# Dr. Brandon Roberts

Tue, 8/10 7:30AM 1:04:10

SUMMARY KEYWORDS

people, training, studies, muscle, myostatin, supplement, big, bit, run, couple, super, calves, week, thought, muscle growth, cox, human, roberts, good, bad

SPEAKERS

Michael Nelson

M

Michael Nelson 00:01

Hey, welcome back to the flex diet podcast. Thank you so much for listening. On the podcast, we focus on all things to enhance your performance, which could be competitively or in the gym, body composition and all without destroying your health in a flexible paradigm. So today, I've got my friend, Dr. Brandon Roberts on, we talk about a lot of really fun stuff we had. And he was at one of the dinners that I used to send recently, you can check out the other podcast I did with Dr. Guillermo Escalante. He was there at the same dinner. So I wanted to, you know, get some of these guys on basically to pick their brain more or less on just really fascinating topics that they've spent a lot of time researching. So in this one, our main topic is looking at the effect of n sides, like Advil, etc, on muscle growth. So Dr. Roberts has done some very interesting studies on this for the military, looking at different effects of Cox one and Cox two. And then we kind of go all across the board, talking about you know, science versus being a researcher versus being a coach and a practitioner. And Dr. Roberts has been on both ends of the spectrum, which is great. Some of the old school supplements we've tried and have not really worked out so well in the past some genetic stuff, which he's done working, we did a discussion about some the effects of Myostatin, right? And people may remember the old pictures of the Belgian blue and was a dog also, from a single versus a double Myostatin? No, what does that mean for muscle growth? And is there pros and cons to that? So check out this podcast with Dr. Brandon Roberts. And I thank you so much for listening. As always, it's brought to you by the flex diet certification, you can get more information at www dot flex diet.com Fl EXDT comm go to the waitlist there now it'll put you on to the daily newsletter.

And as soon as it opens again, you'll be the first to be notified. And you also get more exclusive content there also. So go to flex diet.com. Make sure you get on the newsletter, and enjoy this podcast with Dr. Brandon Roberts. And welcome to flex diet podcast. We're back here again. Today we're here with Dr. Brandon Roberts. Say hi. Hey guys. great pleasure to be here. Thanks for having me, Mike. Yeah, thank you so much for being on. We got to sit next to you at the ISSN president's dinner again, which was super fun. We had Dr. Guillermo Escalante on just the other week, which is great to talk to him. And one of the things I love about going to conferences, again, it was super nice to go to a live conference. I confess, I won't say what organization put it on. And the conference they did virtually was really, really good, like really top name, speakers. And it was great. But I got through like two and a half hours and I just couldn't sit in front of my computer anymore. So it was great to actually go to a live conference to get up between speakers, you know, to go to dinners, hang out at the bar and just talk to people about all sorts of different topics. So that was great.

03:35

Yeah, I think I you know, echo that sentiment. But there's a lot as a scientist, you know, that goes on kind of in between stuff at conferences, where you're talking about science and like, you know, you have a few drinks, and you're like, I've got this idea. Yeah. And then, five years later, you're like, writing grant, do a study on the idea. So I was super cool. Because like you sat down next to me. I was like, Oh, I know. Mike. actually met Mike. Yeah. And yeah, we had some pretty good conversations on that. And the table too. So

M

Michael Nelson 04:07

yeah, it was fun. I wish it was almost as probably some of you can do it. But for years, I've had this idea of, if you could just record like a dinner conversation there. You know, I don't know how well that would go over to the lay audience and maybe some stuff you'd have to you know, some of the weird borderline proprietary and other stuff is not published. You have to edit a few things. I'll But yeah, I had that idea. Like the first acsm conference. I went to 2004 I think. And then that's like before podcasting was really a thing. And then now it's nice to have just kind of follow up conversations too, which is great. Yeah, yeah, definitely. Yeah. And for people who may not be familiar with your work, you want to give us your your background. So not only do you do bodybuilding competitions, But you're working with the military and you have a super unique background, which I find is always fascinating.

05:06

Yeah, so I was, let's say, bred as a traditional academic. So I went to University of Florida for my undergrad, I did a molecular biology degree. And I did a lot of bacterial and virus research. And, you know, as I was going through it, I was like, this is really cool. But I really love exercise, how can I get into exercise, I was like, there's not really molecular biology and exercise. And I was like, Oh, wait, somebody introduced me to kind of the human performance, molecular exercise kind of track in exercise science in general. And I was like, Oh, I can do this. So I did a Masters to make sure that it would kind of be what I thought and work out. Got got in with a good pie young bi, we were actually studying muscle loss to like muscle wasting during cancer, or like when you get put in a cast, or just like de innervations, or you get a nerve damage type thing. And so I did that for my masters and my PhD. But I was still kind of like, hunting and searching and not like super happy about studying muscle loss. And at the same time, I was kind of learning about, you know, the different organizations and I was training on the side, and I was really just falling in love the whole my whole, like, undergrad, master's, PhD, just falling in love with like training, just in general. I play every sport. Go train every day, slowly learning like the evidence based community existed. So it was kind of I was, I was following your stuff back then. I was like, Oh, yeah. Oh, well, thank you. Yeah. So and it's exploded since then. But, you know, there weren't that many people around back. So, yeah, so I was like, Okay, I got it, I got to transition into like, hypertrophy strength training, like research just with my molecular stuff. And my muscle biology background. So my PhD was in muscle biology. And so I did when did a postdoc with Dr. Bowman, who is one of the like two people in the United States, that studies muscle growth, and does muscle biopsies and does big clinical trials. And when I say big, talking, you know, 60 to 150 people, someone there

M Michael Nelson 07:22

for that kind of work. That's massive,

07:24

yeah, pulling in like millions of dollars, or getting paid millions of dollars by the NIH to do this work. So I did that for a few years. And I kind of really learned a ton in my postdoc when PhD was good when my postdoc was just like, oh, wow, you actually are scientists now. Especially on the like, Grant side and the paper, you know, I'll get into that a little bit. So at the same time, I was also kind of going in with some different companies. So I started with the strange guys online training. Oh, cool. Yeah, so I was with them for like, four, four years, think of like 2015 19 or so. So as to train power lifters and bodybuilders, and at the same time, I competed in bodybuilding. So I was actually writing my

dissertation and prepping for my competition at the same time, which was,

M Michael Nelson 08:16
that's gonna be absolutely freaking horrible. It.

08:22
I wouldn't advise it. I made it. It was it was basically immediate, because I was so far ahead. Like, we had stopped doing experiments for a while. And it was kind of like an in between time for our lab. And so I just had six months to take my time writing dissertation and do a prep and not much else. So it was it wasn't that bad. But it was, you know, mentally a little hard sometimes. No, I can imagine. Yeah. So yeah. So I then I, when I went to my postdoc, a little before that I started online training, worked with strength guys. And I worked with macros Inc, for about a year, just coaching, just getting more more and more coaching experience I just wanted like, because I'm learning science at the same time, as I'm coaching, I can kind of like bring those two together, right? Yeah. And for me that just like, coaches have a lot of really good ideas. Oh, yeah. So kind of combining those, and then kind of figured out that the traditional academic academic life wasn't really for me, like, wasn't like I had figured it out already. I didn't want to spend at least that the next few years becoming a professor and kind of going that route. I was like, Okay, I got this figured out, I can come back to this if I want. And I'm and I was good at it.

M Michael Nelson 09:38
So I haven't done a postdoc too. And all the work you put into it. I mean, so that's you did all the requirements by far.

09:45
Yeah. And so and I have a lot of lots of friends in an academia like I was talking about grant and Abby Smith, Ryan and all those people. And it's super fun, but I just was I wasn't ready to do that yet. And so I was like, okay, I've been thinking about joining the army since I was like an undergrad. And the army actually has lab techs. So you'd like to be a research technician on the enlisted side, but I didn't really want to go on the enlisted side, because they have to do a lot of stuff. And it's really hard. It's, yeah, it's good. And you can use it to your advantage, but it's just hard, hard life. So I basically commissioned in after my postdoc, and so, I've been in about a year and a little bit over a year now, um, and kind of went through all through officer training and stuff like that. But it was an

opportunity to kind of continue doing what I wanted that like the science side, because I'm at a place that studies exercise science in the military, so it kind of worked out. But also, it gives me more of like a leadership and even like a physical activity roll where I'm, like, you know, still young enough to get out there and rock, you know, 12 miles with a 50 pound bag on it, like, That stuff's gonna fund. Right? And, and as you kind of age up, you get more responsibility of kids, you know, all this other stuff. So I was like, Okay, let's try this for, let's say, three to five years. And if I love it, keep with it. And if I don't want to go back to academia, so that's where I'm at now. I also am a Chief Science Officer for two different companies. So tailored coaching method. So as a coaching companies, I coach the coaches for them, basically keep them on track with the science and it's a really good group, and then a nutrition company called log smarter. And then I write for weight ology, and I write for examine, so I stay pretty busy, but I like all the stuff I do. So it's not like a chore.

M Michael Nelson 11:47

So Mr. Krieger isn't too hard on you at weight ology, jewel, right?

11:52

Yeah, no, he's, he's good. He's got a really good scientific mind too. So

M Michael Nelson 11:57

yeah, yeah, I finally got to meet him at the fitness conference a couple of years ago. So we had talked back and forth and read, obviously, a lot of this stuff. And yeah, so his VA kept sort of missing each other at conferences like he would be at the one I was at, or I'd be the one that before that type of thing. So yeah, very cool. Obviously, the guys examined do really good work, too, which is nice to see them. Doing well, and trying to stay very focused on what the actual science is, especially being geared more towards supplements. It's Yeah, you see a lot of will say interesting stuff. Yeah,

12:33

I've reviewed a couple sites where I'm like, did they make this up? I can't tell. But I can't you know, when when somebody publishes something, you can't be like, no, that's made up you have to be like, No, that doesn't really fit the bounds of what we know.

M Michael Nelson 12:46

Yeah, yeah. Like HMB. For Yeah, so maybe not to throw anyone under the bus. But you know, yeah,

12:54

occasionally, you guys will get some stuff like that, where you're like, or there's a there's a good bit of research on ashwagandha, which is super cool. But there's like a couple studies, if you look at him, you're like, they put 2020 pounds of muscle on and how, yeah, okay. Yeah, no, I tell you, you know, but stuff slipped through the cracks. And journals matter a little bit. So I try not to hate on people too much. Yeah,

M Michael Nelson 13:17

yeah, I always get my little bs detector goes off when the data just looks way too clean. And just way outside the bounds of what just seems reasonable. You know, and that's very kind of unscientific II. But I mean, there's ways you can look at, you know, variations and data and that kind of stuff, and CV, etc. But when you publish something that is a supplement, and looks like your first steroid cycle results, and then you couple that with, no one in the real world is talking about this thing. That's the part to me, that's always fascinating. It's like, how, what do you really expect is gonna happen, right, because, you know, from being around bodybuilding and training that, you know, something tends to work pretty good. Obviously, there's a placebo effect, which can be massive, but the stuff just tends to, you know, what sort of works and what doesn't sort of work, right, you've been around long enough to see the latest things come up and have a ton of hype, and they just kind of disappear because, you know, people try them and nothing really happened. You know, so when you're seeing some study that says massive gains here, and everyone else is like, I don't know, didn't happen to me.

14:27

Yeah, and that's, that's the I try to stay connected with, you know, coaches and then even athletes to make sure that that like, I don't like lose track of that aspect. Because that's it's super important. Like and you don't sometimes you don't know until, like, you're so some of the scientists are so far removed. From all like the groundwork, you're like, well, I got to make sure I go back in there occasionally, and stay on track. But yeah, the supplement world is a little crazy. And like you said, you know, we know high protein works, but we've known that for quite a while.

M Michael Nelson 14:59

Yeah. Yeah, my last comment on that, too, is it's the system is set up as this huge catch 22. Right? Because if you're a new supplement company, do you even have to spend any money on research? Not really. I mean, I think you should, obviously, but there's no requirement that says you have to, you know, so again, if you're going to run a study, and it's going to cost you a lot of money, I get that you're probably going to have some vested interest in it, hopefully turning out somewhat positive, you know, and then you get into the debate of, well, who actually owns the data? If you contract with the university? Does the supplement company own the data because they bought and paid for the study. And if it doesn't turn out to positive and they own the data, then it'll probably disappear and never get published? You know? So all that sort of stuff comes into play, too, which makes it messy.

15:52

Yeah, I always feel bad for the students who like, cuz I mean, you know, if you're a supplement company, big or small, doesn't matter. You want to you want to do a little bit of science. Yeah, you can. But you do. Like you said, you don't want it to go bad. But there's a PhD or master's student on the other side running that project, and they just get, like, the paper just like yanked out. Like, no,

M Michael Nelson 16:15

yeah, that's always my advice to them. It's like, just be wary. Because if it works, well, it can be really good, right? And there are companies who do research and they're not as vested interest into what actually happens, you know, here's the money figure it out. That's great. But, I mean, I did one of my PhD studies was on, you know, Monster Energy Drink. When people are like, Oh, did you just sponsored by monster, I'm like, Nope, I paid for monster out of my own pocket, actually. And part of that was probably a good thing, because they weren't offering up a huge amount of money. And I'm like, Whatever happens, like, they don't really have any control over it, then either, you know, so as long as I can get all the other stuff, I need to be funded by the lab, and I'm not occurring, the huge amount of cost out of my own pocket per se, I kind of rather go that route. Because, you know, especially back, you know, eight, nine years ago, everybody thought energy drinks are either gonna magically give you wings, and you're gonna just do amazing all your tests, or they were the devil's brew, and they're just gonna destroy your health, like, either way, it'll probably get published.

17:18

Yep, that's a good outlook. I like that. I didn't opt out to go back and look at some of that stuff. That's pretty interesting.

M Michael Nelson 17:26

Going back something real quick is you mentioned you're looking at D innervation. Studies. So for people who are listening, that's basically where you just kind of cut the nerve to a muscle? And if I remember, right, that's probably one of the fastest ways to lose muscle tissue. Correct. With the exception of maybe microgravity?

17:45

Yeah, yeah. I think Yeah, yeah. If you said, if you've got a spatial is it faster, but that's about the only way and actually, you know, some of the interim studies, we would use as like a rapid onset atrophy model. So like, if we wanted to test because we did a lot of genetic stuff. So say, we thought a gene was involved. And we knocked it out, or we gave it maybe increasing sperm expression, we wouldn't do DNA innovation real quick to say, huh, is it doing anything in the muscle? Right? And it's like a, like a 3d model in an animal or rodent? Mouse? Yeah. But, you know, it's not super applicable. But it's a quick peek. It's like, Oh, well, yea or nay? Let's see.

M Michael Nelson 18:25

Yeah, in rare cases, I've seen some case studies of that where someone's been in like, obviously the military you could have you know, trapped and all that kind of stuff, motor vehicle accidents, things like that, where you, you have a lot of physical damage, and obviously, a lot of trauma. But whenever you slice through that nerve, though, you can just see, just even humans, just massive loss of muscle, which, yeah, to me is, it's fascinating how something like that how fast you can lose it. And then on the other side, how hard it is to try to add more muscle. It's like this very weird the asymmetrically weighted thing.

19:04

Yeah, actually, that's, you know, that's a good point. I never really thought of it that way. But yeah, that's kind of sad. It is

M Michael Nelson 19:11
depressing.

19:14
Just be like, I don't want to lose my job. But I think the closest thing in humans to that is like, so a couple examples you gave but like spinal cord injury, you see some similar effects where like, you can't walk and now you're losing muscle and you can't, you may not be able to use your legs and then you get diabetes, and then all this other stuff happens. So

M Michael Nelson 19:30
yeah, I'm harassing Steve Phillips this question years ago, too. And I'm like, Can you put people in like hyper gravity or do like more constant loading like Jose Antonio did the old chronic wing lading studies on birds where he like put these weights on one of their wings and showed hyperplasia, right, so splitting of actual fibers, but that only seems to work in birds who walk around with a weight stuck to their wing the whole time doesn't seem to happen in humans, but You know, there's some interesting stuff now with adding like a weight vest of people have, you know, can you sort of trick their body into thinking it's got a heavier weights, you have to move it around all the time for weight loss? And I don't know, I always thought that was just kind of an interesting concept.

20:14
Yeah. And there's so we, the military, we deal with that a little bit because the route of heavy weighted stuff.

20:22
Yeah, yeah. So just the racking, it's essentially like, you know, 20 to 50, or sometimes 100 pounds, depending on sometimes they scale the body weight. So there'll be like, 30% body somewhere studies, and sometimes it's just like a flat number, like 30 pounds or 40 pounds. But yeah, some of the some of the research around mccanna stat or Meccano stat is kind of interesting, because it's like, well, you know, we put a weight vest on and we can keep up or an injury expenditure, or maybe some kind of sensors in us somewhere. To make us lose fat or weight as we were, well, then that's kind of neat. We can eat the same.

M Michael Nelson 21:05

Yeah, the other example I always think of too, is I've never seen a really large mammal with small calves. Right? Like, you'll see the exception, right, you'll see some, some people who are very small and have just these monster calves like how the heck and like most time they don't train, which is even more crazy. But I've never seen someone who was very large human with like small calves numbers are always wondering if that's because you have to exert pressure on him all the time via walking and load because there's so far down on the kinetic chain to

21:38

Yeah, and I think there's even a study on calves specifically, and it's like to see anything I forget who did it, but Schoenfeld is probably on it. Yeah. He's probably on it somewhere. Yeah. It was like training calves four times a week, basically, with like four sets per session or something was just like barely enough to move the needle. Like, wow, yeah, that kind of makes sense. And, and I definitely agree with the weight thing, because like I used to be. So in college, I was like two, I fluctuated between 205 and then to 220, which is like five, eight, on a good day. Oh, yeah. Yeah, so I had some muscle, but I was I had a good bit of fat. And then I lost, probably like 50 or 60 pound went down to like, 160. And I was pretty shredded. But like, my calves have always kind of stuck around. And I'm like, Okay, thank you.

M Michael Nelson 22:36

Yeah, the best I've ever had for increase in muscle mass on my calves, which are not very big was I took a summer and did the same amount of like, kind of lower calf body stuff that I was doing. And then I added like, just a ton of farmers walks and I did it and kind of like a barefoot type shoe. And so I would do that sometimes 234 times a week, you know, not always heavy, but just kind of mixing it up. And no, I put like on like in four or five months, like almost not quite an inch on my calves, I think. Because my thought was, can I just, you know, pretend like I'm a heavy person, right? Can I just carry this amount of load, like all the time? And who knows? Right? It might even been that it could have just been the increase in volume could have been a different stimulus because I hadn't done a lot of it before. Who knows? But yeah, always interesting.

23:26

Yeah, it's it's fun to to, like use yourself as an experiment sometimes. Because there's, during my postdoc week, I got into response and the duality basically. So heterogeneity.

presented a fun presentation at the IE FC out in was a Spokane fitness conference out there. But like, there's so much variability, sometimes when you look at training, and even nutrition, even with good adherence, and it's like, sometimes you kind of just have to experiment on yourself. Like, of course, there's some some scientific principles you shove in there. But you know, if if you want to try some stuff like that, like, go for it. So

M Michael Nelson 24:10

yeah, well as St. Philip's that acsm years and years ago, I think it was might have been was in Seattle that year. But he was presenting some data on a hypertrophy study that they ran. And it was great because he put up the scatterplot. Right, so people listening, it's a plot of the end results of this, I think it was an eight or 1012 week program, of you know how much lean body mass all these people gain. And it's typical, like you're looking at it like most people are kind of around the middle. I don't remember the exact number was one poor guy, actually, technically, and it was a measurement error, but he actually lost mass. He was like down below at the bottom. So one poor bastard got worse than these two other people were like, way up at the top, like two standard deviations above everyone else. And so we asked him like, hey, like, what's, what's going on with that? And he's like, oh, he He nicknamed them he called them the beef brothers. There's two guys who were brothers actually, they both grew up on a farm. And they ate like, you know, two or three pounds of beef a day, you know, worked as farmers. And they did the same program as everyone else, like it was a training study wasn't necessarily nutrition study. And that kind of led them to looking at, like, what's going on with them, right, so some of the hyper responder studies. And so if I remember correctly, that led to some of the hormone hypothesis that David West and then did stuff on, that maybe these guys are like, hyper responders to testosterone with training, because they're, they're doing the same training stuff as everybody else. So like, what's going on? You know, and that study, very elegantly designed study showed, yeah, yeah, you get big bumps and growth hormone and testosterone from, you know, doing squats and compound exercises, but doesn't really translate into any more muscle mass. So I've been given your background in genetics, do you think there's probably a genetic predisposition for some of that, that even with the same amount of load or stimulus that some people for whatever reason, in their genetics just tend to respond better?

26:12

I think that's part of it. I we've so we've been looking for, like a hypertrophy gene. Like, like, you know, and we've never found something a single single, like, you know, you're single. Yeah, yeah, single snip. That is, can explain more than like three to 4% of the responses,

Michael Nelson 26:32
which is horribly low. Yeah, you're looking at the president,

26:35
can you get three to 4%? In this in a single, you know, snap? And then you're like, Okay, well, now I've got to make this snip panel. And so then you maybe get like, 50% of the response or 60? If you're lucky,

Michael Nelson 26:46
you're combining other things, right?

26:48
Yeah. So you're combining all these genes? And you're like, Well, you know, if I have to put 100 genes in there, like, like, we're not that different as humans, I mean, it's kind of reach it a little bit. So I think, I think, you know, it's partially kind of your environment. Growing up, you know, just kind of nutritional environment you're in, and whatever sports you may play, that plays a role, too. But a lot of times, when you look at these hyper responders, they're like, they've done nothing, and they're just already jacked. Like, why did you get all that muscle? Sir?

Michael Nelson 27:20
I don't know. Like the story of I think it was Andy Bolton, right. So people listening when the first guy is a deadlift over 1000 pounds. I want to say the first time he ever trained, I think he dead lifted, 600, squatted 500, and bench like 450 or something like that, like the first time he ever really, I could be off on the numbers, but he was deadlifting over five. Yeah. And I'm just like, Whoa, what? I've been training my whole life. I know. Or you see, like, the pictures of Lee priest when he's like, 18. And, you know, granted, he had been training for, you know, four to five years. And he said he started training at age 13. But still, it's like, he could just walk up on a bodybuilding stage in almost any state and just destroy people at 18. You know, it's like, yeah, I've had the,

28:14
I think one of the mistakes I made early in my, like, bodybuilding career was like trying to

like compare yourself to other people. And that's Oh,

M Michael Nelson 28:21

yeah, that's not the best. Well, what are your thoughts about Myostatin? Because that seems to stick out like everyone's seen the pictures of the, you know, dogs that are miles set. No. And the blue jeans a blue gin Bell bowl, I think and I think there was, was there one human I think a kid in Germany that was double negative, I think if I remember, right,

28:44

yeah. Yeah. So that's, uh, that's one of my favorite, like, lectures that I've given is I have genetics, you know, kind of enhancement, a lecture that I gave my students. And so yeah, you put up the picture of the ball, and you're like, why is that ball so jacked, and I wasn't in the gym lifting either. See this feeling this gains on the farm. So basically, in in rodents, if you knock out Myostatin, you get these big muscle effects. But like, functionally, they're not better. So you have this like fake hypertrophy almost. And there's like a long series of experiments that kind of figured that out. But pharma companies, right, have still thought, Hey, you know, we've got these cows wrote and seem to make sense. And then there's a couple I think there's a couple kids that are like, semi knockouts or don't have the mindset genes. You look at them and young, they're like, they have six packs at age like five. Yeah. And the one from Germany. He's actually still alive, but he He kind of looks like he leveled out or something. But he's not like superduper jacked he's not like right coalminer anything, he's just kind of like, you know, a Leo muscular than usual, but not like a complete outlier. No, no something that most people can attain with a little work. But so the pharma companies develop these Myostatin antibodies. And obviously from muscle wasting perspective, like if you can get give that to someone who's losing muscle, that's amazing, right. So it's a moneymaker. And so they a couple different companies ran trials, and they all got shut down. And so during my dissertation, I dug into it a little bit. But it turns out that some of the participants in those studies were having internal bleeding, which is bad. Which is, which is why the studies got shut down. Now, you know, with antibodies, you can, like science has evolved, obviously, you see, like the mRNA vaccines now, we didn't have this 10 years ago. So there's always potential for it to come back around. But I think for now, it's kind of like, put it on the back burner, and come back to it. So

M Michael Nelson 31:07

yeah, and I think some of like, the top bodybuilders, I think, is in Flex Wheeler, and some of

those guys supposedly, like a single, a single mile set know, supposedly, when they've had their genetics tested. I heard. Yeah, I think I think some bodybuilders claim that whether it's true or not, yeah, I've never been able to find anything that says your name. And it could be just one of those rumors you hear 800 times you're like, maybe it's true. I don't know.

31:33

sounds right. I think I've only done I've done the 23andme genetic panel just for fun. And it was like it is okay, I get anything special. And I was like, Yeah, I kind of figured that stuff out myself. But

M Michael Nelson 31:46

yeah, it's fun. You probably remember full list that as Myostatin supplement, and then they had the super old school. What was the one from the seaweed? Was it Mio zap? I think was like the trade name that was supposed to inhibit Myostatin it was, it was at biotest Pinnacle. And there's one other company on it for a while. I'm kind of dating myself. But I was like a big thing a long time ago, I think right around them. And the ads would show like pictures of like the Belgian blue bowls and talk about the mechanism and they never panned out, but

32:25

yeah, I don't I don't really see me as one but I do remember the fall status and stuff. And I think I'd never bought it, but I remember seeing the magazines and like GNC and like, yeah, like, oh, that would be so expensive. Yeah, it was crazy expensive. Yeah. There's a couple supplements as a as a teenager, I was like, That's ridiculous. I would totally buy it. If I had the money and I'm like, I have the money and I don't want it

M Michael Nelson 32:49

over the other two. Do you remember? Oh, man, do you remember? I think it was gak or Yak or something? Yeah. Yeah. All the muscle style tech stuff. Just It was so shiny. Yeah, like it. It was like no longer case, bro. So it had to be good.

33:04

Yeah.

33:09

Oh, is it? They're not the androgen. Fake androgens, pro hormone stuff. Yeah, therefore hormones are always like, Oh, what's that? Yeah, nothing. Don't waste your money. So

M Michael Nelson 33:22

yeah, and some of them were almost the other side like was it one to one testosterone? I think it was one knuffel testosterone I think and people got some pretty good gains from it, but also huge amount of water. And I saw a couple of guys liver enzymes from it, which were absolutely freakin scary. Oh, shit. Stop whatever you're doing now, please. Yeah. I even find to this day. Like, if a supplement was super effective. My first thought is it it almost scares me. Right? Because like, on all the stuff we know, so far, it's like, what is the cost that you're paying for that, especially if it's new, and it's kind of like an unknown thing? You know, because, as you know, like, there's no real free physiologic lunch, right? There's stuff you can do. That's, that's better. But if it's really good, and someone says there's no side effects, then I'm like, you just don't know what they are. Right? It's, if it's a little bit less effective, like creatine is a good example, right? creatine very effective, but you're still talking like, single digits, and it's well studied, and we have an idea of what you know, the side effects are, which are pretty much minimal, but we've got a good idea and it's not like you're gonna gain 20 pounds in a couple weeks either. You know, it's gonna be a little bit here and there, so you're not seeing a massive effect size either.

34:48

Yeah, the other one. So the other one was the Clin beater on the medics. So like, I don't remember the name of but there are a couple that were just like really off the wall.

M Michael Nelson 35:00

was supposed to be like the beta three agonist, supposedly.

35:02

Yeah, and and some of that back way back then the bodybuilders used to take like the real thing, because it's just like asthma. That is, essentially a clone is Yeah. Yeah. So it was it was interesting to see that knockoffs of that I don't think has panned out either. So

Michael Nelson 35:18

yeah, yeah. Cool. And then the transition a little bit but related, you talked about the effects of n sets, which, to me has always been super interesting. because on one hand, you see, even in, I'd say late literature, there's always kind of an over and under reaction to stuff. Right? I think some of the early mouse studies I looked at and said, people were like, Oh, it's horrible. Don't ever take this guy, it's gonna destroy all your muscle growth. But yet, I knew people who were pretty big, who took a fair amount of insides, and it didn't seem like it was harming them all that much per se, you know. Um, and then fast forward, we saw some other data, we saw some stuff from trappy. That was done and older adults, that showed it was probably a minor anabolic event, like it actually helped with some muscle growth. So what are your thoughts about just in sets, in particular, on muscle growth? And then we'll get a little bit more detailed from there and to some of the stuff you've presented at ISSN?

36:25

Yeah, so intense are interesting, because, like,

Michael Nelson 36:30

to maybe give us a little background on what actually ends ads are for people listening, or like Ed says, What is even talking about?

36:36

Yeah, so your your ibuprofen, you know, your aspirin, your things like that. They're non steroidal anti inflammatory drugs. So insets, that's initials. Basically, they they block, the Cox inhibitors, and your Cox enzymes convert lipids in your cell membrane. So like think about, you know, your muscle cell, or just pretty much any cell in your body has a membrane around it to protect it. So it when you get injured, or something happens, the membrane kind of breaks down. It goes through these Cox enzymes and gets converted to prostaglandins, which are like inflammatory signals. So it tells your body, hey, you know, something's injured here, we need to infiltrate with cells and kind of cleared out or we need to heat it up or swell it, or we need to do something to stop it.

Michael Nelson 37:31

Which is great, because that's a purely local effect, too. So it's a way of getting things to the spot where you actually have some of the damage without having as much whole

systemic type things to Yeah, yeah, exactly. So these drugs block different aspects of these toxins. There's two Cox enzymes, Cox one and Cox two. And so different drugs stop each one. So I think like celecoxib is a prescribed INSEAD, and it blocks Cox two specifically, not really Cox one. ibuprofen is kind of like a middle of the road type drug or walks a little bit of both, and it's not super specific. And then we have flurbiprofen, which is another prescribed drug that blocks Cox one. There's like, tendons that there's a whole bunch of them. But those are the ones that we use, and probably the most common ones. Like even that said, most of the listeners probably have no idea what's alkoxy flurbiprofen probably just know it, because they're prescription based, right? Yeah, yeah. And so it's kind of hard to get that because even when you go like after surgery and stuff and get a drug, they just give you high dose ibuprofen. Yeah, that's what I've typically seen to Motrin. Yeah, that's right. Yeah. Here's 100 milligrams of an inset. Yep.

38:50

So yeah, so that's, that's the background. I'm impressed with your knowledge of the inset literature, because the chappies have probably done some cool stuff by the cool stuff, I think. Yeah, super fascinating. But it is an older adults. Yes. When you look at some of the younger adult literature, it's kind of like there's some hints that if you take a whole bunch insides, like I'm talking the equivalent of a whole day, if you took it every, what, four hours, so like 1200 milligrams, which is like four, four pills, usually, if you take it all at once,

39:26

and then did some resistance training, it would kind of inhibit or partially inhibit some of the muscle protein synthetic response, right? And which is not ideal for people trying to grow muscle.

39:38

And so, you know, there's a couple studies that show that and the trappy studies show the older adults, data where it's anabolic, and actually so during my postdoc, I wrote a little grant on muscle inflammation susceptibility. And that's this idea that older adults, one of the reasons they don't or this inside me You're working or other drugs, is because they're more susceptible to the inflammatory response, just like the normal training, employment authority response, they can't handle it. And so now you have instead, they can handle it better. And so now it's anabolic.

M Michael Nelson 40:14

So do you think that's because you're changing the mechanism of hate use a Goldilocks thing all the time, but they're having almost too much inflammation that may be impairing the process, you're kind of bringing it back down to a better level, and not so much. Because you're leaving any pain or any analgesic effect that they could do more training. And there's actually a molecular mechanism there.

40:38

I think so and so we dug into it and and I never like I looked at a couple things, but you have to kind of pick your spots and pick the wrong spots. Or, or maybe it's not that big of an effect. molecularly and it is the analgesic capacity. So it's hard to teach those out. Yeah. Because you essentially need two types of drug, you need one that kind of stops pain, that same drug that doesn't stop pain, and that doesn't really exist, right. So, yeah, I think I think they're useful in moderation. But when people use them a whole bunch at once, it's probably not a good idea. That's what I tell most people.

M Michael Nelson 41:20

Yeah, and they hold on to you. We're talking dose like 1200 milligrams, which, like, how many tablets? Would that be for just the person listening if they're going to the store and buying like Advil?

41:30

Yeah. So like three to four at a time? Yeah. So pretty high dose? Yeah. And most people aren't going to do that even like your I think your endurance athletes are probably the most like abusers or users. Try it, you know, people like do triathlons and longest and stuff. And even then they'll just like, pop one, like a day or something and be falling. So yeah, I think it was it was overhyped for a while. And then it was kind of cool with the older adult data. And now we're trying to figure out kind of lead into some my research like which INSEAD is best for which situation? And so that we can say, Hey, you know, you had a muscle strain,

42:13

you should take this and said,

42:14

Hey, you had a stress fracture in your leg? There's a problem in the army population. Take this headset, because it won't affect your bones and your muscles. You know, we're not worried about your muscles when your bones broken. Yeah. Right, little triage there. Yeah, yeah, just be like, yeah, this is walk it off, can't can't walk off broken. So yeah, we, I guess leading into the the more detailed stuff, we did cell culture data and kind of screened these drugs and figured out that, you know, not too much was going on unless we gave a whole bunch, which matches kind of the human stuff, right, you take a whole bunch of bad. So then we were moving into an animal model. And we're in the middle of the study now, but we give five or six different insects to animals that are running on treadmills for six weeks. And you know, it's not like perfectly translatable to humans, but it's, it's okay. And we can, we're going to take some bones and muscles and see which end said was the best worst or what you know, different molecular pathways and things and just try to kind of tease out what's happening. And then kind of third arm is that the human aspect. And so we are going to give humans a bit, not a big dose of a normal dose of of different incense. So like ibuprofen and celecoxib, and things like that, and then just having to do exercise, and then measure twin take some biopsies, I'm not going to do muscle protein synthesis stuff, but we'll do kind of the surrogates of that. And we'll get some bone biomarkers. So you know, getting more closer to like realistic use stuff. I think long term. There are a couple studies that have actually given INSEAD over like 12 weeks, why is this training? And it's kind of like the trappy data where it's it's okay and not detrimental for older adults, but depends what you're looking at. And so not nobody's ever really done that in younger healthy people. There's one study where they did it and they did bicep curls, and they measured bicep size and nothing happened but they use normal dose and that's not super surprising. So again, I don't I think if you're taking normal doses, you're probably fine. There may be a caveat if you have like a broken something that maybe it's not a good idea but also you're in a lot of pain then like that, I guess 20 minutes into like, I don't want to be in pain or know what my my bones to heal 10% slower faster, you know.

M Michael Nelson 44:51

And is there data on and says like, currently you're talking about bone healing the is theoretically better, worse or kind of neutral for that because I'm assuming different mechanisms sounds like? Yeah, so

45:02

it's in the animals stuff. It's pretty detrimental. Like it like if you again, no models, but and compression models and they just like compress legs of animals kind of like you would

45:19

I don't know, there's not

45:20

really a good example on human, but they give them insights and they compress their muscles and their bones. So they're like getting stressed. And there's like a 20% difference in adaptation, which is pretty big.

M Michael Nelson 45:33

And that's what like an Advil, like a mix Cox one talks to,

45:37

yeah, yeah. And so and so we're working with some people who have done those studies, to try to figure out like, Hey, you know, what, what's happening, because 20 percents a lot. So we'll see how it turns out, but I think there's some solid animal data, there's a really solid cell culture data, and then the human stuff and muscles, way more known than the bone side. And I'm, again, I'm not a bone person, muscle person here. So I have to like lean on my, my fellow colleagues and be like, Hey, what is this?

M Michael Nelson 46:11

Yeah. So in theory, that may make it worse for endurance athletes, right? Because I'm thinking about overuse injuries, you know, lower body. And the nerds athletes, I know, tend to take it more frequently, because they tend to run almost every day or six days a week or lifters I know, tend to, like every other day is probably a heavier session, then granted, there's exceptions to all of that, but I'm just thinking about mechanism of injury and frequency and dose, etc.

46:43

Yeah, yeah. So I think we also have a kind of a observational study going in the kit that, get that sir trainees who come in for basic combat. And so they have a really big stress fracture problem. And we think it might be due partially, you know, not all of it, but partially due to insect consumption. And so we're kind of like moderate monitoring, this huge cohort of basic combat trainees to see if like, is, if they take in sense, are they more

likely to get a stress factor? Are they less likely to recover? Like, we know, how does it play a role in that aspect? And I think that's more of the overuse injury, because those kids are not trained like they're going from untrained to trained in eight weeks. roof. Yeah. And so it's not quite endurance athletes, but it's pretty close.

M Michael Nelson 47:33

Yeah. And I would imagine, again, you're stuck with, they have an analgesic effect, too. So I, you know, most people are using end sets are using it for an analgesic effect. So you could argue that one of the cofactors is looking at, okay, so I've got some pain, which is indicating something might be going on. But oh, I can take an inset and mask it. And I can keep doing that type of training. So now I can kind of unfortunately, push a little bit further and you know, have a higher risk of injury going on. Yeah, and there's a couple analgesics. I think aspirin is one that is a different mechanism. I'm trying to remember what aspirin is, and I can't.

48:15

Yeah, it is. It's one of its pseudo silicic acid. But it's a different mechanism. And so that's what I generally tell people to take, like, if you're having issues with pain is take aspirin. Now, the only problem with aspirin was the whole like, gut bleeding problem, right? Yeah. So it's like,

M Michael Nelson 48:38

yeah, yeah, I think acetaminophen, so Tylenol is different entirely, and that can potentially have more liver issues at higher doses, correct? Yeah, yeah. So

48:49

acetaminophen, so those are our three like ibuprofen. acetaminophen and Tylenol are kind of like, they do that same type of things, but they do them differently. And one's worse at certain thing and others worse, something else?

M Michael Nelson 49:03

And does acetaminophen, does that modify Cox enzymes to or is it preferential? one direction or the other? I'm pretty sure it's in the middle. Okay. I think I thought it was middle the different mechanism, but I'm not sure at all.

49:20

Yeah, it's like the newer researcher for me, but and we're not even using cinnamon.

49:26

Yeah, it's not something you're working with at all. So yeah, so I'm like, What is it? What is it? Yeah, that's a good question.

M Michael Nelson 49:33

And I know that the potential risk of liver toxicity with that can be rather high, especially if you're using escalating doses over long periods of time. So yeah, yeah, for sure. No, very cool. So if someone is trying to work to avoid overuse to kind of stress injuries, independent of insides, any recommendation from just kind of what you've observed, because you're kind of also dealing with a worst case scenario. You're going from untrained people to Hey, we got eight weeks to be trained. Here we go.

50:05

Yeah, yeah. So what I think is a key is not increasing your volume load, or you know, your running mileage too quickly. And I think there's a Tim gabot put out a couple papers on this topic where it's like, you don't want it to be 1.2 fold higher. So like, 20% of the load spikes stuff. Yeah. So basically, each week, you want to avoid big jumps. Or even like, you know, across a couple weeks, maybe two to three weeks, I think, like, having to become more of a runner, I have to be careful, because like, it's like, Alright, well, you're only tested on two miles. But then this other test is like a five mile and probably be able to run eight miles just because and oh, yeah, you're gonna have to run 12 miles. Yeah. So it's like, managing all of those different endurance activities, right? Within kind of, like a mesocycle. But yeah, I generally tell unders athletes and like, just don't ramp up real fast, don't like come back from vacation after two weeks, and then try to run, you know, 90% of your maximum mileage, like, it's not gonna work out? Well.

M Michael Nelson 51:20

Yeah, and that's one thing I found with a lot of people I've worked with to like. So I don't work with a lot of endurance athletes, but people are doing you're kind of mixed goals and CrossFit and wanting to climb mountains and different things that in general on like, if we can mix up modalities, I find that that works. Well, like do a run day, maybe do a bike

day and do a day on the rower. Or if I have athletes that are much more on the meathead side. I don't trust them run in a light, because I've seen most of them run and it's pretty scary. So it's like, oh, let's use the bike and use the rower because they don't have a goal of running. So it's not going to be specific to them. But like in your case, it gets a little bit trickier because you've got specific goals that are, you know, rocking or running base, you can't get around the fact that you're going to have to practice that particular thing and then it's just trying to manage the the load and the stress and split it out more.

52:13

Yeah, and one of the things that I did was I went actually got some some running shoes, like some good running shoes. And I tried a bunch of different brands like that, you know, a six and Brooks and you know, God or something, and that the on brand, but like putting those shoes on and running after not being a runner and not having good running shoes, and then having those be like wow, that's worth the 150 bucks or whatever it is gonna cost me. So I found that made a huge difference for me.

M Michael Nelson 52:45

Yeah, I even got this, I should know better. But I've got this beat into my head a lot more now. Because some stuff I'm really cheap on my wife yells at me like overly cheap. All it's been, you know, six $7,000 on a metabolic card to have at home and um, you know, 1012 $100 in a Moxie setups, I get to look to see what's going on with muscle oxygenation. But it'll wear the same pair of shoes I got for free for like a year and a half. Yeah, I understand. But what I realized was I'm like, I knew the soles were getting kind of bad. And you tend to, you know, have different wear patterns in them. But I'm like, how they're not that bad. And then I finally broke down and bought a new pair of shoes, the shoes weren't even that expensive. And then I realized once I put them on, I was like, holy crap, this is like so different. And then you compare the patterns on the bottom and you're like, wow, I was an idiot for wearing these like for you know, so long because you I was good at fixing my gait. And then I realized after doing even longer walking and just a little bit of running, it would like revert back. And I'm like, Oh, I'm probably just tired. You know, I cut back on mileage a little bit, watch my volume. And what I realized was the shoes were basically like forcing me back into this old position, more of the gate position I had once I got the shoes. And so once I got the new ones, it was like, oh, wow, everything, like sticks so much better. And it doesn't feel horrible when I'm done because I'm not going back into that kind of poor gait pattern again, so

54:11

yeah, yeah. And I'm the same way like I'll, I'll keep out on stuff. And it's just like, I think it's the mentality. I don't know if you still have it, but from like, just doing a PhD or being kind of like just poor for like I'm used to make they make it like right at the poverty line. And now I'm like, okay, I can buy a nice pair of shoes. Yeah, I could do that.

M Michael Nelson 54:35

Yeah, that was like a big change for me too. When I started traveling a couple of years ago, like for probably the first two years I was like, oh, if I'm traveling, I can do a fast I can do all these things. And you're so used to going to the grocery store and buying cheaper food, I can buy a bunch of chicken breast and white rice and the carbs don't cost much money and I tend to very much cheap out when I when I was traveling, and I realized I'm like Oh, you know what, like, maybe if I ate a little bit higher quality food, which means just allowing myself to spend a little bit more money, and it was nothing like exorbitant, you know. And I remember the first time I did it, I was at a, presented an NCAA conference in Jacksonville, maybe three or four years ago now. And I'm like, Okay, I got here, took the Uber to the whole foods that was nearby, I had a hotel that had a fridge and everything. So I'm like, Okay, so I'm actually going to buy like, nice food. So I have good food for the three days, go into the store, buy it, and I get to the checkout. And I realized I left all my credit cards in my room, which is a mile and a half away. I didn't have a rental car, I took the Uber there. And I'm like, shut. So I'm telling the person that is in the store closes in like a half hour. So I got in there late at night. And I'm like, okay, just set him aside. I'll try to get the Uber or run back or something. And this lady behind me, she's like, no, I got it. And I was like, What? She's like, no, and like, before I turned around, she had already paid. She didn't even sign the thing and like ran out the door. She was like, No, don't worry about it. And I'm like, shit, there was like $135 worth of groceries that she just paid for. So I was like, Wow, that was crazy. And I'm like, Well, what are the odds that the time I actually go to spend money? I didn't have enough cash to cover it. And then someone just bought all my food for the weekend. I don't even know who she was. So thank you, whoever you are. Yeah, that's a sign. That's a sign that you were supposed to get that good food. Yeah, yeah. Yeah. So I've been trying to be since then more cognizant of like, okay, here's a list of stuff I'm going to spend money on. And here's the list. Yeah. I don't really care that much. I'll wear the same pants and shirts, and you know, whatever. Don't don't care so much. But I think having that vision of what you're going to do and not do just like training stuff, right? It's like, Oh, this is my goal. Here's, I'm probably going to do this stuff in probably not so much of that stuff, either. So,

57:02

yeah, life, life is all about balance. And like finding that right. Like, give and take, I think, not to burnout and not to stress too much about things. So I think, you know, as a as a vape. Shop, it's, it's been a little eye opening.

M Michael Nelson 57:19

Yeah. And then the last part to even less like training is having like some exercise in that you really like doing is probably not going to make or break your training either. You know, like, I remember seeing my good buddy here was training some NFL athletes. And I walked into his place on Friday. And I was like, Hey, man, like, all these huge dudes are just doing a 20 minute arm session. I was like, No offense, man. But like, why are they all doing arm stuff? And he's like, Oh, we made a deal with him. I said, if they do all my training Monday through Thursday, they get to do 20 minutes of arm training on Friday, man, so he's like, they all completed all the training. So today, they get to do 20 minutes of arm training. I was like, Oh, okay. And then I asked them I said, well, there's no offense, but like, why did they care so much about arm training? Like these are guys who are like literally legit starting people in NFL? That's huge. Dude walks by and flexes his bicep. And he goes, got to look good on TV, bro. That's what I realized. I'm like, this is probably like, 13 years ago. And I'm like, Oh, so elite athletes are humans too. Oh, no shit. Yeah, yeah.

58:31

I so in high school, I played against Tim Tebow. And, yeah, so. But then in college, I was at the same college as him and when he was there, and so I was, like, I worked a bit with strength conditioning. And I would train these, like, elite athletes, and you're like, wow, but no, some of them were just like, No, I just want to do arms. Yeah. freshmen, you gotta want to make varsity, you gotta keep going.

M Michael Nelson 59:01

Yeah. And it's also weird to see some of the some of the very gifted athletes didn't really train that much and did amazing, you know, and then you've got the elite of the elite two are very gifted in whatever forms and also train very hard. But my assumption when I was working with some of them was that, oh, they all must work hard. And then you realize, some do and some don't. And they still play well, and it's like, one guy actually got an argument. He's like, I don't train that much. And I made the all star team. And so I'm just not gonna train a lot. And I'm like, Okay, I guess for performance. I don't know. I guess you got me. I don't know what to say.

59:47

Yeah, yeah. Some people are very gifted athletically without much work. It's It's nice. But I always I always think I'm like, What What have you tried how much

M Michael Nelson 59:59

and that's what so Crazy last point too is I did some nutrition work for two high level track athletes, they were in college by the top, usually top 10 runners are female and 100 meter. And the great part about track stuff is you know if people are legit or not because everything is timed, right, so you can just look up their Times Online, very easy to do, you know, their football player, whoever, it's a little harder to equate performance. And so the coach that you need to work with them, like great, so they sent me their diet logs, and I look at it, I'm like, their coaches like punking me like this, this has to be a joke. So I emailed him, I'm like, okay, is this really what you ate? Oh, yeah. Like no, literally, this really, it was like fast food and like way under even just the normal amount of calories. And long story short, the coach had hired me, they didn't hire me particularly long story short, I got fired. Because they're basically like, this is what we eat all the time. We're running this fast. We don't care about nutrition get lost out. I was like, oh, cuz then you your assumption is like, well just think if we made some minor modifications, like you might be able to do even better. But their thought process was I'm already doing this good eating trash, though. I don't care. It's not gonna matter. You know? Oh, fascinating. Yeah. Like I said, Okay, look at that and be like, Yeah, whatever. It's not my deal. But now, awesome. Well, if you want to be found, where would people find out more about you?

1:01:37

Yeah, so most of my content goes up on Instagram. So it's B, Rob underscore 21. Id I usually do like series of topics. And so

M Michael Nelson 1:01:48

you got some really good stuff there.

1:01:50

Yeah, so it's a lot of fun. I kind of a couple of with some of my writing projects. But you can find me also on Facebook, just Brandon Roberts, Twitter. Basically, Google me and you'll find me. Like, I'm not that famous, but I've made enough content that something will pop

up that you can kind of go through the trenches. But definitely, you know, your listeners have any questions, feel free to reach out. Email is Roberts b 20 one@gmail.com. So always open it to chat.

M Michael Nelson 1:02:21

Cool. Well, thank you so much for taking the time out. To do this. I really appreciate you sharing all your knowledge and everything. And it's always, always fun for me to learn more new stuff, too, which is great. So thank you so much. Yeah, thanks for having me on. Mike. Appreciate it. So much for listening to the podcast. Really appreciate it. big thank you to Dr. Brandon Roberts for taking time out to chat about all the fun things we discussed from insects to Myostatin supplements, genetic engineering, and so forth. If you enjoyed this podcast, if you could help me out by sharing it with someone who you think would be interested, leaving us a short review primarily in iTunes, or whatever platform you want, and leaving us whatever stars you think is appropriate. So far, everyone has enjoyed it, but I think we had one person they'd like a one star for some reason. But if that's you, then great, send us any feedback at all really appreciate it. As always, this one is sponsored by the flex diet certification. So go to flex diet.com Fl EXDT comm you can get on to the waitlist there, which will notify you the next time the certification opens up also puts you on to the daily newsletter that has a vast majority of most of my content goes out there and it's completely free. So go to flex diet calm. Thank you so much for listening. Please share it and give us whatever stars you feel is appropriate. leave us a review that helps us get bigger guests and more distribution of the show. Thanks again for listening. Talk to you next week.