, stabilizing the brain, and balancing the blood sugar is key. Then, getting the blood flow to the brain. We were doing ginkgo, fish oil (which helps with cell membrane fluidity) exercise is key, recovery, and rest.

When he first was coming out of the brain injury, it was like raising a really big baby. It reminded me of when he was six months old, only he was now 150 pounds and six feet tall. He needed to get stimulated and then rest, and then stimulated and then rest. He was sleeping, about 18 hours out of the day. He would sleep throughout the night, and then throughout the day we would go and stress him and then let him recover, and stress him and recover. That's another key thing that you have to look at with the brain injury is really giving adequate rest and recovery.

The most important thing I've seen with Grant is that it's never too late, and there's always something else that you can do. When Grant was going through this process, there was a time where he was really suicidal and he was like, "I don't know why I'm here. I don't know what my point is." I said, "You know Grant, your purpose is to show people what's possible." My son was basically dead on the street. The doctors told us to let him die. They didn't think he'd ever wake up. They didn't think he'd ever walk or hear again. He's now better than he was before the accident, and he'll continue to get better. Now he knows his purpose is to show people what's possible.

The biggest limiter to what's possible is our mindset that tells us you can't do it, but if you flip that around and go, "Okay, what do I need to do to be 110%?" and you open yourself up, anything is possible.

Dr. Mark Hyman:

When it comes to brain disorders or any health challenges, having a miracle mindset is key.

Up next, we'll talk about the Seven Keys to an UltraMind. I'll take all the information we've learned in this docuseries and condense it into a comprehensive plan that you can start today so that you can get one step closer to healing your broken brain.

BROKEN BRAIN

BROKEN BRAIN

EPISODE 7

7 STEPS TO AN ULTRAMIND (PART I)

Dr. Mark Hyman:

By scouring the medical literature, consulting with other doctors and scientists, and by experimenting with my own body and mind, I finally came to understand that it wasn't just one thing that caused my brain to break, but the accumulation of many things.

The combination of heavy metal toxicity, a nutrient-deficient diet, high stress levels and a leaky gut, created the perfect storm that led to my broken brain.

So far in this docuseries, we've covered the key themes and ideas that create brain health and reverse disease. Now, it's time to take all the core ideas and principles covered thus far and turn them into a step-by-step action plan that anyone can follow immediately. I call this plan 7 Steps to an UltraMind.

You might be asking what is an UltraMind? Having an UltraMind is not just about the absence of disease. An UltraMind is a mind that's designed to thrive. An UltraMind is resilient and can withstand the twists and turns of modern day living. Our brains are stronger and more adaptable than we could ever imagine, but they need our support to function at their highest potential.

In Episode 7 of this docuseries, we go deep into the first four steps of the 7 Steps to an UltraMind.

Before we dive into these steps, I want to tell you more about what I did to heal my broken brain, and how by doing many things, not just one thing, was the key to achieving my UltraMind.

I struggled for a number of years going to doctor after doctor, specialist after specialist, to Columbia, to Harvard, to all the greatest minds in the country who I thought specialized in what I had, and I got no answers. Then, one day a nutritionist at Canyon Ranch invited me to a lecture by Dr. Jeffrey Bland, who is a nutritional biochemist and studied with Linus Pauling. I listened to him speak, and he painted an entire new view of medicine and of disease, and I said to myself, "Either this guy is crazy or he's a genius, and if what he's saying is true, then I owe it to myself and my patients to learn about it."

That's when I took a deep dive. First, I applied everything to myself, and incrementally I got better, peeling off the layers of what was wrong with me. I used the roadmap of Functional Medicine, which doesn't just look at symptoms, but looks at causes and understands the body as a whole dynamic, integrated system where everything affects everything, and everything is connected. Even though my brain was affected, the problem wasn't in my brain, the problem was in my body. All that inflammation, toxicity, and gut dysfunction was then feeding back up to my brain. Once I understood that, I was able to apply the principles of Functional Medicine and get better.

This was a really slow process, because I didn't know what I know now. If I knew what I knew now, I'd get better a lot faster. Essentially, I had discovered I had mercury poisoning via meeting a naturopath who listened to my story and said, "Oh, you lived in China. You might want to check your mercury level." I had a level that was off the charts. If I see a patient with a level of 30, 40, 50, I think that's serious—mine was 187. I was extremely toxic and I needed to figure it out how to undo that. By getting the mercury out of my body, I slowly, slowly got better. There wasn't a moment where I was just better—it was a very slow process, and I'm grateful that I was able to learn the things I did to actually help myself.

In Functional Medicine, we deal with root causes. I had to find all the causes. It's a principle that if you're standing on a tack, it takes a lot of aspirin to make it feel better. You have to get rid of the tack, whether it's mercury or whatever it is. The second rule is if you're standing on two tacks, taking one of them out is not going to make you 50% better, you have to find all the tacks. It turns out I had many tacks, and I had to deal with all of them.

I also knew from Functional Medicine that you have to create a healthy soil, a foundation so that your body can reset and heal, and that foundation is really based on very simple principles. Nutrition, exercise, stress management, sleep, and relationships and connections. All of those form the basis of creating a healthy human, and if you don't have those sorted, the rest of it may not work.

Because my gut was so disrupted from the mercury, I went on an elimination diet. For months, I ate turkey, broccoli, and brown rice, and that was it. I modified all sorts of things to try to get better, but it took a lot of time for those things to work. For some people, it's very quick, if food is the issue, but my issue wasn't so much the food as it was the mercury. I learned how to do gentle exercise, yoga, meditation, and learn how to sleep at night in a regular rhythm, which I had never done in my life—all those things really form the foundation. And then, I had to deal with the real issue, which was mercury.

I did what we call chelation, which means, to bind to metals. We bound up the metals with various medications, and then supported my body's own detoxification system with things like glutathione, with a lot of cruciferous rich vegetables such as broccoli and collards, and through various supplements like lipoic acid, all of which were designed to help boost my detox system and get rid of the mercury.

This revolutionary plan has helped thousands of people from all over the world on their path toward a better brain. Now, I want to share it with you. In this Episode, we go through the first four steps to creating an UltraMind.

The first step to an UltraMind is to optimize nutrition.

Dr. Elizabeth Boham: Patients always come to me and say, "Oh, you know, my doctor said that it doesn't really matter what I eat." They may be having problems with their memory, their mood, or their digestive system. Physicians have not been trained in the importance of nutrition, so they just don't realize that there's such a connection with nutrition in our health.

We know that food is really powerful medicine. There's a tremendous impact, of course there is, in terms of what we eat and the health of our body. We're working really hard with The Institute for Functional Medicine to get that message out there, and to train physicians so that they can recognize that there is this important connection and they can start to use food as medicine.

Dr. Rupy Aujla: Food is literally the most important health intervention that anyone can make. It's a collection of fatty chemicals, the chemicals that we find in plants, the fiber that has massive impact on things like gut microbiomes that have effects on neurotransmitters and inflammation. The process of eating subsides lots of different barriers, it crosses the way we communicate with different people, our cultures, our ability to nourish ourselves is just one of the aspects of how food has medicinal properties.

Food is probably the first question I ask after taking a full history with a new patient. I want to know what they're eating for breakfast, what they're eating for lunch, what a typical day looks like, or the 7-day plan looks like. I want to get an understanding of how they're using food in their daily lives—if it's something that's rushed, something they don't really pay that much attention to, if they're on a particular diet plan, all that kind of stuff. I work as an emergency medicine doctor as well, so that's probably not going to be the first thing I'll ask there. Certainly, in the clinic environment when we're dealing with patients with chronic medical problems, that's one of the first things I start with.

Dr. Mark Hyman: The first thing you can do to optimize your brain function, a simple take-home, is to change your diet. Get rid of these processed foods, get rid of the starch and sugar, increase whole foods, plant-based foods, and increase healthy fats. Omega-3 fats, avocados, nuts and seeds,

healthy grass-fed animal protein, healthy grass-fed butter, coconut oil. All these things will help dramatically improve your brain function almost overnight.

Fats are one of the most important nutrients for optimal brain health. Our cell membranes are made up of fatty acids, phospholipids, cholesterol, saturated fat, and protein.

Dr. Elizabeth Boham: Nutrients have a huge impact on our brain health. Some of the most important nutrients for our brain health are omega-3 fats. Omega-3 fats are those essential fatty acids that make up a good portion of our brain and are critical for adequate brain health. Unfortunately, we are seeing a decrease in our omega-3 fats in our diets that's happening naturally because our food supply is becoming more and more deficient in omega-3 fats.

Dr. John J. Ratey: There's a lot we're learning, and one of the things we learn about our diet is that we became fat-phobic in the 60s and 70s and 80s, so we became low-fat people, and that meant we became high-carb people but we cheated ourselves on the good fats.

One of the things that we've known in psychiatry since 1990, is that omega-3 fatty acids are perhaps as good a treatment for things like bipolar illness as are some of our bipolar drugs. With that came a whole lot of research looking at omega-3s as a way to treat mood, anxiety, ADD, and autism. It has a positive effect on all of those pervasive problems. Plus, it's great for the heart, skin, bones, the connections in our body, and also treats arthritis and the like.

Dr. Mark Hyman: Omega-3 fats are well-known for their benefits in heart disease, obesity, and type 2 diabetes. They help prevent heart attacks and arrhythmias. They help prevent strokes and reduce inflammation. And they prevent blood clots. But their effects on the brain are just as critical.

Omega-3 fats may sound like a miracle cure, and they can be in some cases. I've seen patients completely recover from autism with cod liver oil, which contains omega-3 fats and vitamins A and D. Omega-3 fats can also help with traumatic brain injury. To get more omega-3 fats in your diet, eat foods like sardines, wild salmon, herring, mackerel, and anchovies, as well as walnuts and flax seeds. I also encourage you to take a purified fish oil.

Vicki Koblinger: The other thing I see that we're limited in is fat. We're a culture that's been taught that fat is dangerous. The truth is that that is not actually the case, especially for growing children and pregnant women. Our brains are predominantly fat, and when we don't eat enough fat, we can't support that good brain growth.

There are two components that are really important for brain health that come from fat. One is DHA, which is an omega-3. Eating good quality fish is a way that we can get that DHA. The problem with that speaks to the problem of heavy metals. A lot of fish is contaminated with mercury, so getting mercury-free, clean fish can be a challenge, so it's often important to make sure we get our fish oil in a way that's clean, possibly from a supplement.

The other thing that's really critical for brain health is something called choline, which comes from fats and is found in high amounts in eggs. Again, we've been taught very often to avoid the egg yolk, but the egg yolk is rich in choline and it's really important for brain health.

Dr. Mark Hyman: For so long now, cholesterol has been demonized, and we were told, "Don't eat foods high in cholesterol because they're bad for your health." We now know that isn't true. Cholesterol is absolutely critical for your health, and is a glue between molecules.

Dr. David Perlmutter: The brain loves saturated fats, and the body loves saturated fats. We've been eating saturated fats for as long as we've been walking the planet. When you realize that 50% of the fat in breast milk is saturated fat, who do you think got that wrong? Mother nature or God? I'm not willing to take either side.

We need saturated fat. Why is it so good for us? Because by virtue of the fact that saturated fat is saturated, it means by definition it cannot be oxidized—that's the beauty of saturated fat. We incorporate saturated fat into our cell membranes and our brain cell membranes, our neurons, because they can't then be oxidized.

Dr. Mark Hyman: Or damaged.

Dr. David Perlmutter: Or damaged by these crazy chemicals called free radicals, which we actually need, but against which everybody seems to be manning a war.

I think it gets back to something that we talked about earlier, in the context of eating a diet that has a lot of sugar in it. We begin to wonder about having high levels of saturated fats and total fat in the diet.

Dr. Mark Hyman: So, ice cream, fried...

Dr. David Perlmutter: All those good things. A fried ice cream would be about as bad as you could get. It's not just fats, but it has trans fats too.

The notion of cholesterol being our enemy is...

Dr. Mark Hyman: That's the whole point of saturated fat is it raises your cholesterol so it's thought to be bad because cholesterol is thought to be bad.

Dr. David Perlmutter: Everybody wants their low-density lipoprotein (LDL) as low as possible, and their cholesterol as low as they can get it. However, when you realize, for example, that those elderly individuals with the lowest cholesterol have the highest risk for dementia, you should take a step back and say, "Gee, does it make sense that we should declare war on cholesterol?"

No, we need cholesterol. Why? It's a critical part of cell membranes, it's a brain antioxidant, and it's the chemical from which your body makes testosterone, estrogen, progesterone, cortisol and even vitamin D. We wonder why it is that people who have the lowest level of cholesterol have such issues.

There are plenty of factors we can read about on a lipid profile that do relate to cardiovascular risk. One of them is a damaged form of this LDL that we call oxidized LDL.

Dr. Mark Hyman: They say rancid LDL.

Dr. David Perlmutter: Yes, rancid LDL. What does it mean? It means it became oxidized, or it became damaged by free radicals. More and more laboratories are demonstrating that we can reduce the oxidation of our LDL by, believe it or not, reducing our sugar. How does it work?

Oxidized LDL correlates with the level of glycated LDL—the level of this protein that has been bound to sugar. The less level of our blood sugar, the less that process happens. Reduce the glycation of LDL and it reduces the oxidation of LDL. That's why it's important.

If you don't know your oxidized LDL, you can infer whether it's high or low by looking at your A1c. That's a blood test that far too many Americans are very familiar with because 20-30 million of Americans are now diabetic. Estimates are that as many as a 100 million of us may be what is called pre-diabetic.

It's not a surprise, when you look at people in general, that that's happening. Diabetes and obesity are happening because of our diets being higher in sugar, and because of changes in the microbiome.

There are plenty of people who aren't taking in very many calories and are now on low carbs, low sugar, and eating a little bit of fat, and still can't lose weight. They will not lose weight until they first reprogram their microbiomes and their gut bacteria that right now think their body is

starving and hold on to every calorie as if they are starving. That scenario sets the stage for diabetes. It sets the stage for Alzheimer's disease as well. If you're diabetic, you quadruple your risk of Alzheimer's.

Dr. Mark Hyman:

Key essential amino acids that come from protein are also important for our brains. Protein is used to build the little docking stations for the neurotransmitters that are embedded in your cell membranes. If your cells are going to cohere anything at all, they need protein to help them do it.

All of the thousands of molecules in your body are built from only eight or nine essential amino acids that we must get from our diet. These essential amino acids are the raw materials we use to make all of our brain messenger chemicals, or neurotransmitters, and the receptors or docking stations on our cells on which they land to transmit their messages.

The only source of these amino acids is the protein you eat in your diet. Ideally, the majority of these come from fish, chicken, grass-fed meats, beans, nuts and seeds. If you don't eat adequate protein at every meal, your brain can't work. You will be sluggish, foggy, anxious, unfocused, tired, and depressed.

Dr. Gabrielle Lyon:

I get this question a lot. Are Americans under-eating protein? People say we're eating way too much protein, but that's not true. What's actually happening is the distribution of the way people are eating protein is absolutely incorrect.

The standard distribution of eating is, for example, for breakfast, they have maybe 12 grams of protein—a vegan protein shake, or maybe two eggs. We know that you need 30 grams of protein, or 2.5 grams of lysine (the amino acid that triggers muscle protein synthesis) per meal.

If you undershoot that at breakfast, which is the most important meal for setting up your metabolism, you have to compensate for something else. If you are low on protein, you're typically high in carbohydrates. If you are higher in carbohydrates and fat in that balance then, four hours later, we know you're going to be starving. fMRI imaging definitely shows that the first meal you have is the most important, because four hours later reward centers are all lit up.

When it comes to Americans eating too much protein, it's that they need to distribute it over time. Each meal should have around 30 to 40 grams of protein per meal, to trigger that muscle protein synthesis. Americans typically have two meals with low protein amounts: breakfast is two eggs, lunch is maybe a small turkey sandwich, and then, dinner is a big steak. You reached that threshold one time at dinner, and a lifetime of doing that destroys your metabolism, because it does not augment your muscle.

Dr. Mark Hyman:

You might be surprised to hear me say that we need to eat plenty of carbohydrates as well. The carbohydrates I'm talking about are real, whole, nourishing plant foods that the human species has thrived on since the dawn of evolution. These foods contain slowly-released sources of sugar that prevents surges of blood sugar and insulin, which are toxic to the brain. The slowly-released carbohydrates from whole and processed plant foods also helps keep our serotonin levels even.

Dr. Daniel Amen:

Carbohydrates are really important—they're essential to life, but I want you to eat smart carbs—carbs that are loaded with nutrients and fiber, low glycemic carbs, which are carbs that don't raise your blood sugar (high blood sugar levels are a terrible predictor of premature aging and Alzheimer's disease). Think colorful. Carbs, berries, red bell peppers, orange bell peppers, and carrots, and kill the sugar before the sugar kills you.

Dr. Mark Hyman:

Good carbohydrates also contain all the vitamins except B12 and the minerals our bodies need to operate normally and optimally. They also contain fiber, which helps normalize our digestive function, and slows the absorption of sugar and fats into our body, which keeps us balanced.

Dr. Rupy Aujla:

When you're eating high-fiber foods, not only is that great for nurturing your microbiome, it also has positive effects on brain inflammation, and reducing your instance of chronic disease, like heart disease or diabetes, that have brain effects. It also means that you're going to be more efficient at removing things like environmental pollutants that Dr. Joe Pizzorno is scaring us all about. It's interesting to see how high-fiber foods are actually facilitating that process and actually make our bodies more adaptable to our new environment.

And the other foods, with regard to brain health, are things like colorful plant-based foods, different sources of foods that have high-nutrient density, like tomatoes, and the yellows, greens, and dark green leafy vegetables, and brassica vegetables.

Not only are they good for cardiovascular reasons, and diabetes reasons, but the particular chemicals that you find in those pieces of food reduce inflammation, neuroinflammation, and generalized inflammation that has holistic effects on the body, improving brain health at the same time.

High-fiber foods, yes, tons. Beans, legumes, lentils, chicory, asparagus stems, broccoli, sunchokes (or Jerusalem artichokes), sweet potato, cold potatoes (lots of prebiotic fiber), garlic, you have tons of different types of prebiotics as well. I tend to have a list and go through it with patients. I say look, these are different ways in which you can get them into your foods and these are the kind of recipes you can use as well.

Launching as a segment, you can talk about foods that generally improve your gut microbiomes. Things like probiotic foods, like kefir, kombuchas, and probiotic yogurts. These are all great at nurturing these microbiomes that we know have inflammation-reducing effects on the brain as well.

Dr. Mark Hyman:

The bonus factor in plants are phytonutrients, which are colorful healing compounds made by plants to protect themselves, and when consumed, protect us against aging, obesity, brain damage, and more. It's important to boost these phytonutrients, so eat a lot of colorful vegetables and fruit that are full of these phytonutrients.

All the dark, deep reds and yellows, oranges, greens and blues in food, are a sign of powerful anti-inflammatory, detoxifying, antioxidant, energy boosting, brain powering molecules. Enjoy those blueberries and dark leafy greens like kale, and be sure to incorporate a lot of fiber-rich foods like beans and whole grains if your body tolerates them. If not, nuts and seeds, artichokes, Brussels sprouts, and broccoli are also great.

Our experts have said over and over again, nutritional deficiencies range from problems like the epidemic of broken brains, to problems like reflux, allergies, and asthma, to chronic diseases like heart disease, diabetes, and cancer. Whether you are suffering from a bad mood, difficulty concentrating, or have a more serious condition such as depression or Alzheimer's disease, it's likely that nutritional deficiencies are one of the primary causes.

To optimize nutrition I recommend specific brain vitamins and minerals including folate, B6, B12, vitamin D, as well as minerals like zinc, selenium and magnesium.

The good news is that we can improve the function of these receptors with proper nutrition. Remember, fats influence neurotransmitter and receptor production. Vitamin supplementation will help improve your cells' ability to listen, as well as produce more neurotransmitters.

Studies show that supplementing with the amino acid tyrosine, as well as essential fats, and special nutrients like folate, B12 and B6, can improve depression, ADHD, and Parkinson's. These nutrients give your body what it needs to function as it was designed, and to repair the damage that leads to the conditions like these in the first place. In fact, nutrients often work better than conventional medication and without side effects, because they are part of your brain's natural raw materials and design.

The next thing we need to do is balance our hormones. There are three main communication systems in your body. They direct all the traffic and the messages from your nervous system, including the gut (the site of your second brain), your endocrine, your hormonal system, and your immune system. Each of these systems is part of a larger integrated system called the psycho-neuro-endocrine-immune system (PNEI).

The three main communication systems are—number one: neurotransmitters, which are messengers of the nervous system, number two: hormones, which are messengers of the endocrine system, and number three: cytokines, which are messengers of the immune system.

Health is good communication. All your cells talk to each other all the time, and they do so through many different messengers and languages. There's the endocrine language, or hormones, the immune language, or cytokines, and the nervous system language, or neurotransmitters.

Your hormones are produced and controlled by your endocrine glands, and the conductors, or the command and control centers for all your endocrine glands, happen to be located in your brain. They are the hypothalamus and the pituitary glands. These glands send signals to distant parts of your body to control your stress response through adrenal glands, your blood sugar balance through your pancreas, your thyroid hormones by your thyroid gland, your sexual behavior and function through your reproductive organs, and your growth, sleep, mood, and much, much more.

There are three big epidemics of hormonal problems in America today. Too much insulin from sugar and starch. Too much cortisol and adrenaline from stress. And not enough thyroid hormone. These all interconnect with and affect the other major category of hormones: the sex hormones.

First, let's talk about insulin.

Dr. Maggie Ney:

Hopefully, we're born with a healthy pattern of glucose and insulin, and that is partly dependent on how mom was during pregnancy. The more we're exposed to sugars and processed foods as the diet changes, we have fluctuating levels of insulin. When we eat a high-sugar, high-glucose meal, our insulin levels spike, and what that does is it causes the glucose to be absorbed into the blood.

The more sugar we have throughout the day through chronic glucose exposure, insulin keeps being produced in high levels, and our cells have had enough—they stop listening. We're left with high insulin and glucose levels, leading to insulin resistance. Insulin resistance is now shown to have a huge effect on the brain, actually causing a lot of neurodegeneration and neuroinflammation, and contributing to Alzheimer's disease, which is now considered to be type 3 diabetes.

Dr. Mark Hyman:

It affects many varieties of people, and it's not exactly the same in everyone. The only sure way to know is with an insulin response test, that measures blood sugar and insulin one and two hours after a 75-gram sugar drink.

It's not a genetic defect, an error in our development, or a mistake by God. The simple fact is we have strayed from eating in harmony with our genes. In other words, we do not fit into our genes. Historically, we ate the equivalent of only 20 teaspoons of sugar a year as hunter-gatherers. Now, we eat over 150 pounds per year per person, or half a pound a day. The average school kid eats 34 teaspoons of sugar a day.

We evolved in a world without super grocery stores, convenience stores, and fast food restaurants. We had to work for our food and had limited access to refined foods or excess calories. In fact, our genes are preagricultural. We only started farming 10,000 years ago, and

only started refining flour about 200 years ago with the advent of the steam engine and the powered flour mill.

Then, came the advent of 15,000 low-fat foods on the market over the last 15 to 20 years. With the help of these high-sugar, high-calorie foods, we've created an epidemic of increasing obesity, type 2 diabetes, and heart disease. The scientific foundation for the low-fat movement was shaky from the start.

Our bodies normally produce insulin in response to the food we eat, particularly sugar. We once thought that insulin's only role was to help sugar enter the cells to be metabolized, taking the energy from our food, combining it with oxygen, and creating the energy we use every day to run every function of our bodies. Now, we recognize insulin as a major switching station, or control hormone, for many processes in the body.

Too much insulin can cause weight gain, increase bad kinds of LDL (cholesterol and triglycerides), and it can lower HDL (the good cholesterol). It can lead to increases in blood sugar and blood pressure, and makes your blood sticky and more likely to clot, leading to heart attacks and strokes. It stimulates the growth of cancer cells, as well as increases inflammation and oxidative stress, which can age your brain. It also causes sex hormone problems that can lead to infertility, hair growth where you don't want it, and hair loss where you don't want to lose it, including acne, low testosterone in men, and mood disturbances. We need to learn to control our insulin.

Balancing blood sugar and correcting insulin resistance is well within our reach. My goal is to make your metabolism more efficient, to make your cells more intelligent and cooperative, and not resistant to the insulin. Here is what to do.

First, stop eating flour and sugar products, especially high-fructose corn syrup. Second, don't have liquid calories—your body doesn't feel full from them, so you eat more food all day. Third, stop all processed, junk, or packaged foods. If it doesn't look like the food your great-great-grandmother ate, then stay away. Fourth, stop eating trans or hydrogenated fats.

Next, slow the rate of sugar uptake from the gut through balancing your meals, using foods with a low glycemic load, and with healthy protein, such as nuts, seeds, beans, small wild fish, and organic chicken and grass-fed meats. Also, eat healthy carbs: vegetables, nuts and seeds, beans, fruit, and small amounts of whole grains. Also, make sure you add healthy fats like olive oil, coconut oil, nuts and seeds, avocados, and fish oil.

Next, eat plenty of soluble fiber—about 30 to 50 grams a day. Next, make yourself smarter by giving your cell membranes an oil change with omega-3 fats, fixing them so they can more readily receive the messages from insulin. Also, be sure to exercise. Exercise improves your cells' ability to work better, to respond to insulin better, and to burn sugar faster. Also, be sure to relax. Stress reduction also helps improve blood sugar control.

Finally, make yourself smarter through increasing specific nutrients, such as chromium, magnesium, vitamin E, biotin, the B vitamins, zinc, bioflavonoids, and some newer compounds, including alpha lipoic acid, arginine and carnitine. Just balancing this one hormone, insulin, can have wide-ranging effects on all your other hormones and brain chemicals.

Now, let's talk about the thyroid. As our food environment has become more toxic, and our exposure to pollution, petrochemical industrial waste, and heavy metals have increased, our thyroid problems have also increased. In fact, it seems that the thyroid hormone is critical for helping the brain make new brain cells, particularly in the hippocampus, which is responsible for mood and memory.

Mood disorders, in general, including bipolar disorder, are increased in people with altered thyroid function. Research shows that low thyroid hormone levels reduce the function of

serotonin receptors, which leads to depression. Aside from the clear effects thyroid has on mood, it is also clear that low thyroid function affects cognitive function, memory, and other indicators of slowed mental processing, and that treating the thyroid improves memory.

Dr. Datis Kharrazian:

The first book I wrote was on Hashimoto's thyroiditis disease, and I wanted to add a part two to my book, which is why I wrote a book on the brain. It was really for my Hashimoto readers.

90% of people that have hypothyroidism, the underlying cause is they have Hashimoto's, which is an autoimmune disease. They have antibodies to their thyroid gland, and that's why it's being destroyed.

It's actually an autoimmune disease, but most patients don't know that. Most patients get diagnosed with hypothyroid, they're told they have this genetic endocrine disorder, and that's it. That's partly true, but in reality the genetic disorder is turning on an autoimmune mechanism that is now making antibodies called TPO, which attach to the thyroid gland and destroy it.

Research is showing that TPO antibodies have amino acid homology, or they have the potential for molecular mimicry, and that the antibodies against the thyroid can actually attach to the brain. When those antibodies attach to the brain, the immune cells destroy them.

When someone has an autoimmune disease for the thyroid, and they make antibodies called TPO, thyroperoxidase antibodies, those antibodies not only attach to the thyroid gland, which then signals inflammatory destruction of those tissues, they also attach to the brain. If this happens very acutely and aggressively, they call it thyroid encephalopathy. Many people have it to a very subtle degree.

Also, researchers have found that when people are thyroid hormone-deficient, they might not be taking the thyroid hormones, or it took years for them get diagnosed. Being thyroid hormone-deficient turns on brain inflammation, so the glial cells get activated. The longer it takes to get diagnosed, the more brain inflammation you have, and the autoimmunity itself for being hypothyroid, turns on brain degeneration.

Most of the people who have Hashimoto's, have some degree of HLA-DQ genotypes for gluten sensitivity—not always coeliac disease, but gluten sensitivity. There's also lots of strong research that shows gluten antibodies attach to brain target sites.

We published a study four years ago. We looked at 400 healthy blood donors in the US, and we measure their antibodies to wheat protein and milk protein, and we found that there's actually close to 15% of the population that had antibodies to different proteins associated with casein and gluten. Of those, we found half of them had brain antibodies.

The Hashimoto's hypothyroid person is very genetically susceptible to gluten in wheat, so when you add gluten in, the antibodies for the thyroid attach to the brain, and being thyroid hormone-deficient turns on brain inflammation. Perhaps they have gluten intolerances and that turns on brain degeneration and brain inflammation.

In my clinical practice, we see about a third of my thyroid patients also have brain antibodies. One of the ways to look for neurological immune disease is you check antibodies for the brain. These are like myelin basic protein, myelin oligodendrocyte protein, and neurofilament protein. What we're finding is that about a third of the patients we're seeing in a private practice, mind you is not a research study, they have autoimmunity to their brain, but it's not necessarily multiple sclerosis, is just a subtle, neuroinflammatory, autoimmune disease.

A lot of chronic patients have hypothyroidism and their chief complaints are depression and fatigue, and most of that is brain-based in some of these patients. As the brain gets inflamed, they can't activate their brain, so they have depression. The fatigue is really brain-based because they have no need to do anything, and everything they do activates their brain. Their

exhaustion and depression is really all brain and has nothing to do with the thyroid. When they spend all this time trying to figure out the right thyroid medication dosage, they're usually unsuccessful, because they haven't really addressed their brain autoimmunity, or their autoimmunity in general.

Dr. Izabella Wentz:

The TSH test is the standard of care test for figuring out if a person has a thyroid condition. Unfortunately, this test, while it's very, very good in the late stages of Hashimoto's and thyroid disease, can miss thyroid disease in the first 5, 10, sometimes 15 years that we have it.

Do the TSH test, but also look at your thyroid antibodies. TPO (thyroperoxidase) antibodies, and TG (thyroglobulin) antibodies will show up in the very early stages of Hashimoto's when the attack on the thyroid gland starts, and when a lot of the brain symptoms start. We know there's an immune system imbalance and that we can do something about it. Get the three most important tests done: TSH, TPO antibodies, and TG antibodies.

I also like to look at free T3 and free T4. This tells us what amount of thyroid hormones we have available in our body to interact with thyroid hormone receptors. Make sure you ask your doctor for all of these different tests and not just look at the TSH. Many times, that test can be "normal," while you have this attack on your thyroid gland, and you may not know that part of your body is under attack because you're not getting the right testing.

In many cases, we'll see that there are objective markers we can measure in the blood where we see that thyroid antibodies are elevated or we see alterations in TSH, T3, and T4. Sometimes, there's something called reverse T3 that may also be altered. Beyond that, I also encourage clinicians to really look at their patient's symptoms, because there are instances where a person can have something like seronegative Hashimoto's, where they have the attack on their thyroid gland but it may not show up in blood work.

Doing thyroid ultrasounds can also be very helpful to determine if a person has an attack on their thyroid gland that can be visualized on an ultrasound, but in some cases, those can also miss Hashimoto's. I do advise really looking at the person as a whole and considering what their lab tests look like, what their ultrasounds look like, what they feel like, and what they're telling you that they're going through. This will help figure out what is really going on with the person.

In some cases, utilizing thyroid hormone therapy, as well as all of the lifestyle interventions that I'm a big proponent of, can help a person feel like themselves again, and that's really the most important thing we're aiming for.

What I like to do with people with Hashimoto's is I want to look at getting them back into balance. We're going to be looking at, first and foremost, their thyroid hormones, see if those hormones are imbalanced, and look at how to individualize their therapy. We may utilize T4, T3 medications. We may utilize natural desiccated medications, or even compounded thyroid medications to meet that person's needs.

And then, very important and not to be ignored, we're also looking at the root cause of their condition. What is causing their body to attack their own thyroid gland? A lot of times, it's going to be related to the foods they're eating. We're going to be thinking about what foods we can remove from their diet that can be causing cross-reactivity or inflammation within their thyroid gland. We're going to be thinking about what nutrients they're going to be missing.

These are going to be two of the cardinal things that we oftentimes will just start a person on and they feel significantly better. Once we remove the inflammatory foods—gluten, dairy, and soy are the most common—and once we add some nutrients to the mix like selenium, vitamin D, the B vitamins, especially thiamine and B12, as well as magnesium, we start seeing big improvements in how a person feels.

Beyond that, it can be a little bit like peeling back the layers of an onion. I like to focus on addressing toxicity by supporting the person's liver. I like to focus on addressing their stress response and the health of their gut. And then, also dialing in and seeing if they have any kinds of chronic infections that can be cross-reacting with their thyroid tissue.

When a person has an infection within their thyroid gland, or perhaps even somewhere else in their body, the immune system may attack that infection either where the infection lives, which may be the thyroid, or anything that looks like the infection. In some cases, some infectious organisms can resemble the thyroid gland when you look at them in tiny, tiny pieces, which is how the immune system recognizes what's a friend and what's an enemy.

It's a really comprehensive whole-person approach to try to figure out how we get the person back into balance. How do we establish safety in their body? How do we get their immune system to start recognizing the thyroid gland as a friend and part of us once more?

The approach is going to vary for each person. For some people, it may be as easy as just removing one food from their diet, and within two to three months they're going to see all of their symptoms melt away, their thyroid antibodies go away, and in some cases, they can even wean off of thyroid hormones.

With other patients, we may have to go deeper. We may have to remove a whole bunch of different foods. We may have to address various nutrients, infections, traumas, or a whole host of toxins. It really varies on the individual to see what their unique triggers and unique root causes are, to bring them back into balance.

Gluten, dairy, and soy should absolutely be avoided if a person is dealing with a thyroid disorder. We've seen 88% with thyroid conditions feel significantly better off of gluten. About 80% feel significantly better off of dairy. And somewhere between 60% and 70% feel much, much better off of soy. A lot of times, we see miracle stories happen when they just get off of those three foods.

Some of the most common thyroid toxins are fluoride, BPAs, and triclosan. We're going to have fluoride in our water supply and this can be potentially problematic. We're going to have BPA in our plastics. And triclosan is going to be present in our antibacterial soaps. Flame retardants in our bedding. These are all potential triggers and toxins that can contribute to thyroid disease.

I recommend doing a cleanup of your environment. Get rid of some of those low-hanging fruits. Get a reverse osmosis fluoride filter to try to get some of the fluoride out of your tap. You're going to want to go green on your personal care routine, so you're going to get rid of the antibacterial soaps, you're going to get rid of the heavy chemical-based products like shampoos, lotions, potions, and perfumes. You're also going to be thinking about not utilizing as much plastic, especially for cooking, microwaving, or storing your food, so you're going to go to all glass. We see that when you stop adding toxins into the mix, you can start finally getting rid of and eliminating them.

Another component of addressing toxicity is to support your liver with nutrients, as well as some herbs, that can help it detoxify and get rid of some of the toxins that you've been building up in your body.

What I really like to recommend for people with Hashimoto's and for thyroid disease is to focus on eating a whole-foods-based diet that's minimally processed. The diets that I've seen the most benefits with are going to be the paleo diet, as well as the autoimmune paleo diet. We've actually been able to see and measure improvement in people's symptoms, as well as in their thyroid antibody markers, which can tell us how aggressive the thyroid condition is.

We see symptoms like headaches, panic attacks, palpitations, weight gain, fatigue, all these symptoms begin to melt away when we get rid of the reactive foods and we focus on having

organic, wild-caught, real foods within our diet. I love to see people eating bone broth. I love to see them eating good fats. I love to see them eating organic and wild-caught meats, right?

As far as nutrients go, one of the most important nutrients that we want to address is selenium. Selenium deficiency has been recognized as an environmental trigger for thyroid disease. We find that 200-400 micrograms of selenium methionine can reduce the attack on the thyroid gland by about half. We also see that it reduces anxiety, reduces hair loss, and a whole host of other thyroid symptoms.

I also really love to see people with thyroid disorders on thiamine, especially when they have any type of fatigue or brain fog. Thiamine, around 600 milligrams, has been clinically shown to reverse thyroid fatigue in as little as three to five days. I love the benfotiamine version as well—this has been very, very effective for many of my clients and readers.

Dr. Mark Hyman:

Next, let's talk about cortisol and adrenaline, also known as the stress hormones.

Dr. Hyla Cass:

Hormones are very influential on our brain and our brain health. Hormones like the thyroid, which is a butterfly-shaped gland in the neck that really runs our energy system as does our adrenals. Our adrenals are tiny glands above the kidneys. These glands are very important and influential. The adrenal glands put out adrenaline and cortisol and other things too.

They are fight-or-flight glands. If we've been, for example, really stressed for a long time, we're putting out a lot of fight-or-flight chemicals and we get worn out and tired. What happens is the brain dials down the adrenals, because it's like you just can't keep going full-bore all the time, so what ends up happening is you get really, really tired and depressed.

That depression may not be clinical depression. To me, clinical depression just means you're depressed—let's find out why. If somebody has come to see me, and I take a history, if they've been through a stressful time, a court case, a divorce, something really big, job loss, and they're feeling that way you could say, "Oh, well, you're depressed because that happened to you, but let's look at the level of stress that's gone on. Let's have a look at the adrenals. Let's look at adrenal function." You can check that with a saliva test, which is pretty simple.

Dr. Todd LePine:

It's okay to have anxiety when you need to be vigilant, but if you can't turn off that hypervigilance, there are some people who actually have difficulty in detoxifying stress hormones. I can almost literally predict if a person has a catechol-O-methyltransferase (COMT) deficiency. COMT basically means that when you're under stress, your stress hormones linger in your body longer, so that sort of fight-or-flight response that you get when you're anxious, is basically like a merry-go-round—it just keeps circulating in the person's body and they remain anxious all the time.

It's natural—if you get more adrenaline you're going to get more anxious. If I shot you with adrenaline, you would feel on edge, and that edge should go down as your body detoxifies those stress hormones. There are some people who can't detoxify those stress hormones. Those are the people where mind-body types of exercises, like meditation, deep breathing exercises, visualization, and relaxation are really, really key for dialing down their anxiety.

Jim Kwik:

Most people don't realize all the anxiety, depression, challenges that they have from this environment because it's there all the time. It's like the fish never noticed the water, because when you're inside the jar you can't see the label from inside the jar. When you're living under this kind of stress, whether it's environmental stress, emotional, physical, work, or relationship stress, we start to get accustomed to it.

The problem with stress to your learning, to your brain, when you have cortisol, when you're producing adrenaline, it's good for fight or flight, something physical, but it's not good if you need to take a test, if you need to remember someone's name, if you need to give a

presentation at work to a group of people, because stress really shuts down parts of your brain so you can't learn it really well.

Dr. Robin Berzin:

My top tips for addressing stress in the moment are: develop a breathing practice, something that is your go-to. We know that if you inhale for say a count of three and you exhale for a count of five, so your exhale is longer than your inhale, we know that that activates your vagus nerve, which is your parasympathetic nervous system. That's your rest, digest, relax, and heal side of your nervous system. That will immediately lower your heart rate, relax your digestive system, and even lower your blood pressure.

This is an active, basic cue. You can do it in public, because no one needs to know that you're doing that. And you can immediately relax your nervous system. If you find yourself in a meeting, on a call, in a conversation, or wherever you are, getting anxious or stressed, immediately turn to the simple breath—breathing in for three and out for five, and that can relax your parasympathetic nervous system.

It's also really important to have a period of time every day where you put your body in a relaxed state. That can be yoga, walking, cooking, meditation, doing your breathing practice, or listening to music and not doing anything else. Some period of time where your body gets to redevelop that muscle memory, that visual intuitive memory of what it's like to feel relaxed. So many people are so anxious and stressed all day long, their body doesn't even remember what it's like to not be coursing with some of those stress hormones.

Dr. Mark Hyman:

Next, let's talk about the sex hormones.

What many people don't know is that sex hormones act on the brain directly to affect mood and cognition. In fact, they are receptors for all hormones, including estrogen, in the brain. And estrogen in the brain seems to be neuroprotective, potentially reducing the risk of dementia. A little too much can cause breast cancer, uterine cancer, and cervical cancer. Getting the balance right is essential.

Progesterone is another important sex hormone. Levels drop in PMS and in perimenopause leading to increases in anxiety and insomnia. There's evidence that natural, bioidentical progesterone—hormones that are identical to those produced in the body—reduces this anxiety and stress through its action on GABA receptors, the relaxing neurotransmitter. It's your body's natural Valium.

As women and men age, testosterone drops significantly, and has an enormous impact on the quality of life. It drops mostly because of weight gain, lack of exercise, stress, and high sugar diets, not because we are genetically designed to have less testosterone as we age.

High levels of belly fat drives insulin up and testosterone down. That's why men start looking like women and lose hair on their bodies, grow breasts and have round, soft skin, because they are producing less testosterone and more estrogen. At the point that their estrogen levels exceed their testosterone levels, they sort of become like women.

Correcting insulin problems by eating whole foods, cutting out sugar and flour, and doing some exercise to build muscle, may naturally raise testosterone levels. Especially in older men, I find that giving them a little topical bioidentical hormone helps them build muscle and bone, lose weight, relieve depression, stabilize mood swings, improve memory and concentration, and improve sexual function. Even women benefit from the use of bioidentical testosterone.

Hormone replacement therapy must be carefully administered under doctor supervision, after adequate testing. I strongly advocate the use of nature-made molecules to support normal function, rather than new-to-nature, or man-made substances, which often have many unwanted and dangerous side effects.

Sex hormones can become imbalanced in both men and women, but why does this happen? PMS and the perimenopausal symptoms most women experience are because their hormones are out of balance. Estrogen levels actually increase, especially from the age of about 30-40, and progesterone levels decrease, either relatively or absolutely. Testosterone levels drop off in men and women leading to a loss of energy, depression, and low sex drive.

Many things promote imbalances in the hormones. Things like a high-sugar, refined-carbohydrate diet, caffeine, stress, dairy, added hormones in our dairy products and meats, and estrogen-like toxins from pesticides, plastics, and pollution. Exercise also helps keep hormones in balance. If you don't get enough of it, levels get out of whack.

Alcohol damages the liver and prevents it from excreting excess estrogen, yet another factor that influences hormonal imbalance. Men who drink too much literally grow breasts along with beer bellies. In addition, constipation and imbalances in the gut bacteria can lead to the reabsorption of estrogen from the gut back into your blood, even after your liver has tried to get rid of it.

The 6-week plan that we will discuss in the next Episode, will serve as the first step to balancing your hormones, including your sex hormones.

Hormones are critical for your brain, and they affect almost every function. We often ignore treating these problems because they may not be a true deficiency, they might just be an imbalance. As we age, we see a number of different hormones go out of whack.

One, insulin goes up, and that causes prediabetes, which we know affects the brain. Also, we see cortisol go up as we age, which is the stress hormone. We see growth hormone go down, which helps our brain repair and grow. We see estrogen and testosterone, the sex hormones, decline, all of which are really critical in regulating our health. Melatonin for sleep.

All of these hormones are delicately balanced, and when they're interrupted or dysfunctional because of all these insults in our lives—lack of sleep, stress, poor diet, toxins, infections, gut dysfunction, etc.—when, we start to age fast, and we start to break down. It's really important to optimize hormones.

For example, I had a patient who had Alzheimer's who just had a slightly dysfunctional thyroid, she wasn't full-blown hypothyroid. When I give her a little bit of thyroid hormone, she woke up, she had more energy, and her memory got better. We see really significant improvements by tweaking these hormones as we age, particularly in things like dementia or dysfunction.

Balancing your hormones is key to an UltraMind.

The next step to an UltraMind is to cool off inflammation. You have a swollen brain like a swollen knee. New evidence links hidden brain inflammation to almost every known brain disease from depression, to dementia, autism, anxiety, from schizophrenia to sociopathic behavior. The fire comes from the foods we eat, from toxins in the environment, from hidden infections, unknown allergens, and stress. If you want to address your swollen, inflamed brain, you have to find the source of the fire and stomp it out.

Dr. Datis Kharrazian: First of all, it is really important to understand that two-thirds of the brain are actually immune cells, which tells you how important neuroinflammation is to the brain. The brain itself is made of neurons and glial cells, which are immune cells. We usually think of the brain as being all these neurons, but it's actually all these immune cells, so most of the chronic neurodegenerative diseases of our time are really a consequence of neuroinflammation and immunological activity.

Dr. Mark Hyman: Inflammation is part of the body's natural defense system against infections, irritations, and foreign molecules. Inflammation can be a good thing. It fights foreign invaders of all types.

However, when the natural balance of your immune system is disrupted, the immune system shifts into a chronic state of alarm, spreading a smoldering fire of inflammation throughout the body. When this fire spreads to the brain, it can cause depression, dementia, autism, ADHD, Alzheimer's, forgetfulness, brain fog, and a host of all sorts of other problems.

Cytokines are a class of proteins that are the language of your immune system. These chemicals can either promote or reduce inflammation. When triggered by toxins, infections, allergens, stress, a bad diet, or a sedentary lifestyle, cytokines run out of control starting fires all over the body and the brain.

When testing for inflammation in the body and the brain, I recommend getting two tests. I strongly recommend that you talk to your doctor about testing your levels of C-reactive protein, or CRP. CRP is a protein found in the blood, and it's the major marker for systemic inflammation. I would also test for gluten sensitivity, which is one of the biggest causes of inflammation.

Everything in the body is connected, and there are only few things that cause inflammation. The first is our inflammatory diet, which consists of enormous amounts of sugar, refined flours, as well as trans fat and omega-6 refined oils.

The second is food allergens, or food sensitivity, especially delayed reactions to food or hidden allergens that lead to brain allergies.

The third is imbalances in digestive function and the gut immune system that produce widespread systemic effects.

Vicki Koblinger:

We talk about the intestinal bacteria, and the lack thereof, or what I call the weeds. It's also called intestinal permeability, or leaky gut. Some of the things you can do to help resolve leaky gut issues, or help heal them, is a multifaceted approach.

Number one, you want to get rid of those things that grow the bad bacteria, like sugar and processed carbohydrates. You want lots of the things that grow the good stuff, that support its growth—those are called prebiotics. Certain types of fiber are really, really good for that, and again, those fibers are often going to come from fruits and vegetables. You want to add that good bacteria from lacto-fermented foods. You want to grow the good bacteria and starve out the negative, undesirable germs.

The other thing you can do is there are lots of herbs that are really wonderful as natural antimicrobials, which help normalize the gut—things like garlic, rosemary, oregano, and olive, are great at helping reestablish a normal gut, and are great for managing microbes naturally.

Dr. Frank Lipman:

How do we optimize our gut bacteria? It's much more than just taking probiotics, antibiotics, or antimicrobials to kill the bad bacteria. It's about how you feed the bacteria in your gut. The more diverse your bacteria in the gut, or the more types of bacteria in your gut, the healthier you're going to be.

How do you create a diverse bacterial gut? By eating many different foods, because different bacteria are going to feed on different foods. It's important to eat different types of vegetables. I always tell my patients to eat the stalks and the stems, because that's the fiber that your body doesn't break down properly and the bacteria love that.

Eat lots of different types of vegetables, eat lots of different types of foods. The more diverse your diet, the more diverse that food is going to be for the bacteria. What you feed your bacteria and how you treat your bacteria is going to create a more diverse microbiome.

Dr. Elizabeth Boham:

We also know that our digestive system is impacting our brain health. When there are imbalances in our gut flora (all of those bugs in our digestive system), that really impacts our

mood and our brain health. When there are imbalances in this gut flora, people can have more anxiety. We see that often. When we treat those imbalances with changes in diet, good bacteria, like probiotics, fiber, and sometimes even with medications to lower those imbalances, we see improvements in brain health, like we see improvements in anxiety.

Dr. Mark Hyman:

Again, many different factors affect the gut and the brain health, such as unfriendly bacteria in the gut, or other bugs like yeast that produce brain toxins, or the fermentation of starches from your diet that produce gas and toxic levels of ammonia, or odd, partially digested food proteins that interfere with normal brain operation, or activation of the immune system because of the digestive imbalances that damage the protective barrier in your gut, which normally keeps the outside world from entering through the gut.

The fourth is toxins, such as mercury and pesticides, and the over 80,000 untested toxins in our environment, which have been linked to immune dysfunction and autoimmune diseases.

The fifth is low-grade hidden or chronic infections, such as HIV-associated dementia, herpes infections, syphilis, Lyme and tick diseases, which can cause many neurologic and psychiatric diseases, or even things called PANDAS (pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections) that lead to OCD from a bacteria.

The sixth is a sedentary lifestyle. The seventh is inadequate sleep. And the eighth is nutritional deficiencies such as vitamin C, the B vitamins, vitamin D, zinc, and omega-3 fats.

Addressing each of these challenges is pivotal to creating optimal gut health and brain health. The 6-week plan that I'll discuss in the next Episode will serve as a jumpstart to cool off inflammation, to heal your gut, to balance your hormones, and optimize your nutrition.

In the next Episode, we'll talk about the final three steps to an UltraMind. Optimizing your detoxification systems and your mitochondria, calming your mind, and of course, creating community. And finally, we'll put everything together as a simple plan that you can start today to create your best brain.

BROKEN BRAIN

BROKEN BRAIN

EPISODE 8

7 STEPS TO AN ULTRAMIND (PART 2)

Dr. Mark Hyman:

Welcome to the last Episode of the *Broken Brain* docuseries. In this Episode, we will cover the final three steps to an UltraMind. These steps include optimizing your detoxification systems and your mitochondria, two important areas that dramatically impact the function of everyday and long-term brain health.

We'll also talk about how to calm your mind and how to use the power of community to keep yourself supported on your journey towards your best health. Learning how to calm our minds and how to build community are often overlooked when it comes to our health, but I can assure you that these two components are part of all my patients' treatment plans.

Throughout this series, we've talked about the growing problem of toxicity in our environment and food, and how these toxins are wreaking havoc in our bodies and our brains. Let's dive a little deeper into this topic and learn why addressing the issues of toxins is such a crucial step to creating an UltraMind.

In today's world, food and toxins are more important than ever. The nutritional value of our food has been compromised by factors that range from corporate agribusiness, over-farming, depleting the nutrient levels of our soil, to food conglomerates like Kraft, Nestle and Nabisco putting highly processed, high-glycemic-load foods on the market that contribute to every health problem we see today—from heart disease to dementia. The poor nutritional value of our food is further complicated by the extraordinary amounts of toxic chemicals that have entered our bodies through what we eat.

Dr. Joe Pizzorno:

I've been involved in medicine now for about half a century and over that period of time, I've watched quite a significant change in why people are sick. When I was first started working with patients back in the 70s, people were sick primarily because of nutritional deficiencies, nutritional excesses, lack of exercise, smoking and the obvious choices people were making.

Starting around 1970, I saw a significant change in what was happening to people, and that is they're becoming sick because of what might be called the passive determinants of health. In other words, they're becoming sick not because of what they're choosing to do, but because of what was changing in the environment around them.

Starting in 1970, we began using a lot more pesticides in our foods, more metals in our manufacturing, and these things leaked into the environment. We started using more and more water supplies that were less healthy, because as the population grew, people had to use water with more levels of arsenic.

I started seeing more and more chronic disease, not because of what people were doing, but because of what was in the environment that was poisoning them. As I started noticing more of my patients suffering from disease because of toxins, I started looking at what percent of chronic disease is due to toxins? I hired a couple of really bright graduates 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 now 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.

Dr. Mark Filidei:

Environmental toxins are actually a really big problem. In one aspect, with technology, we're healthier and living longer lives, but in the process, we're poisoning ourselves for the long run. This is causing environmental consequences right now. You've all heard of phthalates and plastics and they are in the food we eat. These are some of the hundreds and thousands of chemicals we all now contain.

Dr. Joe Pizzorno is a specialist in this field and when you hear him lecture, you want to run and hide in a corner. We're really toxic—eliminating those toxins and reducing that toxic burden can be difficult, but we really need to be vigilant and not get exposed.

How do you not do that in your everyday life? Don't ever cook anything plastic or heat anything plastic in a microwave. Hot foods aren't good in plastic. Try to always eat fresh organic food, not processed. Those are simple things you can do. There's a big knock against organic food, "Oh, it's no healthier for you than regular." It absolutely is, even on a vitamin level, but certainly on a toxin level.

The top foods you really want to avoid are farmed fish (probably the worst), GMO soy and everything made thereof, and commercially-grown dark leafy greens (which are all grown with lots of pesticides).

Environmental Working Group puts out a great little bulletin *The Dirty Dozen and the Clean 15*. You can use that in your everyday life when you shop. Certain things aren't that bad commercially. Other things you always want to buy organic, and those are again, simple things you can do on a daily basis.

Besides the pesticides, herbicides, etc., another thing you can do is don't spray for bugs in your home and find out what the landlord or the landscaping company is using around your house for pesticides.

Mercury is a known neurotoxin, an endocrine toxin. Most people have heard of the mad hatter—it's a real thing. These are people back in old England that used to make hats, turning animal fur into felt with mercury salts, and they literally went mad. It was a tremulous, anxiety-ridden madness. Well, you get the same thing with low levels of mercury, albeit not quite so bad. Mercury toxicity manifests as anxiety, sleep disturbance, insomnia, and it's a neuroendocrine toxin. It poisons all your endocrine glands, so you have low hormones. It's an immunosuppressant and you can get sick and get cancer.

Where do you get it? Fish and fillings. If you have those silver fillings in your mouth, it isn't silver, right? Those are 50% mercury. It's really ridiculous dentists are still putting these in people's mouths. When we do some special testing, they even have different reference ranges on the test, if you have fillings or not, right? The levels are higher with fillings. You want to avoid that.

The fish that you want to avoid the most are the big ones that live a long time: tuna, swordfish, and shark. Fish don't make mercury, they eat smaller fish that have mercury in them and the bigger fish accumulate it. Fillings and fish are two main sources.

That's just one toxic metal. We also have lead. A lot of this actually comes from the air from China, along with mercury. This gets into the vapor in the jet stream and drops over here. It's estimated that 20% of the pollution here in the Los Angeles basin is actually from China. Same thing with the Northwest. It's a global problem, not just local.

Arsenic is also a known toxin. People get poisoned with arsenic on purpose or accidentally. It's in the groundwater in a lot of places. You're not likely to get lead or mercury in your water, but arsenic definitely can be there, especially if you're on well water so you may want to check.

We do a hair analysis test very frequently, which is a pretty good indicator of your metal burden. It's a good, quick, cheap, and easy way to start looking for metals, and arsenic shows up in the hair pretty well. Sometimes on these TV shows, they'll dig up a body and see if they were poisoned with arsenic. They do hair sample testing.

- Dr. Mark Hyman: Toxins must be excreted through the body's liver detoxification system. I find that many patients, including autistic children, have low levels of glutathione, the major detoxification combat in the body, so they cannot excrete metals.
- Dr. Joe Pizzorno: Glutathione is incredibly important to the body. Why is that? Glutathione does basically three things that are critically important. Number one: it's the most important antioxidant in ourselves and in our mitochondria. If your glutathione levels are low, your cells will degenerate, your DNA will degenerate, and your mitochondria will degenerate more quickly.
- If you look at a species' ability to produce glutathione, it predicts how long a species lives. The longer-living species produce more glutathione than short-living species.
- Number two: it places a critical role on the liver for getting chemical toxins out of the body. There's something called phase 2 liver detoxification, where you basically bind glutathione to chemical toxins, which makes them easier to get out through the bile, and also through the kidneys.
- Number three: it's responsible for pumping mercury out of the brain, across the blood-brain barrier into the blood, where the mercury can then be disposed of. Glutathione also helps to get mercury out of the cells and binds to the methylmercury we get from fish, helping to get it out of the body.
- Dr. Mark Hyman: It is important for us to boost glutathione levels. To do this, you must get the methylation train running properly, because if it stalls, so does the sulfation train. Sometimes you can take glutathione itself or compounds that help your body make more glutathione, such as n-acetylcysteine (NAC).
- You can take alpha lipoic acid and milk thistle, but you can also eat your way out of trouble using phytonutrient superfoods from a mostly plant-based diet, which should be the foundation for everyone's diet and health. Broccoli sprouts are the biggest inducers of glutathione production, but you can load up on all the members of the broccoli family every day, such as collard greens, kale, cabbage, kohlrabi, mustard greens, rutabaga, turnips, bok choy, Chinese cabbage, arugula, horseradish, radish, wasabi, and watercress.
- The next step is to boost our mitochondria. Most of us don't think much about where our energy comes from, why sometimes we have more or less of it, how it might affect our brain, or even the whole process of aging. In fact, everything we have explored in the first six keys influences our health directly through energy. Enough energy means a happy, healthy, focused, and sharp brain. Lack of energy means slowed mental function, autism, mood disorders like depression, and ultimately Parkinson's and dementia.
- One of the things we've discovered in the last few decades is the importance of energy. I don't mean energy that you feel, although it's related, I mean energy that your body produces from oxygen and from eating food. That gets burned in your cells in a little organelle called the mitochondria. They're like tiny little energy factories or power plants. When those power plants start to become dysfunctional, which can happen from anything that causes inflammation (from toxins, your gut, or nutritional deficiencies) those little energy factories and power plants start to wind down and that's when disease occurs.
- What's striking is we found this link to autism, Alzheimer's, Parkinson's, diabetes, and depression. These are all common pathways by which these diseases are affected. A leading autism researcher Dr. Suzanne Goh is studying mitochondrial therapy and autism, where she provides the nutrients to help the mitochondria work better in a certain subset of kids with autism, and they recover. Things like CoQ10, carnitine, lipoic acid, n-acetylcysteine, ribose, are mitochondrial nutrients that were often low.

We see this in Parkinson's. We know Parkinson's is a mitochondrial disease that happens from insults like toxins, infections, inflammation, and poor diet. When you support the mitochondria, you can help these patients feel better, function better, and halt their Parkinson's. We know that it's linked to Alzheimer's.

All these mitochondrial dysfunction conditions are ones we never really paid attention to. They are not a disease, but they're dysfunction that comes from all the insults in our life. They have been linked to all these horrible diseases that we now can do something about.

The part of your body that uses the most energy is your brain, which has the most mitochondria, the little energy factories inside your cells that produce the energy that runs your body.

We're messing up our mitochondria, yet we can fix them. In fact, it's the fundamental phenomena of aging.

Dave Asprey:

Yes.

Dr. Mark Hyman:

It's linked to Alzheimer's, Parkinson's, depression, chronic fatigue, to all sorts of cognitive issues—ADD, autism, Asperger's, all these things that we think are fixed brain disorders. You're suggesting something pretty radical, which is they're really not fixed and that you can actually fix them.

Dave Asprey:

You can fix them. The cool thing about these power plants in your cells is there are a quadrillion of them in your body and they all talk to each other. They're designed so that the weak ones can die and be replaced by fresh ones. All you have to do is send them a signal that says, "Hey, it's time to straighten up here." When you do that, they make more energy for you. That's how I can start companies that grow big, I am able to be a good parent, and I can do all the things I do, because I regenerated that part of me.

Dr. Mark Hyman:

That's amazing. Let's talk about the two parts of what we need to know to fix our mitochondria. What are the things that harm them—what are the mitochondria poisons? What can optimize your mitochondria?

Dave Asprey:

It's fantastic that you went in the right order there, Mark. The first thing to do is stop doing the things that make you weak. It sounds obvious...

Dr. Mark Hyman:

Brain kryptonite, you called it.

Dave Asprey:

Yes, that's exactly what it says in *Head Strong*. The idea is if you are used to carrying around a 100-pound barbell, like, "I'm going to get strong so I can carry another one," but what if you just set that one down? You'd have a lot of strength. That's the equivalent of getting rid of toxins.

Some of the biggest toxins that affects your mitochondria are eating damaged vegetable oils, fried foods, and other things that are pretty commonly-known toxins like mercury—these directly impact the mitochondria.

Dr. Mark Hyman:

These are powerful things that we're exposed to every day, that we have no awareness of. The sad thing is that this is the future of medicine, and yet most doctors when you go to them say, "I don't know what's causing this," or they'll say, "I don't even know about mitochondria. I don't know how to diagnose mitochondrial problems. I don't know how to treat mitochondrial problems." However, there's a huge science around this. You talk a lot about that in your book and you help us understand that this is not just some crazy idea. This is actually the future of how we're going to be treating patients.

Dave Asprey:

It's the future of how we're going to treat patients because mitochondria are the uniting element that explains everything that's happening—all inflammation comes from mitochondria. There's no other source of it. If you get to the very root of it, when you make some simple

changes, everything can get better all at once, instead of this ancient view, "I'll work on just the kidney, I'll work on just the knee, I'll work on just heart disease."

If you fix a disease and still cause cancer, which is also mitochondrial at the same time, like some large research organizations are doing, it doesn't work. You have to do everything and the only way to do everything is to go down to the root cause. The root cause is, your body is not converting food and oxygen into energy for you to go out and be who you're capable of being. We can fix that now, because we understand that system. It is hackable.

Dr. Mark Hyman:

Breakdown in mitochondria are caused by two things. Number one, the standard American diet or SAD diet, which contains too many calories and not enough nutrients and antioxidants. And the second reason is reduced nutrient, vitamins, and mineral intake that limit the ability of our antioxidant enzymes to function.

For example, without enough zinc or selenium, these enzymes cannot do their job. A number of basics are essential for boosting mitochondria including omega-3 fats, which make up the membrane of the mitochondria and two B vitamins—niacin (vitamin B3) and riboflavin (vitamin B2), which are necessary to help the enzymes involved in turning food into energy in your mitochondria.

Other nutrients we get either from our diet or our bodies produce them, but as we age or if we're exposed to any type of physical, toxic, or emotional stress, we need to replace these nutrients. The top mitochondrial nutrients are acetyl l-carnitine, alpha lipoic acid, coenzyme Q10 (CoQ10), NADH, D-ribose, magnesium, riboflavin, niacin, and NAC. These mitochondrial nutrients and antioxidants can protect your critical energy-producing factories.

The final step to an UltraMind is to calm the mind. Your body governs your stress and relaxation responses through your autonomic nervous system. This system controls all the automatic functions in your body and is divided into two parts: the sympathetic nervous system and the parasympathetic nervous system. Chronic stress increases inflammation, anxiety, and depression, and damages the hippocampus, leading to memory loss, mood disorders, and reduces serotonin levels. It also interferes with thyroid function causing loss of muscle, and much more.

We asked all of our top experts for their best tips on calming the mind. This is what they had to say.

John Mekrut:

Are we making ourselves sick with our thoughts? Sure. If you think about it from the perspective of brain wiring. Let's just use what I know best—your thought patterns will tightly wire together if you continue to invest in them. Your perception of anything in light of, "That's fearful, that makes me angry, that makes me sad," whatever the thing might be, the longer and harder you hold on to those thoughts and ideas, the more robust they will remain.

If you want to get rid of some of those thoughts, start thinking other thoughts. It's that replacement strategy. Those will then slowly dissolve. The circuits that fire together, wire together. The reverse is true. If they're not being used and the circuit is not being activated by your thoughts, it will slowly disintegrate. The brain is an incredibly flexible place. It wants to use resources to the best of its ability and if that's kind of useless, let's get rid of it.

It can work either way. You're not going to eliminate stress as stress is a part of life., and is actually a valuable component of life. It's an indicator for your system, that something needs attention. There's a stressor coming in, what do I need to do?

It's how you manage and react to it, that's important. If you observe the thing that you think is horrible, if you think about it for a second, okay, it's not that bad. It's just not that bad.

- Dave Asprey: Every night before you go to sleep, find three things that you're grateful for and just think about those for 30 seconds. That's all it takes. When you do that, it's going to change the way your heart beats, it's going to take you out of fight-or-flight mode, and it's going to tell your body, "Hey, while you're sleeping tonight, maybe you should fix the mitochondria. Maybe you should grow new proteins, instead of being ready to fight while you're sleeping." If you do that, you will be head strong—you'll turn off your inflammation, and as a side effect of all this, you'll probably need smaller pants.
- Annie Hopper: As a general rule of thumb, noticing the goodness in life is a really good habit to get into, to really train your brain to look for what's going well. Other than that, it will increase our emotional state too. Instead of getting anxious or worried about small things, really put it into perspective. Is it worth it for me to get upset about this, and what are my choices? Become empowered in your life and make those moment-to-moment choices that will provide you with happiness in life.
- Dr. Rick Hanson: Mother Nature has evolved to help her little critters, her little babies, including us. Move out of spikes of red zone stress and recover rapidly by returning to the resting state. I call it the green zone, which is an ongoing, equilibrium condition of basic safety, satisfaction, and connection. How do we get out of that spike of red zone stress? A little bit goes a long way.
- One, experience some form of safety—that you are protected. In the moment, maybe you're anxious about something, maybe you've got a real challenge to deal with, but register in the moment, "I'm not dying." For example, I've had a lot of situations in the wilderness where I wasn't physically comfortable, but I knew I was going to live through it. Establish a sense of safety to the maximum that's authentically available. If you think of the evolution of the brain, the reptilian brain stem is associated most fundamentally with safety needs. In the wild, the motto is eat lunch today, don't be lunch today. Safety comes first.
- First and foremost, establish a basic sense of safety. Like, "Okay, it's this bad but it's not that bad." "The yuckiness is going to last my whole evening, but tomorrow's going to be another day." Or, "Yeah, they really got me on this one but there are these other parts of my life that are still fine." Or, "I don't like it, it's uncomfortable, but I've lived through this kind of thing previously. I know I can do it. I'm going to draw on that knowledge and I will keep going." Establish a basic sense of safety. Notice protection that surrounds you, that one is in an environment that's physically safe. Whatever you can do, for 5, 10, 20, 30 seconds. It doesn't take forever to do it. Register safety.
- Second, in terms of the mammalian subcortex, look for healthy rewards. Eat something sweet, have that cookie (make sure it's gluten-free, you know) but have something pleasurable. Look out and see something beautiful, brush your hair, wash your hands. Basic, wholesome things, a pleasure of one kind or another. Watch a kitten video on YouTube, watch somebody doing something goofy and funny—something that is momentarily rewarding and activates the feeling of satisfaction, the need system in the brain. That too, tends to bring us right out of something that's a spike in stress.
- Third, in terms of the most recent layer of the brain, look for some sense of connection. Who do you love? Who has loved you? Who are your friends? Have compassion for people who've wronged us, if it's authentic, alongside having compassion for ourselves and sticking up for ourselves. But having compassion for them, which is a very social emotion, actually helps us feel less upset. It seems paradoxical, like compassion. A sense of the suffering of the person who's been a jerk, would make me feel better, but in addition to whatever's moral about it, it is enlightened self-interest to do that. So those are the big three.
- Adam Cobb: I would say the biggest relief technique is the idea of writing, because writing is releasing. The more you can write, the more you can release and the more you can let go. Writing and journaling is very important, whatever that looks like for you, the practice of having a stress

release. Normally, most people don't say, "Why did I read so much last night? Why did I write so much last night? Why did I drink so much tea last night?" Unless they were up all night.

However, people do say, "Why did I watch so much TV last night?" TV can be an immediate stressor. Documentaries, etc., are fantastic, but the idea of too much TV, you can start to go into monkey mind. and If someone watches too much TV, you know it because they're not really there. It's a different take on things, for real.

Going back to that stress relief, a nighttime rhythm is one, reading is another, writing is another. A hobby. Do you have one? Is it coloring? Get a coloring book. That's really big nowadays, but having a coloring book and having to associate it to colors and making sure you're doing circles and shapes. Having not only that, but whether it's painting, musical instruments, all these things that are de-stressers.

When it comes to movement and exercise, some of the things I are real simple—just stretch at night. Keep it really, really simple. What's tight? It could be as simple as just stretching your neck and different movements like that. Standing and doing a pretzel stretch, putting one leg over the knee, the other leg over the knee and really stretching your lower back and then stretching up nice and high. Reach up to the ceiling and do that multiple times, over and over again.

Roopa:

To have a better brain, the five things I would recommend are food (energy that you put into your body), exercise (any form of movement, the body needs to move), meditation or mindfulness (taking a pause within the day, whether it's for 5 minutes or even if you can do 10, 15, just to come back to yourself and to be with your thoughts, to center yourself and to really get away from the day's stresses), connection (connecting with people, with whom you enjoy hanging out, people who have the same goals or interests—we are social beings and so we need people around us, whether it's friends, family, your partner, people that you trust) and lastly journal writing (journal writing is a great way to let go of your fears, your stress).

In fact, Dr. Hyman, in one of his articles, recommends journal writing at the end of the day, just before going to bed. He suggests that you write down all the things that are stressing you out and put all those things in a book, close it, and have faith that the next day will be brighter and you'll be able to better deal with your worries.

Dr. Mark Hyman:

Your path to a better brain does not have to be complicated. Follow these steps for six weeks. Number one, eat right for your brain. Plant foods, good healthy animal proteins, healthy fats, lots of vegetables, and colorful foods. Eliminate processed foods, sugars, and refined carbohydrates.

The first thing you can do to optimize your brain function is change your diet. Get rid of the processed foods, starch and sugar, increase whole foods, plant-based foods, and increase healthy fats—omega-3 fats, avocados, nuts and seeds, healthy grass-fed animal protein, and healthy grass-fed butter.

Number two, tune up your brain with supplements. Take a high-quality, high-potency, highly bioavailable, broad-spectrum multivitamin, which contains all the basic essential vitamins and minerals. I also recommend taking magnesium, vitamin D3, omega-3 fatty acids, such as EPA and DHA, and special methylation factors like folate, B6, and B12.

You can often find special, activated forms of these nutrients, which are most effective for brain health. I also recommend taking probiotics to improve digestion and reduce gut inflammation. In the companion guide, you'll find all of my recommended doses and brands.

The next step is to exercise. We now know that movement and exercise are critical for the brain. Find some form of movement that you love and incorporate it every single day.

- Dr. Wendy Suzuki: I think my take home message for everybody is you can start small, but start exercising now. It could be a walk, because we know that just walking alone can enhance your mood. It's not going to get you the hippocampal growth of brand new brain cells or increases in growth factors, but walking is the next step to increasing your aerobic exercise. You don't have to become a triathlete. It can start small, but start it, be regular, and gradually build up. There are so many great apps out there to help you do that in a seamless way. It's so important to get that regular exercise.
- My second big tip is do something that is fun for you. Don't do the most popular thing. If you hate it, find something that you love. If you love working out with your friends, find friends that will work out with you. If you love being outside, find something for you to do outside. Everybody can find something to do to make their life more physical, and you can start small.
- Dr. Mark Hyman: The next step is to sleep.
- Pedram Shojai: One of the things I tell my patients and students all the time is three hours before bedtime, no more artificial lights. We like to light candles in the evening. Hundreds of thousands of years, our species sat by fires and had torches and candles. That red light does not drive our physiology into imbalance. It doesn't keep us up, it doesn't keep us cranking the way our society would have us do.
- Once you start learning to decelerate in the evenings, to value sleep, and give yourself that sacred empty space to go down, recover, and heal, that's when you start to see the benefits ripple out across your health, your relationships, your waistline, everything.
- Dr. David Musnick: Most people have Wi-Fi in their homes 24/7. It's going and it's strong. It's often not just your house—you're also receiving Wi-Fi from other people's houses. I know when I do it at my house, there's like five Wi-Fis available and most of them are locked. I don't even have Wi-Fi at my home because it's all wired, but I can turn it on if I want to.
- There's information that electromagnetic fields can actually damage the brain. When a cell phone is held near a child's head, they've done studies that show the pattern of penetration into the brain. They've also done studies with rats, in which it's shown that electromagnetic fields from cell phones actually cause immediate brain damage.
- One time, I was at Sea-Tac Airport, to give a talk at a Functional Medicine meeting, about five years ago, and this news came out that cell phones held near the brain could cause brain damage, and everybody went like this for a second, "Oh my God," and texted somebody, and then right back to holding their cell phone to their ear.
- One of the things I recommend is to decrease electromagnetic fields after a head injury. I recommend everybody turns off the Wi-Fi at night, because you don't need Wi-Fi when you go to sleep. A lot of brain healing occurs while we're sleeping, but it appears that brain healing occurs better if there isn't a strong Wi-Fi field.
- I asked everybody to turn off their cell phones. A lot of people have their cell phones next to their bed, and these cell phones are constantly receiving emails and texts. I asked if they do that, to try to please turn it off or put it far away. Some people have clock radios that are plugged in, and there are huge electromagnetic fields from that.
- Dr. Mark Hyman: Take our experts' tips and maximize your sleep time. Your brain will thank you. Also find ways to actively relax and find ways to connect with others. Meditation, yoga, hiking, deep breathing, and deep conversations are all ways to relax and make your brain happy.
- Also, train your brain. Learn something new. Pick a new hobby or passion and pursue it. Remember, if you don't use it, you lose it.

Dr. Titus Chiu:

Exercise and activation. What do I mean by that? Things like playing chess or mental stimulation like mindfulness practices, meditation. Or learning Sudoku, learning how to play a new instrument, rocking out, learning a new language. That's what I call a top-down approach, where you can use your mind to train your brain.

There's also another way that I call sensory genomics, where we can use all the senses like sight, sound, smell, taste, touch, and proprioception or body awareness. Proprioception allows us to get a sense of our own groundedness and being on this planet.

If your proprioception is off, you can have problems of balance and coordination, but it could be so subtle, that it's just in the back of your mind. One of the main functions of the brain is to allow us to move on this planet and not fall over. We weren't born reciting poetry, playing music, all those wonderful creative things, filming with the RED cameras. We were born to walk and navigate on this planet. If the systems in our nervous systems start to break down, then we have to use all of our mental resources to be able to balance.

All of a sudden, we can experience brain fog and not really know why. Or forgetfulness, or our capacity to deal with stress is right at this level because those systems aren't working well. We should always be challenging ourselves to learn new things, whether it's learning how to play the piano, learning a new language, or meeting new people. All these things grow and strengthen the brain.

For example, the next time you're washing the dishes, close your eyes and bring your attention to how the water feels, the warmth of it, the soap suds, and the sound of the water. When you bring awareness to your senses, you actually powerfully activate the brain.

In Norman Doidge's book *The Brain's Way of Healing*, he talks about all these neuroplasticians. That's what I do in my practice, things like aromatherapy, where a person smells rosemary or lavender, and it can help with their anxiety. It's not only impacting our nose, it's actually activating specific areas within our nervous system that can calm our emotions. That sense of genomics.

Another example is what I call vestibular rehab, where we spin someone in a chair and it activates these little canals in their inner ear. If they have problems of balance, coordination, or anxiety, a lot of times it's because they have an imbalance in their inner ear and we can retrain that. That sense of genomics.

Going out with me for an enjoyable glass of wine and then I teach you the differences between Pinot Noir from Sonoma and from Willamette Valley, that sense of genomics. You're not expanding your palate, you're expanding this area called your orbitofrontal cortex in your frontal lobe, that allows you to differentiate between the different wines. That sense of genomics.

Dr. Mark Hyman:

Our final tip for the six-week plan is to live clean and green. Minimize toxic exposures by reducing the use of plastics, staying away from foods high in mercury, and checking your home for mold or other toxins. This also means buying organic when possible and choosing sustainable clean meats and fish.

Dr. Robin Berzin:

There are numerous neurotoxins we're exposed to on a regular basis, and while any one of them in a minute amount on its own might not make you sick, the cumulative burden of them is bad. A lot of them are stored in fat tissue, which we all have. Our brains are made of fat and a lot of these neurotoxins get stored in our brains.

It's bad for our hormones, brains, metabolism, and we're only beginning to see the cumulative effect of them. Some of the common neurotoxins to which we're exposed are things like pesticides, flame retardants in furniture, chemicals used in non-organic dry-cleaning, and heavy

metals like arsenic, mercury, and lead in the past, although luckily, to a lesser extent, because that's been highly regulated.

The number one thing you can do to avoid these neurotoxins is to eat organic food. A lot of these toxins are in non-organic food and while it is more expensive, the investment in your body, which is the only vehicle you have for your entire life, is so much more important than the little bit of extra money that you're going to pay for just buying organic.

The Natural Resources Defence Council (NRDC) and others have great resources on high metal levels in fish and which fish to avoid. At Parsley Health, we educate all of our patients on which fish are high in mercury and which ones to avoid. Get organic dry cleaning and avoid furniture that is treated with chemicals. A lot of furniture makers are making non-toxic furniture.

These are little choices that you make day-to-day, but they add up to a life that's toxic or nontoxic. The research is out from top researchers at Harvard and Mount Sinai Hospital that these neurotoxins are not only affecting us, they're affecting IQ points of our children.

Dr. Mark Hyman:

I recommend checking out the Environmental Working Group's guide and their web site to find the cleanest household products and cosmetics. EWG also has plenty of guides on finding clean meat and produce.

True health is not about the absence of disease, it's about the presence of vitality and energy. I asked our experts to share their top tips for brain optimization and here's what they had to say.

Dr. Datis Kharrazian:

The top tips for neuroplasticity? Number one is you have to get sleep. Number two, you have to do some degree of physical exercise. With physical exercise, the research is showing that the key thing that it releases something called BDNF (brain-derived neurotrophic factor). It doesn't have to be for long periods of time, but the exercise has to be high intensity. The higher the intensity of exercise, the more BDNF you release in your brain. That encourages the growth of neurons.

Often, I have my patients do what's called the seven-minute workout. If they can get their heart rate up just for a few minutes, that completely changes their brain chemistry. Also, do whatever you're bad at. This is not the trend for what people like to do. People like to do what they're good at, right?

As a kid, you're good at some things, you're encouraged to do them, and then you don't do the things you're bad at. Whatever you're bad at, you need to do. If you hate learning a language, you need to go and learn a language. If you hate art, guess what you have to do? You have to do art. That's the best way to develop neuroplasticity.

Dr. Robin Berzin:

My top tips for optimizing your brain every single day are pretty easy. The first one is get sleep and prioritize sleep. Try to go to bed by 10:00, 10:30, 11:00pm at the latest, and get seven and a half to eight hours of sleep a night. You can take magnesium at bedtime and that can help you have a higher quality sleep, without any addictive side effects.

The second one is green your life a little bit. Avoid some of the common neurotoxins, whether it's in non-organic dry cleaning, high mercury fish, or pesticides. Choose organic whenever you can, get some of these common chemicals out of your cleaning and personal care products, and avoid the heavy metals that are in our food. These are some of the simple ways in which I know I'm protecting my brain. For the long haul, we're living longer and so we want our brains to be there for us.

The third way is to find some sort of relaxation practice every day. It could be a two-minute breathing practice, yoga, meditation. The effects of chronic high cortisol and stress hormones on our brains is really depleting our brain power.

Recognize how stressed you are and then find some way, even for two minutes, to breathe your way or meditate your way out of stress. There are great apps and videos out there that make it really easy online, for free, to learn a simple practice that reduces your stress response.

Jim Kwik:

What is brain training and why is it important? What I believe is, in this day and age, our wealth is not based anymore on our muscle power, it's based on our mind power. It's our brute strength, our brain strength.

When I'm interested in working with clients, it's yes, mental intelligence. I want to get them to remember facts, figures, formulas, and foreign languages. That's really important. Also, it's not just mental intelligence, we want mental fitness. Similarly, as you're building your body, you're building your muscles, you want them to have energy, you want them to have strength and power, endurance, flexibility, agility, and speed. Your brain is like that also. Your brain can be trained for greater agility, speed, endurance, power, strength, all of that correct brain training is going to help foster that, where you're going to be able to remember things, have greater focus, greater retention, and be able to take in this information. Knowledge is not power, it's potential power. It only becomes power when we implement it—when we are able to take that information, apply it, and turn it into action.

My thing is this: we all could have better, brighter brains and what it takes is just as you have physical muscles, you have mental muscles. The challenge here is we're not using our mental muscles to our greatest ability. If you're not growing those mental muscles, then they're atrophying. If I put my arm in a sling for six months, it doesn't stay the same, it doesn't grow, it becomes weaker. The same happens to our brains.

One of the big modern-day challenges people have, they may feel like they're suffering from a broken brain, because senior moments are coming a little bit too early or they'll read a page in a book and forget what they just read, or they feel absent-minded.

Say they're in the shower, they can't remember if they shampooed their hair, so they end up doing it twice. Or they misplace things like their wallet, purse, or cell phone. Have you ever found yourself calling your own cell phone, hoping you kept it on, so it rings somewhere in your home? Or you misplace your keys or something much larger like your car. You ever see the people outside of the mall parking lots using their car alarms trying to figure out where they parked their car?

These are the challenges attacking us on a regular basis. One of the best ways to prevent brain aging, to keep your brain useful and young, is by activating your brain. By using your brain more often, you actually can live longer.

There was a study featured on the cover of *Time* magazine with these super nuns. They were living well into their 80s, 90s, and longer, and the researchers wanted to find out what they attribute that to? Half of it had to do with their gratitude, their emotional gratitude in their faith, but the other half had to do with being lifelong learners. Throughout their entire life, they were mentally engaged in conversation, games, reading, by keeping mentally engaged, and dedicating themselves to being lifelong learners, they added years to their life but also life to their years.

We've discovered more about the human brain in the past 20 years, than the previous 2,000 years combined. You hear about new science out there like neurogenesis or neuroplasticity, saying that you could create new brain cells till the day you die. You could create new connections inside your brain to the day you die, and what does it require? Probably just two things. It requires novelty and it requires nutrition. Novelty and nutrition.

It's kind of like the human body, right? You go to a personal trainer and they want to introduce stimulus to your muscles, they want to give it a novelty or exercise. They also want to feed it

with the proper nutrition, so it can grow and be healthy. It's the same thing with your neuro/mental fitness. By giving it new stimulus, like new thoughts or new body movements it will actually build your brainpower.

There was a study at Oxford University that said the act of juggling will create more white matter in your brain. We teach people how to not only juggle, but to do other things. Like, for example, eating with the opposite hand or brushing your teeth with your opposite hand, because we know that there is a mind-body connection. We know that one half of your brain controls the opposite side of your body. So God forbid if somebody had a stroke on the left side of their brain. If there's paralysis, it would manifest on the right side of their body and vice versa.

Dr. Elizabeth Boham: The most important things to do to improve your brain function is first and foremost, exercise. Exercise is critical for brain health, and you want to get some exercise every day. It's really important for the prevention of dementia, but also for improving brain health.

The second thing you want to do is eat from the rainbow of colorful plant foods. You want to choose foods from every color of the rainbow, every day. These phytonutrients that create the color in our plant foods have a tremendous impact on our health. They have anti-inflammatory properties, prevent dementia, and decrease risk of cancer. You want to reach for a plant food from every color of the rainbow every day.

The third and probably one of the most important things we can do is to get adequate sleep every night. You really want to reach for those seven to nine hours of sleep every night, and give your body time to rest.

Dr. Todd LePine: Another thing that is highly important for helping with health is to keep mentally sharp. Use your brain to think: doing puzzles, engaging in conversation, reading books. The brain is like a muscle. If you don't use it, you lose it. It's really important to keep the mind stimulated but not over-stimulated, not like multi-tasking.

Dr. John Ratey: My biggest piece of advice to people that want to live a healthy life is to get connected and stay connected, because that is the spice of life. That is the meaning of life, that's what we should be doing and we evolved to be connected to one another. It gets harder as we age to maintain that, and not just think, "Oh well, I'll just sit in my chair". When you do that, you'll erode.

Dr. Mark Hyman: When I asked our experts for the most powerful tool to keep our brains healthy, they quickly replied community. Community can be more effective than medication, when it comes to our health.

Dr. John Ratey: Community is really important and community happens on a family level, it happens at a neighborhood level, and it happens in a broader context. There's a wonderful book called *Alone Together* by Sherry Turkle. She talks about how technology in some ways is bringing us together, but it's also making us separated. Real connection is vital, and I call this vitamin O— vitamin oxytocin.

Oxytocin is the thing that mammals get when they're in community, touching one another, hugging, and they're sitting down eating together. That sharing, that social bonding that happens, that glue that cements us together is really important. Look at the Blue Zones (an anthropological concept that describes the characteristic lifestyles and the environments of the world's longest-lived people). —They have that sense of community and a sense of purpose and cohesiveness. We're a social animal. We need that. That vitamin O is really important.

Dr. Mark Hyman: There's another ingredient for our health and well-being that is often ignored, which is the power of connection, love, and community. So what role does that play in your health, mitochondria, your brain, all the rest?

Dave Asprey:

When I was running Head Strong, I realized that there are three basic things that a bacteria does in the world, that we also do. Number one is, run away from, hide or kill scary things that might be a threat. That's our fear response. The next thing is eat everything. Bagels, cookies, whatever it is, and this is to make sure that the bacteria doesn't starve to death, doesn't run out of fuel. And the third thing that's also an F word is make sure that you reproduce. So fear, feed, and some other thing.

Once a bacteria has done those things, it'll do something magic, it'll make yogurt. And this is the fourth word that starts with F and it's friend. What we do at a cellular level is the same thing we do as humans and we form a community. Yogurt is cooperating bacteria to make something bigger than any single bacteria. Your body does this to form who you are. When you get those basic three needs met, where you have individual companionship, enough of the right kind of fuel, so your cells don't feel like they're starving, and when you don't feel like you're scared all that time, we call that forgiveness.

When you get those in order, you're ready to go out and form a community, and the community can support you. We are wired to be kind, nice, and supportive to other human beings. It's our core nature, but that nature gets disrupted. When your mitochondria don't work, you don't have the energy to be kind to other people. That's why it's so important that we fix our mitochondria and we fix our brains, because it makes us help our community naturally, and that's what makes us feel best. When we do that, it creates a feedback loop.

You support your community, you commit acts of kindness, and you help other people, and that makes you feel good. When you feel good, your mitochondria gets stronger because you know you're doing the right thing. It actually pays it forward, but you always get a return on that. That's why community is so important, because community helps you and you help the community.

Dr. Omid Naim:

Most antidepressants are either designed to boost serotonin or dopamine. Dopamine is the challenge neurotransmitter. We really are mostly designed for gathering the food and then building comfort. What are all the other wonderful ways that can nurture us with comfort? Number one is actually physical contact.

I come from a culture where physical contact is a lot more normal. We hug, we kiss, and what's lovely is science shows how touch is very essential to our nervous system. If you also step back from a very basic sense, look at all of the primates and mammals. Touch is how we know that we are safe. The most basic part of comfort is knowing that I'm safe and knowing that I have others around me, and there's no better way than actual physical touch. It makes sense that we're designed to seek serotonin through the comfort of safety.

When I work with people who struggle with addictive behavior, I help them through meditation, mindfulness, slowing down, and starting to become their own monitor. I have them ask themselves with compassion and curiosity, "What is it I'm really seeking right now?" The food or the drug is a solution, and let's get away from a judgmental stance on that, and actually say, "You are seeking something, you need something, you're not getting something. But let's name what it is you really need and then give you a chance to explore ways that you can get it, that feel more nurturing to you and that are more sustainable."

Dr. John Ratey:

The most important thing is community, being connected to one another. I'm working with a group that studies this for the elderly. One of the big ways to keep people well, to keep people from using Medicare B, is being more social and staying more social. It's even three times more important than if you exercise every day, which I think is one of the most important things you can do, which is twice as important as taking medicine as your doctor prescribed.

It all comes down to being connected and this is the biggest advice we have from *Go Wild*, and that is to work together, be involved with other people, be in a small tribe. As hunter-gatherers,

we were in a group of about 40 or so people maximum and we knew and depended on everybody. CrossFit, a Zumba group, running or walking group is like a very interesting small tribe. Or just as people are getting together for this docuseries. We need to do that because it gives so much to us in terms of health benefits.

Dr. Mark Hyman:

Health is contagious. In a large social experiment that I did with my friend Pastor Rick Warren and Dr. Daniel Eamon at Saddleback Church, we helped 15,000 people lose a quarter of a million pounds in a year, by doing the program together as a community. They met in small groups to help, love, and support each other. Those who did it together lost twice as much weight and got twice as healthy as those who did it alone. I call it *The Love Diet*. Everybody needs a buddy, and this is why I recommend using friend power to help you stay or get back on track with your health.

Think about it. How much easier is it to stick with an eating plan, get out of bed, exercise, and really work towards your health goals, when you know your friends are in it with you?

Dr. Robin Berzin:

I absolutely believe that your community is one of the most important determinants of your health. We know that the social determinants of health are more important than the genetic determinants of health. We know that the health status of your Facebook friends can actually be a really good indicator of how healthy you are.

I try to remind people that they need to deliberately cultivate friends in their lives who make them healthier. Of course, we can't control every person we come across day-to-day, but we can choose to work and have social lives with people who make us healthier, who encourage us to move and eat better. We all have those friends who we get together end up having too many beers, or eating pizza, or skipping the workout, and those are friends who can be amazing for us, but we need to counteract those friends with some of the friends who help us live a little bit more healthy.

I've literally done that in my life. For instance, I practice yoga and my yoga community contributes to making sure that I practice yoga. I'm more active than I would be if I just had to remind myself all the time.

Dr. Mark Hyman:

Having a group of like-minded individuals to keep you accountable can be a key part of the journey toward health. You need to build yourself a support system to succeed long-term. You need a team working together towards the same goals. It might be just one person. A self-guided support group, a group led by a health coach, wellness champion, community health worker, health professional, or even an online community is key for support, encouragement and guidance.

If you don't have healthy friends, you can be the healthy friend. I almost always find that the progress I make in my own health journey is enough to inspire my friends and family into creating their own healthy habits.

Dr. Omid Naim:

I think we undervalue community because the culture has moved forward with this individual mentality, especially in America. America is just an extreme of a Western mentality—we value the pioneer, the frontiers, the singular hero. And yet, at the same time, if you do a survey of people, if you ask at a dinner table or around your friends and bring up these kind of conversations, how many of us feel like we're doing too much and that we can't complain? How many people feel overwhelmed being so alone?

I think we're subject to a culture that really promotes individualism and there's a lot of value in that, but at the same time, I think there's a diminishment of community. We need resources: coaching and supportive programs for people to change their behavior. What we're really talking about is we need community. What I often say is that the solutions are simple, but difficult. They're actually not that complicated.

Dr. Mark Hyman:

Implementing the tips provided by our speakers can kickstart your journey to your best brain. I remember what it felt like to have a broken brain. I felt helpless, hopeless, depressed, anxious, tired, and just plain miserable. It wasn't until I discovered Functional Medicine and the power of our bodies and brains to heal themselves that I started to feel hope again.

This is what I want to provide for you, for anyone out there who is reading this, who is dealing with a broken brain or has a father, mother, child, sibling, or a loved one who is dealing with a broken brain— there's hope. It all starts with the steps outlined in this docuseries. I want to remind you that there is almost always something you can do to improve your condition. Never give up and keep digging for the answers. Thanks for reading.

Creating the *Broken Brain* docuseries has been one of the most rewarding experiences of my life. The information provided by each of our experts was so valuable, that I wish I could have included all of it in this docuseries. I know that just one part of a single interview could be transformational for your healing journey or perhaps a family member or a friend that you love. That's how important this is.

Thank you for reading this docuseries, which was created as a way to show you how healing is possible and how you can live the life you deserve. I so look forward to hearing about the limitless things that can happen for you, when you reclaim your health and your brain. If you're looking for more support on your healing journey, I encourage you to research all the practitioners featured in the series. A comprehensive list of their centers can be found at www.brokenbrain.com/center.

"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.

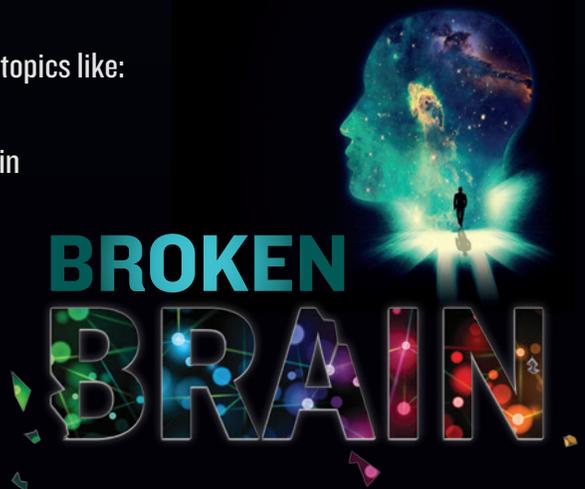


That's when I took a deep dive into healing myself by using the roadmap of Functional Medicine and peeling away the layers of what was wrong with me. And, incrementally, I got better. The Functional Medicine approach doesn't focus only on the symptoms. We understand that the body is a dynamic, integrated 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 informative and easy-to-read book, 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!**