Introduction and hypertension overview

Hello. I'm Dr. Laurie Marbas. And today I'm very excited to introduce Dr. Andrew Freeman, who's not only a friend but a very amazing cardiologist. He's really in help us understand, high blood pressure and the regulation in a few of those questions.

But how are you doing today? Dr. Freeman I'm great and thanks for having me. No, absolutely. Well, thank you for joining us on the summit. And I'm can't wait to hear your pearls of wisdom as we really look to understand, you know, blood pressure, regulation and and really understand maybe the plant based perspective, which kind of gets me to my first question.

So what are the foundational principles of sustained blood pressure regulation, especially maybe from a plant based perspective? Yeah. So I mean, maybe I should even back up and let people know that the scope of the problem is humongous, right?

So something in the range of 50% of Americans suffer from high blood pressure, commonly known as hypertension in medical jargon. So it is incredibly prevalent.

And the reason why it matters to people like me and it really should matter probably to all doctors is it's super low hanging fruit to improve cardiovascular outcomes.

Meaning for roughly every 20 points that we go up, on average over 120 systolic, the top number, the risk for dying doubles. So you can imagine that is an exponential problem that very few people do well.

And the truth is, the vast majority of Americans that are, quote, under treatment, unquote, for blood pressure don't necessarily have aggressive enough approaches.

And we know that aggressive blood pressure, control in community dwelling individuals, meaning not people in institutions or nursing homes, etc., actually it really improves outcomes.

So really the major principles are that first it should be guideline directed. There's a lovely humungous document from the now ACC/AHA and a number of other societies together on the management of hypertension.

And it goes into all the different pearls of wisdom and facets, classes of drugs and where to start and so forth. And the truth is, the goal is to get people under ideally 120 over 80.

And there's a lot that has to be done in order to measure blood pressure. Well, and a lot of people don't realize this. Even doctors don't realize this, that when someone zips into your clinic that ran from the parking lot, they've got their traffic.

You throw them into the medical assisted workup booth and you throw the blood pressure cuff on and their blood pressure is high. That's the blood pressure that we record.

And of course, that's not their accurate blood pressure. So I always tell people that, doctor blood pressure, you know, as I always take with a grain of salt, you know, you're supposed to sit quietly, you're supposed to pee and empty your bladder.

Believe it or not, you're supposed to have both feet on the floor. Your arms uncrossed, your arm and heart level, and like all these things that none of us do at any doctor's office.

And so our blood pressures are often wrong. And then the other thing that patients need to do is periodically

calibrate their blood pressure cuffs, meaning they need to bring it in and either have it tested against what someone can hear or a medical grade calibrated blood pressure cuff.

So once you get all that out of the way, then you're like, okay, does this person actually have high blood pressure or not? And then what do we do about it?

And the truth is, most of high blood pressure we don't fully understand why people develop it. Right. We call it essential hypertension, which is a weird thing to call it.

Blood pressure measurement and treatment basics

It's certainly not an essential thing to have, and it's certainly not something that anyone wants to have. And most of it is what we call idiopathic. We don't always know why, but what we are learning is that as people get heavier, as their lifestyle gets more sedentary, as they have untreated sleep apnea, untreated diabetes or undertreated diabetes, their blood pressure tends to go up and their cardiovascular risk goes up.

And these are all sort of interconnected in every way possible. So when we treat blood pressure, we often will start actually the guideline directed therapy for all comers is typically a drug like chlorthalidone which is in the same class of drugs like hydrochlorothiazide, although chlorthalidone happens to be three times more potent and very effective, although there is a slightly increased risk of diabetes with using it in hyperkalemia hyponatremia can occur.

So you have to always monitor for that. But that said, it's a very effective drug. And then from there we go into the various classes of ACS and ARBs and, you know, calcium channel blockers and beta blockers, all these other things.

But in general, you know, the goal is to hit multiple pathways, to control blood pressure. And so that's a really important concept because it used to be and four generations ago and the people who trained me right, you would start one drug and then maximize it to the maximum possible dose, and then you would add another drug.

And now we started to do a little smattering of this and a smattering of this and a smattering of this to try to hit all the different pathways at once, which is much more effective.

That said, what is the most effective? Antihypertensive It's probably exercise and diet together. And so what does that mean? Well, it turns out that if you can get 30 minutes of breathlessness in every day, this is an amazing effect, that lowering blood pressure.

And for those of you that are, you know, really want to geek out on this, as you probably know, if you start exercising, your blood pressure will actually go up for a bit.

And then when you stop, it actually comes out lower than when you started. And that's the effect we're really after. So 30 minutes a day there. The other thing that most people don't realize is we consume far too much salt.

So salt used to be incredibly scarce in the diet and now it's incredibly prevalent in the diet. And so we are quite avid as human beings for salt because it was so scarce and animals do this to right saw this scarce animal based diet.

Right. If you're a deer, you know, you're eating grass or whatever it is, you would go find a salty rock or a salt lake and get salt in your diet. And, you know, if they had, you know, chips on every corner, they would just eat that, which is what Americans do.

So that said, you know, salt content and believe it or not, salt hides in everything. So for those of our listeners that may still eat meat, poultry, for instance, is one of the number one sources of salt in the American diet.

And that's even before it leaves the grocery store. So salt is an amazing component. And then the other part of it is there's something quite magical about eating plants, and it could be the potassium content, it could be the naturally

occurring nitrate content of many green leafy vegetables and beets and other things like that.

But they all have factors that seem to relax blood vessels and keep blood pressure low and improve vascular health. And that's really where the magic is.

So how many times have I had a patient call me up and say, Doc, you put me in all these great medicines. I change my lifestyle because I actually thought what you said made a lot of sense and now my blood pressure is 90.

I can barely get out of the chair. And I'm like, Great, let's get you off of these blood pressure pills. So I would say that, you know, there are certainly people out there who have and there's a more of an emerging epidemic of this hyper aldosterone is in where people respond to spironolactone and a lot of that also has to do with lifestyle.

But there are lots of reasons for people to have high blood pressure. But I think it really, really response to lifestyle probably more than almost any other disease.

So that was a very long winded answer. Sorry. No, I think it gets to the point of, you know, I like how you're saying you need to hit multiple systems at once.

And that's kind of how we've changed our principles of treatment with medications. Then maybe that's also kind of go to the next questions. How do whole plant based foods contribute to stabilizing blood pressure levels, and are there any specific foods or nutrients that have been shown to be particularly beneficial?

Yeah, so a great question. So you probably are familiar with the portfolio diet and the Dash Diet, right? The portfolio diet is one of the very first medically tested plant based diets and the dash diet dietary approaches to stopping hypertension.

And they're if they're not fully plant based that are mostly plants whole and unprocessed with limited added salt, highly effective in lowering blood pressure for a variety of reasons, as you mentioned. So we already know that's the case.

But it also turns out that many athletes, as you may know, are sort of doping, if you will, with beets and beet greens these days. And they're surprisingly effective with no drug effects.

Right. Which is pretty great. The only thing beets might do is turn your urine and stool red, which can be scary for some, but in general, very effective.

In fact, there was a study several years ago that showed that the equivalent of roughly a cans or 250cc of beet juice a day can lower your blood pressure as well, or better than many of the pills we commonly use.

So beets are a great thing. Greens are a great thing. Potassium rich fruits and vegetables are an amazing thing and there's really not one superfood, if you will.

Then I say, Oh, this is what's going to lower your blood pressure. But when you cut out junk, when you cut out processed food, when you cut out all of the highly ultra processed foods we eat, it works great.

Diet, plants, and stress reduction

But I should I would be remiss to not tell about sort of lifestyle factors beyond food, which I know you're going to get into. But stress is an incredibly important thing.

Right. And I know you're probably going to ask me about this, but maybe I'll jump. But you know, the medical word for high blood pressure, of course, is hypertension.

Right. Too much tension. And there really is something to be said for that. Right. We all notice like if you almost get

into a car accident or you watch a scary movie or you get into a fight with your significant other, whatever it is, you can feel your blood pressure rise.

Some people turn beet red, right? Because their blood pressure is so high. So, you know, these things really do happen. And so we live in a, you know, maxed out stress world.

Is there a way to get rid of stress? And the answer is definitely. And will that contribute for sure. So. You know, that's exactly right. So I was definitely going to speak to stress.

So are there any particular evidence based strategies for stress reduction that can contribute to an improved blood pressure? Yeah. So you'll get a kick out of this.

You probably already know this, but there are the so-called Type A or type one personalities which most of us doctors are. It turns out that that actually puts us at risk for a variety of cardiovascular conditions.

So, you know, figuring out how to de-stress by any mechanism, but I would tell you, is actually more recently, things like yoga and other mindful meditation approaches are very effective at lowering blood pressure.

Simply focusing on your breathing, whether you call that yoga or focusing on your breathing, also works. And then in many parts of the world, they do really interesting things, right?

They go for hikes or in Japan, they call it forest bathing, right where they go out in the woods. And it actually works to keep their blood pressure down and so forth.

So I guess what I would say is, yes, I think there's a lot of things out there that can certainly lower blood pressure, physical activity being a key one diet and then, of course, some form of stress relief or mindfulness is is a really powerful approach.

You know, there hasn't been a lot of randomized controlled trials here because you can imagine it's difficult to tease out all the different things. Right.

So, you know, for instance, some of my patients say, well, I find myself most mindful when I'm at church or synagogue or mosque or whatever it may be.

You know, we haven't thrown blood pressure cuffs on people while they're in, you know, you know, intense prayer and whatever, although we probably could that would be a neat study and see what happens, you know.

So anyway, bottom line is, I think there's a lot out there and a lot emerging. But it appears that getting rid of stress or turning disease into ease really seems to do wonders for people's blood pressure.

No, I think that's a great just a really quick story. I had a patient who had elevated blood pressure. I think it was like close to 140 was close to 90 diastolic in.

What was interesting is she had a lot of anxiety and so we just had to do the four, seven, eight breathing. So it's basically four repetitions of breathing in over for holding your breath for seven and releasing over eight in her blood pressure.

And I checked it with my ears. It wasn't like, you know, any type of electronic blood pressure cuff. It dropped 15 points historically, literally in a matter of minutes.

So I think it really speaks to the importance of being mindful in how we're responding to stress because we all see stress, but how are we responding, the mindset?

So absolutely. And actually a lot of that breathing that you talk about is is some of the cornerstones of many of the different mindful techniques for the listeners that are interested.

There's this wonderful institute you may have heard of called The Art of Living Institute, and they offer a variety of meditation classes that are actually designed for doctors in many cases to help with burnout and resiliency.

And some of their breathing techniques are very, very similar to that, and it's pretty effective at getting rid of stress. So anyway, food for thought, if you're looking for some outlets, do that.

And then I would also say there are many religions that are quite welcoming to outsiders that would encourage you to visit, to learn mindfulness in various parts of our country that I would encourage people to check out Buddhism and Harikrishna and a handful of others all incorporate many of these.

And it's it's really interesting and unique to hear about this. And many of them actually practice plant based diets as part of their beliefs, which is pretty neat.

So yeah. Well, one of the blue zones right here in California, Loma Linda, is Seventh Day Adventist and mostly vegetarian. Vegan. Absolutely. And so another question I think is really interesting is can you explain the role of sodium and potassium in blood pressure regulation and the importance of their balance?

Because I do know that, you know, consuming maybe soy based miso even gives you that a little bit of salt is less likely to raise blood pressure versus some of the others.

So we'd love to hear your explanation of that, please. Yeah. So I don't know if there's a clear set of guidelines here or, you know, this is what the experts all say.

So what I would say is this, you know, salt is salt. And in theory, if you consume salt, be it potassium chloride, sodium chloride, magnesium chloride, which most people don't since it's really road salt.

But and so potassium chloride for that matter. But, you know, they all, in theory, can raise blood pressure via cardiac mechanisms and a number of other things.

What seems to be the case is that things that are higher in potassium seem to lower blood pressure. And the mechanisms behind that, I don't think are entirely clear.

So what I usually tell people is that you probably don't ever need to add salt to your food. And of course it tastes good. We all get that. And then the things that occur naturally in your fruits and vegetables will probably lower your blood pressure better than anything.

So I'm not sure there's an exact balance. And I think you're right that, you know, some of the fermented soy and other soy products, miso, etc., which are quite tasty and may be more than you know, naturally salty by virtue of their their production don't seem to have the same potency of, say, eating a bag of chips or a hot dog or something like that.

So I think there is a variety of factors at play and it would be hard to say, well, how do you know it's not the soy in all of its antioxidants playing a role?

And how do you know it's not this? So I guess what I would say is, you know, do your best if it comes from a package, try not to eat it. You know, the thing I often say to my patients is the longer the shelf life, the shorter your life.

And if they can get to a place where they're eating a predominant, you know, produce rich, minimally processed diet, great. And then when it comes to things like miso paste, use them sparingly, right?

They come in these little teeny tiny tins because they should be used sparingly. They're really tasty and they can be yummy and feel free to do it. Just don't overdo it.

And then there are people among us and you probably know many of these people that if they go off for a salty

meal, they can't get their rings off or their bracelets get too tight or their socks get so deep and you can't see them in their calves anymore.

So, you know, those types of people might have to be extra careful of salt. They're very salt sensitive. And why they're salt sensitive, I don't know. It may be genetic.

It may be something else altogether. I wish I could just tell you, but I would say that there's not an easy, clear set of guidelines about how much sodium versus potassium.

Sodium, potassium, and vascular health

But what it turns out is more potassium seems to be beneficial. Absolutely. Well, this kind of segueing into the salt. Can you explain the salt mechanisms and what actually how that dries the blood pressure up?

Did you gave us a hint of it, but yeah. Yeah. So I don't claim to be a nephrologist. They're much more cerebral than I could probably ever be. And that's really the people that might know the answer.

And if you haven't had a chance to speak with Dr. Joshi yet, he's really pretty smart and probably could give you a much better answer than I could. But when we consume salt and right salt and water stick together just to keep it simple.

And so salt and water stick together. And that sort of sodium chloride solution, if you will, often can stay in the blood vessels and raise blood pressure and when it's really doing behind the scenes as it's triggering your body to produce a whole bunch of chemicals like renin and aldosterone and angiotensin and all these things that we now have drugs for that block, that effect to raise blood pressure or lower blood pressure, depending on what's going on.

And most of these mechanisms are actually adaptive, right? They're designed like if you were to become acutely hyperventilate, bulimic, like you were to bleed to death or something that your body would constrict down as a result of all these different things being released in an effort to keep your blood pressure up and keep your your mind profuse.

And so, you know, in modern society where we are, you know, typically not bleeding out, although I guess it happens, you know, when you eat a lot of salt, it triggers all sorts of mechanisms that contribute to blood pressure elevation.

And part of that is also to help push the salt back out into your urine. Right, so that you can excrete the salt. And then when it becomes chronic, it starts to become much more disarray.

So that's my overly simplistic cardiology answer. I don't know if that was in line with what you were thinking, but. No, I think that's fine. Yeah. Just speaks to, you know, bringing in more fluid into the vessels, hardening the arteries that basically, you know, salt.

And I should talk I didn't talk much about the hardening of the arteries. Right. So, you know, a lot of people, you know, if you go to probably you're in my parents generation, you know, when they would forget things as they were older, they would say, oh, that's hardening of the arteries.

Right. And there actually was probably some truth to that. Right. So hardening of the arteries is simply atherosclerosis or calcification about their sclerosis, which is a marker of coronary disease, cerebrovascular disease, whatever it may be.

And as we eat junk and we don't exercise, atherosclerosis becomes more prevalent and our blood vessels lose their elasticity and suppleness. And they also don't respond well to things like nitric oxide and all these other things that relax blood vessels.

And so, you know, there's a whole variety of mechanisms that as we start to eat poorly, if we develop diabetes, for instance, it impairs all sorts of endothelial function, which are the blood, the cells that line the blood vessels.

And we end up with, you know, the inability to significantly sort of dilate our blood vessels when we might need to. So you can imagine that if you have very stiff blood vessels and you eat a lot of salt and water, that that pressure has nowhere to go except to raise the pressure in the vessel.

You know, it's funny, in many of my patients that I see, typically the men who come in later in life and they have erectile dysfunction, I always screen them for ankle brachial index, which is a blood pressure on the arm compared to the leg.

And many times the blood pressure in the leg is so much higher than the arm. And we're, of course, looking for the opposite lower all that means that the blood vessel has become non compressible or nearly non compressible.

And so they can't really tell if there are significant blockages in there that way. So anyway, very interesting stuff. And, you know, the more you look, the more you find these things.

So yeah, that's true. The more you look, the more you find for. Absolutely. Which brings me to the conclusion, at least to this part of our conversation.

so that treatment I have a question regarding a few different things at home and maybe some resistant hypertension, but could you discuss the importance of managing blood pressure at home and how frequently patients should do that?

Yeah, so if you are somebody who is suffering from hypertension and especially if you're trying to change your lifestyle, what I want to point out is it's very important to get that blood pressure under control as quickly as possible.

And this may sound strange to some of your listeners, but my suggestion, what I do is I have my patients come back weekly for medication titration to get their blood pressure under control, usually in under a month.

And then from there we can you know, I always tell people to kind of put out the fire before you can plant flowers. Planting the flowers is changing your lifestyle and getting off of these meds.

So a lot of people think that when they get a medicine, it's permanent. And for many it is. But for people who are willing to make these massive lifestyle changes, they can get off of their pills, which is really, really awesome when they do it.

So in general, when I first see a patient, you know, we used to prescribe these things called ambulatory blood pressure monitors. I don't know if you had any experience with these.

And then they were largely denied by insurance. And there's all that. In order to get it now, you have to like prove all these crazy things. So what I usually tell people to do is to go on to a website called validatebp.org and find a blood pressure cuff that they like.

They're usually around 50 bucks. Some of the good ones are from like Omron Omar and others and get a good blood pressure cuff. And then I want them to spot check.

So one of the things that I actually hate the most is when a patient will come in and they have checked their blood pressure for six years at 7:00 in the morning, every day.

And then they tell me their blood pressure at 7:00 in the morning is always normal. And I said, I bet it is, but what about the rest of the day? Right.

So you really want to spot, check and do it randomly. So when you're first diagnosed with high blood pressure, it

makes sense to spot check three, four or five whenever you have time four or five times a day.

The ambulatory blood pressure monitors we used to use, you know, would check every 30 minutes or an hour, depending on how we had them set. So we got a lot of data and we could figure out what was going on.

And interestingly, we often found that people had nocturnal hypertension, which would often be indicator of sleep apnea, which is also highly associated with daytime hypertension.

So nevertheless, I recommend people check it three or four times a day randomly throughout the day and kind of get a running average. Now, remember, you don't have to call your doctor if your blood pressure hits 140 once, right?

So if you're watching a scary movie or you get into a car accident, that is, you decide to check your blood pressure. It might be high. That's okay. Right?

Blood pressure is an adaptive mechanism to keep you alive or safe or, you know, fight or flight or whatever it is. But at the same point, if it's staying and usually I tell people over 130 is that normally our action threshold, even though we want blood pressure lower, to give your doctor a call to get that under control more quickly.

And so typically we'll have weekly visits where we adjust meds and check bloodwork and adjust meds and check bloodwork until we get it under control.

Home monitoring and resistant hypertension

So the bottom line is be aggressive with your doctor. Remember that your doctor or nurse practitioner, your PA, whoever it is, works for you and you want them to be aggressive with your care to keep you out of harm's way.

And if you're not finding that, take it into your own hands. Right? So check your blood pressure and say, you know, Dr. Smith, my blood pressure has been running 138 every time I check it. And I need you to make an adjustment in my medications while I change my lifestyle.

Very reasonable. Perfect. And I also like to say, you know, make sure you're checking in at least once without medications, because that will give me an indication how you are outside of medications. Right.

So if you take medications and it gets low, we'll kind of get an idea doing this either slightly titrate or take you off completely. So that's always really helpful to.

Know and I did do that one just a little bit differently, only because some of the medications have longer half lives. So I wait until they get closer to like 110 most of the time and then I'll back off the drug.

So yeah, absolutely. Yeah, absolutely. Especially if they're symptomatic at all standing, getting dizzy upon standing or they had great energy and now they're super fatigued.

And then also, you know, kind of speaking to people who are improving their health, if there's others in the home that are also on high blood pressure medications, please convey this information to them because they actually might also be finding some benefit.

I call it positive collateral damage. So the. Accountability partners. Yeah, exactly. Exactly. So, you know, share the information. But getting to a little bit more tougher cases for those with resistant hypertension, which doesn't seem to respond or like to common interventions or what advanced strategies or treatments might be considered or reasons why that's happening.

Yeah, so resistant hypertension and it depends on which definition you like most people would say that they're usually on for more drugs, usually one of them a loop diuretic.

So I would tell you that sadly a lot of those cases that I see are not on loop diuretics and those are drugs like furosemide or torsemide or be met at night or whatever your favorite is.

So a lot of those are aiming to get rid of that extra salt and water. For those of you that are on a loop diuretic and it is not working first, most of them are threshold drugs, meaning that if you take furosemide at 20 and it doesn't make you pee much more and it doesn't have a major effect on your blood pressure, you might need to double the dose because your body has gotten used to it.

Some people would refer to that as tacky full access. So that's one too, is a lot of people, they take a water pill and this is like the bane of my existence is they get thirsty and then they drink a lot of water and they eat a lot of salt and they completely defeat the pill.

And I always tell people that if you remember that Seinfeld episode with the soup Nazi said, No soup for you, soup is truly the antidote to a water pill.

It's salt water. So I usually tell people, no soup for you. And be wary of hidden salt in a variety of things you'd never think of as salty. Once you exclude that, then you typically have to try to get somebody on a drug like Spironolactone because many people do respond.

You don't have to do all the formal testing for hyper, although and all these other things. But you can. And then after that I typically will reach for less commonly used drugs, you know, believe it or not, things like minoxidil or clonidine or whatever, which I don't love using for one reason or another.

And I won't bore all your listeners unless you really want to know those details. And then I hesitate to reach out to either an endocrinologist or a nephrologist for them to weigh in with us, because many of these advanced cases of refractory hypertension have some underlying endocrine issue or nephrology kidney issue and nephrologists, very surprisingly beneficial entity when it comes to managing resistant hypertension.

So use them well. And then most importantly is many people are not necessarily doing a lot of lifestyle coaching. So many of the patients that I see, you know, I'm the first one that ever talked to them about their diet or their exercise or their sleep apnea or their stress.

And I would tell you, gosh, how many times have I had a case of, quote, refractory hypertension where the spouse says, you know, Joe snores like he could wake up the whole neighborhood and we sent him for a sleep study.

And lo and behold, he is reporting sleep apnea and we treat it. And all of a sudden his blood pressure is normal or Joe starts exercising and loses as little as 3% of his body weight.

Blood pressure can drop. So there's so many amazing lifestyle things that people are never told for one reason or another that are effective and sometimes really effective.

So that's exactly right. So lots of conversations that should continue on, maybe with a specialist or cardiologists like yourself makes perfect sense.

So I think the final question would be great. With the focus on a plant based diet, how can individuals ensure they're getting all the necessary nutrients while also working on improving their blood pressure?

Like are there specific food categories that you would highlight over others? Yeah. So, you know, first, a lot of Docs out there are in the habit of giving out supplements on their first visit in large quantities.

And many of those doctors actually sell the supplements, which you can imagine has its own conflict of interest and sometimes they need them, right? So that's great, but sometimes not.

And remember that eons and eons of human beings survived without vitamins and whatnot. So we have clearly made it this far without and now people are eating poorly.

So if you eat a grain that has been stripped of all of its nutrients through bleaching and processing and whatever, you're going to be nutrient deficient.

Plant-based nutrition and supplements

But I would say that first of all, if you eat a well-balanced diet, which means that you're eating all the colors of the rainbow, you're eating whole grains for starches and energy and so forth.

The likelihood of a deficiency in anything is really low. The only thing you might become deficient in is B12, and that typically can be gotten either through nutrition or brewer's yeast, if you like that on your food or through a multivitamin.

Most of us that live, you know, Colorado and above and other parts may be vitamin D deficient. You can get a lot of that from mushrooms that are grown in the sun as precursors and then some sun exposure yourself and if not a supplement.

And then there are some people out there who might have like, you know, DHA, EPA deficiencies. This is pretty controversial in how they may represent and show up in the clinic.

But if you eat an occasional walnut or ground flaxseed or something like that, or if you want, you can take algal oil, which is where your fish get their fish oil from. Right.

Or just eat algae, if you prefer. But you've got to eat a lot of it. Our bodies are not that efficient at making that, but they're efficient enough that they can do it.

So in general, I think you can do fine. You know, me personally, I've been plant based for, I don't know, more than a dozen years. If I remember to take a multivitamin once in a while, I'm proud of myself.

But in general, I usually eat well enough that I don't need it. I usually try to take B12 a couple of times a month. As you may know, the the pill that you all will take is something like 10,000% of your RDA, your recommended daily allowance.

And that's because it's not absorbed all that well. So do take that from time to time if you can. But I think in general, you probably won't go, you know, nutritionally depleted anyway.

Right. So one of the things that has been told for years is, oh, if your kids grow up vegan, they're going to grow up these little pinheads and be, you know, mentally slow and unathletic.

And the truth is, that's all been disproven and in today's massive childhood obesity epidemic, we really should all be going plant based for our children's sake as it is.

But of course, the American curse is you eat, you know, you grow up your whole life, you save your money, you retire, and then you look forward to heart attacks, strokes and dementia.

You know, we should be doing this early in life anyway. So that's it. I think if you eat a well-balanced diet, the likelihood of nutritional deficiencies are low and if you're worried about it, they make a variety of multivitamins designed for vegans.

There's one out of Boulder and a handful of others that are out there that, you know, are surprisingly effective and can help you maintain. But, you know, there's a lot of people out there who are going for those dried fruit and vegetable powder pills.

And I just tell people to eat the fruits and vegetables. Right. It's works. It's tastier, it's filling. You know, you can't feel full on a little pill full of dry powder.

You just won't. So so that water weight that you eat with the fruits and vegetables, that really helps to keep people going. So anyway, so long winded answer to saying you don't usually need supplements, but there are some occasions or special cases where you might.

Absolutely. So again, it goes to fruits, vegetables, beans, legumes, whole grains in nuts and seeds and looking for a variety of colors in a variety of the plants throughout a week.

So I think that's fabulous. Absolutely. Yeah. And just to make sure the audience is comfortable, one last point is you don't have to eat like beans and rice together.

That's all been proven. So I just want people to know that if you have beans today and rice tomorrow, you'll be just fine. Yeah. And actually all plants have actually all the elements of all the amino acids is just in varying amounts.

That's why you to eat different foods as well. So really interesting research coming from Stanford on that. But again, thank you so much Dr. Freeman, I keep on calling you Andy, trying to be your trailblazer, Dr.

Freeman. And we appreciate your valuable service to our community as a cardiologist. And thank you for being on the summit. My pleasure. It's been a lot of fun. Absolutely.