



Multiple Sclerosis
Association of America

MSAA Podcast:
**3 M's of MS: Mangia, Microbiome, and
Molecules – Episode 9**

Host: Alexis Crispino Kline

With special guest: Dr. Andrew Woo, MD, PhD

Alexis Crispino Kline:

Hello and welcome to the Multiple Sclerosis Association of America's podcast, "The 3 M's of MS: Mangia, Microbiome, and Molecules." I'm Alexis Crispino Kline, Director of Mission Delivery and Grants Management for the Multiple Sclerosis Association of America and your host for today's program. I'm also delighted to introduce our guest and the mastermind behind today's podcast topic, Dr. Andrew Woo.

Dr. Woo is in private practice at Santa Monica Neurological Consultants and serves as an assistant clinical professor of neurology at the David Geffen School of Medicine at UCLA and Cedars-Sinai Medical Center. Listed as one of America's top physicians by the Consumer Research Council of America, Dr. Woo also serves on the Navigating MS International Steering Committee and is a member of the Board of Directors for the Multiple Sclerosis Association of America.

We are so excited to have you here today, Dr. Woo, particularly for such a neat podcast. I believe previously you have described this as one of your favorite topics to talk about.

Dr. Andrew Woo:

That is true. But when you said "mastermind", I thinking more "mini-mind". But thank you for the title. I appreciate it. And my mother thanks you, wholeheartedly. Yes. So I'm Asian, so I like to eat. Everything has to be a food analogy. And yeah, I came up with that little "M" thing because I like little things go in threes and I like to eat. And so I thought, well, what's kind of a catchy title that encompasses things that have to do with food? Because food is good and food brings people together and food is social. And one thing I found that when you see patients, patients you know, sometimes they listen to you, sometimes they don't, but they want to engage. But one thing that happens is often times as patients are listening to things about medications, and kind of what they're learning about MS and their bodies, and we're talking about the immune system and the white cells and the T cells and what happens with MS, oftentimes the question comes up, OK, OK, OK, I get that. And I'll I'll think about medications, what they do, and I'll do this and the blood test, but what should I eat and what should I do about my lifestyle? Because that, as we all come to learn, is very important, sometimes almost just as important as whatever

I tell them about the science of MS and, you know, the cornerstone of most health things really is diet, exercise and sleep.

And for things like MS or any other kind of immune condition, that is very, very critical. And I think in our talk, we did just, you know, not too long ago, we find that, yes, stress and the mind-body connection is very important for especially for things like MS, and I think we talked about even some of the MRI studies from 2010 so that you can literally change your MRI spots by stress management, which when that paper came out, I thought, that's crazy. You literally can change your MRI lesions and inflammation in your brain by stress reduction without any fancy medication or injections or IVs or pills, that's unbelievable to literally change your MRI by stress reduction.

So to think that, oh, dietary things can actually make a difference, too. So when patients ask me, oh, is there an MS diet or is there something that I could do to empower myself in my lifestyle, I love that. So I embrace that. And then the other thing happens as well, if you Google search "MS diet", guess what? You have over 600 million hits and things. And is there an actual standard MS diet? And the answer is no. But there are a lot of data out there and it can be very exciting, but also very daunting and terrifying because you can go down many, many rabbit holes and there are lots of places where they're trying to sell you supplements and take you down things that maybe don't have any real data or any scientific value, but they're trying to study stuff.

So I think it's our job as healthcare practitioners to help patients navigate, you know, what actually makes sense, what's practical and also respecting some patients may have food allergies or food intolerances or foods they don't like or like, oh, I don't like spinach, I don't like this. And I love chocolate and pizza and, and ice cream and those are three of our four basic food groups. So, OK, great. But maybe that's not great for your MS. So, you know, you kind of have to kind of look at every individual person and see what works. But also help them navigate what actually might have some data that could be helpful for their immune system and for their MS.

Alexis Crispino Kline:

Thanks so much. Yeah, and I think that that introduction was great. And you kind of led us right into, and touched on a little bit, one of my first questions that I had for you, which is what is the three M's? And you gave us a little bit of an overview, but did you want to describe them each, you know, place by place and how they fall in with the MS disease course?

Dr. Andrew Woo:

Yeah. So I said the three M's is "mangia", because we all have to eat something. You can't really sustain your life without eating something. And then, "mangia", and then the "microbiome", and then "molecules", because, you know, when I do my little nerdy PhD in neuroimmunology, neuroimmunology being, well, how does the brain communicate with the immune system? And that has a lot to do with not just MS but other kind of autoimmune conditions like rheumatoid arthritis and lupus and psoriasis and Crohn's disease and asthma and everything, and we find now that, well, all the things we learn in MS also apply to all those other conditions. And then when you look at things like the gut, turns out that not only do we have to eat to sustain ourselves, the things we're learning about the immune system of the gut, which is kind of one of the first things, you know, when a baby, when it's born, and it starts introducing food into itself, that kind of is its first introduction to like foreign invaders. Like how come, you know, how does a baby when it eats, when it has maybe breast milk or formula, how does it not reject that and you know, fight it. But it knows that bacteria and virus = bad. You

know, mother's milk or formula = good. How does the immune system know what's good and bad, how does it recognize self, non-self? You know, this applesauce and carrots and mashed-up peas = good, but that is bad.

So all of these things kind of come in play when you have these conditions, like MS, where, oh just the covering of the nerves, the myelin is being attacked and what happens to that signal that gets changed over the years and what things kind of involves that? So one thing we learned with MS is, well, if you look at the gut bacteria that we all have, as you probably know, this whole microbiome. People wonder, well, what is the microbiome?

Well, the microbiome is basically the whole community of all your microbes in your gut. So that includes your bacteria, viruses, your parasites, if you have some. So bacteria, viruses, fungal elements, your yeast, your molds. And if you have any parasites, on a good day, on a bad day. Having a bad hair day? You got more parasites.

So all those kind of microorganisms in your gut that live in a community. Now, some are healthy, some are not healthy. They live in this kind of symbiotic community in your gut, and you literally have more of these microorganisms in your gut than you have cells in your body, you have maybe 30 trillion cells in your body, but you have about 39 trillion microorganisms in your gut. So you have more of them in your gut, you have cells in your body, and they play a huge role in not just conditions of autoimmunity, like MS, and things like I mentioned, you know, lupus, rheumatoid arthritis, Crohn's disease, psoriasis, eczema, asthma. But also we find there are data, in at least animal models, for other things even like that are not classic immune conditions like Alzheimer's dementia and Parkinson's disease and even things in other psychiatric conditions that are looking at things as well, like some mood disorders as well, and other conditions like diabetes and diabetes 2, that you don't think of as classic kind of immune conditions. So it's not just the classic autoimmune conditions, but other things as well.

So what is it specifically I'm talking about with MS patients and their gut? If you look at the bacteria of the patients with MS, they actually have different bacteria than somebody who doesn't have MS. How do we know this? Well, sure, you can take dietary studies, people say, Hey, what did you eat last night? Oh, I had this great flambe or I had a great burrito or I had Japanese food, something you might remember, but you start asking, well, what did you have the day before that or last week or the week before that? People aren't really going to remember.

So dietary histories are hard, but if you look in the stool, that's where the money is. You actually study the stool, you look at the bacteria, you look at the actual RNA, the DNA of the stool, your stool studies, that's where a lot of labs, like at Harvard and other places, you can actually look at exactly what bacteria are living in the stool.

And so for like really great studies over the past ten years at a lot of these labs, you can actually find out what bacteria are in the gut of patients with MS. Turns out there are a lot of bacteria that are different in patients with MS, for example, *Methanobrevibacter smithii*, that won't be on the test. No need to write it down. But that bacteria is about six or seven times higher in patients with MS compared to somebody who doesn't have MS. And that's a very common bacteria that's kind of overgrown or overabundant in MS patients. That, *Akkermansia*, archaea bacteria are much higher in patients with MS compared to patients who don't have MS.

Likewise, in MS patients, there are some bacteria that are much lower. There's *Butyrivibrio*, *Porphyromonadaceae* group, *Faecalibacterium* and others. So I think, OK, this is sounding

really kind of nerdy. I'm not going to remember this. What's your point? Well, your bacteria are your main source of short chain fatty acids. They break down carbohydrates, complex carbohydrates, and are what called short chain fatty acids, which are the food for your cells and your colon, that type of thing.

So, OK, I kind of get that. What's your point? Well, your short chain fatty acids are anti-inflammatory. And you think, Oh, OK. Now you're kind of making some sense. Anti-inflammatory, I like that. MS is inflammation, I need the bacteria to break down my food, my carbohydrates, into these short chain fatty acids, which in turn are anti-inflammation. So what are short-chain fatty acids?

You may have heard of things like propionic acid, propionate, or acetate or acetic acid, which is literally vinegar. You know, you always hear about Oh, red wine vinegar, apple cider vinegar, all these of types of things, and then butyrate, butyric acid. Those are three classic short-chain fatty acids. What do they do? These short-chain fatty acids are anti-inflammatory, if you like immunology, that type of thing, what do they do? They actually, if you're, like, biochemistry people out there, if you want to nerd out, yes, they biome the histone on T regulatory cells and they actually kind of help upregulate near the promoter region of histones of T regulatory cells. And, if you remember from our talk last month, with MS, there are T cells that help regulate the immune system, that kind of quiet and decrease inflammation, called T-reg or T regulatory cells. So these short-chain fatty acids help those cells, which in turn quiet down the bad cells that we don't like in MS that cause inflammation, those are called TH17 cells. So these short-chain fatty acids kind of eventually quiet down the bad inflammation cells, called TH17 cells, which are kind of new, they were only discovered in humans in 2007 when your iPhone came out.

So you want to get more of these short-chain fatty acids that are produced by the good bacteria in your gut. And you can also, there are also foods we could talk about that are high in short-chain fatty acids and the good kind of carbohydrates and vegetables that give rise to short-chain fatty acids. There are also supplements we'll talk about that also give rise to short-chain fatty acids. So you're sitting there, OK, all right, I kind of get it. You're saying if I have MS, I have the wrong kind of bacteria, I have an overabundance of the bad bacteria that don't give rise to breaking down things with short-chain fatty acid. How do I change that? What can I do? Are there things I could eat? Are there ways I can kind of get rid of the bad bacteria? And there are lots of things, dietary-wise: intermittent fasting, we'll talk about, supplement-wise. There are lots of things to change that microbiome.

Alexis Crispino Kline:

Doctor, thank you so much, and that, you know, that is a really perfect introduction to our next question that we had, which was there are so many diets out there that suggest they might be potentially helpful for MS, and, you know, for exactly the reasons that you suggested. And there's ones like the Swank, and Wahl's, and vegetarian or vegan, intermittent fasting. Do you have any thoughts on what diets or foods would be best or worst or diets that are good to follow or that you might suggest or new research on any diet?

Dr. Andrew Woo:

Yes. So one of the earliest kind of MS diets that was talked about was way back in the 1950s. So Dr. Swank, who trained at Harvard, and then eventually went to Oregon, where he became very famous, started the neurology department at Oregon. He developed what's called the Swank diet. And again, this is way back in the 1950s. And he kind of observed in his research before he even arrived in Oregon was, you know, in Norway there's a lot of MS, kind of, inland Norway, kind of in the middle of the donut. Again a food analogy, you know, in the middle of the

jelly donut there's lots of MS. But on the coast, on the edge of the donut, there's not. You know, where people eat a lot of fish. So, on the coast of Norway, very little MS. But in the middle of Norway, there's much more MS. So he said, oh, well, what if the people on the coast are eating a lot of fish, is there something about fish and eating foods that are high in polyunsaturated fats? So he thought, well, if you eat healthy diets that are high in polyunsaturated fats and kind of avoid things that are bad in the saturated fats, like red meat and butter and cream and those kinds of things, then maybe that's good for your diet. So he developed what's called the Swank Diet back in the 1950s.

And he had his MS patients do that and he felt that that would be a healthy diet. Now certainly that is a healthy diet in general because you can imagine well if you eat less red meat and butter and ice cream and those types of things, you're going to have less chance of developing cholesterol problems and high blood pressure. It's going to be good for your heart. You're going to have less corrosion in your arteries and pipes, and that's going to decrease risk of heart disease and heart attacks and stroke. So that's already, I think, a very good diet for anybody, any human kind of walking around. So that was in the 1950s. So before he passed away by 1990, he published Nansen, Hey I have these patients, you know, keeping this Swank Diet for their MS, and yes, over 30, I think 37 or 39 years, these patients had less morbidity, mortality with their MS than patients who didn't follow that diet. Now it didn't prove that it actually helped their MS, but they did have less morbidity and mortality.

So it's certainly a healthy diet, at least for heart disease, if nothing else. Now over the years when they looked at diets, looking at the polyunsaturated fatty acids, primarily omega 3 fatty acids from fish and that type of thing, the studies were kind of mixed. Some of them were negative studies, some of them are positive studies. And even up until more recently, again, it's kind of mixed. In fact, some of the data were more positive for omega 6 fatty acids and not omega 3s, which is a little bit kind of conflicting. So it's unclear whether it helps or not. But there are some other studies looking specifically at omega 3 fatty acids with and without vitamin D, and they've had some mildly positive things. So there have been some positive as well as some negative studies looking at omega 3 fatty acids specifically.

I think in our talks from a little while ago, there was one study I would like to mention in Belgium, it was actually a PhD study, and they were like, oh, they followed about 1300 patients over a number of years, over 20 years, and they found... they asked the question: is there anything that decreases progression of people who already have MS? And they found that oh yes, three things independently decrease progression, and that was people who ate fish, drank coffee and drank alcohol. And so again, that fish was that component. Then we said, oh, let's just develop some sardine brandy lattes. So drink up! Tastes disgusting, but let's market it and let's retire early. Yes, we'll have to think of a cool name for that. So I digress.

So there is something maybe about omega 3 fatty acids. Obviously fish are very high in that. And if you are vegan, or don't like fish, or that kind of thing, yes, you can get omega 6 fatty acids, you can get blue-green algae, is a source of different types of omega fatty acids that are not fish based, that type of thing as well. So what about other things? So, that's why there may be something to it, but kind of unclear. What about some of the other diets that have been popular? So people say, well, what about cutting out all dairy? That has not been shown to be helpful. Vegan and vegetarian diets have not been shown to be helpful for MS. Other diets... I think a gluten elimination diet has been studied for MS and that has not been shown to be helpful.

One diet that is popular in other things, these kind of heart-healthy diets. There's the DASH diet, you may have heard of. It's a diet that's kind of against stopping hypertension. So the DASH, D-A-S-H diet. And there's also something kind of with that, the Mediterranean diet, they kind of go hand in hand, they're very similar. And the Mediterranean diet, kind of like it sounds like, oh, if you think of a Mediterranean area, those are very healthy diets that are more for things... a lot of vegetables, fish, olive oil and nuts. And kind of decrease, not eliminating, but decrease red meat, concentrated sweets, and maybe not eliminating dairy, but maybe limiting dairy a little bit. So kind of that Mediterranean diet. Those have been shown to be associated with less risk of stroke, heart disease and Alzheimer's dementia.

Now, it's a little bit hard to prove it's a cause and effect, but there's certainly an association of less risk of stroke, heart disease and Alzheimer's dementia. So that's been studied. And there's a lot of data out there to that effect. And by 2015, turns out that berries have also been associated with less risk of dementia as well. That was back in 2015 in Chicago, as well as kind of the Framingham study, and a couple of years later about 40% decrease of association of developing Alzheimer's dementia. So, in addition to a Mediterranean diet and a diet again stopping hypertension, berries are added to that whole more fish based, vegetables, nuts, and kind of cutting back on red meat. That type of thing.

So, the question is, Alright, well, what about the Mediterranean, diet does that have data for MS? And it turns out that there's a little bit of data for that as far as decreasing fatigue. So a study by the Mount Sinai Group just done more recently, I think last year, I believe it was, showed... a small study, again, about 30 patients showed a little bit decreased fatigue and disability scores in a small group of patients, with 30 patients, a little bit decreased fatigue scale and disability scores with that.

So, Mediterranean diet I think is a good basic diet, I like that diet because it's certainly good for heart disease, pretty easy to do, healthy for your heart. Some data, with decreased association for dementia and for cognitive benefit, as well, and there's some emerging data in a small group of 30 patients for fatigue as well. So that's a heart healthy diet and pretty easy, and a globally healthy diet that's kind of a basic diet.

Now there's also another diet that gets a lot of press called the Wahls Diet. So W-A-H-L-S. Terry Walls is a family practice doctor in Iowa. Around 2000, she herself was diagnosed with MS and she's very well known, kind of in her role with MS because she herself as a practicing physician and also diagnosed with MS in 2000, and then she was tried on a few MS medications and was not doing well and basically lost some mobility. And then her journey was such that she tried a few MS medications and took it upon herself to design her own, what she called, Wahls Diet. You know, again W-A-H-L-S, and she kind of claimed that by modifying the Paleo diet, remember, Paleo was kind of a hunter-gatherer diet, so it's based on cutting out dairy, cutting out, you know, nuts and having a lot of great sulfur-rich vegetables, a lot of, two or three, colorful fruits and vegetable servings a day, a lot of dark green leafy vegetables, meat - 6 to 12 ounces of meat a day. And then options of bone broth, seaweed, and those types of things as well. But cutting out all grain, cutting out dairy, cutting out legumes, cutting out eggs, no nitrate vegetables... it's a very strict diet. She herself, I believe, she does some calorie restriction as well, which she claims that after doing that, even after a number of months, that she was able to regain mobility.

Now, that's the Wahls Diet. And so the Wahls Diet has been studied, but again, very small studies, one study. So the question is, well, is the Wahl study, the Wahls Diet, are there any data out there showing that has any benefit in MS? And the answer is yes and no. There are a

couple of small studies out there showing it might help fatigue a little bit, which I think, you know, again, by cutting out red meat and some of the other kind of fatty foods and concentrated sweets, kind of makes sense. It's a healthy diet, although it's a little bit restrictive. What are the studies? Well one study shows that it did decrease fatigue, that study was with with six patients. So again, pretty small study that was published.

Another study had about 87 patients with either Wahls diet or the Swank Diet and both showed that there was some decreased fatigue and there was no other kind of control thing. So, you know, Swank or the Wahls diet both show there's decreased fatigue. It didn't show any benefit for walking. But again, both groups, patients, either the Swank or the Wahls, both felt better as far as fatigue goes. And then there's another small study of ten patients published in 2014 that show there's decreased fatigue. So, these were small studies without necessarily a control group.

So, are there data showing that the Wahls diet has benefits for MS? Yes. Were they small studies? Yes. Were there any kind of control things where people didn't do the diet compared to somebody on the Wahls? And the answer is no in that sense. So there is some data... there are data, rather, that fatigue can be decreased either with the Swank diet or the Wahls diet, and the answer is yes. So the Mediterranean diet, the Swank diet and the Wahls diet all have data showing some decreased fatigue.

I should also mention what's called a mind diet. M-I-N-D. And the mind diet is kind of a combination of the Mediterranean diet with the DASH diet. So it's kind of a heart-healthy diet. Also coming out of a Russian university, which does a lot of these studies looking, trying to connect the dots between decreasing Alzheimer's dementia risk and having healthy diet.

So again, this all very heart-healthy, stroke prevention kind of thing and looking at cognitive data. And again, it's hard to prove causal relation, but certainly there seems to be some kind of connection between that. And that was published last year where they actually looked at MS patients in the mind diet, which is again, you know, fruits and vegetables and grains a couple times a day, beans, at least four times a week and eating some poultry a couple of times a week and fish once a week and really cutting back on red meat, cutting back on dairy, cutting back on sweets and they actually showed some preservation of MRI volume. So brain shrinkage, that type of thing. As we know with MS, especially if untreated, the brain strikes a little bit faster than somebody who doesn't have MS. So anything you do to prevent brain shrinkage is good. So the mind diet does have some data from last year to prevent some brain shrinkage.

So all these diets, again, you see this kind of theme that, All right, you talked about the mind diet, you talked about the Mediterranean diet and the Wahls diet, the Swank diet. What do they have in common? Less red meat, less concentrated sweets, maybe a little bit less dairy, but more fish, more vegetables, you know, nuts, berries, they all have one underlying theme. So whether you call it the Wahls or the Swank or the Mediterranean or mind, to me they all have one common denominator, and that is probably more vegetables, you know, more fruits and, you know, a kind of a variety of things, nuts, berries and less red meat, maybe a little bit less dairy, definitely less concentrated sweets and that type of thing. So to me, that's all important and they all have kind of underlying themes that way.

To me, if you look at all the data, what has the most data is what's called intermittent fasting. Now, intermittent fasting, there are a couple of different ways to do it. And you may have heard of intermittent fasting because it is popular for weight loss. So, you know, Jimmy Kimmel talks about, oh, he did intermittent fasting, lost about 25 pounds. So, Ah! Well, he's a celebrity. And

other people - Tom Cruise, Ben Affleck, Hugh Jackman, people... other celebrities probably do it and don't admit it. And so there are different ways to do it. You could do it a couple of days per week like, you know, on a Monday and a Friday, or Tuesday, Saturday, where you kind of, you know, calorie restrict those two days, you eat less than usual. Women, 500 calories, men, 700 calories, but the other five days a week, you kind of eat normally and healthy, of course, you know, but to me, what's actually easier is if you actually do it every day, what's called 16-8, and that is every day you basically, All right, I'll try to eat all my meals within an 8 hour window. So that 8 hours, you eat, the other 16 hours you don't.

So what does that mean? Well, you basically kind of maybe skip breakfast. So maybe you have your your tea or coffee in the morning. Try not to put a pound of sugar in your coffee, right? So you get up in the morning, you don't... you have your coffee, if you drink coffee, that type of thing. And we talked about caffeine, because there are data for caffeine as well. So, let's say you get up in the morning, you skip breakfast and you don't eat until noon, then you eat your lunch, whenever, and you eat all your meals from noon until 8:00 at night. So that eight hour window, you eat all your meals, all your little snacks and everything, and your treats. But then after 8:00 at night, you don't eat, you don't eat anything from 8:00 at night until noon the next day. So that's 16 hours, you don't eat. And that's why they call it 16-8. Or you can make it, you know, 2pm to 10pm, or you can make it any eight hour window where you're actually eating and then 16 hours where you don't.

What does it do? Well, number one, most people will drop some weight. Number two, if you're borderline diabetic and your sugar is starting to climb and your doctor says, you know, you're gaining some weight and your sugar started climbing you're not ready for any kind of diabetes medication, but you got to drop some weight and you're getting kind of... your sugar. is starting to climb. You got to watch this. It can help that. But more importantly for us, it decreases inflammation. You literally change the bacteria in your gut into the good bacteria, which gets back to what we're talking about before, you know, instead of the nasty *Methanobrevibacter smithii*, *Akkermansia* and *Archaea* bacteria and the *Clostridium perfringens* B and D type. Yes. You're going to get more of the Firmicutes. You're going to get the *Butyricimonas*, you're going to get the *Fusobacteria*. You know, the bacteria that we like, that are going be producing the short-chain fatty acids, that are anti-inflammatory. So you're going to shift back to the microbiome bacteria that we do like that decreases inflammation. And it literally can do that. And it's strange that this is literally not what you're eating, not supplements, not an MS medication, not people telling you to clean up your room. This is literally just changing the timing of your eating, which is crazy to me that it's that simple. It takes a lot of discipline, but it's literally just changing the timing of your eating, not what you're eating.

How does this play out? Well, to me, out of all the diets we just talked about, and I did a lot, and you can stop me if I need to come up for air. So how do we know this? Well, this diet actually has the most scientific data in the animal model. Hardcore immunology... you know, I'd like to know now about my T-cells or my T-reg cells, my TM17 cells, my CD4 cells, my microglia, it actually has scientific data on the slide, under teh microscope. And two small patient studies. None of the other diets we talked about have that kind of stuff except for one supplement we'll talk about. So yes, in 2016 Dr, Longo... Dr. Longo's group at USC, has some mouse data, so every MS drug out there, you know, if you count all the different brands, we have 22 different MS drugs out there, if you count all the different brands, they all have to jump through the same hoop that, Yes, you have to prove this drug works in the EAE model, the experimental autoimmune encephalomyelitis model, whether it's a mouse or a rodent or a monkey, whatever, you got to prove it works in animals before you try it on any patients, otherwise we're not touching it.

So in the EAE model, in the mice, they basically didn't say, All right, Mouse, we're going to not give you a medication. We're just going to feed you either every other day or calorie restrict you, and the mice said, What? You're going to take away my cheese? I can only eat cheese between the hours of 12 and 8. Seriously, like cheddar, gouda, like... Camembert? like Boursin? What? Goat cheese? What? Only between 12 and 8, between my Netflix, like I just download Ozark. I mean, how am I not going to eat cheese after 8pm? What? So they did that, and guess what... The mice did not get EAE. They did not get inflammation. Literally. So they didn't get the CD4 cells, that cause the inflammation, they did brain slices, the spinal cord, and the brain did not get inflammation. They literally did not get the MS in their brains and spinal cord, they didn't get the inflammation and the oligodendrocytes, little cells that look like little fried eggs, they were still pumping out myelin and there was no inflammation. So they didn't get their MS as the regular... what they normally would. So it actually, by changing the timing of the mice eating, they didn't get inflammation. And boy, these mice, oh, they're so slim, they dropped weight, they're eating their cheese by the pool, for summertime really svelte. They look great.

And so in addition to the mouse model proving that it decreases inflammation, they did a small patient group as well. So they did 60 patients that started on the intermittent fasting and then transitioned to Mediterranean diet for the next six months and they didn't look anything hardcore as far as MRI data, relapse rates, or walking speed or disability scores, they looked at just quality of life scores. And then those patients compared to placebo did have improved quality of life scores. So again, small... 60 patients, but this is going back to 2016. Since then there was another smaller study by doctors at Washington University in Saint Louis and Yukon, Connecticut, looking at a small group with 16 patients as well as also an animal model, kind of, feeding the animals every other day.

And so that same kind of thing, they found that the animals fed every other day, they increased their lactobacillus, which, again, that's one of the bacteria that's high in probiotics, which we'll talk about... the lactobacillus increase as well as the patients also had some clinical kind of quality-of-life benefit too, and that was only 16 patients. So to me intermittent fasting, it actually has the most scientific data, both from an immunology standpoint as well as from two small patient groups - 60, six-zero, patients, and then another study in 2018 with 16, one-six, patients. So intermittent fasting to me is pretty easy to do, takes a little discipline but that actually to me has the most immunology data of all the diets we mentioned... you know, the Swank, the Mediterranean, the Vegan, the Wahls and all of that other... it actually has the most kind of hardcore immunology data. And plus if you use Mediterranean as your basis and then do intermittent fasting on top of that, that to me has the combination of, yeah, you kind of pick and choose, it's healthy, it's heart-healthy, it decreases your risk of cholesterol, that type thing.

The other thing I should mention is that obesity is a big problem in the country, as you probably know. So about roughly 42% roughly of the US population is obese. By 2030, which is less than eight years from now, by 2030 about 50% of the US population will be obese, which is a huge epidemic. And as you know, obesity is not just a risk for diabetes, heart disease, stroke and heart attack, it's also a risk factor for Alzheimer's dementia. Literally abdominal girth, how tight your belt is, and you know, I love to eat. Obesity is a risk factor for Alzheimer's Dementia. It's a risk factor for developing sleep apnea. Sleep apnea is a risk factor for Alzheimer's dementia. So I can't tell you how many... I probably order at least one sleep study a week. You know, I'm still a general neurologist. I'll see kids as young as, you know, 12 for epilepsy, migraine. I have patients who are 100. I see a lot of cognitive impaired patients from, you know, sports concussions, Alzheimer's dementia. You know, sleep apnea, as people are gaining weight, it's more common.

So sleep apnea, gasping, snoring, that type of thing, that is a risk factor for Alzheimer's, dementia, so all these things, as far as dietary things, if you can drop some weight, that decreases risk of Alzheimer's dementia. So any MS patient with cognitive issues, you're more forgetful, your processing speed is a little bit slower, your kids are making fun of you, that kind of thing. Oh, you're forgetting this. I just told you that. Yeah. Improving your sleep quality, if you have sleep apnea, that can make a difference. So those are kind of some of the dietary things we talk about.

So what else besides dietary stuff? There are other things, if you think about, Alright, well, dietary stuff, my feeling is, all right, if you use the Mediterranean as a basic kind of foundation and then add intermittent fasting, that to me I think will be very helpful. But then, well, what about supplements? If you Google MS diet, there are millions of supplements. What about other things out there? Well, you hear a lot about vitamin D, you know, any nerdy neurologist out there is going to think, well, you know, we're going to check your vitamin D level. Why? I thought you just wanted to check my liver and my kidneys and make sure my MS drug is agreeing with my system.

Well, you know, since at least about 2009, was Ellen Mowry when she was at UCSF, she's at Hopkins now and other people, Ascherio as well, it turns out that people they observed, when your vitamin D is too low, that might be associated with more relapses, more spots on your MRI scan, more progression and even more brain shrinkage. So we typically like to look at your vitamin D level, in normal vitamin D levels, if you and I were to walk into a lab, normal levels are 30-100, roughly, but it turns out, if you have MS, if it's below 50, people actually might have higher likelihood of having more relapses and attacks and progression in spots on MRI scans. So we like to keep levels above 50. So, we like to look at vitamin D levels.

What else? Dietary salt. So dietary salt seem to be bad for MS. So we like to say, all right, you know, try not to add extra salt to your diet. So a lot of fried foods, a lot of preserved foods, you know, canned foods, frozen foods, you know, processed foods tend to have a lot of extra salt, so to try to avoid those, if you can.

What about other things? Alpha lipoic acid, which is a short chain fatty acid, in neurology we've used alpha lipoic acid for years because there are some data showing that for other unrelated things, peripheral neuropathy from diabetes, for example, somebody with diabetes gets a little numbness, tingling in the feet, which feels like MS numbness, alpha lipoic acid has been shown to help a little bit with that. numbness in the feet from diabetes neuropathy. But, Dennis Bourdette, in Oregon showed that 1200 milligrams a day of alpha lipoic acid...he looked at 54 patients with secondary progressive MS, and over a two-year period, alpha lipoic acid, which is literally just an over the counter supplement, it actually decreased brain shrinkage by 67%. So that's something that, again, short-chain fatty acid, along that same theme, Oh, well, if it's a short-chain fatty acid we just found out and we just talked about, hey, we know that decreases inflammation, that helps the T-Reg cells, it kind of quiets down the TH17 cells that we don't like. That's why we're trying to shift our bacteria to produce more short-chain fatty acids, and that's over the counter. Now if you go to like a CVS, or a Rite Aid, or Walgreens, they might sell that, but it's only in 100 milligrams. It's like, who wants to take 12 of those? There are some websites that actually sell 600 milligram capsules or alpha lipoic acid.

Other things. We talked about probiotics. Well, probiotics, there are millions of them out there. Some of them are pretty inexpensive, like \$10, \$15 dry on the shelf. And then there are fancy ones, if you're kind of bougie, and they're like, oh, they're like \$60, \$70, in the refrigerator, you

have to keep them in a locked safe because they're so fancy. So I don't know which ones are the best ones. There have been some that have been published, like Stephanie Tankou, one of our former USC residents, she did her fellowship at Harvard. Now she's at "Mt. Si", she did a nice study back in 2018 looking at vsl#3, which is now called a visbiome, and that one's kind of expensive, like \$60, but she did a very nice immunology study, looked at MS patients on that one, and showed that yes it actually does change the immune system in a good way to be less inflammatory in a small group of MS patients.

So there have been some studies now coming out looking at probiotics in MS. Why? Same theme - if you change the bacteria in your gut using probiotics, it favors less inflammation. So you think, well, what is it about probiotics? Well, probiotics are very high... If you look at any label of probiotics, you go to any health food store, whether they're dry on the shelf or the fancy expensive ones in the refrigerator, you look at the bottle, there are always two bacteria with many subtypes, lactobacillus and fidobacterium, F-I-D-O, fidobacterium, it's kind of old school dog name, I don't think people really name their dogs Fido anymore. That's like very old school, like Rover. Like, do you know any dogs named Fido or Rover these days? That's very old school. I don't people name their dogs, but I don't know.

Alexis Crispino Kline:

I don't think so. But, you know, Rover is that dog-sitting app now that people use, so it still exists.

Dr. Andrew Woo:

That's true. But Fido? No? Fido, maybe it's too, like, aggressive, Fido.

Alexis Crispino Kline:

Maybe my next dog.

Dr. Andrew Woo:

Yeah, or maybe name your dog Fidobacterium. Then you'll be like really unique.

Alexis Crispino Kline:

Then I can start a really good conversation about bacteria.

Dr. Andrew Woo:

Right. Fidobacterium. Here's my dog, Fidobacterium. Don't mee... Step off! Right? OK, so any probiotic, it has those two bacteria, but and there are zillions of subtypes of those. Who knows which types are the best because you talk to any GI specialist, they talk about using these probiotics for different inflammatory bowel diseases - Crohn's disease, ulcerative colitis, there's a lot of research on that. I don't know which subtypes are really specific for every individual, every kind of, you know, GI condition, whatever, but lactobacillus is in every probiotic. And there are a lot of data in the EAE model that, yeah, lactobacillus does the same things - it decreases the bad cells we don't like in MS, like the TH1, the TH17 cells, interleukin 17, and helps the good cells that we do like, so the same kind of things we just talked about. As far as the immunology goes, it helps the good part of the immune system that we like to quiet down things in MS. So there are data for probiotics.

So vitamin D, decreasing extra salts, omega 3 fatty acids from fish, fish oils, you know, that kind of stuff we talked about, so I think, you know, fish oils I think might not be a bad idea to

consider those. If you don't eat a lot of fish you can take fish oils. Again, if you think, oh, I can't, I'm vegan, I don't like fish. But yeah, you could take blue-green algae or you could take flaxseed oil. Those are omega fatty acid kind of things that are not fish based if you're vegan. And then probiotics I think is something to consider.

And then, TUDCA I love talking about TUDCA, what is TUDCA? It's T-U-D-C-A, TUDCA. TUDCA stands for Tauroursodeoxycholic acid. Again, not on the test, no extra credit, don't write it down. TUDCA. TUDCA, you know, Chinese herbalists love TUDCA because they've been talking about it for years because it's very rich in bear bile, so no, you do not have to wrestle bears for TUDCA. Don't be aggressive. We like our friends, the bears, friend of nature. TUDCA. So why? Because, you know, Chinese herbalists, and you know, I do martial arts, that whole thing, I've heard about TUDCA for a long time, they feel like, oh, it kind of balances your liver chi, your chi is your internal energy through which the 14 meridians of acupuncture flow, your internal energy, wax on, wax off. Yes. So what about TUDCA? Well, if you balance your liver energy, you know how your liver detoxes, it's like your your sewer system of your body, your liver detoxifies you. So yes, TUDCA rebalances your liver. Well, TUDCA, turns out, is actually also a bile acid.

So, you say, Oh, bile acid, what is that? Well, bile acids are what happens when you break down cholesterol. And so when you break down cholesterol, it breaks it down to bile acids. Well, it turns out bile acids are actually anti-inflammatory. And turns out that MS patients, and even kids with MS, are actually low in bile acids and that's interesting. Well, it already turns out that people with MS have different bacteria. Turns out MS patients also are low in bile acids. What does that mean? Well, bile acids help you decrease inflammation. If you're low on that, then you're going to have more inflammation. And TUDCA is a bile acid. So here's a supplement that's a bile acid that you don't have to wrestle bears for. So, all right, that's off my checklist. I don't have to wrestle bears; I'm going to enjoy my day today. I don't have to, like, confront a bear.

And then, turns out, it's been on the market for a long time. What does it do? Well, actually, it has some some benefits. We combine a receptor in microglia cells in the brain and it decreases NOS, decreases other things that are kind of inflammatory. So basically, it decreases inflammation. And I can just buy off of Amazon, you know, 2-month supply, it's like, \$9-\$12 a month. And there are studies now, my buddy Pete Calabrese, we were med students together, he's head of Hopkins MS Neurology, and they're doing studies with TUDCA to see if it helps MS patients, because in the EAE model, again that MO, it shuts down MS, it's anti-inflammatory. So here's a supplement that's been around for a long time, shows that it shuts down the EAE inflammation MS model, and now they're doing patient studies for it and it's been out on the market, you know, for other reasons to help your liver balance and that kind of stuff. So TUDCA is an interesting kind of thing. Another supplement.

What about propionic acid? you know, we talked about these short-chain fatty acids, acetic acid - vinegar, propionic acid or propionate, and then butyrate, butyric acid. So, propionic acid, that's one of the three big ones, right? And that's kind of the most predominant one of the three short-chain fatty acids in the gut. Again, when bacteria, the good bacteria, break down carbohydrates, that was studied in Germany and published I think in 2020 and that was studied in about 300 patients, they actually looked at patient up to six years before they started and about three years afterwards and some of those patients actually did MRI scans as well. And they found that in the cohort that they did study, out of the 300, they actually had some decreased relapse rate on propionic acid, as well as preservation of gray matter volume. So a little bit decreased brain shrinkage rates in the gray matter, which is, remember, kind of your deeper parts of the brain.

So in the caudate and putamen areas of the brain. So there was some kind of, as far as shrinkage, benefits as well as relapse rates. And that's available too. It's a little bit hard to find. There's a German distributor, which is the only place I can find online, but it's not very expensive, it's about €19, which is about I think \$22 or so. But the propionic acid actually had some data that was published. So that's one of the supplements that actually has both relapse rate reduction as well as some brain atrophy shrinkage too.

So that was kind of interesting as a supplement, that the data, just like the alpha lipoic acid supplement, actually has some brain shrinkage data, too. So, I mean, again, when you Google MS diet and you have literally 600 million hits, then I think, OK, just show me where there's actual data and people not just trying to sell me stuff, or a blog saying, Oh yeah, I feel better because I did this whatever change, or I did this and I stood on my head and I did this and my friend told me... no, I like to see things that are actually published and actually have data, hopefully with some controls and larger number of patients, not just a couple of patients, otherwise you just go down these rabbit holes and end up buying things that really, maybe don't hurt you, but that really don't help you, that kind of stuff.

Alexis Crispino Kline:

Thank you. Yeah. No, and that really, that... you brought us on a really cool timeline just of how research and our understanding has changed about the three M's, and so you kind of touched on it a little bit, but I guess just to close, if you do have any suggestions or feedback for somebody who might just be starting out, they think that this sounds really neat and cool, but like you said, there's a bajillion things on the Internet now to go through. How does someone find what's recent and evidence based and has been practiced? Is there places you'd go or someone you'd talk to or refer to?

Dr. Andrew Woo:

Right. So, yeah, the problem is there's no central website that says here's a a validated MS diet website. And these are things that actually have data and here are the data links to the papers and the authorities that have like a a title that isn't somebody who's linked to... here's some cyber cash, you know, buy my product! And who is actually not trying to make money off of you. So here's the scientific data that's published in a peer reviewed journal and they're not trying to sell you something. Unfortunately, that doesn't exist. They're just kind of little mentions here and there and there are a lot of anecdotal stuff that unfortunately doesn't exist. So I think you're going to websites like the MSAA website I think are helpful, and listening to people like Alexis is helpful.

Yeah. It's just kind of trial and error. Unfortunately, there's no centralized thing. And there have been some papers out there kind of reviewing things like, Hey, we're going to look at the Cochrane data to see what is it about this vitamin or this supplement or this diet. And so there are reviews out there and they all kind of say the same thing, Yeah, there's some stuff for the Wahls and Mediterranean, but they're really small, there were like six patients and four controls and this kind of thing. So yes, there are rumblings of some stuff and they all conclude like, This warrants further research, this warrants further investigation, which is true. So I'm saying the same thing. You know, nothing is proven for MS diet, but to me, intermittent fasting makes sense because there is some scientific immunology data in animals and small groups of patients, 16 and 60 again, I agree, very small but there's a lot of data now for Mediterranean diet and heart disease, stroke and Alzheimer's literature that there may be some kind of link there. Again, not totally proven, because cause and effect is very hard to prove in those things, but there is less hazard ratio and that type of thing, as far as eventually getting kind of a decline, there is a link there from the statistic epidemiology standpoint.

And so I think, well, that kind of makes sense because you want to preserve memory cognition regardless. So there's another added bonus that way. And then when you look at these supplements, there is statistically a link for these things like some of the fish oils, the propionic acid, the alpha lipoic acid as well.

There's two things I should mention, one is caffeine, because there, you know, this is a java nation, as we know. Right? And so, yeah, there are some data, as I mentioned from that Belgian study as well as, you know, some recent studies showing that, oh, too much caffeine is not good. We know from about 2012, 2014 that drinking some coffee, you know, one to three cups a day is probably OK and decreases mortality by about 8% if you're having at least a cup a day, so a decrease in mortality, like three to five is probably OK.

A study came out over the summer that if you're drinking more than six cups a day it actually is not good and it actually could increase risk of dementia by about 53%. So if you're drinking more than six cups of coffee a day, not good. Cut back. So do not drink more than six and it could be affecting your sleep as well. So some caffeine is probably OK and probably beneficial. Again, nothing to do with MS except for that one Belgian study I talked about. But in general, caffeine is probably OK and probably cognitively, you know, or at least mortality wise, there are some data that is good for caffeine.

And the other thing I talked about is berries. This has nothing to do MS, it's just kind of my own kind of pet thing that I love because I love berries. And you always hear about all berries, berries, berries. What is it about berries? Well, April 2012, a paper came out about Parkinson's disease, and it showed that, oh, 120,000 patients, and those that eat berries twice a week decreased risk of getting Parkinson's. What? Berries twice a week? That's easy. A couple handfuls of berries on a Tuesday and Friday, decrease Parkinson's by about 40%. I'm gonna tell my Parkinson's patients and their kids and their neighbors and their accountant and their bookie and, you know, I'm gonna tell everybody! That's great, that's easy to do, So, and I thought, well, that's got to be a class effect. Berries, you know, and we'll talk about antioxidants and flavonoids and things like that, and that has nothing to do with berries or the dopamine receptor or the the synuclein gene or the parkin gene. It's gotta be a class effect of something biochemical, maybe antioxidant, maybe mitochondrial or the NK receptor or the mTOR receptor or something metabolically or catabolic. Why wouldn't it be true for other degenerations like Alzheimer's dementia, or dementia, or my MS patients or, you know, other kind of degeneration. And then sure enough, three years later, same group, you know, at Tufts University found that, oh, there is also, seem to be linked with decreased risk Alzheimer's dementia by about 39%, 40%.

And then in 2020, the big Framingham data set that's been out there forever since 1970s in Massachusetts, they found that, Oh yeah, about 40% decreased association of Alzheimer's dementia. So here, berries in Alzheimer's, and that has nothing to do with the presenilin gene or acetylcholine receptor or glutamate receptors in Alzheimer's, too. So I thought, all right, well, berries in Parkinson's, berries in Alzheimer's, why wouldn't it be true for MS? So again, no data whatsoever for berries and MS, but I'm thinking, all right, what is it about berries?

So berries as you know, are the superfood and the antioxidants. What is it about berries? So berries, when you talk about polyphenols, you know, polyphenols are, you know, the brightly colored micronutrients in vegetables and fruits. So there are a million types of polyphenols. There are the flavonoids. It's kind of a big category, but there are also like the stilbenes that are high in red wine. There are the curcumins and, which were big in, Oh, doesn't that cure Alzheimer's? And that's like coriander in Indian foods. And those trials failed. I actually had

some patients in those trials years ago for Alzheimer's. Didn't work. But it's still interesting. There are tannins, which are polyphenols, that are high in like tea and grape skins and other things like that. But if you look at the flavonoids, which is the big group, they're the flavones, the Isoflavones, the Flava Flav, all these types of things. But then under the flavonoids, my favorite group is the anthocyanins.

So within the flavonoids, the anthocyanins, they're the ones under which berries fall under. So the anthocyanins are a lot of these kind of purple foods. So one of the highest concentration foods with anthocyanins is a lot of purple foods, like blue corn. So in L.A, of course, a lot of great Mexican food, great salsa, great guacamole, and salsa... so if you need chips, I reach for the blue corn chips.

And if you like popcorn, I have fallen in love with these Amish country midnight blue. If you like popcorn... I was eating popcorn one day, and I was thinking what is this popcorn? My wife had made it. And I think this popcorn is not like regular popcorn. This is like stealth pop. What is this? And the kernels were kind of bluish when you pop them. And it was not popcorn, it was Amish Country Midnight Blues. So I implore you, everyone listening, go get Amish Country Midnight Blue. It is the best frickin popcorn I've ever had in my life. So if you like popcorn, you pop it yourself, it's, like, better than any popcorn I've ever had. If I go to the movies, I'm like, eh, no, I don't think so. I'm like, I've become a popcorn snob. I didn't know I like popcorn that much. Then I had this popcorn. So literally, you know, the kernel is kind of a bluish-purple, it just tastes better than regular popcorn. Just like blue corn chips. I like them better than regular corn chips, tortilla chips, right?

So blue corn is very high in anthocyanins. What other purple foods are really high in anthocyanins? So blue corn is one of the highest. Number two on the list is eggplants. So eggplant, you know, growing eggplant. Now baba ghanoush, which I love, doesn't have the skin, so it's not... You got to have the actual eggplant, grown with eggplant... eggplant parmesan, that kind of stuff. Number three on the list: blueberries. Love blueberries, love blueberries. Right. And all the other berries, too. So, goji berries, blackberries, boysenberries, they're Brazilian - açai berries. Right. All right, so those and then strawberries as well. So all the berries, you know, blueberries, if you had to pick one berry, I'm very partial to blueberries, you know, I love blueberries, but any of the berries. So those are all those kinds of purple foods.

People ask about, Well, what about beets? Beets are kind of that color, but they're not that high in anthocyanins. They're that color from other things, but not anthocyanins. So to me, again, not proven in MS, no data in MS for anthocyanins, it's just, I'm just... I just love that popcorn. And I should probably be getting some kind of residual from the Amish Country Midnight Blue. People. Listen. Amish Country Midnight Blue. But I get nothing from them. I never heard from them for years. I'm sure their sales are due to me. Really? But it's just great popcorn if you like popcorn. I digress. So that's my thing about the anthocyanins in the blue food.

So to summarize, what would I recommend if someone were to walk in? So, yes, eat healthy, you know, don't overeat. If you want to try the intermittent fasting, yes, you may drop a couple pounds, but there are data for decreasing inflammation. So use Mediterranean diet because as a foundation, yeah, you don't want to eat too many concentrated sweets and you don't, you know, red meat, sure, a little bit, but cut back. The other thing about red meat is there's a crazy study in 2015 out of Columbia, Columbia University, not the country, and it shows that just eating fish, like 3 to 4 ounces a week, already decreased brain shrinkage by about five years. And it's like, really? Fish? Like, I mean, you put 3 ounces of salmon in your palm, you know, you can slap it on somebody's forehead. Like that's not a lot of fish. Like 3 or 4 ounces a week? Or

by cutting red meat out, that is, I mean, and plus your friends are walking around, what's on your forehead? That's three ounces of salmon... I'm saving my brain atrophy like five years of brain shrinkage by eating three ounces of salmon. And I will walk around with like three ounces of salmon on my forehead. That would be a good look for you, by the way. Yeah. So, do I see Alexis's hair pulled back? I could just basically... check out the visual and make, you know, I might have to make a meme with, like, three ounces of salmon on Alexis's forehead with her hair pulled back. That would be a good look for you. We need to put that on the MSAA website, like Alexis with a salmon, three ounces, like, on her forehead.

Alexis Crispino Kline:

That will be the cover.

Dr. Andrew Woo:

Yeah, exactly right. For April, it'll be "Salmon Forehead Month". I think, if we do that. So again, Mediterranean diet, as kind of a basis, maybe considering intermittent fasting and then other things. Yes. Cut back on extra salt. So if you're at the Texas State Fair, try to hold off on that fried butter. I know it's extra tasty. Hold off on the fried butter. Go for something else this year. Fried Twinkies, try to hold off. And then, yes, vitamin D, take vitamin D, keep your levels above 50. Try to eat... oh, I didn't mention the short-chain fatty acid foods.

So there are foods that are high in short-chain fatty acids. Some of them are like your basic starches, like oats, and barley, lentils. Those are good. The pectins...pectins, like your pep rallis, blah, blah, bah. So pectins are less starchy foods like apples, nectarines, those kind of... carrots, kind of the grainy things. So pectins are high in short-chain fatty acids, naturally. And then your fructooligosaccharides and inulins, and that's like your garlic, your onions, your asparagus, your leeks, your sunchokes. Sunchokes are the same thing as Jerusalem artichokes. Bananas actually as well.

So those are all foods that are high in short-chain fatty acids. So yes, you don't have to take supplements, if you're like, you know, I don't want to take supplements, I just want to eat healthy. Those vegetables are all complex carbohydrates. Those are all natural sources of short-chain fatty acids that your bacteria are more likely to break down into short-chain fatty acids.

So eating those kinds of things, then if you are interested in supplements and other things, in addition to eating a basic Mediterranean diet and intermittent fasting, then yes, maybe consider some caffeine. Maybe consider alpha lipoic acid. The studies with 1200 milligrams a day. Maybe going to this German website, it's under propionic acid, not propionate. So that was studied again and published last year and had, as I mentioned, relapse rate data and some brain atrophy data. And then probiotics, again, should you spend the money for refrigerated versus dry. I don't know. You know, maybe the dry is enough. I don't know. But they all contain lactobacillus and bifidobacterium Woof! Sorry, I guess there is a Fido in the background. Did you hear that? Yeah. OK, and then TUDCA. TUDCA, you know the supplement and I think those things are important.

And then of course, in addition to all the dietary stuff, you know, mindfulness, relaxation, exercise is key. So, you know, when patients come into my office, I don't say "you're my patient now and... [plays theme from *The Good, the Bad, and the Ugly* on flute]... you must follow my MS diet. You must do what I say!" No, I don't do that. I say, "look, what do you like? What do you not like? Are you vegan? Are you gluten free?" You have to know everybody's different, and I respect that. So you got to kind of engage your patient. You got to vibe with them. I don't want

to force you to do stuff you're not going to do because nobody likes to be told what to do. So you got to work with what you have, right? But if you want to know what data are out there and you need help navigating those 600 million hits on MS diet, then sure. I'll battle as much as you want me to battle because I have opinions and I like food, like you. But knowing that, yeah, you can go overboard. There are a lot of rabbit holes that you can fall into. You know, I can help you with that. So there are some resources out there. But to your point, there's not one central trustworthy academic website saying, Hey, here are the things you should do. Here are the things you should avoid. That's unfortunate.

Alexis Crispino Kline:

Oh, I mean, gee whiz! That was a lot of information and we're so...

Dr. Andrew Woo:

I'm sorry, did you say Cheez-Whiz? Did you just say Cheez-Whiz?.

Alexis Crispino Kline:

That was just such great information, that was so fun that you had me cracking up in the background. So I hope that everybody gets to enjoy it and chuckle the same way that we did while we're learning.

Dr. Andrew Woo:

Well, again, as long as people are eating enough chocolate and then you can avoid going to the dentist. Alexis, how does that molar feel? People can't see that I actually virtually have just done a root canal on Alexis through the power of virtual dentistry on my other degree I've just given Alexis too much chocolate and I just had to perform a little root canal. So yeah. Very nice.

Alexis Crispino Kline:

Too many sweets, but...

Dr. Andrew Woo:

Our take home message is have chocolate or sweets, but not too much.

Alexis Crispino Kline:

Oh, that is just a wonderful takeaway note for us. We really appreciate your expertise and you spending time again with us and what a great complement to our web-based program we did the other month, too. I bet that these would be two good partners to watch together. And so if you have any other closing notes for us, we can include them if you'd like.

Dr. Andrew Woo:

So food should be a joy. You know, with anything, whether it's MS or any other condition, you gotta find joy every day because look, there's a lot of stuff going on in the world and if food can be a comfort, not a chore, not a huge decision tree. Yeah. If a snack brings you joy, couple nuts or little treat. Yeah. You don't have to cut out all your joy. I mean, I find food to be a joy. Even if it's a small joy, you got to find joy every day in your life. So I want to bring sexy back, bring food joy back. That's what we got to do. That'll be our motto - Bring food joy back. That's what we got to do.

Alexis Crispino Kline:

All right. Well, thank you so much, Doctor Woo. And this concludes our podcast. The Three M's of MS: Mangia, Microbiome, and Molecules. On behalf of MSAA, I would like to thank Doctor Woo once again for his helpful and wonderful knowledge and insight on this topic. I'd also like to thank Gradwell House Recording for hosting us today and producing the program.

Please know this podcast, along with additional information on multiple sclerosis, can be found on our website at mysaa.org. Once again, thank you for listening and...

Dr. Andrew Woo:

[plays a melody on flute]

Alexis Crispino Kline:

Beautiful closing!

Dr. Andrew Woo:

My honor!