



## What's for Dinner? Let's Talk about Nutrition and MS

Presented by: Laura J. Kruskall, PhD, RDN, CSSD, FACSM,  
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### Alexis Crispino Kline:

All right. Good evening, everyone, thank you so much for joining us. My name is Alexis Crispino Kline, and I'm the Director of Education and Healthcare Relations with the Multiple Sclerosis Association of America. As you may know, MSAA is a 501(c)(3) nonprofit organization based in Cherry Hill, New Jersey, but all of our programs and services are available to individuals living with MS nationwide. Dr. Kruskall has a wonderful presentation ready for us tonight, so I just want to take a few moments to highlight some of MSAA's programs and services.

The first one you see here is the MSAA Patient Helpline. If you've connected with MSAA before, you've likely connected with an MSAA Helpline specialist. These individuals have a background in counseling and social work and are familiar with MS and are available to provide resources from MSAA, as well as information about the broader resources from the broader MS community. We also have the MSAA Equipment Program and cooling equipment programs to help with tangible items that people living with MS might be having difficulty accessing. Items available through these programs include items such as cooling vests and four-prong walkers. MSAA also has the MSAA MRI Access Fund for individuals who are having difficulty accessing their cranial or C-spine MRI for a diagnosis of MS or to track disease progression. If you would like to learn more about these programs or any other MSAA programs and services, please feel free to visit us online, send us over a chat, or give us a call. We'll be sure to include these resources in the chat box.

This is just a friendly disclaimer that all of the programs and information being shared today do not constitute medical recommendation. And to be sure to check with your trusted care provider for the information that you're learning.

And finally, if you can please take a moment at the conclusion of the event to complete the MSAA survey, it helps us to make sure that our programs are effective and the information is appropriate. We'll be sure to link that in the chat box as well.

Without further ado, I am delighted to introduce Dr. Kruskall. She's the Founding Director and Professor in the UNLV Nutrition Sciences academic programs and the UNLV Nutrition Center in Las Vegas, Nevada. She teaches undergraduate and graduate courses in human nutrition, sports nutrition, medical nutrition therapy, and advanced clinical nutrition. Without further ado,

I'm going to hand the evening over to her and let her begin sharing her screen. Thank you so much.

**Dr. Laura J. Kruskall:**

Thank you so much, Alexis and Marie So give me a moment so I can start sharing my screen. So thank you again. I appreciate everybody at MSAA for inviting me to join you this evening. And more importantly, thank all of you, our participants, for taking the time out of your busy evening, especially this time of year. We really appreciate you taking the time and listening today.

So I'm going to speak with you today about MS and nutrition. So I always want to point out a little bit about the research first, and much of the nutrition research that we have has been done in the experimental animal model. That means that their research has been done on animals such as rats and mice and other species as well. And even though we have some pretty good replication, there's no animal model that fully replicates MS in human beings. And we do see some nice animal research showing us some positive clinical findings, but we cannot always replicate those in human beings.

Now, on the good side, we do have some human research regarding MS and nutrition, a little bit more limited than in the animal research, and that research has shown mixed results. But however, let me share the good news with you. What I'm going to do this evening is take the human research that we do have and the evidence from that human research, and I'm going to give you some evidence-based guidelines regarding the role of nutrition in multiple sclerosis.

I apologize, we jumped ahead there. So what I'm going to be doing this evening is kind of the overall theme that you're going to see in the evidence that we do have really talks about the general approach for nutrition and MS is general healthy, anti-inflammatory eating, and that is the emphasis that we're going to be placing this evening. There also may be an important role for vitamin D and Omega-3 fatty acids, and we'll be discussing those.

Now, in addition to just managing MS, we also know that healthy eating or anti-inflammatory eating may decrease the risk of developing other chronic diseases and secondary conditions, things like osteoporosis, the cardiovascular diseases and diabetes. In the new world of research, we also now find that obesity is an inflammatory disease, so it's very important for all individuals, including people with MS, to manage body weight.

And then finally looking at a newer area of research, we do start to find and see data showing us that cardiovascular disease risk factors, such as having high blood cholesterol or hypertension, that having those may be associated with MS disease progression. So again, putting all this together, the theme I'm going to give you tonight of healthy anti-inflammatory eating not only is beneficial for MS, but also beneficial for managing and preventing some of those other chronic diseases that could impact MS in the negative way.

So the first thing we'll discuss this evening is vitamin D, and we start looking at research, looking at what we call population based research, where we see that people who are vitamin D insufficient, so in other words, their blood vitamin D levels are low, that actually may increase MS susceptibility in both adults and children. And then again, looking at those large population studies, we see that the risk of developing MS is lower in, actually, individuals who either take adequate vitamin D supplements or who have higher blood levels of vitamin D. So based on those population studies, we do see that very strong relationship with vitamin D and MS.

Now how does it work physiologically? We think that vitamin D has an important regulatory action on the immune system, and we think it's considered neuroprotective. And all of you know, MS is a neurodegenerative disease. And we thought that people with MS have an increased level of pro-inflammatory cytokines and lower levels of anti-inflammatory cytokines. And we think that vitamin D may help kind of keep those pro-inflammatory cytokines in check. So, in other words, keep those inflammatory guys, keep them at a reasonable level so that inflammation does not worsen with disease.

Now, as far as research in vitamin D, this is one of those what we call hot topics in nutrition sciences. I always teach my students that nutrition is a very young science and we have new research evolving on a daily basis, and vitamin D is one of those topics that we sure do have a lot of. When it's specific to MS, what we see is that low vitamin D levels are associated with increased risk of MS relapses, new MRI lesions and disease progression. We also show the animal studies, in animal studies, that vitamin D supplementation may slow the progression of the disease. But remember, I cautioned you about animal studies because if we look at humans, unfortunately, we don't see the same thing in human beings. We see that recent research in humans report that vitamin D supplementation may not play a role in disability progression or improvement in depression. However, this is very limited research. It's very new research, and we need much more research before we can make that inclusion. But on the good side, we still know that vitamin D plays many, many beneficial roles in the body and some of the newer research coming out in human beings with vitamin D and MS, there is some evidence that vitamin D may be very beneficial in helping with medical treatments, meaning taking certain types of medications.

So as far as vitamin D goes, people say, well, how much vitamin D, you know, how do I know if my vitamin D is adequate? Well, that can be done by taking a blood test at a local laboratory, and all you need is a physician to order that for you. And then you go to the laboratory, they draw the blood and it's quite that simple. So looking at the numbers, we kind of have different numbers to look at, the definitions that we tend to use is that if your vitamin D is less than ten, you would be deficient in vitamin D. Less than 20 means that it's insufficient. And then we want to get to that target of 30, was what we call adequate or sufficient. Now that's for the population in general. That's not specific to individuals who have MS. So the guidelines that we have currently and again, the jury is still out, we still have a lot more research that's needed, but based on the evidence that we do have, it is suggested that MS patients have a blood level above 50. And then for most individuals, physicians would want you to have a target vitamin D level of somewhere between 60 and 80. So again, this is a general guideline based on the current research that we have available, and your physician may have an individualized blood target level that's specific for you. So please, if you're unsure about your vitamin D levels, make sure you're working with your physician to set a target that's best for you.

Now, as far as vitamin D requirements, how do we get this in our diet? How do we take it in orally? So we have some recommendations for you. And we have what we call the Recommended Dietary Allowances, and those are the values for different vitamins and minerals that are set for the general population. So we have those for vitamin D and those are very close to those of the National Osteoporosis Foundation. And I put those on there because a lot of people take vitamin D because it is a bone nutrient, and that foundation plays a very important role with preventing osteoporosis research. I put these up here because they're very much in agreement. So for most individuals, if you're looking at, well, how much vitamin D do I need, it depends a little bit on your age, and our values increased slightly with age. But most adults are going to need somewhere between 600 and 800 hundred international units of vitamin D each

and every day. And again, that's for the general population, that's not specific to MS patients, we'll get there in just a few minutes.

So I wanted to point that out to you. Most of the time when you're looking at vitamin D, the most common form is called an international unit or an IU. But vitamin D may also be reported, particularly on something like a supplement label, it may also be reported in units that we call micrograms. So we can report it either way. Again, international units is the most common, but microgram is another way of reporting vitamin D levels. Now, I like to point out that micrograms should not be confused with milligrams, and thinking back to our days of maybe elementary mathematics, you may have learned this in school, but it takes... one milligram is 1000 micrograms. So just to kind of put apart, there's a big difference between a milligram and a microgram. So again, I just like to point that out, so as you're looking at your labels, if you're looking at vitamin D, it's either going to be in international units or in micrograms.

Now, how much vitamin D is too much? A lot of us have the idea, while the vitamin D is good and we have a recommended intake, more should be better. And unfortunately, that's not the message that we want to give, because vitamin D is one of those vitamins that we do have an upper limit for and that if you take too much vitamin D, it can actually cause some dangerous side effects. And one of the key things that vitamin D does independent of MS physiology, but one of the other things that it does is vitamin D enhances calcium absorption in your intestines. And if you take too much vitamin D, it actually allows too much calcium absorption and that calcium can actually deposit in some of your soft tissues in your body. And that's not a good thing. So we do have an upper limit set for vitamin D, and that's either 100 micrograms or 4000 international units a day. Some literature says in MS patients, 10,000 IUs is safe. But my professional opinion is that unless you're under a physician's care and unless your physician is recommending a specific amount for you, do not take in more vitamin D than 4000 international units a day.

Now we know that MS patients require more vitamin D than the general population, and it is common for a physician to recommend an individual with MS to take in, for example, 2000 IUs a day, that would not be an uncommon recommendation, and that certainly does not exceed the upper limit. And then if you happen to be so insufficient in vitamin D or even deficient in vitamin D, they may add an extra 100 IUs a day, kind of like for every one point that they want to raise your blood levels. So again, keeping in mind if you are taking in more vitamin D than the upper limit, make sure you are under a physician's care. And it's very important to have your vitamin D levels in your blood measured kind of routinely with your doctor to make sure that you're not getting too much.

Now, as far as vitamin D supplementation, again, vitamin D is one of these things, it's really difficult to get in the diet; It's not abundant in our food supply. Certainly, we get vitamin D in our milk that's fortified. We do get vitamin D in our other dairy products. We do get vitamin D in fortified cereals and then in some of our fishes, but it's not abundant in the human diet. So this is one vitamin where supplementation is probably going to be encouraged by your physician or your qualified health care provider. So again, make sure that you're working with them for targets and testing in general. If you're recommended to be taking a vitamin D supplement, it's vitamin D3. That's the active form that you want to be taking in the form of a supplement. And again, we do see that doses between 1000 to 4000 international units have been found to be safe and effective. And the nice thing about vitamin D supplementation, and I am a dietitian, so my principle is pretty much food first and then supplement when necessary. And again, vitamin D is one of these that many people can benefit from a supplement. And the nice thing is, these

are pretty readily available and inexpensive. So this is not something that you need to spend a lot of money on.

So there's one thing I really enjoy about vitamin D. And then one question I get all the time, I might as well address it now while I have a picture of the sunshine on my slide, vitamin D is also nicknamed the sunshine vitamin because our body does make vitamin D. If we have healthy skin, a healthy liver and healthy kidneys and we are exposed to sunshine then our body will make vitamin D for us. However, depending on how much sunshine you get, that could be a limiting factor. Some people work indoors, some people work evenings. I do live in Las Vegas, where what we call a 24-hour town, and as much as I have a lot of vitamin C, or vitamin D, rather, I have a lot of sunshine in Las Vegas, I know a lot of individuals who, for example, they work an evening shift and they sleep all day, so they really don't get that sun exposure. So other question I get is sunblock. Second thing is, if you use a lot of sunblock, it does block vitamin D synthesis in the skin. So that would be another instance where you might want to consider supplementation.

The next nutrient I want to jump onto is omega-3 fatty acids, and the thing about omega-3, you may have heard of these, and these are actually essential in the diet, your body cannot make these, so you have to consume them orally, either with food or supplementation. Now I mentioned to you about vitamin D and measuring the vitamin D in your blood, and that's a pretty easy blood test. Now, usually, if I'm doing this presentation in person and I get to see all of your faces, I would ask you to give me a show of hands and say, how many of you know your omega-3 status in your blood? And I'm pretty sure none of you are going to raise your hand. And that's because it's not a blood test that we simply do. It's not something that you go to the lab and you measure your omega-3. We don't have that technology yet. In the research world, they can get a little bit of feeling for omega-3 status, and some of the research that we do have is based on measuring the omega-3 levels in your red blood cell membranes. But again, we're not at the routine level yet where you can walk into a laboratory and have your omega-3 measured. So hopefully in future presentations, we'll be able to discuss more about that.

There are three omega-3 fatty acids that are essential in the diet that you must take in. And those, I'm not going to get into the chemical names, but they're ALA, EPA and DHA. Now ALA, that is the plant source of omega-3 fatty acids. And then our EPA and our DHA are what we call the animal source of those fatty acids. So all of these are required in diet and relating it specifically to individuals with MS, we feel that adequate levels of these omega-3 fatty acids are directly involved in MS physiology and that they help control inflammation and cell signaling pathways. So omega-3s are these anti-inflammatory fats that are very important for us. So very important that we get these in the diet.

Now with omega-3 they, looking at the research that we do have, and again, it's limited, and it's kind of mixed in that omega-3s may or may not have a preventative effect on clinical relapses and MS disease progression, and the current research data are a little bit inconclusive. But at the same time, we really don't have any research that says, you know, they may not have research that says they're absolutely beneficial to prevent relapses, but certainly they're not going to be harmful. So I am going to also emphasize that omega-3s do play a very key role in keeping whole body inflammation in check. So even if we don't have research at the moment suggesting that omega-3s are preventative for disease relapse or disease progression, they do play a very important role in other inflammatory diseases such as heart diseases, cardiovascular diseases, obesity management and some of our other autoimmune diseases. So I don't want you to leave with the message that well, because I don't have the research that

says omega-3 will prevent disease progression. Again, there's many other beneficial effects for these in our diets.

So getting down to some of the practical stuff with these omega-3s now, again, you need the plant form and the animal form. So the plant form again is that ALA and the animal form is our EPA and our DHA. Now here's the trick - the most biologically active forms in our body are that EPA and that DHA, those are the ones that are the most biologically active. And if we consume the ALA, or the plant form, it actually has to go through a conversion process in the body and get converted to EPA and DHA. And this is a very, very slow process and a very low amount is converted. So the reason I bring this up is that omega-3s are so important to us, but they're very limited in our food supply, and that where we find EPA and DHA in the food supply is either from fatty fish, and you have those on your list, and there's some other examples on this slide. So, you find them in fatty fish and then the algae that that fish eats to survive. So they're very, very limited in the human diet. And if somebody is a vegan and they don't eat fish at all, now it's going to get really, really tricky. Now, fortunately, with our technology today, individuals who are vegan can actually purchase the algae form of EPA and DHA, and they're able to get some in that way. So at least there are options available for individuals. So I just wanted to point that out to everybody because, again, it gets really tricky as far as how do I get enough omega-3 in my diet when it's really limited? The most rich sources would be fish, those fatty fish and then the algae that consume them. And if somebody is not a fish eater, then it gets a little tricky. So we'll get into that in just a minute here.

Now, even when we get into the fish, though, it gets a little tricky because people think about, well, fish, OK, there's fatty fish. How do I know how much omega-3 is in a piece of fish? And they don't carry food labels; If you go to the store and you purchase a piece of fresh fish, it doesn't have a label on there that tells you how much omega-3. So we don't have that information readily available on our food labels. So the rule of thumb I try to give individuals is that if you'd like to get adequate omega threes from fish in your diet, two rules of thumb: number one is that the darker the flesh of the fish, the higher the omega-3s. So if you can think of a piece of salmon, that dark color that has a higher omega-3 content than a piece of fish that's white, like something like a cod or a flounder. So the darker the flesh, the more omega-3. So that's one thing you can keep in mind, because again, they don't have labels. And then people think, Well, gee, well, how much fish? And the general recommendation, and this is not for pregnant women, individuals who are not pregnant, the general recommendation is about twelve ounces of fish in a weekly period. So maybe spreading that out to four ounces, maybe three times a week. That's the type or the quantity of fish that we're looking at to meet those requirements.

Now let's get into other ways of getting these omega-3s in the diet, because again, fish is only one way of doing that. So of course, we do have supplementation available. And I mentioned to you earlier as a dietitian, I'm always a food-first person - if we can get everything we can by food, I'm going to recommend that first. But this is another nutrient that it can get really tricky, again, if you're not a big fish eater, well, how do I get these omega-3s? And this is where supplementation can come in really handy. And then if you don't like the idea of supplementation, this is kind of nice because we have what we call fortified foods. We have, for example, eggs that have omega... that are enhanced with omega-3 fatty acids. So we have different common foods that are in the marketplace that actually have enhanced amount of omega-3 fatty acid in there. So there are lots of ways to get omega-3s in the diet and in the supplemental form and in fortified foods. But I'm going to give you some cautions and just a few minutes.

Now, the last point I have on this topic or this slide with omega-3 fatty acids is that, again, we're going to talk in a minute about omega-3s, and you know, how much omega-3 do I need? So we're going to get into that in just a few moments. But at the same time, we want you to have a little bit of omega-3 without having too much because, again, too much omega-3 can cause problems with things like, maybe if you're on a blood thinner, for example, it can interfere with blood thinning. So the general recommendation for omega-3 is, for individuals, is we want people to get 1000 milligrams or one gram, it's the same thing, of EPA and DHA on a daily basis. Anything that starts exceeding either 3 grams or 3000 milligrams per day, that's what we call a therapeutic dose. And you really need to make sure that your physician is aware that you're taking omega-3s in a dose that high.

So as far as omega-3 supplementation, this is where it's really important for us to get to know our food labels and really pay attention to those. If you're looking at something like a fish oil supplementation, or even if you're looking at a food product that has enhanced omega-3 fatty acids in it, so again, maybe it's a particular egg, maybe it's a bread spread, or maybe it's a type of oil where they talk about enhanced omega-3s on the label, you need to be careful because really, again, what you're looking for is EPA and DHA. Those are those biologically active ones. And sometimes if they just say, for example, 1000 milligrams of fish oil or 1000 milligrams of omega-3, you don't really know how much of that is EPA and DHA, because it could be that plant form, remember, which is the ALA. So it gets a little bit tricky. We need to read our labels very, very carefully. And if you really want to make sure you're getting kind of that 1000 milligrams or one gram of EPA and DHA, read that label carefully and look for those words, EPA, DHA and those two should add up to 1 gram or 1000 milligrams a day.

Now, with supplementation, there's a lot of little tricks out there in marketing, and if we look at omega-3 fatty acids or fish oil, they're the top five products on the market as far as marketing and sales. They're a very, very popular product and we have a lot of marketing geniuses out there trying to get individuals to buy the product. Be wary with things like "double strength", that's a big popular one that's on a label. You got to read that label carefully - "double strength" may mean just take two pills instead of one pill. So you always have to go back and read that label. Because if you're looking at a price and a price per tablet, if you have to take two pills of one brand to get the same dose as one pill of a different brand, then you need to again read that label carefully so that you're not being fooled into buying something that's more expensive.

Another common marketing scheme, I see this one all the time with omega-3 or fatty acid supplements, they will put the word, something like "added omega-6s" and "added omega-9s". I bring this up because omega-6 fatty acids are required in the diet, but they are abundant in the American diet, in particular. Omega-6 fatty acids are found in all of your common vegetable oils, so they are very, very abundant in the diet. We really don't see omega-6 fatty acid deficiencies too often in this country, so it's just that marketing ploy. If you find a fish oil supplement where they say "added omega-6s, be wary. It's not something that you're going to need in a supplement and omega nine fatty acids. Those are just the fancy words for the fats that are commonly found in nuts and seeds. They're not essential in the diet. Again, they're healthy for us, but they're not essential. So to buy them in the form of a supplement isn't always necessary.

And then one of the other things that we have to worry about with omega-3 and the whole issue with fatty fish is mercury poisoning. So here's one of the problems that we find is that food products like fish that are rich in omega-3 fatty acids, unfortunately, those are the fish that are also highest in mercury content, and mercury is a very toxic element. So we need to be very careful with that. So with our supplementation, if you're going to be purchasing supplements instead of eating the fish, the best recommendation I can give for everybody is to buy big brand

names, and I don't have any stock in any supplement company. But if you buy your big box store or your chain or those popular brand names, chances are that, again, those are going to be mercury free. Hopefully, they will label them "mercury free" because you want to make sure that you're not getting mercury poisoning when you're taking in that omega-3. And again, if you're getting it in the form of fish, that's where that recommendation of about twelve ounces of fatty fish a week, that would be enough to keep individuals from becoming toxic with mercury.

And then the last question I get commonly is, well, should I be eating fish or is absorption better from fish? Or is absorption better from supplements? And unfortunately, our research data is kind of controversial. Some research says fish is better as far as absorption. Other research says nope, absorption is just fine from the supplemental form. So until we get more research available where we're able to look at absorption levels better, and so we're actually able to kind of measure it in the serum on a routine basis, you're probably just, again... stick to that target, try to get fish in your diet if you can. And if you can't get fish in your diet, taking a supplement may be warranted for you. But again, make sure if you're taking an omega-3 supplement that you clear this with your physician or your medical provider.

Now, I really want to get into food a little bit. We're going to get into some of the other nutrients. We're going to get into fats and carbohydrates and proteins a little bit and get into this idea of anti-inflammatory eating as far as food. So starting with fats, dietary fats can be broken down into two categories - we have anti-inflammatory fats, and then what we have, pro-inflammatory fats, and those are the ones that kind of initiate this inflammatory cascade throughout the body. So taking a look here at the anti-inflammatory fats, these are the ones where we want individuals to get most if you're getting fat calories coming from this side. So again, those omega-3s the nuts, the olive oils, the canola oils, those would be the ones that we consider anti-inflammatory. And then trans fats, saturated fats, some of the cheaper vegetable oils, and then unfortunately, animal fat tends to be on the pro-inflammatory side.

Now I do want to spend a minute talking with you a little bit about animal meats because a lot of individuals, when they see a slide like this or they hear that animal meats are pro-inflammatory, people get very, very confused or very worried that, oh my goodness, does this mean that I can't eat a piece of meat ever? And I do want to point out the facts here a little bit for you in that animal meats do contain what we call arachidonic acid, and it is an inflammatory fatty acid. But at the same time, we need to look at the portions and the quality. So there are kind of two sides to kind of figure out here. I can tell you there's some research going on at Penn State University where they're looking not only at the idea of... the question I get is red meat bad? Should I avoid red meat? And the answer is no, not necessarily because we need to look at the quality. There's a big difference between a piece of lean beef from an animal that's been grass-fed versus a piece of processed meat that's served in a fast food restaurant, for example. So both can be, you know, four ounces of beef, but they behave very differently in the body. So that quality piece of meat is going to behave differently in the body than the processed piece of meat. So if you're looking at that, you know, a very nice quality piece of meat, there's nothing wrong with a piece of meat as long as our portions are reasonable.

So that's where we get into number two, having a reasonable portion, maybe, you know, four to six ounces of meat in a serving a couple of days a week, as long as its quality would not be something that we would consider sending somebody in a pro-inflammatory state that's chronic. Now eating meat several times a day every single day, that's where we get into the whole idea that that's probably going to put your body in more of a pro-inflammatory state rather than an anti-inflammatory state. So the message here is yes, try to choose your fats from the anti-inflammatory side. If you're going to have those lower inflammatory fats, try to limit the portions

of those. So again, if you're going to have animal meat, having it in smaller portions, having quality, the minimally processed the meat, the better the choice.

Kind of the same message with carbohydrates, as far as carbohydrates and inflammation, we have different qualities of carbohydrates. Some of our quality carbohydrates are those that are fruits and vegetables and whole grain kind of in the natural or minimally processed form. There's a big difference between something that's a whole grain, so for example, a whole grain piece of bread is very different from a piece of white bread that's been processed. Sugar that comes from a piece of fruit is very different from white table sugar. So even though they're all carbohydrates, the quality of them is very, very different. So if we're looking from an anti-inflammatory perspective, most of our carbohydrate calories should be coming from fruits and vegetables and whole grains and things like beans and legumes. So those are quality carbohydrates, where those carbohydrates also contain phytochemicals, which are biologically active compounds that are good for us. They contain fiber and they contain what we call prebiotics, which is a fiber that is good for our intestines, and we're going to talk about that in a few minutes.

What we want to limit are those carbohydrates that are refined, so like, again, the white breads and the white flours, and then the added sugars and the white sugars. Those are the ones that tend to be pro-inflammatory. And again, remember, we're talking on a regular basis if somebody is going to sit and enjoy a piece of cake on their birthday. Certainly, there's nothing wrong with that. Having a little bit of sweet in our life. There's nothing wrong with moderate levels. But if we're consuming a large portion of our calories on a daily basis from these refined carbohydrates, they tend to be very inflammatory.

Now the one question I get and I've had an issue with the media on this one is because I see this popping up all the time is that a lot of times in the media, I'll get a pop up or a blog or an alert that tells me that, oh, here's another article saying that, Oh, fructose and fruit sugar, woop, it causes inflammation, and fruit is very inflammatory. So if we look at the science, the one thing I want to point out is that you have to tease out the science, and yes, it is true that fruit contains fructose, that is the natural form of sugar that's in the fruit. But if you look at the literature and you dig deep into the science, it's the excess consumption of the combination of fructose and glucose that's pro-inflammatory. So I want to tease that statement out. Number one, it's excess, we gotta look at the quantity, and it's when you combine fructose and glucose together. That's also known as table sugar or high fructose corn syrup. So it's the it's the glucose and fructose together, and again, that sugar that tends to be pro-inflammatory. It's not the piece of fruit itself. So we don't tend to see people with, you know, biomarkers of inflammation that are elevated if somebody is eating a normal quantity of fruit in their diet. Again, a couple of servings of fruit a day in the diet is not pro-inflammatory. It's when you're adding all of these other sugars. So I always like to point that one out.

Now, along with carbohydrates, a very important nutrient I like to mention is fiber. And this can also be very important for everybody, of course, but individuals with MS in particular, because it's really important to make sure that we have regular bowel movements and that we're "cleaning out", getting ourselves clean, so to speak. So fiber does play a role in optimal health. Not only does it help keep our stools regular and keeping our bowels moving regularly, but it also may help with weight management, blood lipids and colon health as well. And I mentioned the term prebiotic a few minutes ago, and I'm going to get into the detail on that in just a few minutes. But all that is is a fancy name for fiber so that when that fiber ends up in our large intestine, the bacteria that live in there, they actually digest that fiber and that actually keeps your gut very, very healthy.

So as far as fiber goes, individuals with MS, it is really important again to get that adequate fiber to keep our bowel movements regular. But the one thing I always like to point out whenever I discuss fiber, just in case I motivate anybody out there to start increasing their fiber intake, you also need to make sure that you're increasing your fluid intake at the same time. Very, very important. If you decide to take in a lot of fiber but you don't increase the fluid, you're going to end up with constipation, which is the opposite effect. So making sure we're getting adequate fiber and adequate fluid is very, very important for us. The nice thing about fiber, it is required on a food label. So if you have a particular food item that you like, it's very easy to pick up that label and find out how many grams of fiber are in there. And then, of course, something like a whole piece of fruit, vegetables, whole grains, all those foods that don't necessarily have a label, but in its whole form would be also good sources of fiber. And then also, I do have the recommendations for you on the right side of the slide as far as how much fiber do I need? And it's listed on there a little bit higher for males than females.

Now, let's talk about the gut a little bit. As a dietitian, I always say, I think the gut is my favorite organ, it's a very complex organ in our body and our gut is basically made up of our small intestines and our large intestines. And this idea of microbiota, so this is something that is getting a lot of research attention. If you ask me, you know, five or six years ago, a question on the gut, and the gut microbiome, I wouldn't be able to answer very many questions. But again, thanks to the evolution of research, I have a lot more to share with you this evening. So we know that in our large intestines, we have trillions of these little bugs or micro...you know, I call them bugs, but bacteria that live in our large intestine and these bacteria are good for us. So they are good for us. They keep us healthy and again, they live in our intestines. And over the last 20 years, we've been able to see that there's been lots of research. And again, particularly in the last five or six years, we see that there's communication between the microorganisms that live in your gut and the central nervous system, and that's called the microbiota gut brain axis. So again, really fascinating research. Who would have thought that little little tiny microorganisms that live in your intestine communicate with your brain, but they actually do?

Now, what these good bacteria do is that when they're living in your intestine and if you eat something with a lot of fiber in it or a prebiotic, those little bugs that live in your gut actually start to digest that fiber and then they produce these short chain fatty acids. So it's kind of like the little bacteria make these little, what we call, short chain fatty acids. And then we think those short chain fatty acids play a really important role in immune function and homeostasis of the central nervous system. And then we also find that if you have an imbalance of the microorganisms that live in your intestine, again there's trillions of them that live in there and there's all different species of them, and we find that if you have an imbalance of these gut bacteria, it might actually induce a systemic pro-inflammatory state that contributes to disease pathogenesis and severity. So all of the things I've been discussing with you this evening as far as the anti-inflammatory eating pattern, all of that will actually help promote that balanced gut microbiota.

Now what we find that actually is, again, what causes harm to the gut microbiome? Again, it's the processed carbohydrates. We find that obesity can play a role; that the more body weight we carry that impacts our gut microbiome. Processed foods, chemical foods, all of those things have a negative impact on those microorganisms. But again, going back to the whole foods, the minimally processed foods, those are the ones that promote positive gut health. So again, your prebiotic is a food that's high in fiber, and it feeds those good bugs that are in your gut.

And then the other term that you may have come across or read about is called a probiotic. And I'm going to emphasize, you know, the difference between these because again, a prebiotic is just the fiber that the bugs live on or digest and work on. A probiotic is actually a live organism that you would ingest orally, so you would take it in the form of a food or in a tablet or in a liquid form, and you're actually swallowing a microorganism. Now, a couple of things I like to point out is that because these are live microorganisms, if you're going to be taking these, your physician must agree on these as a course of treatment. So again, you're ingesting a live microorganism and you're putting it into your body. Now there is lots of research to suggest that they can be very beneficial. A lot of people that have intestinal issues, maybe they have certain diseases or conditions in their intestines, these can be very, very beneficial. But again, a physician needs to know about it because if somebody, for example, did have an ulcer in their intestine and they took in a live microorganism and then that microorganism got into the body, that could be a major problem. So again, these can be very, very beneficial. But make sure that your physician knows that you're taking them. And then the last thing I'll point out is that these are not regulated by the FDA, so we need to be very careful with our probiotics because they are not regulated. Again, they could be a little bit of a problem. So make sure your health care provider is aware if you're going to be taking those.

Now, the last kind of major topic I'll discuss this evening is what about diets, I get questions about MS diets all the time. And there are several diets that are promoted for MS management, and I'm sure a lot of you have heard of many of these. Some of them fall into the category of what we call low carbohydrate diets, and common ones that fall into that category are the keto diet or the paleo diet. And these are diets that are rich in meats and fish and vegetables. They're limited in fruits and legumes, and in general, there's no dairy, no gluten and no processed foods.

Second popular diet that you'll see promoted for individuals with MS is called the swank diet. This one has a saturated fat maximum of 15 grams per day, in unsaturated fat of 20 to 50 grams per day, and then it encourages four servings per day each of whole grains and fruits and vegetables. And there should be no processed foods on this diet.

Third, popular diet is called the Wahls protocol, and this one emphasizes six to nine servings a day of fruits and vegetables, six ounces of meat for women, twelve ounces for men. It does allow grains and legumes. Eggs and dairy are not permitted and again, no processed foods.

And then there's been a kind of a revolution or a little bit of a modified Wahls diet where, we call it, what's called the Wahls elimination. And in that one, there's further elimination of gluten free grains, legumes and the nightshade vegetables, so things like tomatoes and eggplant and those dark colored vegetables.

So those are three of the common ones promoted for multiple sclerosis in particular. But then the last one I'm going to talk about is the Mediterranean diet, and I don't even like the term diet, I actually call it a Mediterranean eating plan because I like that term better, because it really isn't a diet, it's a lifestyle. But individuals who follow this Mediterranean pattern, it's rich in omega-3 fatty acids, moderate amounts of fruits, rich in vegetables, quality grains are included, fish is included, small portions, again, of those quality lean meats, and even red wine is included in small portions on the Mediterranean diet. So again, I prefer the term Mediterranean pattern. Again, you may choose the term Mediterranean diet, so whichever you prefer, it's one that I like the most.

So but now let's look at the research data because that's the most important thing. And we do have very small numbers of research studies looking at the other diets individually, so looking at keto or paleo or swank or Wahls, and looking at MS outcomes. And we have very small amounts of research looking at, yeah, we can find a little bit of a benefit from all of these diets. But again, the research is very limited. Just recently, though, another study came out that looked at the swank and the Wahls diet, and they did see improved cognition and fatigue with these diets. But again, it didn't really address anything about disease progression or MRI lesions. So it gave us just a little bit of positive data, but it wasn't very beneficial as far as progression of disease.

The best evidence that we do have is found with this Mediterranean diet or the Mediterranean eating plan. And again, the Mediterranean eating plan is just a fancy way of looking at this whole anti-inflammatory eating pattern. So because we have the best research data supporting this pattern, it is the one that I recommend the most for individuals with MS. And then a second point, the second reason why I recommend the Mediterranean style is that, again, this isn't a diet, and this is why I don't like the word diet. For me, this is a pattern of eating, and it's something that can be used long term as a healthy lifestyle. This is not a diet that we look at that we do for a short period of time and then we stop. It's a lifestyle, and it includes a very, very wide variety of foods. The Mediterranean pattern can actually be kind of modified to meet needs of all different individuals. A question I get all the time is that, well, I'm an individual, I have multiple sclerosis, and a lot of people say, Well, I'm overweight and I want to lose weight at the same time, but I want to keep my heart healthy and I don't want to develop diabetes later in life. Well, a Mediterranean pattern, along with adequate levels of energy or calories is perfect because if you control your calories by eating in a Mediterranean kind of pattern, that's going to help be preventative for heart disease, diabetes, weight management, and of course, MS. So that's why the best outcomes are really seen with this Mediterranean eating style.

Sodium is the last thing that I'm kind of going to mention. I'll mention a couple of other things but sodium is the last thing I'm going to spend a lot of time on because I get this question a lot as far as sodium and MS, and I want to kind of tie it together. Now I do want to point out that, you know, sodium, we don't consider really sodium as a nutrient. It is an element. It is something that your body, you know, your body does need it, but it is not something that you really have to focus too much on the diet because it occurs naturally in so many different foods. And we do find that looking at the limited research that we do have that some individuals, if you're consuming more than two grams a day, it may actually lead to worsening of MS symptoms. Now, not all studies will support this, but there are enough studies out there to make us think about, you know, sodium intake is something that we should probably pay attention to. And even if the data on MS are not perfectly clear, there is lots of data to show us that we should be paying attention to our sodium intake for the prevention of various cardiovascular diseases, hypertension and kidney disease. So it is something that we want to pay attention to.

So as far as well, how much sodium should I be taking in for the general population, it's about 2.3 grams per day. If somebody has cardiovascular disease or high blood pressure or risk in their family, then we should be limiting our sodium to 1500 milligrams per day. So how do we do this? Again, if it's complicated, but we really need to start paying attention to, number one, pay attention to our food labels. If you have something with the food label on it, you could read the amount of sodium. Second is watching that table salt. Anytime we pick up the salt shaker and we start sprinkling it on our food, we're adding a very large amount of sodium to our food table. Salt is about 40% sodium, and then I get the questions all the time about sea salt and kosher salt and Himalayan salt. And it's almost just as high in sodium as table salt. Now per teaspoon, they're a little bit lower in volume. So if you had a teaspoon, for example, of kosher salt,

because of the larger granules, it kind of takes up more volume, you might be getting a little bit less, but you can't just substitute, you know, all the sea salt and all the kosher salt you want. It still does have that same impact.

So read your labels kind of avoid the salt shaker at the table, but the top sources of sodium in our diet, again, those processed foods, you got to pay attention to those processed foods. And my philosophy is that if it comes from a restaurant, it's probably high in sodium. If it's in a package, a box or a package, it's probably high in sodium. So make sure you're reading those labels. So eating whole foods, minimally processed foods, whenever possible, is a great strategy for helping eliminate sodium.

So this slide kind of goes over some of the general recommendations that we've discussed this evening. Making sure that you're drinking adequate fluid, and I mentioned that especially if you're going to be upping the fiber in your diet, make sure you're getting adequate fluid. And a lot of people think, Well, how much fluid do I need? And a really simple way you can do this is that your urine color should be pale yellow to clear. I always give the visual for people of think lemonade, not apple juice. Your urine should be a nice, pale yellow color. If it starts getting dark, dark, dark, dark, then that indicates that you're not hydrated enough. Watching portions to maintain healthy body weight. Now I get a question all the time about how many calories do I need? And that's not a question I can answer to a large group of individuals. That's a very individualized thing where everybody has a different calorie need and that has to be assessed by a health care provider.

So making sure you're getting enough vitamin D and enough omega-3, watching those saturated fats and then eating those, again, minimally processed foods, your fruits and your vegetables and your quality carbohydrates. Watch that sodium. And then, of course, with any kind of supplementation, make sure you're under a physician's care or healthcare provider. Make sure that they know that you're taking supplementation.

So in bringing it all together, I like to kind of summarize for you in one place, and hopefully we'll put it all in one piece here at the end so that it makes sense to you. So just to emphasize in general, again, what is the best, strategy for individuals with MS? And again, it's that anti-inflammatory eating approach. And remember, it's a pattern. It's a lifestyle. Vitamin D and omega-3 fatty acids, those are being studied. And as of now, we feel like adequate amounts of vitamin D and omega-3 are warranted. There is insufficient evidence to recommend one specific diet for everybody with MS, so again, it is a very individualized approach, working with a qualified healthcare provider to see what works best for you. But the overall general recommendation, most evidence suggests that the Mediterranean style diet pattern, it's the easiest to maintain and it promotes overall health. So I'm going to stick with that Mediterranean style.

And another thing I wanted to point out this evening is that everything I've given you are evidence-based guidelines, so it's all based on research. These aren't guidelines that I have kind of pulled out of my head. It's all based on research studies and many years of clinical trials. But these guidelines are really for the general population or general individuals with MS. And these guidelines I'm giving you this evening do not replace individualized patient care. So if you need individualized care, if you want to see a dietitian, it's very important that that dietitian would complete a thorough nutrition assessment on you before they can come up with an individualized intervention that's going to be appropriate for you.

I did include on here how do I find a registered dietitian nutritionist? You do want to find somebody who is credentialed. There's a lot of individuals out there who claim to be experts in nutrition, but they don't have the credentialing and training. So I've given you the website for the Academy of Nutrition and Dietetics. They are the governing organization for food and nutrition experts. The website is eatright.org, and there's a little button that you click that says "Find a nutrition expert" and all you have to do is type in your zip code and they will list individuals in your area with different specialty needs.

So and then the last thing I'm going to say, and to me, this is probably the most important message I'm going to give you this evening because I have given you so much information and I know we are together for such a short period of time, and I always feel that, in order to become a dietitian, it's about six years' worth of training for my students, yet I'm supposed to teach all of you nutrition in under an hour. So it really is a challenging thing, and I know I've given you so much information, but one message I do want you to take home with you is that balance in life is very important, and it's very important for all of you to pay attention to your dietary intake. It's important for all of us to pay attention to our dietary intake. We definitely want to prevent disease, and if we have disease, we want to manage it. But we do need to balance that with quality of life and not miss out on life's enjoyable moments.

So what I mean by that is, again, I mentioned to you that sugar is inflammatory, but we certainly want you to enjoy a piece of birthday cake on your birthday. Maybe there's a favorite treat you enjoy over the holidays. We don't want anybody to miss out on the quality of life. But again, it's having those treats as a once in a while thing and then paying attention to our diet most of the time. And that's kind of the rule I follow with life is if 80% or 90% of the time, you can make really good food choices, that's fantastic. And then allow yourself a little bit of time for life's enjoyable treats.

So I think with that, I need to stop sharing my screen for a moment and then I'm going to open it back up to Alexis.

**Alexis Crispino Kline:**

Yes. Oh, Dr. Kruskall, thank you so much. That was a really wonderful presentation and that was definitely a lot of information.

**Dr. Laura J. Kruskall:**

A lot of information, I know, that's the challenge. Like I said, it takes me six years to train students to become a dietitian, so it's fun.

**Alexis Crispino Kline:**

We got a few questions and I think that, thank you so much, I think that, hopefully, the folks that joined us could tell a lot of questions that were submitted beforehand, you helped answer them throughout the presentation, I think. But some, we got a couple and I think we have a few moments. So one I thought was interesting is how do you think, or in your opinion, are the most important factors in helping a person living with MS to make changes that are sustainable and long term?

**Dr. Laura J. Kruskall:**

Yeah, I agree. And if I had the answer, I would probably win a Nobel Prize. So, it's not a black and white answer. I wish it was. But I think you need to look at it, and again, everyone takes a different approach, but we need to look at it as again, that balance. So again, if you can say,

you know, 80% of the time, I'm going to try to make really good food choices today. But you know that 20%, I am going to have the piece of cake and I'm going to have whatever the favorite food is. Maybe it's a fettuccine alfredo, whatever your favorite thing is. I think if you can look at it that way, that most of the time I am going to make good choices, but I'm also going to occasionally allow myself that so-called favorite food, if we can get into that mentality, I think that might help.

And if you have a day, let's say, I mean, we've all been there. I've had those days. Has anyone had a day where at the end of the day you think I cannot believe what I put in my mouth today. It was nothing but processed food and cookies and caffeine, and we've all had those days. I've done it. We've all done it. So what I find with my patients and clients that people that do that, they almost give up and say, Well, I had a bad day, so why bother? Or even if it's just, you know, my morning and my afternoon was terrible, so I'm just going to kick it up and, you know, pizza and breadsticks for dinner. I've already ruined my day. No, because you can make a better choice the next meal, the next bite the next day.

So if you had a really bad day, it's OK. You need to forgive yourself and say, Well, tomorrow's a new day and tomorrow's an opportunity, I'll try to make better choices tomorrow. So if you look at this as a rigid approach, that I can never do this, I could never have a piece of sugar, I can never have a piece of trans fat. I can never have a fast food hamburger. If you think of it as never and rigid, you're not going to be able to sustain this. But if you look at it as you know, hey, I know on the weekend I'm going to go to the fast food restaurant with my grandchildren. So you know what, Monday through Friday, I'm going to try to make some really good choices so I can enjoy Saturday at the fast food restaurant with my grandkids. That's the, I think, a better way and a more sustainable way of looking at it.

**Alexis Crispino Kline:**

That is such a wonderful answer, and honestly, that brought us to 7:00, and I feel like that's such a really great way to kind of close it out and bring it all together. And, you know, we really, really appreciate that. And thank you, Dr. Kruskall for sharing that with us tonight and sharing all this information. And thank you to everybody that joined us. And just as a closing note, if anybody here, if you need anything, if you want to reach out to us, again, MSAA's email and chat is in the chat box. And if you wouldn't mind going ahead and sharing and replying to our survey at the conclusion of the event to just let us know how you enjoyed it, and I saw some questions come in asking - this program will be on demand, it'll be up on the MSAA/MSI website in the next couple weeks. So just check back there. And again, thank you all so much for being with us tonight and thank you, Dr. Kruskall.

**Dr. Laura J. Kruskall:**

I'm glad, you know, I was going to add that too, because we went through the slides quickly. So that way it'll be available for anybody later on. I assume with the on demand, you can press, play and pause at your leisure. So that way, if anybody wants to screenshot the slides, you'll have all of the information right at your fingertips.

**Alexis Crispino Kline:**

Absolutely. Well, thank you so much to everybody and see you all.

**Dr. Laura J. Kruskall:**

Thanks everybody.