

EPISODE 246

[INTRODUCTION]

[00:00:19] AVH: Hey everybody, Happy New Year! Welcome back to Paleo Magazine Radio. If you are a new listener, thank you for being here, I will not let you down. If you're an old friend, thanks for coming back. I hope that everybody had a fantastic holiday, a nice break and I hope that you feel good and inspired and ready to kind of hit the ground running with the new year and not too worn down from the holidays because that can happen.

So anyway, I hope you're feeling great and I wanted to start this new year off with a bang with a very awesome guest. So I'm excited that today I am offering you my interview with Dr. Dom D'Agostino. He is an Associate Professor with tenure at the University of South Florida. He teaches at the Morsani College of Medicine and the Department of Molecular Pharmacology and Physiology with the focus on topics like neuropharmacology, medical biochemistry, physiology and neuroscience. So, little bit smarter than I am.

He's also an early pioneer of exogenous ketone supplements and ketogenic therapies. So if you know or if you nerd out on like anything to do with nutrition and diet and keto, you've already heard this guy's name, you may have heard him on the Joe Rogan Podcast on the Tim Ferriss Podcast, he's a pretty big authority in this world and I was very lucky to grab some of his time and it turns out he's also a super down to earth and friendly human being, which is always a plus when you're interviewing somebody, and he's able to kind of talk to me at a normal person's level, despite the fact that he's talking about researching work that it's just like, miles over my head.

So it was a very cool interview and I highly recommend you giving him a follow and do some research, read some of the stuff he's put out there online and the work that he's continuing to do. Also, by the way, maybe think about attending his Four-Day Keto Seminar, a metabolic health summit, which is happening in LA at the end of this month. I did an interview actually with the cofounder of that event. Her name is Victoria Field and that is Episode 240. So feel free to go back and check that interview out. There's also a discount code in that episode for tickets if

you want to attend, which I highly recommend you doing. Paleo Magazine will also be in attendance.

Bottom line, this is a really interesting conversation and it's not just like pro keto, convincing you to go keto because, you know, I'm not trying to do that, I promise. I'm really not trying to do that. I ate a lot of carbs today so just yeah, I'm not trying to make anybody change their diet. But he has some really interesting research. Like he is testing performance resilience and people doing incredible work like astronauts, Navy SEAL divers. So he's going to be bottom of the ocean and testing metabolic therapies and diet. I mean, he's got a very weird and cool job to be honest with you.

So I hope that you enjoy it and if you do, please don't hesitate to reach out to me on Instagram. You can talk to me personally, @themusclemaven or across all of our social media, @paleomagazine. Start a conversation and you know, let me know who and what you want to hear about in 2019 because it's a new year, it's a fresh start, we can talk about whatever you want to talk about. So send me a message, let me know. Let me know what you want to hear and I'm going to do my best to provide that for you.

All right, that is enough for me after a quick word about our show sponsored Bonafide Provisions.

[SPONSOR MESSAGE]

[00:03:52] AVH: Bonafide Provisions is a family owned company founded by a clinical nutritionist that makes real, certified organic bone broth the way it's been known for hundreds for hundreds of years, using only bones, no filler stock and slow simmering for 18 to 48 hours. They use no high heat processing and no preservatives to make it shelf stable. So there's no garbage in this product whatsoever and you're going to want to eat it quickly after you thaw it out. But you will, because it's delicious. It is frozen at the peak of freshness and they're got a bunch of different flavors for you to choose from, depending on what you're into. They've got chicken, beef, turkey.

Their bone broths, I think, make like a perfect just sort of drink, right? Like you drink it from a mug like you would your coffee or your tea. It's great if you are trying to cut back on caffeine or you just kind of need something warm and comforting in the afternoons. I know when I start to feel kind of sick, like just kind of run down in the winter, first thing I do, grab some bone broth. I just know that it's full of all of those vitamins and minerals and collagen and all that delicious stuff that we need. But, Bonafide also has launched a line of soups that combines their bone broth with organic vegetables. They've got flavors like butternut squash, chicken vegetable, and yeah, I mean you can try all of it because they're giving us a discount for any of their products if you use the code "onlybones" at checkout.

So go to Bonafideprovisions.com and order now!

[INTERVIEW]

[0:05:20.7] AVH: Dom, thank you so much for taking the time on a holiday weekend to chat with me. I really appreciate it.

[0:05:25.5] DD: Glad to be here, Ashleigh. Thanks for having me.

[0:05:27.5] AVH: So I guess inquiring minds need to know right away, what did you eat yesterday? Did you eat a bunch of carbs, or what?

[0:05:34.0] DD: I ate one meal and that was my Thanksgiving day meal. I was working on the farm all day clearing brush and chopping logs and stuff. My wife made turkey and no stuffing, no mashed potatoes but I had turkey and asparagus and vegetables and, you know, kind of like all the trimmings, minus the carbs. She did make a cranberry sauce with like a slight stevia sweetened that was pretty good too. I had a little bit of that.

[0:06:03.2] AVH: That sounds pretty delicious though despite the lack of stuffing, which for most people — we all like to think that turkey is kind of like the main part of this meal, but I think for a lot of people it's the stuffing or the pie in my case. So you did a pretty good job and I guess working on a farm and clearing brush and trees is a pretty good way to prepare yourself for a big meal too.

[0:06:22.8] DD: Yeah, I was pretty hungry by the end of the day yeah.

[0:06:26.4] AVH: Tat's awesome, yeah. I think and I've heard a lot — I mean, a lot of stuff, it's about hedging your bets, right? You said that was your one meal of the day right? A lot of people, maybe that's a way that they prepare for having like a big meal is just maybe not overdoing it the rest of the day and kind of making that your big meal, right?

[0:06:44.3] DD: Yeah, you know, it started at four and ended at about nine with keto ice cream, it was kind of like eating and sort of snacking a little bit until we went to bed.

[0:06:55.1] AVH: That's a perfect Thanksgiving as far as I'm concerned. Was that home made keto ice cream?

[0:07:00.2] DD: No, it was one of the — people will send us stuff. One of the things I'm very excited about is that there's an emerging market for low carb and keto type, I guess what you would say comfort foods. So I have the challenge, I have the opportunity to test these foods and actually do it with blood management. So the keto ice cream was a little or no carbs, absolutely no sugar and I collect data on it and I have probably a dozen different types of keto cookies, three or four different types of keto ice creams that I've been testing. But I do make my own although this is the new commercially available keto ice cream that's out there now.

[0:07:38.8] AVH: Yeah, that's not a bad gig, right? I know I kind of have a similar, not at scientific as you but I kind of have a similar deal with working with Paleo Magazine as I do a lot of product reviews, so I get a lot of stuff sent to me and I get to try it out and try to figure out what's the better quality or kind of tastier stuff and it's a hard life but somebody's got to test the ice cream, right?

[0:07:58.6] DD: Exactly, I promise, well, when they reach out to me, it's like, "Yeah, I will test it, I'll actually do blood work. I'll measure my glucose response and ketones," and they're like, "Oh, really? Okay." Sometimes it's good, sometimes it's bad and I do, you know, if I like the product, the taste and everything and the numbers are good, sometimes I blog about it on the Keto Nutrition Blog so if it's something that I determine, "Okay, is this a product I'll use, is this a

product I like?" Which I've done in the past for things are like ButcherBox Meats or other keto, low carb keto-related products that are out there.

[0:08:32.9] AVH: Yeah, very cool. Okay, so I have a lot of questions that I want to ask you about nutrition and health and keto and other things too. I recognized that some of these questions are going to be a little bit general or high level and that there's a caveat but the answer is always going to kind of be "it depends", right? Because there's so much about diet and nutrition that's specific to individuals and their goals and challenges. So I think all of our listeners and I think you and I both understand that there is that element of there's never kind of a one size fits all answer for everybody, right?

But I do have a bunch of questions because I asked the old Internet and my online community that I was talking to you and despite the fact that I think you got a lot of information out there on the Joe Rogan Podcast, which I also want to talk about, there's still a bunch of burning questions so I have those. But first, I kind of just personally want to ask you what you thought about your debate or your conversation on Joe Rogan? How did that go for you how did you feel about it?

[0:09:25.7] DD: I thought it went well, this was real, I felt like it was an opportunity for my friend Layne Norton to kind of voice his opinion because I know Joe maybe a little bit bias because he does follow low carb ketogenic and tends to have more people on that kind of follow or favor that preference of a diet and a lot of people view Layne as completely anti ketogenic but I know he's not because even today I have someone that he referred me to who wants to follow the ketogenic diet.

So he views it as not a better option necessarily, but he views it as a valid option for some people. I think I guess the controversial topic would be he is a proponent of the calories in calories out and quality of food not being as important as quantity. So quantity as far as macro nutrient composition and calories, you know, he says we'll always trump quality when it comes in the context of fitness and body composition alterations. I come from it a little bit, you know, more from the perspective of nutritional interventions for therapeutic applications and also performance resilience not necessarily body composition changes or strength.

Where Layne is coming at it at purely from a body building sort of power lifting background, which him and I are – we used to train together and we go to the same gym and everything. I'm into that too but most of my research and what I focus on is really about lifestyle therapeutic applications and performance resilience, basically which means in the context of like a war fighter, a military personnel or even an astronaut is being able to maintain that cognitive and physical resilience in an extreme environment. That's actually really what I study the most.

I don't talk about it as much but that's really the corner stone of our research and out of that research evolved the observation that low carb and nutritional ketosis works for an emerging array of applications and I think Layne understands that but is coming at it from a different angle and is purely sort of fat loss, body composition, and sustainability. Maybe with his perspective as the ketogenic diet's not sustainable, I realize that I might live in a little, I live in an expanding bubble. I was going to say a little bubble but the keto low carb community.

[0:11:57.0] AVH: It's getting bigger every day.

[0:11:58.8] DD: Yeah. It's an expanding bubble that really has so many resources available whether it be keto foods, keto ice cream, recipe books and online communities that make this kind of eating or lifestyle very easy to follow in my opinion and sustainable. I know for me it was sustainable.

[0:12:19.2] AVH: Yeah, I think it's what you're saying here is interesting that it's like you and Layne both obviously have answers and have credible evidence-based answers but it depends on what the question is that you're asking. So, as you said, some people are really purely looking at, "How can I be the strongest in the gym or how can I look the best and lose fat and still kind of maybe enjoy Pop-Tarts every now and then?"

Some people are saying, "How can I maximize my brain function and how can I live longer?" These are different questions that require different answers and I think, hopefully I'd like to think that the community and human beings in general were big enough and tolerant enough to allow all of these answers to exist and different things work for different people. But do you ever find, maybe this is just me being cynical, but with — in the example of the debate or the conversation that you guys had on Joe Rogan that sometimes do you feel like you're kind of preaching to the

choir or speaking to the converted already? Because you see, first of all you should never look at comments anyway, but when you look in the comments, you know, there's people who obviously relate to keto or are into keto and they're like, "Yes, this is right, everything else is stupid," and then there are people who are all about "if it fits your macros" and they're like, "Keto doesn't make sense. Layne's best."

Do you ever feel — do you feel sometimes with these kinds of conversations that you're maybe not able to change people's minds because we come into it so setting our ways, or am I just being a pessimist?

[0:13:40.8] DD: Yeah, I don't go at it with the agenda to change people's minds. I go at it from the agenda and it's like, I like talking about emerging research and emerging applications for a diet where the only application is pediatric epilepsy and we know that the guidelines for the diet have softened a little bit when it comes to the macro nutrient compositions and more liberal on protein if we're following the modified ketogenic diet, which makes a diet accessible and the benefits of the diet accessible to a broader population and it's been through the last 10 years when Eric Kossoff, Johns Hopkins published sort of the information on the modified ketogenic diet that I began experimenting with it and doing extensive blood work and also receiving emails and blood work from hundreds if not thousands of other people.

That has given me great insight and as has the research that we do here in the lab on a variety of application. I just like, I like to talk about it and just kind of present it as an option. I know I do have an appreciation that there's huge variability, individual variability in people's ability to follow the diet, even from a genetic standpoint, to adapt to the diet. It's a little speculation on my part but I think that many people have vastly different sort of activity of fatty acid oxidation enzymes and even ketolytic enzymes, which allow your body to sort of produce and utilize ketones and just the numbers that I've seen and also some of the genetic platforms that are available now show wide ranges of difference in fatty acid oxidation enzymes, for example, that are found in the liver.

That's going to influence your individual sort of adaptation and response to the diet and also cardiovascular measures may go in a negative direction for some people but largely they go in a positive direction for others. I think that needs to be appreciated and from my perspective, I just

like to talk about you know, the pre clinical emerging research and also how we're moving the animal research into like human factors research.

We actually are using this in an operational setting as it pertains to sort of the under water under sea environment or even the hypobaric environment. Be in altitude environment. That's like what gets me excited. Although it is interesting when we talk about bodybuilding applications or power lifting applications because these are real world applications too, you know?

Conservation of strength and, you know, lean body mass and things like that. Especially in the context of the calorie deficit, which is a big part of what we're doing now is looking at the anti-catabolic effects of ketones.

Many people, whether they're doing it for sport or just body composition changes, they need to go into a calorie deficit and my – I guess the Joe Rogan Podcast really, that's kind of what we're talking about, right? Because fat loss, to lose fat, I kind of believe in obviously Layne would agree that you have to have a calorie deficit and I think that's where the ketogenic diet really shines. Because it makes your body resilient to low glucose and low insulin by elevating ketones, which are anti-catabolic. Your body won't be catabolizing muscle to maintain that glucose level and we are working on a review right now that will be submitted pretty soon that kind of discusses the anti-catabolic effects of ketones and especially in the context of like a pro inflammatory state and I guess you could say that if you're training really hard, you are kind of putting your body into a stressful pro inflammatory state.

I think that the science is very new and I think the science is emerging quite rapidly and I predict in the next few years that it will be recognized that a ketogenic diet, defined as a diet that increases your ketones, will be favorable for body composition changes and also for fat loss and sort of the weight loss or calorie deficit scenario. So I could have more ammunition going back into the –

[0:18:00.2] AVH: Yeah, part two.

[0:18:00.6] DD: I thought it was really important for Layne to kind of voice his opinion, just also based on his experience too and working with many athletes.

[0:18:07.6] AVH: Absolutely, it's important that we always get as many kind of different sides and perspectives out there as possible. But if keto can or does or eventually will address the life long issue for bodybuilders of can you maintain or grow muscle in a calorie deficit? You would make so many meatheads so happy, including myself. I think that's not a small thing so that's pretty exciting.

One of the things you mentioned that I'm really happy you touched on because I wanted to talk about this too and the work that you're doing on resiliency and that's a topic that I love to explore, whether it's mental or physical or emotional or all of the above. I think that that's one of the things that makes human beings so impressive is how adaptable and resilient our bodies can be to less than ideal situations.

So I'd love for you to talk a little bit more about that in terms of the work you're doing, first of all, what resiliency means in that context and how, if and how a ketogenic diet can make a person more resilient?

[0:19:08.0] DD: Sure, well that's really the focus of my research since I finished my PhD back in 2004 and I started working with the Office of Naval Research in 2005, officially funded early 2006 for a project that was investigating a limitation of Navy SEAL divers, which is oxygen, toxicity, seizures and we developed various environmental chambers that would allow us to look at brain function and cellular function under extreme environments where we could put rodents inside a chamber and look at high pressure oxygen or nitrogen or you know, just pressure. Just high levels of pressure, just called like hydrostatic pressure.

So we did a variety of experiments and the information that I got from this first grant made me understand that it was maintaining metabolic ATP production, maintaining cellular metabolic function and preserving that was really the key to enhancing our resilience, our performance resilience in extreme environments. When we talk about performance resilience, that's really — the definition really would be to prevent a decrease in performance, cognitive and physical, under extreme conditions.

Not necessarily enhancing your performance, but with the understanding that humans have to go into extreme environments, which could be a hypobaric environment, which could be the top

of Mount Everest or it could be a hyperbaric environment, which would be the bottom of the sea floor. Space would be hypobaric too and also high CO₂, which is another thing.

We study all these different paradigms and we look at things like, you know, the activity of neurons, the membrane potential, the firing frequency, we look at EEG, your brain function, EKG, heart rate variability, respiratory function, we look at blood metabolites and all these different variables and if we go back to a very reduced sort of preparation, which would be individual neurons on a petri dish inside these environmental chambers in the presence of ketones, the neurons could maintain the resting membrane potential and also maintain sort of reduce the hyper excitability that typically happens in these extreme environments.

I saw that it had a stabilizing effect and from a metabolic perspective, the cells were able to function normally under conditions where cells would typically die. If we move then to tissues in brain slices, we saw the same thing and if we move the whole animals, the rodent model, we saw that if a rodent were put into a state of nutritional ketosis, they could stay in an extreme environment for an hour and typically if they were not in a state of ketosis, they would have succumbed to the extreme environment after just 10 or 15 minutes.

So it was really making cellular, molecular, and physiological resilience kind of off the chart and I came from this, from the perspective that I would understand the mechanisms and then I would develop a drug cocktail that would do this. But I radially shifted my focus because the best way to alter metabolism was really not with a drug but was by changing the macro nutrient composition of the diet, which is essentially the ketogenic diet or giving exogenous ketone supplements too, and that's something that work with and kind of also corner stone of our project.

It was that work that was done, you know, doing electrophysiology, various forms of microscopy including confocal, laser confocal scanning microscopy where we can actually look, we can optically section the cells and look at the mitochondria functioning under those conditions in the absence and presence of ketones. It was this information that was captured in 2005, six, seven and eight that really setup the scenario of basically developing a ketogenic strategy for the war fighter and that was about 10 years ago it sort of became a reality. Then the Office of Naval Research invested heavily into nutritional ketosis as a performance resilience strategy.

[0:23:41.2] AVH: Do we know if that's something that's being used regularly and consistently within different parts of the military or first responder kind of environments like our people. I mean, I can maybe speak to a Canadian Military because I have some connections there and I know they're big into keto for a variety of reasons. But this is like on an individual level, not a systemic level. But is that something that is being implemented kind of at a high level within the military at this point?

[0:24:08.8] DD: It definitely is in the special operations community. Those guys tend to do what they want to do and they're given a lot more freedom to do freedom in what they eat and you know, the weapons they use and many different avenues. So I communicate with quite a few of the special operations guys that are doing this and sometimes they need a little tweaking and adjusting as they go. Then research is being done, continuing to be done in our lab.

Duke University has a huge physiological, environmental science center where a [inaudible], which is kind of also an extension of the Department of Defense is studying the ketogenic diet in people and pushing them to the point of seizure and then looking at the latency to seizure with and without ketosis and that's all — that information has not been released yet. It's all blinded studies but that's going on and we're continuing to evaluate different types of ketogenic formulas because the first thing that we published on 10 years ago was just a ketone ester.

Now there's different types of ketone ester, there's ketone salts, there's medium chain triglycerides. It's likely that one of these agents alone is not going to be optimal, but the combination of these agents producing a very specific pharmacokinetic profile as far as the types of ketones that are altered in the blood and also the sort of duration of the ketone elevation in the blood that it has to be rapid yet also be prolonged, sustained is very important. All these variables are important.

We're also you know, testing it in the context of preventing seizures but we take the same agents and we put rats on a treadmill on a roto ride device and then run them to exhaustion and then we look at learning in memory, we look at fear response. We're evaluating the agents that would work for the application, oxygen toxicity seizures, but we're taking those agents that work and then evaluating their effects on performance, cognitive performance, physical performance

stress and many other things and then moving those agents to the human studies. So it's kind of like a pipeline.

We do stuff in cell model, so culture work to understand mechanistically how it's working and that gives us information on how to design the formulations for oral administration and then vetting out and then eliminating the ones that don't work, selecting the ones that do work, and then further tweaking the formulas, whether it be a dietary formula or supplement formula or combination of both and making sure that it's tolerable, sustainable, safe, FDA approved, all that stuff. It's quite a laborious — it's very tedious and it's laborious and it also costs quite a bit of money to actually move that into human studies. But we've had some human studies going on for quite some time.

Meanwhile, in the field, the actual operators are using this. You know, from a military standpoint, from Army Rangers, to Navy SEALs, to you know Paratroopers and I'm also in communication with — we do quite a bit of work with NASA with astronauts who are also using this and it's not sort of accepted and embraced fully by NASA, although they funded some workshops on it but some of the astronauts are already doing this. So there's an effort I should say or motivation to actually make low carb ketogenic food an option for astronauts to have in their selection of foods that they could have on the station and ultimately for deep space missions.

[0:27:58.4] AVH: Okay, that sounds super cool, I realized that clinical studies, as you said, can be very laborious and take a long time to be very tedious but also you're working with people in space so that's pretty cool. I run the risk of veering into territory here that's over my head, so I'm going to tread lightly.

But I'm interested in, you talk about hypo and hyperbaric situations. So anything from sort of space to like deep under the water. What are the differences that you're finding at any of the research that you're doing in terms of performance and applying ketogenic principles to both of these environments? Is one of them kind of more difficult than the other? Do they react similarly? How does that work?

[0:28:39.9] DD: So the application, yeah how do you apply nutritional ketosis to these individuals? Well, it depends on the agency. The most important thing is safety, right? We are

doing quite a bit of tolerability and safety studies. The way these things kind of work is that the more – the potency is inversely correlated with sort of taste, right? The higher the potency, the better the potency, the least tasteful it is, or I should say the more taste averse it is. A lot of effort now is actually just designing something that actually does the job, which means that produces a particular pharmacokinetic profile of elevating acetoacetate and beta hydroxybutyrate and specific ratios at the time. To have that agent sort of developed in a way that's palatable and friendly and also, from a dietary perspective too, it's really formulating the diet.

We work with registered dietitians at Duke University, for example, that are formulating the diet with medium chain glyceride with mct oils and different types of proteins and also different types of probiotic fiber to sort of reduce the insulin response and things like that. You know, for me I think I can take anything, I can consume anything and just kind of get it down but when you're talking about large studies, it's really a small percentage of the population can kind of follow through with a prolonged dietary intervention, especially when it comes to ketogenic diet or even a ketone supplement. When you think about it, doctors will tell you, it's hard enough for them to get their patients to take their pills on time, you know, their prescription pills. So when you think of changing someones diet and then having them, having to monitor that and everything, that's a challenging task.

So that's really becoming the focus right now although we are doing the hard science, the hard science is also kind of spanning into making it tolerable and increasing the palatability and sustainability of these approaches for nutritional ketosis. So that's a big part of getting the agencies, the funding agencies to buy into this. Because many of them think, "Well, the diet's not sustainable so we want to do a supplement route," and my feeling is that the dye, a modified diet and a supplement combined together would be ideal.

I'm trying to pitch that. Because I don't favor necessarily one over the other, diet or supplement, but I think the combinations of the two can be appropriate. If it's a very time sensitive thing like you go on a mission and you have 30 to 60 minutes before you engage, you know, you want something that you can consume prior to going under water and being exposed to that extreme environment. So a supplement, in that case a supplement would work much better but if you're already in the state of mild nutritional ketosis through dietary means then that's ideal.

[0:31:59.3] AVH: Sorry, is there a difference with, if we're talking about people in space or we're talking about people under water? Have you seen a difference in how people react to the different, whether it's supplementation or the diet, does one of them they react better to the environment that they're in or has there not been a huge discrepancy there?

[0:32:20.1] DD: Well, part of what we do, for example, on the deep space analog or the Mars mission analogs, which is called NASA Extreme Environment Mission Operations, NEEMO is one. I was a NEEMO crew member for 22 and I lived underwater for 10 days and worked with astronauts and they are super, super high performance people and in that environment, you're confined to a very small space that would be maybe the size of a 30 foot RV, right? You're working together. Occasionally you do EVA's, which means you go outside of the habitat and then you work in the water on the bottom of the Atlantic and then you come back in the habitat but the pressure of that habitat is still like 3 ATM. It's like a high pressure sort of environment literally.

Some of the benefits of being in nutritional ketosis is a decrease in hunger. You know, your appetite's not controlling you and sometimes these extreme environments really set your appetite off. That cognitive sort of performance and resilience because if you're doing an extra vehicular activity, an EVA for example, if you go outside the space station and your body is in space, you just have a space suit on and you're working on the ISS or in our case on the Mars analog, we are working on the bottom of Atlantic and we're weighted down to be weighted for the surface of Mars but we would have five or six hours of work to do.

The preparation to put on all your gear and everything to get out there takes some time too. So you're going a very long period of time without food and you're working hard because you just don't have time to eat and in that case, you know, when you're falling in nutritional ketosis regimen, your decreased food availability does not become such an issue because you're making ketones and the ketones can kind of maintain your cognitive performance resilience in that capacity.

When it comes to a war fighter in austere conditions where you have a limited resources and you have to carry our food with you, the energy density of fat is quite a bit higher, it's like double

right? So if you literally weigh and measure the volume and the weight of the food for a mission, it's like 50% less, right? If you're sending food to mars, logistically, it makes –

[0:34:52.5] AVH: That matters.

[0:34:54.8] DD: It's like, you know, 10, \$20,000 a pound right? So you can say, for a six man crew for two years, it ends up being like 6,000 pounds. So you could do the math on that. It becomes logistically very favorable and NASA has a lot of engineers so I don't talk too much about the logistics behind it but when they – I told them that fat was nine calories per gram, a couple of those smarter ones did the math real quick and kind of set up a scenario of what the food, the volume and the way the food, the savings that would be.

I typically talk about the biological applications, the anticancer effects, the neurological effects and things like that. But it's interesting from a logistical perspective, it kind of makes sense too. From an operational perspective there are many advantages. We study the biological advantages too and we think there's a lot. But I like to emphasize the research is on going and the next NEEMO mission will be on the bottom of the Atlantic again and it's going to really assess micro biome, it's going to assess cognitive performance, stress, physical performance, metabolic parameters will be assessed, a variety of things will be assessed and it will give us a base line of information.

On my mission, I was ketogenic so my base line was a ketogenic diet but the other crew members just ate the standard sort of astronaut type diet, the free stride food and things like that. We collected the idea is to collect two or three crews of data baseline and then come in with the ketogenic intervention and learn how this extreme environment alters all those parameters. From micro biome to cognitive function, we measure body composition, we measure many different things. It's really interesting. When you put your body in this extreme environments, you tend to have rapid weight loss. So one of the things that we'll have to focus on is actually maintaining weight and ensuring that enough calories are consumed on these missions.

[0:37:04.6] AVH: This is so interesting. I mean I think, even people who aren't into keto will agree that a ketogenic diet is favorable to eating astronaut food because astronaut ice cream

and all that freeze dried food isn't super awesome. But you lived under water for 10 days, I feel like that should be a podcast interview in itself. What an incredible experience that must have been?

[0:37:24.8] DD: Yeah, I did a MPR podcast when I finished, when I surfaced a while back. But yeah, that was really an experience. Just being selected for that and the training at NASA at the neutral buoyancy lab where you have to do like your all your safety training and, you know, your swim test and things like that. But, you know, the fascinating thing is just really working with astronauts and Kjell Lindgren was my commander and he was on the space station for about a half a year and it's really one of the top astronauts right now. So it was amazing to have one of the top astronauts in the program be your commander for this Mars analog mission.

[Inaudible], was a European, he's an ESA member, European Space Agency Member and he flew with like John Glenn, you know, he was more of a seasoned astronaut. It was interesting to have that international sort of, you know, opportunity too to interact with these guys from different nations and we had a Japanese space agency guy that was doing mission control. So it was just amazing to work with these individuals that are so proficient in so many tasks.

For example, we had a mini DNA analyzer to look at the microbiome of the habitat and it's interesting to see an astronaut, the manual to run a mini DNA analyzer and sequencer is 58 pages and they're so skilled that just basically reading directions and following directions, they were able to complete the task faster than me and that's what I do. That's my occupation is I work in a wet lab.

[0:39:11.8] AVH: How did that make you feel?

[0:39:12.9] DD: Yeah, a little bit kind of insecure. I really had to step up my game just to like hang with them because we were very task loaded and part of assessing our stress levels and really testing the crew, what they call a team cognition or crew cognition, how the team works together is to basically just task load them.

They have cameras everywhere, so they're watching you and then they're communicating through the communications, the Capcom. So you're kind of being tested for the whole day, you

know, for the whole mission and you know, I really had to step up my game to be able to hang with them on all the different objectives and it was about 15 or 16 different objectives for our mission.

[0:39:54.8] AVH: That's pretty inspiring though, right? It just kind of inspires you to — it keeps you on your toes.

[0:39:59.8] DD: Absolutely, yeah. It's science. I mean, that's why these NASA missions typically it's just to train astronauts but occasionally they bring on scientists like me who can actually do the science in those extreme environments and that's an amazing opportunity for me that it was probably the thing I am most grateful for just to have the opportunity to be on that mission and to move my science at the lab at University of South Florida into an operational environment and working with NASA to collect that data.

Getting five ethics reviews on all the different protocols was probably one of the most challenging things going in to this mission because you write up a protocol and it has to be approved by your institute but it also has to be approved by NASA and NASA, even though they stick astronauts into a rocket, that's like a controlled explosion and the odds are not very good, they are so risk averse. Just looking at for example, the DNA of the micro biome, they see that as a major risk to the astronaut. So there is an enormous amount of paperwork for things that you would never think, you know, there should be a lot of paperwork. But with any big bureaucratic — and it is all a safety thing. But the odds of getting if you just look at the astronaut program, it is pretty risky getting into a spaceship and getting into orbit, getting into space.

That is astronomically, it is almost like if you were a soldier going into Vietnam I think the odds are better that you would come back than getting into space and then they nitpick on things in your research protocol. So it is a lot of back and forth and you really understand or get to understand the NASA system and you also really get to understand your own research because they have a team of experts that is really criticizing your research.

Like, "Why are you doing it this way? If you do a venue puncture to pool blood, why can't you do a finger prick? You could get enough blood with that. It is stuff like that because if you get an infection in space, with a ketogenic diet kidney stones are much higher. So one of the things

that the flight doctors are very concerned about with astronauts in space is that you could potentially get a — getting a kidney stone half way to Mars could be a bad problem, right? So things have to be tailored and addressed and even from a diet or supplement perspective really formulated in a way to get around these potential problems and that is a big part of the science of what we do. We are not just taking an off the shelf ketogenic diet but actually formulating it and tweaking it for maximum safety and efficacy.

[0:42:54.2] AVH: Right. This is so interesting. I guess when you put it that way the idea of putting yourself in a spaceship and blasting yourself to space is a little bit less risky than just taking carbs out of your diet. But then there's deeper elements to it. It is so interesting. We'll have to put the — I will have to listen to it first of all the MPR episode and put that in the show notes so folks can learn more about that one.

I think it is also the other thing that I took from this, of course not being a scientist, is that all we need to do to lose weight quickly is just spend some time at the bottom of the ocean or maybe in space. I don't know if that is ever going to be on the cover of Cosmo Magazine, but apparently that is pretty effective.

One of the questions I wanted to ask that came from this conversation is about the concept of supplements and you were saying obviously you want to find something that works but that is also something that people are able to take and that it is sustainable and it is not gross and I remember listening to a lot of interviews about, back in the day when really the only supplement where these ketone esters and they tasted like rocket fuel. Now these days, I mean there are a dozen keto supplement companies that make collagen and make exogenous ketones and making powered MCT and all of this stuff and a lot of these products are delicious to the point where I'm like, "Really? This almost seems like it is too good to be true. Are these are really effective?" And then they're also touting that you can take them while eating a normal non-ketogenic diet. You are still going to produce more ketones that you are getting the best of both worlds and now I am really skeptical.

So I would love if you could, and you don't have to call anybody out or talk really in specifics, but I would love to hear what you think about the current state of mainstream keto supplements and if you think there's any value or how they work.

[0:44:34.4] DD: Yeah I think there is definitely value to elevating your ketone levels and that's really what we study. We are working with Angelman syndrome. It's a clinical trial we have right now going on and kids with Angelman syndrome, it's a genetic disorder that causes seizures but also motor function impairment. They're very responsive to the ketogenic diet but it is very hard for them to follow. Kabuki syndrome is another genetic disorder that is responsive to the ketogenic diet and that the ketones have epigenetic effect that increase the methylation rates that are suppressed with that.

So I am approaching it from a therapeutic perspective that independent of a dietary intervention, animal models show and now clinical trials have started with ketone supplementation for patients and children and adults that are either unwilling or unable to follow a ketogenic diet for different reasons and that we could get into that but that is another subject.

So there are many applications of exogenous ketones. They lower glucose, as I mentioned, they do have some interesting epigenetic effects. They lower inflammatory status and they suppress inflammatory pathways and that is a big focus of what we're doing. They have anti-catabolic effects. They have anti-cancer effects that in pre-clinical models is very interesting and we are moving that, we are in the process of moving that to human clinical trials, or at least writing grants and working with a federal agency to do that.

So from a performance perspective, which a lot of people are probably interested in, the science is still out on that. I think if there is a performance advantage to just consuming ketones and not changing your diet, it is relatively small. The data that was published in cell metabolism with the ketone mono-ester beta hydroxybutyrate is pretty compelling.

There is an advantage, there is a glycogen sparing effect and also an increase in skeletal muscle, fatty acid oxidation rates and there's probably the most significant thing is a 50% reduction in lactate when you acutely induce ketosis with something like a ketone ester. So that could translate to significant advantages. It's like a new technology and we are just learning like what is the best formulation, what is the best way to utilize this? Do people need to be adapted to it?

So these are the questions that we're working on answering now and we're working on a few publications. So your listeners, keep your eye out for a few publications that should be coming out not only animal studies but also human studies and when it comes to the ketone salts and for MCT's we can even say that and the combination of ketone salts with MCT's probably offers the most advantage as far as rapidly elevating ketones and sustaining that over time, over two to four or maybe even six hours depending on the dose, probably offers the most benefit.

Because if you consume a ketone salt by itself your level of ketones will rapidly shoot up but likely be back down to baseline level after about 60 minutes or so or 90 minutes. So there's different ways to formulate ketone, exogenous ketones and ketogenic pre-cursors to enhance the tolerability, the palatability and also the efficacy and that's a lot of what we focus on.

A big part of what we do is looking at the ketone esters and I will say they still are not palatable from the conventional sense. They can be put into capsules but they are the most effective really for what I am studying, which is oxygen toxicity seizures. So a big part of my research is really focusing on the ketone esters but also gradually formulating the ketone salts to get as effective as a ketone ester is and I think we're about half way there as far as formulations and there is different ways to do that. There's different types of salts that are available. You can combine a ketone with different types of minerals and amino acids and things like that. So we are investigating that.

There are ones on the market, the ones that we've studied and testing on the lab they are on ketonutrition.org website. But there are many out there that I have also tried but just having comprehensively tested but we plan to do that soon and hopefully the ones that pass the test will make it to the website. But they all pretty much taste good. I mean, relative to ketone esters, which taste horrible and that is a major advantage and that was a really big issue with the clinical trials that we were setting up is that the patients just cannot, even if it worked amazing they would not take it if it didn't taste good.

So we had proposed to use a ketone ester but had to move to the ketone salt even though I felt that they would not be as effective in their current formulations. We're working on enhancing their formulations, but clinical trials are underway right now with the ketone salts and I think they had neurological advantages, performance advantages especially in the context of different

disorders. Now whether that will manifest in a person who is healthy and athletically fit, that's still an area under investigation right now.

[0:50:13.6] AVH: Okay. All right that is very helpful and also more positive than I expected. There's me being the pessimist again and I think it is worth for the average listener who is relatively healthy and is just trying to optimize their performance and their health and how they feel. It's probably worth noting that it is not a magic pill and that you can experiment with things and play with things but supplements are supplementary for a reason and you've got to use your common sense as far as that goes.

[0:50:43.3] DD: They are a supplements. I would say, you know, when creatine came on the market I was in high school in 1991 I think. In '92 I actually got my first bottle of creatine. I forgot how much I paid for it but I was very excited to take it and so creatine you consume it and it increases the production of ATP under anaerobic conditions in the muscle, right? So ketones will probably follow the same path. So it is essentially just a form of energy that when you consume it orally, it helps your body make ATP and that can occur at the muscle.

But I am more interested in occurring at the brain and if your brain can – if you control and enhance and preserve metabolic activity in the brain under extreme conditions, and that could be athletic events too, if you keep your brain happy and energized your central nervous system is going to fire better to your muscles and activate and recruit more muscle fibers under strenuous aerobic and anaerobic conditions too and I even think that if you train anaerobically and your ketones are elevated and I get this question a lot because it is almost to the point now where people are accepting even exercise physiologists do accept that elevating ketones has an aerobic advantage for the endurance athlete.

But I think, I guess the evidence still needs to be presented and replicated. I think it is very important for multiple laps to replicate the research findings and to investigate it in a proper way looking at anaerobic performance, looking at strength performance. So I think there is going to be a little bit of a mix bag but I think you will probably find a mild advantage, especially if the individual is at a calorie deficit.

[0:52:33.9] AVH: All right, I want to switch a little bit here because I don't want to keep you all day but I still haven't even gotten to some of the questions that the folks over the Internet asked me. I have to do it or else they would be mad at me. So a couple of quick questions, we'll see if we can get through.

The first one I got a number of requests from peri and postmenopausal women and a lot of them were based around how to break through plateaus with the ketogenic diet, either losing or even maintaining your ideal body composition once you have gotten there and it seems like the stories that I hear are a lot of women who go from a typical standard American diet, they transition into keto, they feel better really quickly. They drop weight really quickly. Inflammation goes down, but shortly thereafter it settles in again and they have a hard time continuing with their progress.

Do you have any general tips or things they could be looking at areas that maybe they need to tweak or places they're going wrong?

[0:53:26.8] DD: Yeah, that is a little bit tricky especially I am not a post menopause expert on things. But I have some opinions. I feel like a continuous ketogenic diet does suppress the hormone insulin and I have seen enough blood work to show that I can go down 50 if not 60%. When that happens female reproductive hormonal health tends to be altered in ways and sometimes when that happens at least from the blood work that I have seen that the female athlete is simultaneously starting a ketogenic diet, exercising more, and also in a calorie deficit.

So you have multiple factors, multi-factorial components that can alter reproductive, sort of hormonal, all of the different hormonal systems from cortisol to estrogen to thyroid even metabolism. I think it's important, if they are really deadest on doing a ketogenic diet, I would say alter between maybe one or two days of the ketogenic diet a week but also intermingle just low carb.

Low carb, basically protein and veggies, so spiking protein maybe on the days that you are doing heavy training and that tends to normalize hormone levels I've seen. Not when you go off of the ketogenic diet if that happens just don't go crazy. Maybe allow yourself a 100 grams of

carbs or a 150 grams of carbs but not three or 400 grams of carbs and then you can quickly get back into ketosis again pretty soon in a fairly short amount of time.

But I think you could get a lot of the benefits, the appetite suppression, the mental clarity and things like that by not necessarily staying ketogenic all the time which may not be ideal but if you like doing that I think it is okay but probably not best to do it all the time. To just alternate between ketogenic diet, general low carb diets, which may have 50 to 75 grams of carbs or less a day but maybe not so high in fat and the fat can be hard to tolerate and then also intermittent fasting or time restricted eating, whatever you want to call it.

I did that continuously for a couple of weeks to a months and was losing too much weight. So now I just do it this morning I ate breakfast but two or three days prior I did not eat breakfast. I was really busy. Yesterday I didn't, for example. So I just alternate it and do intermittent fasting as it fits my schedule. So I believe it is good to change things up and also rotate the food that you are eating to make sure your micronutrients or magnesium or potassium being really important if you are low carb.

[0:56:16.9] AVH: Okay cool that is very helpful. I think one of the things that you're saying too that I'd like to highlight and correct me if I am off base here but one of the things that people that I talk to that get really into keto or even into paleo or whatever kind of diet that seems to be working for them and they get a little big dogmatic and they feel almost to the point of stress and anxiety that they have to stick to what has worked and not vary and not add in any sort of variety of keep your body guessing because they're worried that they are going to fall out of ketosis or they're going to immediately gain weight if they eat carbs again.

I think people need to be a little bit more aware of, again, how adaptable our bodies are and that they sometimes crave a little bit of a change but also the idea of metabolic flexibility too and knowing that in an ideal world your body can switch back and forth between carb and sugar burning and that there are times when maybe your body does require or want higher carbs and that you should be able to be intuitive about that a little bit and not have to stick so dogmatically to one thing because you are under the impression that that's what's going to work best all the time forever in every circumstance, right?

[0:57:26.0] DD: Yeah, I totally agree with that and I think it's good, even with the food selection people get locked into eating four foods. But I think you should have maybe a variety. Like instead of four foods have 12 foods, which is still pretty limited when you go to the store. But I think that is pretty important too and I am going to agree with Layne on this is that a lot of people may obsess over different types of foods and even macronutrient ratios and things like that, but they don't really monitor total calorie intake and on a keto diet, you could grab a bag of cashews and do some damage as far as total calorie counts.

So it is very important to track macros and total calories. A lot of people just say, "Well no, I am on a ketogenic diet so I don't have to track macros. I just stay — I eat this and I could eat as much as I want as long as I eat ketogenic." But no, you really do. I am of the opinion that you really need to track calories.

Inadvertently you'll probably eat less but a number of people, even my sister, I mean she's studying at Johns Hopkins for her psychology and she's a nurse practitioner and needs to be on all the time and she is super focused on keto and she does really well cognitively on a having a big family and working full-time and school full-time and a very demanding course. She functions best on keto but she overeats and although she is skinny I'm sure she probably gained weight anyway, she was concerned that she was gaining weight too fast on a ketogenic diet but she's eating a lot of fat bombs, right?

She's got really into the recipes, yeah and I think that is great but it is some people, that is more like a food behavior sort of thing and I really believe that your appetite regulation is more controllable when you are on keto but sometimes you're just eating maybe for comfort if you are stressed or something like that. So you just have to pay attention to total calorie intake on keto and a lot of people think you don't have to and it is really important that you have to and I think especially true for women too that may or may not — well, guys do too they just eat without under stress and more likely to overeat especially if it's fat bombs or something like that.

[0:59:58.3] AVH: Yeah I can deeply relate to that and also, it's also just the fact that often times, women are smaller too. So we are so used to we live in an environment where we all go to dinner and I'll order the same steak dinner as you and I will get the same meal but you might weigh — I know you weigh a lot more than I do but we expect that we're all supposed to eat the

same amounts and if you are a five foot two, 120 pound woman you probably can't get away with eating three or four handfuls of macadamia nuts as part of your keto diet.

These are things that like you said, it is about paying attention and figuring out how your body responds to things. So yeah, I think that is definitely a good piece of advice regardless of what kind of diet you are trying to follow.

[1:00:37.7] DD: Yeah and tracking. You don't have to track obsessively. I think once you track for a little bit you get a general idea of what your caloric needs are and then you modify things as you go and you just eyeball things, give or take five or 10%.

[1:00:57.0] AVH: Yeah another question that comes up over and over and I know you've probably answered this over and over but it is the idea of generally healthy folks. Healthy, athletic, they have digestion sorted out, all of those things and they are using keto as a way to just maximize brain function, diminish cravings, just kind of easy lifestyle, they like it, what is the ideal cycling time or re-feed schedule and you don't even have to say that it's got to be once a week.

But maybe how individuals can work to determine what their cycling or carb re-feed schedule should be because most people I find and I know people who have done strict keto for months until they hit a point where they feel like they need to have some carbs. Some people do a re-feed once a week, but is there a way to determine what that best re-feed or cycling schedule is for you?

[1:01:53.5] DD: It depends. It is like that answer. Not to get out of it, but it depends on what your goals are and I am of the opinion that glucose monitor can be very helpful and to enter a re-feed if you are on 25 or 50 grams of carbs or less per day and you start with a hundred grams of carbs and then check your blood glucose. You shouldn't have glucose excursions shooting past like a 160. Or some people I have seen shoot to 250, and I think it is good to gradually titrate the carbs back in because when you are on low carb you're going to become, to some extent, carb intolerant, right? Because you have adopted your body to more fat and ketogenic macro.

So if you rapidly introduce carbs again, the same amount of carbs you ate before, that can cause some problems I think from GI issues, bloating and things to just metabolic abnormalities like titrate glyceride and things like that. So I think a carb re-feed should probably be more along the lines of 75 to 100, maybe a 150 grams of carbs for larger people and to really just do one meal and maybe have that meal, you coordinate it or schedule it in a way that that meal is consumed when you are in a situation to recover like a heavy leg or back workout or something like that and then your glycemic response to that meal will be a little bit attenuated because you're probably a little bit glycogen depleted to some extent.

So I kind of do that twice a week. I haven't been to the gym in about three or four weeks because I just been mostly working on the farm. But on days like I do heavy workouts like gym workouts and I try to do it twice a week, that's when I do a re-feed and I just eat more really of the same foods but sometimes I add carbs in.

[1:03:54.6] AVH: Okay, cool. All right, here is a question because we talk a lot about why keto is great and how it works and how it's useful but when is it a bad idea or even not the best idea? So are there circumstances where people are in specific situations or have specific issues or challenges where keto would not be advisable?

[1:04:15.4] DD: Yeah, I think if you have any kind of fat intolerance which some people do and sometimes they don't know it until they start something like a ketogenic diet because it is a pretty radical change in your eating pattern the amount of fat that you need to consume. If you have pancreatitis, for example, that can be inflamed on a ketogenic diet. If you've had kidney stones I would go into it cautiously and without a doubt supplement potassium citrate.

If you've had any kind of liver issues, so the liver will be working harder when you start a ketogenic diet and also functions to produce ketones, right? So if you had any kind of hepatitis or things like that you want to track your liver enzymes and you just maybe want to ease into the ketogenic diet instead of just starting kind of abruptly and pick a period where it is not very stressful where things are normalized in your life where you can make this like a process and not something that you are just doing by the seat of your pants.

You want to do it the right way and I do emphasize that people track glucose and ketones and it's really good to have a handle on what your baseline numbers are and how that changes in response to the ketogenic diet. Not that you – I mean, I carry a meter with me all the time because I am testing different things and that is what I do in the lab. But I would say, if you are starting as you might want to do it once a day in the beginning and then as the weeks go by you could do it less and less and sometimes if I am not testing things I will go a couple of weeks without testing.

But if I change something and try something new, it is important to monitor my ketones and how that affects it. Because it is not that we're shooting for a certain ketone number, but those two metabolic parameters are really giving you a lot of information on your fat oxidation rates and your glucose and your insulin sensitivity. Your response to a meal, your glycemic response to a meal and the production of ketones will give you a lot of information.

[1:06:27.0] AVH: How do you know if you do not tolerate high fat very well? Is it mostly just icky digestion or are there other symptoms?

[1:06:34.9] DD: In the beginning you might feel nauseous and yeah, the fat will go out the other end, right? If you are not – if you don't have the lipase enzyme your pancreas has to work harder because your pancreas makes enzymes to digest fat. Lipase enzymes, and the production, the up regulation of those enzymes really has to be pretty robust to be able to keep up with the dramatic increase in fat with the ketogenic diet and most people can adapt I think but some people can't.

I just know communicating with parents that put their kids on a ketogenic diet, I approach this with the understanding everybody can adapt but of the opinion now that some people just simply cannot tolerate that amount of fat.

[1:07:20.7] AVH: I think you make a really good point too about if you're changing your diet drastically, try to do it during a time when you aren't also dealing with a lot of other things because I think it is human nature that when we get inspired or maybe we just get fed up and we want to make changes and it is like the whole New Year's resolution thing. So we decide we are going to quit smoking and start exercising and completely change our diet and write a book

and do all these things the exact same time because we get super excited. But we have to I think take a step back and realize that most of these life changes are things that have to happen in a progressive way and for them to be sustainable, you have to do a million tiny steps instead of one giant leap in one day, you know?

[1:07:58.6] DD: Yeah, absolutely. Yeah, I think it would be easier for some people. If you are treating a disorder like epilepsy, sure you jump right in. It is called the induction phase and maybe if you are in a hurry to get started or maybe to lose weight fast or something like that jumping right into it could be — but that could really mess up your whole perspective of the ketogenic diet.

If you jump in fast and you just have a bad experience, you may say and I have communicated with quite a few people who just jumped in really fast and they had a really awful two weeks and they're like, "I'm never trying that again," and I think you know what? I think that whole process they wouldn't have been scared away but they would have just maybe cleaned up their diet first, just eliminate sugars and processed carbs and try a little bit and ease into it.

[1:08:50.0] AVH: Okay one final question before we start to wrap things up and this is something that was posted on Instagram and I thought this was an interesting question I think probably on the heels of the Joe Rogan Podcast because that has such a massive following and audience and the question is, with keto becoming so quickly more mainstream like you said, the small bubble that is actually really not that small anymore and granted we are still anyone in the health and fitness world, we have to realize that it's not the larger — not everybody is as nerdy about eating things and then how it affects people underwater. That is not a normal area of interest for a lot of people.

But keto is growing in leaps and bounds and what are some challenges that you foresee that you might have to fight against as it becomes mainstream? One of the ways that I relate to this is bringing it back again to paleo diet which is where I live, and as that grew and it's an easy little name to remember and people picked up the key points of it similar to keto and so people thought rather than it being the general tenets being whole unprocessed food and lower sugar and lower crap you get at the grocery store and stuff that your great grandparents would eat, people thought, "Okay it is all meat. It is what cave people would eat. You have to eat like a

cave person,” and just silly stuff that people like to hang onto to justify that it is a fad or that it doesn’t make sense. So what are maybe some challenges, if any, that you see with keto becoming so popular so quickly?

[1:10:18.6] DD: Well I think people need to appreciate the history of the diet. Like how this diet really evolved as a medical treatment for epilepsy and I think that’s fascinating history and I think Jim Abrahams of the Charlie Foundation, they have a fantastic website, the Charlie Foundation website and there is a movie about the ketogenic diet by Meryl Streep called *First Do No Harm* and that really is a documentary, I guess a docu-drama you would say, that really covers what the ketogenic diet can do from a medical standpoint.

So understanding that history is important because when someone says “the ketogenic diet”, I really think of a medical therapy and I know because that is how I got into it. I studied it and researched it as an anti-seizure strategy and I just happened to try it myself and now I do a modified version of the diet but I do think a lot of people oversell and that brings criticism to the community I think when people oversell the diet as the diet that will end all be all, will allow you to lose weight and have more energy and it does, it can do that for some people. But some people it is definitely not the best option for and I think the diet maybe instead of promoting keto, I think low carb will be kind of a more appropriate term to pitch because keto refers to a medical diet, whereas low carb has a vague definition.

A ketogenic diet has a very distinct definition and is the only diet that I know of that you can define by an objective bio marker; an elevation of beta hydroxybutyrate or urine acetoacetate. So low carb, not so much but you can still make dramatic body composition alterations and get many of the benefits simply by going from a standard diet, which is what? Like 250, 300 grams of carbs a day to a 100 grams of carbs a day and making those carbs fibrous carbs from vegetables or in a minimal amount of sugar and things like that.

So I really feel that maybe the keto backlash is happening because people really need to understand that this is a pretty radical way of eating and it doesn’t have to be continuous either. You could do a ketogenic diet on the weekends. You could do a ketogenic diet for one week out of the months and there is some new data emerging that you could do a mouse study showing a ketogenic diet on alternate weeks. So one week keto, one week standard diet, one week keto.

Produced some pretty remarkable effects, even on health parameters even on what we call not lifespan but health span.

So I think people could think about it in that terms too, that they could do periodically put their body into a state of ketosis and that may have many of the benefits of fasting or calorie restriction, even without the calorie restriction. Some people may argue with that and that is still an emerging science but elevating beta hydroxybutyrate seems to evoke a number of pathways in the body even from an epigenetic standpoint, activates various systems in the body that may be beneficial for suppressing inflammation and even increasing pathways associated with longevity and that could be done periodically.

Sort of like Valter Longo's prolonged diet where you do a modified fasting five days out of a month and that really resets your entire insulin sensitivity. Obviously patients lose weight and have body compositions in that short five day period. But it tends to have a reset and most of the benefits I guarantee are just coming from calorie restriction. The quality of food is very important too. But I think people could just do the same thing and not have to spend money on all of these packaged foods that the prolonged approach does.

It is very convenient and I think it is a great way to go for some people and Valter Longo is really investing a lot of money into showing the validity of this approach with actual peer reviewed research, which I commend them for that and I think he's doing a great job. But I think people could accomplish the same thing. just going into a ketogenic state one week every month or one week every three months, and I think you'd still get benefits from that.

[1:15:10.4] AVH: It's funny you mentioned that because that's actually something that I personally have been experimenting with is basically sort of like a keto version of Dr. Longo's fasting mimicking diet and I've been using it like as you said sort of a reset if I've kind of been eating like I find myself my portion's kind of creeping back up or I'm eating a little bit too much or maybe eating some stuff that isn't good for me and I've been using it every once in a while as this sort of mental and physical reset and it lowers my inflammation and it gets my portion sizes back down and my head in the right space and it's been great.

So I think that it's a positive message that you're saying too that, you know, health and fitness and wellness and diet and all of these things are a journey and it's a constant kind of work in progress for every individual and you don't have to be 100% on the ball all the time and that you can make better choices every day and it doesn't have to be perfect and it doesn't have to be you know, you don't have to be 100% into it, and you can kind of, it's just like w work in progress. Every day you have a new opportunity to kind of make better choices and learn and do things for yourself and I think that that's a less scary and more hopeful way to approach health really.

[1:16:19.4] DD: Yeah, I try to tell people, don't be overly preoccupied with food. Like pay attention to quality and quantity, but don't be like a slave to your food and I think just following the ketogenic diet over the years, people may think I am kind of fixated on measuring food out and measuring – I don't. I actually spend far less time and effort on food. I do pay attention to quality and quantity but it's just become something that I don't think about, right? Probably because I'm not hungry.

The appetite suppressing or moderating effects, it has practical benefits where you're not kind of constantly thinking about the next meal or food. I always had a big appetite, you know. Going up and I had a fast metabolism so that necessitated eating quite frequently and now, I don't have to do that. I can get sufficient amount of calories in, in the window that I'm eating and really have a lot of energy during periods when I'm not eating in a fasted state.

[1:17:22.5] AVH: Well Dom, before I let you go to continue more of your farm chores, I'd love to just kind of briefly mention this event that you guys have coming up in LA at the end of January, The Metabolic Health Summit. I've already actually interviewed Victoria. I had the pleasure of meeting her a while back in California and I got to chat with her about the event, which seems like a really kind of cool, different sort of approach to this kind of half medical, half sort of networking expo kinds of things and you're a part of organizing this event as well, right?

[1:17:53.8] DD: For sure. It's fun and she is doing her and Dr. Angela Pa have been doing much of the heavy lifting organizing this. But yeah, we really want to make it a unique combination of clinical science, basic science, a number of influencers there and also entertainment. They've

organized, at an amazing venue, they've organized an incredible array of entertainment there too.

[1:18:16.5] AVH: Well, you got to learn and have fun or else you know, what's the point? I know you guys also, Victoria offered a discount code for our listeners. So I'll put that in the show notes for people who want to attend. But that's the end of January in LA, right?

[1:18:30.3] DD: Yes, it's January 31st, it starts and it ends February 3rd in 2019.

[1:18:36.8] AVH: Awesome, I'm excited. I'm going to go so hopefully we'll actually get to meet in person then, that would be great. But thank you so much for taking the time. I feel like I have learned a lot and I'm smarter, which is always my goal when I do a podcast interview. Hopefully I'm helping other people too, but at least I feel like I am smarter now. So that's good.

But I really appreciate you taking the time and sharing with us and yeah, thank you so much.

[1:18:57.8] DD: I enjoyed it, thanks for having me on, this is an incredible platform to get my message out. So I appreciate you letting me speak about my science.

[1:19:05.0] AVH: Awesome. Thanks Dom, have a good weekend.

[1:19:07.1] DD: Thank you. You too.

[END OF INTERVIEW]

[1:19:13.2] AVH: All right guys, that's it for today's podcast. I hope you were entertained, I hope you learn something. Doesn't Dr. D'Agostino have like a crazy job? It's crazy. I'm glad he's doing it because we need smart people like that going to the bottom of the ocean and learning things for us. Yeah, so that's it. Thanks again to our show sponsor, Bonafide Provisions. If you want to try some organic, slow simmered bone broth that has been keeping me healthy over the winter, it's perfect for the season and they're going to do it for me again this winter and they've got their soups too, bone broth based soups. If you want to try any of them, head to Bonafideprovisions.com, use the code "onlybones" and you'll get 15% off and check them out

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So that's it, join me next week. Make sure that you're subscribed to Paleo Magazine Radio, make sure you're subscribed to Paleo Magazine, I think that's a smart idea. We're putting tons of new content on the website all the time, we're doing giveaways every week. So if you head to paleomagazine.com/giveaways every week, we're doing something and you don't have to buy anything, you just go and kind of put in your email address or whatever it is and you could win cook books and all kinds of cool prizes.

Just trying to keep it fun and keep it exciting and get some good momentum going for the new year and I'm glad that you're here with me and I hope you stick around. I've got some very cool ideas and guests and things to talk about this year and yeah, I just hope you come along for the ride with me.

So join me next week and have a great day.

[OUTRO]

[1:20:27.8] AV: The intro music for Paleo Magazine Radio is a song called *Stronger* performed by Alter Ego and I hope you love it.

[END]