Beyond Wear and Tear: The Microbiome-Arthritis Connection Transcript

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Summit Introduction and Guest Welcome

Welcome everyone to the Gut Health and Longevity Summit. I am so glad you're here, and I want you to take a breath right now, because what you're about to hear could genuinely change the way you think about pain, inflammation, and what your body is truly capable of.

Most people are living with joint pain, stiffness, or arthritis and have never been told that their gut has anything to do with it. The science connecting your microbiome to your musculoskeletal system has never been clear, and our experts are here to make it actionable.

So today's conversation is one I've been especially excited about the gut joint access and how healing your microbiome can help reverse inflammation, reduce pain, and restore mobility.

My next guest has treated Olympic athletes, professionals, sports teams and members of royal families and in doing so, he discovered something. Most sports medicine physicians never find that the most powerful tool for healing joints and reversing inflammation isn't a procedure or a prescription, it is food.

So I want to welcome Doctor Scott Stoll, a board certified physician specializing in sports and regenerative musculoskeletal medicine. He co-founded the Plantation Project and the International Plant based Nutrition Health Care Conference, and has served as the founding strategic advisor for the Institute for Healthier Living in Abu Dhabi, which I hope to get to one day.

He has cared for top Olympic and professional and collegiate athletes, and competed himself as a member of the 1994 U. S. Olympic Bobsled team. Wow, that that is a conversation in itself.

So he's also been featured on the doctor as show so many other places, including documentaries like The Game Changers, Eating You Alive, and Plant Wise.

Rethinking Joint Pain and Inflammation

He has written extensively on plant based medicine, disease reversal and regenerative health, and his work continues to reach patients through his virtual Total Health program.

And Doctor Scott Stolt, doctor Stolt, I'm going to call you Scott. I've been looking forward to this conversation because I think what you're about to share is going to completely reframe how our audience thinks about joint thinks about pain.

And as an individual who has lived with chronic joint pain, well, chronic pain due to joints for the last five years. I'm really excited about this conversation.

So I want to make sure I'm not missing anything. So let's start where most people are. Joint pain and arthritis are incredibly common. But what most people think of them as wear and tear problems, something that's inevitable with age.

Can you explain to us what is actually happening inside an inflamed joint? And is this really unavoidable? Yeah. Thank you. First, I'm so delighted to be with you.

Thank you for the invitation. I love this topic. It's been a part of my life for, gosh, 20, almost 25 years. I've been doing musculoskeletal medicine along with lifestyle medicine. And, you know, a couple of important points just to highlight before we jump in.

When you and I were trained, we were taught that the joint space was sterile. There was no bacteria in the joint, and that when somebody had arthritis, it was wear and tear that for some reason the joints wear down.

Over time, you develop osteoarthritis. And the only thing to do is anti-inflammatory medications, a quarter zone injection, physical therapy or surgery.

I mean, that's kind of the the basic algorithm for orthopedic medicine today. Well, yes, for today. And one of the things I forgot to mention to you that you might not know about me is I actually have a bone and soft tissue fellowship in a bit.

So I am the receiving end of the orthopedic surgeon. So the number of hip replacements and knee replacements and those bones that I've received like literally to look at degenerative joint disease and then the number of phone calls I have gotten to look for inflammatory cells and joints for failed revisions and whatnot.

I'm on the opposite end of that, but I can tell you I understand where you're coming from. Yeah. And you've seen the raggedy, degenerated cartilage that sits on the bone or the meniscus that comes out that's torn, and it's painful looking at it.

So I can't imagine, you know, people's bodies, how painful it is. So this is why I think this is such an important topic when it comes to longevity. Because, hey, if we can do something about it, we do not want to make that happen.

Yeah, exactly. And, you know, we didn't we didn't know what else to do other than those few things. And then you saw the process, you know, as it gets worse over time, then they have more pain and it leads to a surgery and you know, the tissue.

I wish people could see the tissue because it is so angry looking right. It's in red, inflamed, rough, degenerated. It's no wonder that people hurt so much.

I wish I could show them the tissue, but the hospitals have very specific rules about showing gross specimens. Otherwise I would be all over social media.

Like, here's your knee joint, like I oh my God, I have a lot of gross pictures. Like they're called gross pathology. Like, I mean, it's technically a little gross, but that's what we call it in the laboratory.

But I have so many pictures of this because we, we actually, as part of our pathology reports and stuff, we have to take pictures, right? That's exactly right.

And so, you know, to just kind of frame this out for everybody, you know, and starting with the place where I just came out of practice and I was treating patients like I was taught to treat them.

And then as the new guy in an orthopedic practice, I started to get all of my partners failed cases, everybody that had done everything three times. I was a team doctor at Lehigh University, and so the athletes that weren't getting better with traditional treatment would end up in my office.

Moms, dads, you know, people at work coming to my office and they're not better. And they've done everything and they're saying, what else can I do? So I was just a place of compassion.

I said, well, there's, you know, there's got to be something else that we can do if they're not surgical. And so I started just asking simple questions like, what's going on?

The Gut-Joint Microbiome Connection

And how can I not only reduce inflammation, but is it possible to start healing tissue. And so that be down this road that that thought process of asking those important questions and saying like what, what what can be done to start

healing?

So I attended a conference at the University of Wisconsin that was Regenerative Medicine conference. And back then, you know, we had a regenerative not too many regenerative treatments.

One was which is injecting some sugar and numbing medicine into ligaments, which creates a little local inflammation. And the local acute inflammation begins the healing process.

But that concept of creating an acute inflammatory response to heal tissue made me start thinking about a couple of different pathways. It helped me kind of understand what is healing and regeneration, and oftentimes what happens in a lot of these kind of chronic musculoskeletal conditions is that somebody has an injury or they have some kind of misalignment that's occurred because of work, a link discrepancy, and you get wear and tear, but the body doesn't have the capacity to repair that tissue for some reason.

And we'll talk about those reasons in a minute. And then to understand that if we can create the right environment for people, the body can heal itself.

And that's that, you know, using those early days of regenerative injections help me to see the body is capable of healing when it's given the right opportunity.

Hippocrates said that healing is not just a matter of time, but also opportunity. And so we have to be able to create opportunities for healing. And so out of that kind of regenerative injection conference that I attended for ten years, I began to ask more questions, you know, including what can I do beyond just injections to help people heal?

And so that led me to a lot of exploration of lifestyle and other interventions that actually assist the body at that deep level to repair, regenerate and restore some of the damage tissue.

So it's possible right. So whether that is that cartilage breakdown the inflammation in the synovial tissue. So it's not just about when a patient comes to you believing that their joints are worn out.

It's really looking deeper. So when you've worked with athletes or everyday patients alike and when somebody sits across from you with chronic joint pain, what are the real drivers that you are looking at and how is this different?

I mean, I think you touched upon it, but how is this different from what you like? The previous doctors have been told. Like, what is it that when you're sitting across from somebody, you're saying to them, all right.

These are the specific lifestyle factors that are going to influence the health of your joints. Yeah. And so I always like to educate my patients so that the lifestyle recommendations have some real rooted meaning for them, not just simply to say that, hey, eating more plants is going to reduce inflammation, but really to educate them to understand what's happening at deeper level.

So maybe we can just take a couple of minutes and lay that out for everybody watching so they'll understand what's going on in their joints. As I mentioned at the beginning.

I was taught you were taught that joints did not have bacteria, and if bacteria were in the joints, then it was, you know, from an outside source. And it's one of the reasons and it still is very important.

One of the reasons that surgeons are so about keeping the environment clean. But in the last few years, they have been taking samples from sterile joints and discovered bacteria living in the joint.

And so there's a microbiome in the joints, is what you're saying. Joint space and the microbiome in and around the joint, and even at the layer between the cartilage and the bone mirrors the microbiome in the gut.

And so the health of the gut microbiome is reflective of the microbiome that's in the joint. And when the

microbiome when there's that dysbiosis that your group is learning about.

And there's that dysfunction of the microbiome in the gut, you get a dysfunctional microbiome in the joint. And those bacteria produce acids that actually erode the cartilage and joint intersection and contribute to kind of inflammation in the local area.

We also know that when you have an unhealthy microbiome with dysbiosis, you know, it creates kind of local inflammation. And your audience is learning about the leaky gut.

The gut opens up and the ender talks. And one of the byproducts that can leak out is LPs lipopolysaccharide that floats throughout the entire body, activates macrophages, which leads to systemic inflammation, which also can contribute to joint inflammation.

And so there's kind of two different mechanisms that contribute to inflammation both locally and the joint and systemically. And we further know that when there's a healthy microbiome, the short chain fatty acids that are produced by the microbiome, things like butyrate propriety acetate by those beautiful, healthy, bacterium like bacterium, they circulate through our bloodstream.

How Dysbiosis Drives Systemic Inflammation

And they can be supportive of cartilage. They can turn off key inflammatory switches, these giant switches that drive inflammation in the body like NF kappa beta.

And so they can they can naturally, through secondary mechanisms, turn off inflammation. And as the inflammation goes down, it creates an opportunity for joints to begin repairing and regenerating.

And we have living cells that produce cartilage. We have fibroblasts that lay down connective tissue in our body that are just waiting for the right opportunity to begin repairing and regenerating. All right.

So many words there. Before I go on to the next question, I just want to touch upon a couple of those. By the way, Condra sites are some of the most beautiful looking cells under the microscope ever.

Like, just like they're pretty. I mean, I look at all kinds of cells under the microscope, but are definitely one of the, like, more artistically visual appealing cell.

But one of the terms you mentioned was LPs. So we talk about LPs definitely in the gut. Can you expand on that a little bit more as to which individuals might have more LPs exposure, which then could contribute to these unhealthy joints?

Yeah, the the LPs exposure is created through first gut dysbiosis. So when the microbiome in the gut, which is, you know, it's estimated to be 38 trillion bacteria.

I mean, it's we don't really know. And there's a whole bunch of other things in there too, as your audience is learning when that becomes more predominant, unhealthy populations, things like streptococcus and others, those bacteria produce by products.

So they're going through their normal activity of living and coming out of the back side of their metabolic activities are these byproducts. And one of them is lipopolysaccharide, because there's a lack of short chain fatty acids in the gut, which help to keep those tight junctions strong.

And now local lipopolysaccharide unhealthy diet disposes. You get local inflammation and the gut begins to get leaky. Opening up those spaces and allowing things like LPs to enter into the bloodstream.

And now it's circulating in the bloodstream, something called endotoxin, like these things that are aren't supposed to be in the bloodstream now have had access to get in there and activate the immune system.

So those people then that are susceptible, you know, generally speaking, are the people that are eating a Western diet that are stressed. We know, you know, when someone is stressed, it's activating the sympathetic nervous system, and it's causing through the access the release of cortisol, which also creates inflammation and creates leaky gut, you know, in activities related to the health of the microbiome and toxic exposures, alcohol, tobacco, all these thoughts.

So that lifestyle is really making people more susceptible to the creation about. Yes. And the entrance of LPs into the bloodstream to activate the immune system and start this whole cascade of producing inflammation that ultimately affects not only the joints but the rest of the body as well.

Yeah. I'm not getting to the hefty question yet where we will get to diet, but I want people to understand that their diet definitely influences their microbiome.

But that has such a far reaching effect to the rest of the body and the joint. So if you are experience and experiencing any kind of joint pain or inflammation or degeneration, this is really the question, the conversation you want to listen up to.

So just kind of summarize what you said. We get this leaky gut from an imbalance diet, a high Western style diet, a lot of stress. Two things that without intention are unavoidable if you're not really like paying attention to it.

This leaky gut creates the lipopolysaccharide, which then further enter the bloodstream, leading to systemic immune activation. Joint inflammation. That dysbiosis in turn, reduces some of our good guys or our good anti-inflammatory products, which are short chain fatty acids like butyrate that you mentioned.

Now, I see this as also influencing things like autoimmune joints. Right. So like autoimmune arthritis, rheumatoid arthritis, specific bacteria linking rheumatoid arthritis and ankylosing spondylitis, spondylitis.

So if gut if bacteria in your gut are literally sending signals to protect or attack your joints, if that's a fair way to put it, how can individuals that are dealing with this, like, start addressing the gut microbiome that's driving their inflammation?

Yeah, it's such a good question.

Plant-Based Eating for Joint Recovery

I know lots of people watching are probably for the first time they've seen about this intersection between my lifestyle and my joint pain, because it's never, you know, gosh, we didn't even know his doctors.

Right. And then, you know, one thing I would just add on there, too, that, you know, many of the things that we're taking for our joint pain contribute to this biopsies as well.

Motrin, Advil, Aleve, all these anti-inflammatories created this biases. So it becomes this kind of whirlpool of, you know, pain from dysbiosis. This biases driving inflammation anti-inflammatory medications.

So it really becomes problematic. And people get stuck and they live with pain. And there's a lot of consequences. You know you limp and you develop secondary issues.

And it really can be hard. And I also feel for people that go to the doctors and doctors. I was one of them just didn't know. And so we do we do what we've been taught to do, which is inject cortisone.

Cortisone injections repeatedly over time can contribute to this biases. And they can ensure the converse sites, those beautiful cells that you described lay down.

And they they damage the body's ability to even repair. So you know, we just have a system right now that's not supportive of the body healing, regenerating itself because we're focused on symptom management, which is

pain.

So, you know, we can go deeper. But you're exactly right. Like the it's kind of a multi-part solution for people. One is now appreciating that our lifestyle is causing the dysbiosis, which through several mechanisms that we discussed is causing inflammation, pain and degeneration.

So addressing that through lifestyle and then also kind of locally find to help support the tissue that's been injured and give it an opportunity to repair and regenerate as well.

And so through kind of those two targeted ways, we can help people reduce pain through a process that regenerates and systemically reduce inflammation, that's contributing to pain and degeneration.

And then people can find a pathway forward that allows them to live as pain free as possible without having to do an event that are going to cause harm.

All right. I'm going to divert from my questions a little bit here, because I'm thinking of a question that probably many people who are watching this right now are going.

And I also think of some people I know, which, you know, I'm seeing people younger and younger get hip and knee replacements. I mean, my mom, 75, she my father to like they haven't had anything replaced.

But I'm now talking to people in their 50s who are getting replacements, and I know what kind of diet they have. I know what kind of lifestyle they have.

I know without doing a test that dysbiosis exists in their system based off of their lifestyle. So what is it that you are seeing in your practice? Like if people are like, oh, well, my doctor told me like the only I have osteopenia, I'm going to eventually need a hip replacement or I have like, what are you seeing like in your clinical practice?

I think over time, I would agree with you that more and more young people are dealing with chronic degenerative issues, which kind of then moves us out of the old paradigm that this is, you know, age related to Klein wear and tear over time.

And when you get to 75, your knees just wear out. You know, one quick aside is that I often do like standing X-rays of knees, and they may have like a painful right knee.

And you look at both knees and the left knee is more degenerated than the right knee. And but the left knee is not painful. So it kind of shifts the paradigm to say, well, wait a minute.

It it's not just the generation bone and bone that causes pain. Something else is going on and that's something else is, you know, perhaps it's a kinetic alignment problem that oftentimes, as you're describing, it's because people are now born with this biases and they're living younger from a younger period of their life with this chronic inflammatory state that is injuring their body's ability to regenerate.

And so it's very common to see that.

Nightshades, Fiber, and Anti-Inflammatory Foods

And in fact, there are lots of people who come in and they've not been athletic, they're not doing they've not been injured. And yet they have pretty far reaching arthritis, knees, hips, shoulders.

And you have to say, why is this happening in this individual that, you know, they have multiple joints that are generating without an injury and they're 45 years old.

And so it leads us back to, you know, a systemic cause, which is kind of diet lifestyle. Yeah. I don't know if you've noticed, like so, because I've done a lot of femoral head previews for some reason it's always in the US is the

right femoral head, seems to be the one that I've got on my desktop all the time.

I'm like, wow, we're really we're really working our our right leg there, our right. I know that's the way we drive. But at the same time it is. You know, it's not just that wear and tear.

It's our overall lifestyle. So let's talk a little bit about that. You founded the Plantation Project to transform how physicians think about food and disease.

So what does the research actually show about plant based eating and joint health, and what is the mechanism behind why it works? Yeah, it's quite remarkable. I'll start with the story.

You know, I've been hosting one week health emergency for a large fortune 100 company for 17 years. So they sent 100 people to spend a week with us. And, you know, they come in with lots of joint pain and lots of issues.

We beat them. Plant based diet, a little bit of exercise, teach them how to manage stress. And in just seven days, it's always amazing to me how quickly joint pain gets better.

And I'll never forget we had a woman that came. She had bone and bone in both knees, really severe pain. And at the end of the week I was just sitting on the beach.

I finally had a time to go to the beach and she came walking by with tears in her eyes and she said, you don't understand, doctor Stoll. This is the first time in 20 years I've been able to walk on the sand because my knees aren't hurting that shifting their bone and bone, she said, I can't believe it.

All I did was change my diet. Now, it's not always that effective, you know, it's there are different levels of impact, but inevitably people's musculoskeletal problems get better when they change their diet.

And so, you know, that's the reason that we started the Plantation project, a team out of my own experience as a physician, treating patients and seeing basically, as, you know, miracles happen when they changed their diet and lifestyle.

Things that we never were taught were possible in medical school and residency. And I wanted to help more physicians understand the science behind that, that there is valid science, and there's this growing body of thousands upon thousands of scientific articles that demonstrate the physiologic and biochemical mechanisms why this is happening, as well as, you know, brought a randomized controlled trials that are showing in populations when we utilize a plant based diet specifically for musculoskeletal conditions, that pain does improve significantly.

So what you do, I also do, but on a smaller scale, because I do retreats a couple of times a year, and just seeing what can happen in a matter of five, six days when somebody is fed a fully plant based diet and is put in that environment.

I mean, the brain fog that gets lifted, the gut where it's the funniest conversation is always like, wow. Like I had like the best bowel movement ever.

I'm like, well, that's what fiber does. But yes, you know, so these deals, right. It is a big deal for somebody who doesn't know what like that lightness feels like.

Protein, Carnivore Diets, and Collagen Myths

What that energy in the in the body when the body gets restored is it absolutely is critical. And I and just like you, I've seen it again and again and I and I have had attendees attend my retreats where it's like family members are attending that, like cousins and stuff. Like they haven't seen them and they're like, I don't know what you did to her.

But she came out a different person five days later. And I love this new person, you know? So it's really interesting

to allow people to experience this.

And hopefully the individuals are watching this are and kind of getting this renewed hope that there is a way there is definitely a way. And if they haven't tried it to consider it.

So to touch on what like just I'm going to keep kind of summarizing a little bit. So we talked about fiber. We talked about fiber feeding the microbiome, increasing the butyrate in the short chain fatty acids which can then reduce that leaky gut or that permeability, thereby what we want it to do reduce systemic inflammation.

We can add on phytonutrients like all the plant foods, things like polyphenols. Kirsten, curcumin they can directly modulate the inflammatory pathways.

Now, I understand that there's also studies that have been done on plant based diets and rheumatoid arthritis outcomes, where, you know, they've modified pain scores, functional improvement, all of this.

But what I want to ask you is the myth about the claim that nightshades worth worsen arthritis. Is there any truth to this? Yeah. You know, it's a very interesting question.

And I think that unfortunately, the nightshades get a bad rap all too often. You know, what I've seen through the years is there is a small population.

I think the studies estimate that it might be between 12 and 17%. So it's a small percent that may be responsive to some of the night shades. But largely most people do not experience that increase inflammation from the nightshade vegetables.

And we're talking about, you know, potatoes and eggplant and peppers and things that people would commonly eat. And I think that what's more important is to look at their more comprehensive aspect of their diet and lifestyle.

And that's where we find more of the inflammatory drivers, which are the sugars, the refined carbohydrates and the animal products that tend to drive inflammation and dysbiosis in combination.

That can create problems. And, you know, we don't want to just focus on the negative, but it's also a lack of fiber. And as you mentioned, the phytochemicals, the polyphenols that work, you know, not only to help turn off key inflammatory, which is the one I mentioned earlier.

And if kappa beta is affected by multiple things, including the polyphenols, you know, the anthocyanins from the blueberries, and they work locally in the gut as well to tighten the tight junctions.

So there's multiple mechanisms by what by which these things work. So it's you know, it's the contribution of the damaging and the lack of those things that are really necessary to help the system run efficiently.

Yeah. So let's not hate on the nightshades. It's not as simplistic as all right, let's just remove these foods. Some people might not be affected by them at all, but what they will be affected about is the sugar, the ultra processed foods.

There is there is no argument across the board there. So you mentioned meat. So let's talk about the confusion around protein and joint health specifically.

I mean you you led into it. So I'm going to ask especially around collagen supplements, bone broth, high carnivore diets or high protein carnivore diets.

And as someone who's spent decades in the sports and regenerative medicine area. What does the evidence actually say and what are people getting wrong?

I mean, I already know, but I need to hear you say that everyone needs to hear, you know, this is really important

because, you know, this is the pro science that we have to combat the scientific ideas that get passed around weight rooms and locker rooms that sound good at the outset, but they're not rooted in good biology.

I spent, gosh, about nine months diving into the idea of carnivore to understand it better because, you know, there are short term studies and testimonials of benefits.

So I wanted to ask myself, what's really going on here? And I think, you know, understanding. I'll just take like a couple of minutes to encapsulate what's happening so we can really understand the, you know, the damage of a high protein diet as well as the benefit of a high nutrient dense diet.

So the reason that the there's short term benefit from kind of a keto carnivore diet, even people like recognizing that they have lower pain. When you remove carbohydrates from your body.

Your body was designed to run on carbohydrates. You know, that's glucose is the fuel for the body. When that's gone, your body naturally shifts into a survival mechanism, which is ketosis.

When we're fasting, when we don't have access to food, the body shifts into ketosis. So the system can continue to run, and it pulls from fat stores to burn fat, to create ketones.

That can also keep the system running until the glucose comes back. When the body's in that survival mechanism, it turns off some key inflammatory switches.

NLP three is inflammasome and turns off inflammation. So temporarily people just speaking from the musculoskeletal standpoint feel a little bit better because they're not eating any glucose.

Their blood sugars get better because they lose a little bit of weight. Blood pressure can improve. The lipids don't improve consistently across the studies and they lose weight.

And so it appears like, hey, this diet really is working for me. I'm going to continue using it. The problem is there's a dark side, and that side is the Darth Vader side of all of this is that when you stay on that diet for too long, the body was never meant to stay in ketosis for a long period of time.

It's a short term survival mechanism. When you keep pushing your body into that state, it begins to naturally lose that inflammatory place, and then the foods you're using to push it into that ketosis start accumulating damage.

And the studies show that after 6 to 12 months, it's a complete reversal. You go from kind of an anti-inflammatory state to an inflammatory state. The lipids really begin to move in the wrong direction.

April staple B and LP, little A and oxidized LDL. You're packing fat into your liver and muscle because of the fact that the animal products which drives insulin resistance.

Stem Cells, Recovery, and Sleep

And we're creating dysbiosis to kind of high back to what we started in the beginning, all the animal products are creating, you know, the rise of the empire, right?

So if we're using our Star Wars to get the empire kind of microbiome ruled by Darth Vader pumping out and inflammation throughout the body, and that chronic inflammation starts to damage the joints and leads to more degenerative joint pain.

You know, we've removed the very thing that our microbiome needs most, which is fiber and is your audience now probably knows from all the other speakers.

The most troubling nutrient deficiency in the United States is fiber. Only 4% of any age group is getting the minimum recommendation, not even the maximum of 70g per day.

So we have this, you know, double jeopardy where we've, you know, disrupted the microbiome and we've put in a heavy, high protein diet, which creates a high acid load, injures the kidneys, creating, you know, systemic inflammation and damaging the joints from the inside out and contributing to accelerated issues.

And last comment for athletes, it's really important to understand that when you're working out, you're creating micro tears and muscle and and connective tissue.

And if your immune system is not healthy and robust, which in that kind of state, ketosis after six months, it's not able to go through kind of a G and repair.

You start getting partially repaired tissue that can't fully recover after a workout. And so it leads to issues of recovery of susceptibility to infections and partially healed tissue.

You know, I believe there is an athlete Djokovic who tennis player I have a big tennis fan. And when he changed his diet to, I believe a plant based gluten free, I mean, his game changed and I bet you that had something to do with that recovery on the joints, because there's a lot going on there.

I'm never going to now not think about Darth Vader invading my gut microbiome and like the little white, what are they, the Vader's? I don't know what they're called, like literally running around old troopers.

Storm troopers. Oh, my God, the stormtroopers are taking over. What about collagen? That's another popular one where people are just like, I gotta take my collagen.

It's for my joints. It's making me feel better. They're convinced by it. Is that really going to influence their joints? You know, our bodies produce collagen.

You know, we're taking collagen from an animal and the animal major. Collagen we to make collagen in our bodies, our joints, when they're healthy, make all the collagen that is necessary.

Some things that help or, you know, plenty of vitamin C in your diet and the amino acids that are necessary to build the collagen. But we can make all of our own collagen.

We don't have to take it. In fact, you know, the collagen are just peptides. They're amino acids. And so when we take collagen, it's a protein that's digested normally in our gut, like any other protein, you know, we have enzymes that snip those into little pieces and they're absorbed like any other amino acid into our system.

So in the absence of any of the other additives, you know, silica or something else they might put into these supplements, taking collagen is not necessarily like it doesn't.

It's not like you take collagen. Your body packages collagen and takes collagen to your skin and your joints. It's just a mean of acids that get absorbed.

But the real benefit like stepping back to say, okay, how can we assist our body in building healthier tissue, cartilage, connective tissue, collagen.

It really is the diet. You know, it's the fiber that feeds the healthy microbiome, the short chain fatty acids that are assisting and the vitamins like vitamin C and some of the minerals like copper that are assisting in the body and producing more connective tissue.

You mentioned earlier polyphenols. You know, the polyphenols are magical in our bodies. They do so many incredible things. And these are the, you know, the blues of blueberries and the dark purples of blackberries, which I had on my oatmeal this morning there, you know, the yellows of mango.

It's all these beautiful colors. They go into your body and they're working also on connective tissue and healing. They turn off genes that are involved in the formation of scar tissue.

They turn off genes that are involved in inflammation, and they turn on genes. They're involved in kind of upbringing up, right up regulating pathways that chew up damaged tissue and lay down new tissue.

And they attract stem cells to the areas of our body that are injured to help coordinate more of a robust healing, which is really what we're looking for, not just collagen, but we want to activate this incredible system inside of us that was designed to regenerate and repair tissue.

They increase fibroblasts. The polyphenols increase these little cells called fibroblasts, which come in and they basically stitch things back together.

They're laying down, you know, ligaments and connective tissue and tissue inside of our skin. They protect the sites to go back to those beautiful cells.

You know, they are very protective. And they turn off some, some regulatory switches that would lead to damage or degeneration of those contra sites. And they protect them from piece that degrade cartilage.

So in so many ways, you know, it's our diet doesn't work through just one mechanism. Like taking a collagen supplement to have healthier tissue is when we care for the totality of our diet, we're exposing ourselves to a wide range 30 plus plants a week.

With all this fiber and all these phytochemicals and polyphenols that were playing the keys of regeneration of our bodies. Symphony in such a magnificent way that these systems are naturally doing what they're designed to do repair, regenerate and restore the function of tissue.

Fibroblasts are also very interesting cell and and they get very confused as we age. So we really want to protect our fibroblasts. So they remember that they are fibroblasts.

When we age we can have an entire fashion conversation. But you dropped a word there that I don't know if people picked it up. And it's a popular word right now in regenerative medicine, which is stem cells.

Okay. How do we make our own stem cells for our joints? Sir, we are all born with lots of stem cells and depending on our age, and it's not just our biologic or our chronological age, it's also our biologic age.

And that's the age that's kind of the health of our tissue. We will lose stem cells over time. So a more unhealthy person loses stem cells at a faster rate than a healthy person, and they decline exponentially.

And that's just kind of the nature of life. But you want to preserve these. They're called MSCs, stem cells that are found in our bone marrow and our mobilized by different things that we do or injuries to come to an area.

And they're kind of like a conductor. They bring in signals and they signal all the different tissues to begin coordinating repair of a tissue. So if I twist my ankle, you know, leaving after this, this conversation, you know, there's an injury signal, it triggers stem cells to come fibroblasts.

And they be in coordinating repair so that in the next six weeks my ankle heals up. But we can also there's really interesting evidence and studies that show that food also can activate our SEM cells.

Things like a cup of broccoli, the serving the same serving size that we might eat for dinner tonight. As you're eating that broccoli, it is activating your stem cells.

It is calling them up and helping your stem cells to be revitalized, and to find those parts of your body where repair is necessary. So and stress can impact your stem cells pretty significantly as well.

So the and we also have, you know, I just quickly want to mention for people there's a key regenerative window at night when we sleep between kind of 11 p.m.

and 6 a.m.. And the first half of that is the repair, regeneration of the musculoskeletal system. There's a little bit of inflammation that comes overnight because inflammation levels are generally lower.

And again, that starts that whole kind of initiation of inflammation to repair tissue. And growth hormone is released overnight to repair tissue. And then the second half is the process for the brain flushes and gets repaired as well.

So and those were impacted by our rest which also links back to our diet. It's all connected. And this beautiful regenerative regenerative opportunity that we have every single day.

Okay okay. Two thoughts out of that. That what you just said, it makes me think of all the people going and getting stem cell injections, yet still eating a very inflammatory carnivore diet.

Let's just eat a cup of broccoli and make our own stem cells. Secondly, it makes me think of. So you mentioned this night window. I'm interested with this because like I mentioned to you, I have suffered from chronic pain for the last five years because I suffered a injury, a traumatic brain injury which resulted in three cervical disc herniation.

So like mine was like I got hit in the head. It's awful. I'll tell you a story another time. But besides the cascade of events, the physical is that it caused three cervical discs to herniated this way, thereby causing chronic inflammation down my right arm, which has been a healing process in its own.

But I notice the pain is more at night. Why is that? You know, it's it happens for several reasons. One, we kind of remove all of the other distracting stimuli.

So everything that could distract us during the day, we're moving, talking, thinking. Now we lay down at night and it's dark, and the brain can only think about the pain that's going down the.

So that's the first two. It's positional. You know we're off the specialty with your neck or your back. You're laying down and gravity is pulling on those discs and nerves in a different way.

Or we're in a static position as we sleep and the nerves can get inflamed. That's the second. And then third. You know, the body does have this a little bit of rise of inflammation overnight for repair.

And that can contribute. That can be a tipping point for something that's already inflamed and painful. So there's lots of reasons why it hurts. And then like you're mentioning, the problem is that you have pain.

You don't sleep well, you don't get into the regenerative window, which affects both, you know, your body's ability to repair, heal, that affects your ability to just tolerate pain.

Your pain sensitivity goes up when you're not rested. And when you're tired, you feel more hopeless and affects your mood. And so lots of these things can spiral.

And I've had so many patients through the years where an injury that doesn't heal becomes a tipping point in their life, and leads to this whole cascade of medical problems that follow.

I think for most people, you know, the foods that we eat when we're hurting, to try and feel better temporarily is like sugar, fat and salt because we get a little bit of a hit.

You feel better temporarily, but it causes inflammation despite this, so that whole piece can fall apart pretty quickly too. Yeah. No, I have my body pillows.

I've got my posture. I know what you're saying. And it has improved. And a lot of it has been, you know, my diet was already plant based before, but really upping and with some botanicals and herbs and all this kind of stuff.

All right. Next question. You've worked with athletes whose entire careers depend on their joints, and patients who simply want to walk without pain. Can you tell us, without breaking any privacy about a patient story where the gut, the diet, the join joint connection was the turning point in what happened to them?

Yeah, I sure can. There was a I was working with an athlete, female athlete who was struggling with, you know, fatigue, sleep disruption or chronic joint pain and had done a lot, you know, in and out of the training room struggling to get back.

And, you know, the first thing that we did was fine tune the diet. And I, you know, this is interesting. I have found much greater success working with female athletes than male athletes.

They seem to be much more receptive. You know, I used to work with the U. S. bobsled team, and they would come up with a Snickers bar and they would say, doctor, still, I have my protein bar like that is not protein.

They just didn't get it. But the female athletes to to change diets, she became plant based. She was actually a bobsledder. And a lot of that systemic inflammation went away.

Her recovery times after workouts improved dramatically. Joint pain improved significantly, which allowed her to start working out and working through some of the biomechanical problems that she had, allowing her to resolve knee pain.

And she just felt better every day. And, you know, her performance improved because of that, that single change. But it really was the diet intervention first that allowed many things to improve, including her mood, the way that she saw life, the immediate effect after just a week of reducing inflammation and, you know, catapulted her forward in her career.

Okay. All right. Last question. And I want to be very concrete about this. So somebody who is watching or listening right now, they may have been told that their arthritis is permanent or that they've been managing pain for years and are just exhausted by it.

What are the three most important things they can do starting this week? Concrete to begin healing their gut and changing their joint trajectory? Yes. So I'll give three concrete and then at the end.

So the three most important things that people can do this week. Number one is shoot for 30 plants this week, you know, ten servings a day of a variety of dark colored fruits and vegetables.

And I make that comment because then several studies that have shown comparing light colored fruits and vegetables to dark colored fruits and vegetables, that the dark colored fruits and vegetables result in a 20% decrease of inflammation.

HSC versus light colored fruits and vegetables, which have a slow increase of inflammation over the course of two weeks. So, you know, generally ten servings dark colored fruits and vegetables every day.

And you don't have to get protein from animal products. You get more than enough protein from your plants. You'll get everything that you need protein wise that you that's necessary for your body to rebuild from plants.

On top of all of those benefits that we've spoken about. Number two is get a good night's sleep. Sleep is essential for so many things, not just the regenerative window, but in supporting your decision to make healthier choices when you're fatigued.

You know, all of us know we struggle. You know, it's when we're not sleeping well because of the hormone changes. We're much more susceptible to crave carbohydrates.

And this is not craving broccoli and of kale. This is craving sweets which are going to contribute to this biases. And so sleep is really, really essential.

So you know a great diet a really good night's sleep. And I believe just, you know, starting with some kind of movement through pain free range of motion, it may be just isometric exercises.

You know, we just you're sitting in your chair watching. I'll just put this down and I'm just pulling up and pushing down on one arm. You know, I'm pushing to create some tension.

But to do something that is activating your muscular system because that also is turning on some of those regenerative systems and it is assisting the body in multiple ways.

And when we start moving, things also heal. Tissue is meant to move. And when it's static, it gets fibrotic and painful. It faster that you talked about.

So find ways to just begin adding some kind of movement, some kind of mobility into your life. Wherever you are, keep moving and find some way to exercise and then just build on those every day.

I'm going to add a fourth in here, because this is like the secret for long term adherence is simply to begin changing the way that you think about yourself.

You know, the diet industry and this entire place where we live today has often caused us to think that we don't have enough willpower, that we are ashamed of, that we couldn't keep these diets, that we feel guilty, and that's not the case.

You are perfect in the way that you're created. You have enough willpower. It's not your fault, it's the system. We just have a broken system. So if you can begin shedding some of that old language and adding a new language that things like, you know, I'm learning to become a very healthy person.

I have all the willpower inside of me and the support around me, and I can make healthier choices and begin changing the way that you speak to yourself and the way you identify yourself.

Healthy versus unhealthy. Because the research shows when we change what we believe about who we are, our identity, we don't even need willpower to make those decisions.

It bypasses the need for willpower, and we naturally make healthier choices when we believe that we are healthy and that we can do these things. So changing our identity is that that core piece?

Absolutely. Thank you for the bonus. And Scott Doctor Stoll this has been genuinely eye opening. The idea that bacteria that are living in our gut are sending signals far, far away to the joint and that we actually have our own joint microbiome.

That means that every meal is a vote for which direction we go. And that's the message I want everyone to carry with them. So where can people find you?

Learn more about you, learn more about Plantation Project? Yeah. Thank you. You can learn more about Plantation Project, which is an offer profit educated that's dedicated to educating healthcare professionals and also people that are interested in learning more.

We have an annual conference called The Power of the plate, which will be next May 2027. You can learn all about that at Plantricianproject.org. And that's plantrician plantricianproject.org.

We have a free journal ijdrp.org. So sign up for the free journal. You can learn more about me. I see patients two days a week still because I love seeing patients.

Maxwellclinic.com and I'm happy to see anybody and work with them on overcoming pain. Perfect. Thank you so much. Key takeaway guys is your joints are not breaking down.

They are speaking to you and your gut is a translator. Change what you feed your microbiome and you change what it says to your joints. So stay tuned for another episode.

Don’t go anywhere else. We’re just getting started and thank you so much.