



Episode 4 Transcript

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Dr. Dominic D'Agostino on the Ketogenic Diet

Nick Collias: Hello there and welcome to The Bodybuilding.com Podcast. Monday morning. We're here, bright cheerful and fat-adapted.

Dr. Krissy Kendall: With our coffee.

Nick: I'm the deputy editor, Nick Collias alongside Dr. Krissy "Keto" Kendall. Today, we are discussing everybody's favorite underground macronutrient.

Krissy: Fat.

Nick: The ketone.

Krissy: Or the ketone.

Nick: The ketone is the nutritional equivalent of some legendary experimental music band that you've heard its name. You know people swear it's the most amazing thing ever. The most amazing thing since sliced bread. You can't have sliced bread.

Krissy: No, avoid.

Nick: Maybe you're a bit scared of the ketone. You're afraid maybe it's not for you or maybe you're afraid it will make you rethink your very nutritional existence. Sounds important, doesn't it? Our guest is going to be [Dr. Dominic D'Agostino](#) from the University of South Florida. Krissy, can you please tell us a little bit more about Dom?

Krissy: Yeah. Dom, he's a professor in the department of [Molecular Pharmacology and Physiology](#) at University of South Florida. He is also the senior researcher scientist at the [Florida](#)

[Institute of Human and Machine Cognition](#). Most of what Dr. D'Agostino's lab focuses on is developing and testing metabolic therapies including ketogenic diets, ketone esters, ketone supplements, intermittent fasting protocols, and metabolic-based drugs. A lot of his research explores the use of these therapies for a broad range of disorders and some of what we'll pick his brain about: seizures, neurological disorders, wound healing, muscle wasting and cancer. A lot of his work is focused on using animal models but has also explored, obviously the effects of ketogenic diets, ketone supplements in human participants, as well.

Nick: Including himself...

Krissy: Including himself.

Nick: He's an accomplished athlete. I don't know if he still does. He once held the record for the highest amount of weight lifted in 24 hours.

Krissy: Fascinating guy.

Nick: We actually just spoke with Dr. D'Agostino about an hour-and-a-half ago and we talked about applications about ketogenic dieting, and to a lesser degree, fasting and intermittent fasting can have for athletes, medical populations and even just for normal people. Let's listen to the conversation, shall we?

Krissy: Let's do it.

Nick: Thanks for being with us.

Dr. Dominic "Dom" D'Agostino: Hello?

Nick: Hello, there. Is this...

Dom: Hello, can you hear me?

Nick: Yes.

Krissy: Can you hear us?

Dom: Great. Yeah, I can.

Nick: This is Bodybuilding.com calling. Your delivery is going to be late. I'm sorry. Hi, this is Nick Collias, Dr. D'Agostino. I'm here with Krissy Kendall.

Dom: Hi, Nick.

Nick: We really appreciate you doing this especially so early in the morning.

Krissy: I think it's really just early for us.

Nick: Feels early.

Dom: What time are you guys on?

Nick: 8:30 a.m., it's not that bad.

Krissy: Not bad at all.

Dom: You're out of bed.

Nick: Exactly.

Dom: You guys are in Idaho?

Nick: We are in Idaho. Land of potatoes.

Dom: Got you, carbs.

Krissy: Eggs and trout. Potatoes and trout.

Nick: Beautiful trout here. I tried to catch one this weekend even and it did not work out very well.

Krissy: No?

Nick: No. Anyway, we want to cover a broad range of topics. We both been spending a lot of time reading up on you. You've been on so many podcasts. I try not to listen to all of them. I'm afraid that I'll discover they asked all the questions I already have. Are you fed or fasted at this very moment? That would be my first question.

Dom: I ate breakfast this morning. Just a little bit.

Nick: A big bowl of ketones?

Dom: I'm fed. What did I have? I had the run-of-the-mill breakfast I have when I have to do some teaching early in the morning, so it's real quick. It was 4 eggs and coconut oil, and a can of sardines in olive oil, and my coffee with some Quest coconut oil powder in it.

Nick: Nice. How do you eat the sardines? Do you put them on the eggs or do you just eat them right out of the can? I'm a big canned fish person myself. I'm always curious how people do it.

Dom: Today, I just dumped them right on the eggs. I just cooked my eggs over easy, put it on the plate, a pinch of sea salt. A little bit of pepper and just put them right on the eggs. Last night though, I had a salad and I put it on my salad.

Nick: Great for that. Do you do that with oysters as well? I used to eat oysters. I have to eat a certain way but I'll just eat those right out of the can all the time now. That one makes me feel just disgusted.

Krissy: It smells great.

Dom: We're very similar.

Nick: They're so delicious.

Dom: They are, they are. Foods I never ate growing up really so I just stumbled upon them and tried oysters at a restaurant one time and I was like, "They're not too bad." Then I started looking at the nutritional content and I tried them in the can. I'm picky about what brand I like because they have a particular taste but I do like them. They're a good travel food too.

Nick: Have you ever tried fresh smoked oysters?

Dom: Yeah.

Nick: They're very different than in the can but, man, they're so good.

Dom: So good.

Nick: Now, it would be really easy for us to jump right into ketosis and fasting-related topics but let's start the story a little bit further out. I want to get a little bit more about your nutritional life story leading up this. What were you like as a young person leading into this? Just developing these interests but also your life history of eating a little bit.

Dom: I grew up in an Italian family. Pasta was a staple growing up. Every Sunday, we'd have all the family over for a big Sunday pasta dinner. I ate candy and sugary fruit juices and things like that probably not so much as much as the kids do now if we went out to a fast food restaurant, it was a big deal. We didn't go out as much as the kids do now probably. I think my mom tried to cook pretty much what's considered balanced meals. It's like a meat, fish, vegetable and a starch growing up. I think generally speaking I had a pretty good diet but it was not a low-carb diet by any means. I grew up on a farm. We grew wheat and potatoes and soybeans and everything. I always had potatoes every morning and it was just right from the backyard basically. Fried potatoes and eggs were my staple growing up or oatmeal and eggs so carbs are always thought of as really important. I started mountain biking, I think when I was 13 or 14 and really into that. I even did some racing. Big fan of Gatorade and Cytomax at the time and carbing up a lot 2 or 3 days out even for big events. Pretty much a carb-centric diet, all my life. Until I got into to weightlifting and I became at least aware of a low-carb diet for a body composition alteration effects and cutting. Obviously not a ketogenic diet but a carbohydrate-restricted diet was on my radar and it was talked about in some magazines but I didn't think very favorably of it because I was always under the impression your brain, you did 60 to 100 grams of carbs a day and these zero carb diets could be dangerous or put you in chronic hypoglycemia which was not a good state to be in. I learned more as I got through college and eventually ended up as part of my research. I mean going into high school and college, I started experimenting seriously with low-carb diets probably in college. My low carb diet would just be switching out the starch for vegetables, for steam vegetables or something like that. I think it worked pretty well for my purposes or just getting leaner and I think I adapted pretty well to a low-carb diet although I felt like my blood sugar was fluctuating and I would have periods of lethargy in just foggy-headedness. I just remember being tired maybe from the calorie deficit too. It wasn't until I started studying systems physiology and advanced nutrition courses in college that I really started looking into the ketogenic diet and I did in passing, in one of my classes, realize that it was more of a clinically-based diet for seizures and just put it on the backburner until after my doctoral work in college. I did a post-doctoral fellowship that was funded by the Office of Navy Research. The project that I was interested in that I worked on was understanding the cellular and molecular mechanisms

of oxygen toxicity seizures or a consequence of breathing high oxygen with a closed-circuit rebreather that the special operations guys use, so the Navy Seals. In the process of understanding the cellular and molecular mechanism, I realized that I was really looking at the pharmacology of it but I realized that it was a brain/energy problem. The handling and the transport of glucose to preserve brain energy metabolism and then I realized that the brain could use ketones and that fasting was a way to put yourself into a state of ketosis, fasting ketosis, and that blood sugar was low and ketones were high and then that actually was very effective for managing seizures. This goes back a hundred, even thousands of years and about 90 years ago, fasting was also used to manage seizures and they developed a ketogenic diet which mimic the physiological state of fasting. That's the history behind that is fascinating to me and I incorporated some of that into my research. I studied biology and nutrition as an undergrad and then physiology and neuroscience as a Ph.D. student and it allowed me to bring nutrition back into my research again which I was pretty excited about because I was mostly focusing on anti-seizure drugs and antioxidant cocktails to prevent oxidative stress.

Nick: It's interesting hearing you talk about this tension between therapeutic and you as an athlete. You go back and forth. It sounds like you were studying it pretty much in a clinical perspective for a long time and then maybe started to realize maybe as an athlete there's a place as well. That's an interesting tension that you can learn by looking at yourself a little bit there as well.

Dom: There's so much that we can garner just by watching other people follow a diet and our own personal experience. I did stumble across a Mike Dancer from Bodybuilding.com. Mike was an epilepsy patient. He had severe epilepsy and you guys wrote a story on him. It was like "[RIP \(Rest In Peace\) to RIPPED](#)". Look it up, Mike Dancer.

Krissy: Always the catchy titles, always...

Nick: I don't remember that headline but I'm going to take credit for it.

Dom: This is like, I mean, going back at least 5 years ago. I connected with Mike. He had tried every anti-epileptic drug and was going to have brain surgery on his hippocampus to remove an area that may be the locus of the seizure, generating the seizure. I was just getting into this topic and I said, "Mike, maybe give this ketogenic diet a try. Bodybuilders use this. It's not going to really set you back, so to speak." He was a natural bodybuilder and want to do competitions. I was like, "You could use it as part of your cutting." He did and I didn't actually get in touch with him until about 3 or 4 months after, but as soon as he implemented it, it rapidly controlled his seizures and then we connected a few months later and he was like I have not a seizure and this was 180 degrees from what he was used to. I mean he was stuck at home bedridden for some time just because the seizures are so bad. Bodybuilding.com did a big story on him. Then it took off a little bit. My research took off because I got more into the literature and I connected with Johns Hopkins University and the Charlie Foundation. The Charlie Foundation was a foundation based on the observation of the Hollywood producer, his son Charlie had drug-resistant seizures and he was made aware of the ketogenic diet only after trying a lot of drugs that had very bad side effects. Because this was such a grossly underutilized metabolic therapy, he was angry and decided to start a foundation and Meryl Streep was his friend and she did the movie First Do No Harm. That brought a lot of tension to the ketogenic diet for epilepsy and dateline NBC did a story with Jim and talked about his experience with the diet and I've connected with Jim and talked on behalf of the Charlie Foundation at different events. The more I started understanding the science and the application of it. I incorporated it into the government-sponsored research I was doing. By studying the ketogenic diet and looking at the

mechanisms of the ketogenic diet but also developing ketone supplementation that could rapidly put someone into therapeutic ketosis, feed the brain specific ratios of ketones and those ketones can enhance brain energy metabolism under periods in the face of oxidative stress which would be oxygen and toxicity. We developed that, did the pharmacokinetic studies on it, did some metabolic work on it and confirmed that it does work remarkably well for oxygen toxicity in our rat model which is a pretty good surrogate model for what to expect in humans. Now, we're in the position where we've developed lots of different ketone supplements and we're doing safety studies on them. We're doing pharmacokinetic studies on them. We're looking at a lot of different disorders including different seizure disorders. We're looking at cancer. It's interesting that cancer cells use glucose very rapidly but they don't use ketone bodies efficiently for their energy. We're looking at cancer cachexia muscle wasting associated with cancer. Sarcopenia is something that we're interested in and rare disorders like glucose transporter type 1 deficiency syndrome, Angelman Syndrome. We have a project looking at anxiety and being in state of ketosis seems to lower levels of anxiety and it promotes exploratory behavior. We think this has tremendous implications for things like PTSD or just I mean anxiety in general and PTSD. I think that's actually some of the most robust data that we haven't even presented yet. I'll be presenting in Europe next month but it was like unexpected things that come out of our ketogenic diet research. As we induce ketosis, we're handling animals and realize they're just much more calm and you realize maybe we should study this.

Nick: That's interesting because when I talk to people about the ketogenic diet, their anxiety level goes up when I bring up the idea of not eating a slice of bread.

Krissy: No carbs.

Nick: Around here, anyway.

Dom: It's adaptation. The adaptation to the ketogenic diet is really important. If we talk about how to implement diet, the pros and cons, then there will need to be a discussion about adaptation.

Krissy: I want to take a quick set back especially for those may have never even heard the words ketogenic diet. This is completely new to them. For dummies, how would you explain the ketogenic diet and then what makes it different than it's a low-carb diet, it's a Mediterranean diet, it's a high protein diet. What makes the ketogenic diet such a powerful tool for clinical populations, for individuals with seizures, cancer, some of the diseases you just mentioned?

Dom: That's a good question because the term gets thrown around a lot but it's not properly defined.

Krissy: Exactly.

Dom: The ketogenic diet by definition is a diet that elevates blood ketones. It's interesting. Even a lot of the literature, even exercise and studies and even clinical research that was done on the ketogenic diet does not properly measure ketones or even attempt to do so which is pretty remarkable. They just set the carbohydrate to a certain threshold and think that you're on a ketogenic diet if you do that. I would say first and foremost that the ketogenic diet by definition is diet that elevates the ketone levels in your blood and you could measure urine ketones. You could buy Ketostix at any CVS or Walgreens. It measures the acetoacetate in your urine. If you do measure in the mild to moderate and high range, you likely do have an elevation of blood ketones but you don't really know. The gold standard is just to measure your blood ketones with a meter. There's several

meters out there Abbott Labs makes the precision extra which we use. I have a couple of other ones I use personally. An elevation of blood ketones is the first thing to focus on and the ketogenic diet is a low carb, high fat. It's important to recognize that it's a high fat diet, that's low carb. Then the protein is more or less is adjusted to fit the individual. For the pediatric population, the protein would be probably young growing kids somewhere around just 10 to 12% maybe up to 15% and that would be adjusted based on the growth of the child and the management of the seizures. For the fitness community, most of them use what's called a modified ketogenic diet which would be up to about 20 to 25 percent calories from protein. That's adequate enough to promote growth and recovery from workouts. But there's a lot of fuzzy guidelines in between. The clinically-based ketogenic diet, there's a 4:1, the 3:1, the 2:1, the modified Atkins diet that Eric Kossoff from Johns Hopkins has been advancing. For all intents and purposes for the fitness community, I would say when they talk about the ketogenic diet, they're talking about the modified Atkins diet or the modified ketogenic diet which is much more liberal in the amount of protein up to 20 to 25 or 30% protein. That's almost low for some people in the fitness community that go up to 40 or 50% protein. For the world of ketogenics, that's a higher protein. As you increase the protein percentages of the ketogenic diet, it will lower the ketone levels. Protein is gluconeogenic up to a certain point and it can also stimulate to a smaller degree than carbohydrates but it can stimulate the release of insulin which is negatively correlated with ketogenesis, with ketone production. Adding fiber and fat can help buffer the release of glucose into the blood stream. There's some athletes especially high-performing athletes that can get up to 200 grams of protein a day and still be well into ketosis if they're large and active. The protein level is the variable that needs to be adjusted depending on the clinical scenario and the individual, and the athlete.

Nick: We hear people talk about ketosis being pregnancy basically, "Oh, you're keto or you're not," but the way that you're describing it, it sounds like there's a spectrum. It's not necessarily an on/off switch or am I wrong in understanding it that way? Which image is more accurate do you think, sort of you are/you aren't, or a whole spectrum?

Dom: It's variable. Even for the individual that's on a pretty strict ketogenic diet, his ketones will vary during the day. Me for example, I'm .5 to .6 in some mornings and then later in the day (my blood beta-hydroxybutyrate levels). Then later in the day, I'm about 3 or 4 times higher blood ketone levels. As I get a little bit more hungry, and the fat that I've consumed maybe in the form of MCT or if I eat breakfast that morning, will be fueling beta-oxidation in the liver and as your system gets revved up and insulin stays low, you have enhanced fat oxidation especially in the liver. The acceleration of fat oxidation will contribute to the production of the generation of acetyl-CoA which forms into acetoacetate and then generates ketone bodies, primarily beta-hydroxybutyrate which is the most stable form that we measure in the blood. Fasting will put you there. Intermittent fasting I know is big in the fitness community, can put you there. I like ketogenic intermittent fasting where you would fast throughout the day and then eat ketogenic at night. What a lot of bodybuilders do and fitness athletes do is that they do a modified ketogenic diet that's supplemented and that's supplemented I say they'll use coconut oil or more commonly medium-chain triglycerides. The modified ketogenic diet can elevate your ketones slightly but if you add a supplement to that in the form of medium-chain triglycerides, you can further boost ketone levels and that can further enhance the efficacy of your diet for whatever purposes you're using it for whether it be the management of seizures or for performance. I think the advantage to supplementing a more liberal ketogenic diet with something like MCTs, is that it's elevating your blood ketone levels and that's sending energy to your brain. During periods of hypoglycemia, you're going to have a stress response. You're going to crave glucose. You're going to crave carbs. If your ketone levels are elevated, that more or less abolishes or significantly attenuates the reactive hypoglycemia that you would otherwise have and that reactive

hypoglycemia will trigger a craving for sugar. It will trigger a sympatho-excitatory response. Your sympathetic nervous system will be activated. Epinephrine will flood your system. You'll start to get shaky, sweaty. Being in a state of ketosis can literally abolish that. That's something that I had when I followed a low-carb, non-ketogenic diet. I would have periods of hypoglycemia where I would literally be shaking. That's one of the major advantages of ketones is that you have physiological resilience against hypoglycemia simply by feeding your brain in alternative energy substrate.

Krissy: That's absolutely fascinating because I know a lot of our readers who try to attempt the keto diet, the first few weeks are challenging and I think that's where you lose a lot of people on the diet especially our audience which is more geared towards performance, what their PR in the gym is going to be. They're more concerned about building size and strength versus any health benefit. Who cares what your heart and the rest of your body are doing.

Nick: Do you have a specific person in mind because you sound like you're describing somebody?

Krissy: The one next to me. Not at all. That brings me into... because you talked about it: MCT oil, coconut oil, possibly ketone supplements, what advice would you give for someone who is going through the keto adaptation period? How long does that last and is there any way to get through it faster because I think that's where people just fall off and quit?

Dom: That's a good question, one that I get a lot. There's different ways to do it and I think you just have to grit your teeth and get through it. For me, it was a little bit of a process because it didn't fully embrace a ketogenic diet. I was really skeptical about its use for athletics and just general daily use. I probably followed a low-carb paleo approach. That's what you would call it and transitioned to a ketogenic diet. I think I was relatively fat-adapted. My recommendation would be to lower your carbohydrate intake to under 50 grams per day, and I would reduce protein... Probably the most important thing is to reduce protein down to 1 gram per kilogram per day. I know that sounds pretty extreme but that's pretty low.

Krissy: You're breaking the hearts of all of our readers.

Dom: You'll be able to titrate it back in though once your body is making, but right now, I'm at 1.5 grams per kilogram per day. I would use coconut oil. I use that more for cooking things but to really get your ketone levels up, you'd want to have an MCT oil. There's Quest MCT oil powder, or you could get something like caprylic triglyceride which is the Eight Carbon MCT. Essentially it's split in the liver to produce ketone bodies. MCTs are transported to the liver via hepatic portal circulation and because they go right to the liver, they get oxidized very fast. They're a very quick-burning fat and because they enhance fat oxidation in the liver so much, it contributes to ketogenesis. Those ketones will help your brain manage the, I guess what you would call glucose withdrawal symptoms that you have. It's more than just feeding ketones because if your brain is used to using glucose as an energy source, even if you supply ketones there's going to be a little bit of a transition to using that energy source but having them elevate it in your blood. They readily cross the blood/brain barrier, the ketones do, and it will help you power through that glucose withdrawal that your brain is going to have. Most people, if they do it right, they can get through it. It's also important because when you lower your carbohydrates and get on a ketogenic diet, your insulin goes pretty low. It has a diuretic effect. You're losing your liver glycogen. You may lose initially some muscle glycogen but that will come back over time. The suppression of the hormone insulin contributes to the release of sodium. It's important to get a lot of sodium in your diet. Probably have soups, low-carb soups or beef broth, something or bouillon cubes and make sure you have adequate sodium in your diet and

you stay properly hydrated. If you become dehydrated, your blood volume drops, and you become lethargic, and you'll have what's called orthostatic hypotension. You're sitting in a chair, and you get up, and you feel dizzy, and this happened to me. It was just a matter of getting more sodium, getting more fluids in the system, and MCTs, and making sure that you get a lot of fat. It's hard for a lot of fitness athletes to start throwing in fat into the diet. For years, I ate egg whites but now I literally will eat an egg yolk omelet. I'll give the whites to my dog.

Nick: I'm very curious about this. I've wanted to try that same thing, but also I've been looking around. Is there anybody who makes an egg yolk product? Can you get carton egg yolks?

Krissy: Not egg beaters but just the yolk.

Nick: The opposite of an egg beater. That's the product that needs to be made, don't you think?

Dom: Yeah. I don't know. I don't think they do. That's a good idea though.

Nick: I think I saw once in a baking site.

Krissy: That would make sense.

Nick: I would have felt like weirdo.

Dom: I do have a preference for eggs that are from free-range chickens because the yolks do taste different.

Nick: Ducks also have huge yolks.

Dom: I had access to eggs from free-range chickens growing up in college and the first time I had it, it was like wow, these yolks are like orange and they were really buttery and creamy. I will make an effort. That whole nutrition thing like GMO versus.... I don't get involved in that, but I just know that grass-fed beef and eggs from free-range chickens they do taste better to me. So I tend to seek them out at store. When you get on a ketogenic diet, it's really important to bump up your hydration, bump up your sodium, get in lots of fat, pork, beef fats, nuts, whipped cream. I get ice cream made with coconut cream actually and I have that every night. It's like a big fat bomb. It's really important to pump up the fat and get that going but some people may have some GI issues with the fat initially. You have to titrate it in gradually. My body always did really well with high fat so I didn't have any problems adapting to it but it's the fat, your own body fat and your dietary fat that's making the ketones.

Nick: There's another element in this period though. This person is training in any capacity during those 2 weeks period. However long it takes for them. It sounds like that could also present some complications. What does somebody need to keep in mind about their training and I know I've heard some people say heart rate is a concern when you're adapting to fat adaptation versus glucose as well. I know there's a guy named Phil Maffetone who has a low-carb system. He says, "You really have to watch your heart rate because if it goes too high, then your body starts scrambling for glucose." What considerations does somebody need to have in their training?

Dom: I mean your heart rate can get elevated if you get on a ketogenic diet if your blood volume drops. You get tachycardia. Some people experience that and that could be the hypovolemia or the

natriuretic effect that you have like your electrolytes could be not optimal. I would suggest maybe initially getting adequate magnesium, a magnesium supplement help prevent me from getting cramps. If I train certain muscle groups, I would be prone to get cramps when I start the ketogenic diet. Magnesium in the form of glycinate or magnesium chloride would be what I recommend, potassium citrate. Although chicken and vegetables have adequate potassium and heavily salt your food initially in the beginning and make sure you have a lot of hydration. I guess you're talking about high heart rate during exercise so that would be the activation of your sympathetic nervous system. When you activate your sympathetic nervous system it tends to break down, existing levels of glycogen in your liver. You'll be stimulating the release of whatever glycogen you have and sometimes post-exercise you can get hypoglycemic and that could be an issue for some people. I think it's those periods where you need to supplement with MCT and I think people ask me, if an MMA fighter, if I am a sprinter, if I am doing this or that, can I do the ketogenic diet? I say you really just need to experiment with it but you have to keep in mind that it's going to take months for you to adapt. Think about it, you're changing your whole metabolic physiology from a carbohydrate-based system to a fat and ketone-based system. That takes time. I didn't really get into my stride so to speak until about 6 months to a year after being in ketosis but the benefits are really real. I was just travelling for 4 weeks continuous in Southeast Asia. There were some periods where it just didn't really have food because we were hiking and things like that. I would have completely bonked and because I was adapted, I was much more resilient against limited food availability. I think you really have to force your body to get through it to start getting the benefits. Everybody is going to be different, I think.

Nick: When you say you're more resilient, does that just mean you were not hungry? Is hunger just not a familiar sensation to you at a certain level of ketosis?

Dom: The hunger doesn't control me. I control my appetite. I remember in the past, I would just get really completely 'hangry'. Hungry and angry and just brain fog where ... That doesn't happen actually. When I'm a little bit hungry, that's when I feel my best mentally and most lucid. That's the real world practical benefit I think of being adapted to the ketogenic diet. Now whether in our modern day society where food availability is not usually an issue, but I think for me it is. Sometimes I get busy. I'm in the lab, in meetings. It's several days, I can remember in the past month or so which I just could not eat. I just didn't have that luxury. I was in an environment, in the animal vivarium where you're not allowed to have food or something. That definitely can help me.

Krissy: So is that why, correct me if I'm wrong, you also do follow intermittent fasting to a point. You eat breakfast and you eat dinner but typically during the day, you don't eat much other than coffee or drink that. Was one the by product to the other? I'm ketogenic dieter. I realized I'm not as hungry as much or I don't crave food. I don't need to devote half my day into making food and eating food or are there additional benefits to doing both ketogenic diet plus fasting or intermittent fasting.

Dom: I think there's a benefit to getting your body into a state of hypoglycemia with elevated ketones. Doing that every once in a while definitely has health benefits. Doing it on a daily basis, that's subject for debate whether or not that confer long-term health benefits. I believe it can just by looking at my blood work and just getting feedback from other people. I live my life, I guess going back to high school and college. I was definitely had an unhealthy preoccupation with food. I was pretty much in extreme ectomorphs. For me to gain size and strength, I had to eat every 2 to 3 hours on the clock. I mean I remember having nightmares about not being able to eat, just being hungry. I mean I had chicken sandwiches in my side pockets of my khaki pants. I was pulling bars out and just eating constantly. It's very liberating not to be preoccupied with preparing food, eating food, cleaning

up and just eating, sitting down and having a nice social breakfast which I do and a nice social dinner. We could just sit down and eat whatever. Not have to count macros and things. I pretty much know what I eat anyway. From a practical point, I just get more done during the day and I have more energy throughout the day if I don't stop and consume a meal. If I consume a meal in the middle of the day which I do sometimes. We'll go out to lunch for the lab or sometimes I'll eat and it doesn't throw me off but I just don't eat that much. If I was eating a big meal, in the middle of the day, like I do at night, I wouldn't have the sustained energy and focus that I typically have during the day and then I try to use to my advantage to get as much done as possible, if that makes sense.

Nick: You hear people talk about that sustained focus a lot as a benefit of this but when I talk to some people who try ketogenic diet or fasting, they often say, "Yeah, it's great ... with enough coffee, basically." Where does coffee fit in to this and caffeine? I mean how prevalent is appetite suppression in this approach?

Dom: Just as you said that statement, I was drinking coffee.

Nick: Exactly.

Dom: I swear. Coffee I think has a ton of health benefits like drinking a really potent antioxidant cocktail. Although I can do fine without it. I enjoy it and I think of it as like an MCT delivery system, too. I will put my powdered MCT in it with a little bit of Stevia and that's what I have in the morning. Then I put whatever I make in my French press, I'll bring in my thermos to work and I'll pour it into a cup. Sometimes I have in the middle of the day typically not after 4 pm, I'll brew another small cup of coffee but I do okay without it.

Nick: There's some coffee definitely in the mix here.

Dom: I hate the idea of being dependent on something. When we're travelling, I actually and maybe because just being outside and active and everything I didn't have caffeine withdrawal. Maybe if I was at my desk, my office didn't actually have any windows or anything. I'm not stimulated with light. When I was travelling, I completely got off coffee and I forget where we were at just recently, like Cambodia. The middle of Southeast Asia or something and we stopped at some kind of specialty shop that had coffee and it was super strong. I got a large coffee and it had the LD50 of caffeine in it. I drank it and I survived. I was super wired. It just hit my brain like I thought I was going to have a seizure.

Nick: Luckily.

Dom: Your body becomes very sensitive if you take caffeine and go without it for a little bit. You have to wean yourself back into it. I think coffee has a lot of benefits health-wise and the caffeine has been so well studied by the military. You pull all the military records on caffeine and that's why I incorporate it into all the guys on lots of caffeine.

Nick: Sure. You said something a little while ago and said when you were younger, you had to eat to great excess because you weren't doing exercises, you were an ectomorph. Knowing what you know now about fuel systems and how all these things work, do you think that if somebody is looking to add to even just a little bit of muscle that they have to eat in that unrestrained way or is there a way to do both of these together where you can add a little functional muscle and still be something near to one of the systems that you're describing fasting or ketogenic?

Dom: Instead of 6 or 7 meals a day, I could have easily ... The energy density of fat is much higher. I could have easily taken out all the rice and the pasta and the bread from my diet and put in more healthy fat sources and backed off from 5 to 8 meals a day to 4 and probably grew the same way. I looked at some of the blood work I had. When I was 19, 20, I felt bloated all the time. I was gassy. I had acne. I think I could have reduced or eliminated all that by being on a higher fat, lower carb diet. I think the ketogenic diets have a profound anti-inflammatory effect. I think there's even a publication out there, the ketogenic diet for acne or definitely for inflammatory disorders. We published a Nature medicine paper on the NLRP3 inflammasome. That pathway is activated with a lot of chronic inflammatory disorders. I think I could have made the same gains and probably not put on as much fat as I did when I trying to bulk up. I could probably did it in a more healthy manner instead of literally force feeding bananas and pasta and bread. I don't ...

Krissy: Sorry. I didn't mean to cut you off. You can finish what you were saying before I jump to the next thing.

Dom: I went back and look at some of the dietary records and I was easily getting 500-600 grams of carbs a day back at that time. I would be interested or curious to what would happen to my body if I tried that again. Definitely I would need to adapt to it.

Krissy: All right. I'm going to change subjects a little bit here because there's something that I do want to talk about, make sure we have time to talk about it, our exogenous ketones or ketone supplements. I'm starting to see more of them, hear more about them, have a ton of questions on them but I guess just to start simple, what are they? How do they work? My guess is they are not a means so that I can eat pizza and take these ketones and somehow magically still be in ketosis. Not necessarily a way to reverse or compensate for eating carbs or a higher protein diet that would then elicit an insulin response. How do they work?

Dom: Exogenous ketones I stumbled across that these were being produced and have been around for quite some time. They completely circumvent the need for dietary restriction to put you into a state of ketosis and for our purposes, it was therapeutic ketosis for controlling seizures. They essentially are a ketone molecule or a precursor to a bioidentical ketone molecule that when it's consumed, the ketones are liberated into the blood stream. They're elevated and are used by your brain and your heart and peripheral tissues. If, for example, I was to take a ketone ester which we have done the most of our research in our lab has been on ketone esters. If I'm on a high-carb diet and I would consume a ketone ester within 15 minutes to 30 minutes if you looked at my blood, it would look like I fasted for a week if I took a pretty hefty dose of it. A physiologist that would take a blood sample would be convinced that I had just fasted for a week. Not only does it elevate blood levels of ketones beta-hydroxybutyrate and acetoacetate but it also... large boluses of exogenous ketones also lower blood glucose and we don't know why that's happening but it's become a really important aspect of our research. It seems to reduce hepatic glucose output but more importantly what I think the exogenous ketones are doing are enhancing insulin sensitivity. It actually assists with the transport and utilization of glucose into tissues. How it's doing that? We don't know. We're looking at perhaps activation of pyruvate dehydrogenase complex, PDH, enhancing the insulin receptor, facilitating glucose transport in some way. There's ketone esters. You take a ketone molecule and you can combine it with a lot of different molecules out there like glycerol or 1, 3 butanediol or various things so that when it's consumed the ester bond is broken by esterase enzymes and that ketone molecule is liberated to be used. Then you have what you see pretty common on being commercialized right now is ketone salt products. A ketone salt the ones that are

out there are beta-hydroxybutyrate and they are combined with monovalent or divalent cations which could be sodium, potassium, calcium and magnesium, typically are the ones out there. It's a simple ionic bond between the ketone molecule and the mineral and when they're consumed the mineral is liberated from the ketone and the ketones get into circulation. They can be very efficient fuels for the heart and the brain and if it's combined with different fats, you can slow the absorption. I think there's products out there by Keegenix, by Pruvit, Forever Green. There's different companies out there developing this. These technologies actually were developed in our lab, the mixtures of the salts. I think they have incredible application. I think the products that are actually out there right now have not been tested in our lab so the actual products. The formula that's incorporated in some of these products have been tested in our lab for efficacy, for quickly elevating and sustaining ketosis but what I'm interested in doing is actually working with the companies to do very specific pharmacokinetic studies, performance enhancement studies with their actual products to make sure of their purity and their potency. That's what we're in the process of doing. We're negotiating with these companies to do that. It's nice because these companies, unlike some other companies out there, they're really sincere about they want to create the best product they can. They seem pretty sincere about supporting the research that's necessary to further develop and validate their product.

Nick: Speaking to this athletic population, the athlete of the future who's wondering what is the athletic keto supplement or ketone supplement going to look like. When am I going to take it? What do you envision? Is this a ketone pre-workout somebody could be taking or is it something they're sipping on during the day or what do you see happening down the road?

Dom: That's a good question. I think when your body is fat and keto adapted, it will more efficiently transport and utilize ketones as an energy source for your brain and your heart. I think you'll probably get more benefits from a ketone supplement if you're low carb, but some of the work that was done with the monoester beta-hydroxybutyrate from Richard Veech's lab at the NIH and the research was done at Oxford University. It looked at elite-level rowers and they were not on a ketogenic diet. They're primarily on a carbohydrate-based diet. When they took a dose of the ketone ester, it enhanced power output significantly. I'm not sure that's published but it's in the patent reports. There's a little bit of discussion too about the form of the ketones that are being sold currently. There is a racemic ketone which are the D and the L, or the R and the S enantiomers. If you look at your hands... You know how there's L amino acids and D amino acids, and there's L-Lycine and L-Arginine. If you were to have a steak out of a D amino acid, you probably wouldn't absorb it and utilize it very efficiently but that really does not seem to be the case with ketones. If you have the R or D depending on what kind of chemistry, how you characterize it, form is the physiological form of ketone that our body makes and the salts that are being sold are racemic so there's the R and the S or the D and the L that are being sold. The other enantiomer actually breaks down to Acetyl-CoA and can inter-convert back to the physiological enantiomer, the R. There was a podcast I think, Dr. Veech did a podcast on Bulletproof Radio I think, and just talked about the racemic salts that are being sold out there right now are ineffective and dangerous but that's really not the case. You could just look for various disorders for MAD. It's a disorder that's inborn errors of metabolism where they gave kids even very high doses of racemic salts. The same salts that are being sold. It not only managed their disorder but had no side effects. We know that the racemic salts, I know there's been a big safety issue going on but there's a mountain of safety data even showing the efficacy of some of the salts that are out there. Even the sodium salts. Even taking a large dose of sodium, I think sodium has been demonized but it's probably more important if you're in a state of ketosis because we talked about when your ketones are elevated typically you're excreting more sodium. You definitely need to bump up sodium a little bit especially initially. The sodium salts that are out there if you're trying to be the best athlete you can, what I would

recommend is taking them pre-workout and intra-workout to fuel your workouts especially if you're already low carb. If you are on a high-carb diet, there's pretty good evidence to suggest that it enhances insulin sensitivity and it enhances glucose disposal, ketones do. This is very obvious in our studies if we administer by mouth a ketone supplement, the blood glucose reliably goes down and then comes back up. It almost has the inverse pharmacokinetic profile of the ketones. As ketones go up, you get this hypoglycemic effects. It's actually facilitating and enhancing glucose disposal. That would almost like taking a little bit of insulin before you work out. Actually pushing more glucose into the cells, into the skeletal muscle.

Krissy: With that being said... When do you know you've gone overboard? When do you know you've taken too many ketones or the higher dose?

Dom: That's a good question. I think with the products that are out there now, that's highly unlikely because you'll have GI issues way before you'll have ketoacidosis.

Krissy: So that's your warning system?

Dom: Yeah, your GI. For example, if you take too much medium-chain triglyceride, MCT, oil, you'll have disaster pants. We know this.

Nick: That's my band name, by the way.

Dom: It's a great name. As these technologies advance and then you can develop ketone salts also out of alkaline and amino acids. You could envision a ketone salt that has a spectrum of monovalent and divalent cat ions and a panel combined with a number of different amino acids. They could be formulated into a drink that's tolerable and palatable. It could put your ketone levels very high. That's not the state right now. The technology is not evolved to that point now but with ketone esters, it's a very real possibility but they taste horrible. They need to be diluted into a mixture where you probably have to drink up to half a liter to a liter or more. You have to consume a pretty high amount. Ketoacidosis has been thrown around a lot and some people say the ketogenic diet could be dangerous because you risk diabetic ketoacidosis. It's important to recognize that that's a metabolic derangement specifically associated with the absence of insulin as it would apply to a type 1 diabetic. So without your body's ability to produce insulin, you have runaway ketogenesis. Your liver will just pumping out ketones if you don't make insulin. With that said, I think a ketogenic diet could be a great option for a type 1 diabetic because it reduces their need and their reliance on insulin. If you can get a type 1 diabetic to use 10 IUs of insulin instead of 80 IUs of insulin, that's a good thing. Generally speaking, they don't go into ketoacidosis only if they were to become dehydrated or undergo some kind of physiological stress. As far as safety is concerned with the supplements, you would have to consume a lot of it, too much of it to really put yourself into a state of... The levels of ketones that you would need to be in a state of ketoacidosis with normal blood glucose or low blood glucose would be about 8 to 10 millimolar. Then you'll start to get into the danger zone. And currently the products on the market barely get you to 1 millimolar. So you're magnitudes of order away from the potential even to get into ketoacidosis.

Nick: When people talk about, "Oh, this is my keto life. This is what it feels like, you hear about 2 benefits primarily is what I see people talk about: body composition benefits and they talk about how they feel the feeling of mental clarity. Do you feel like ketone supplements have potential to be a value to that person who isn't a high-level athlete, isn't somebody who's looking for therapeutic setting, isn't type 1 diabetic but just thinks, "Yeah. I'd love to be a little but leaner." "I'd love to feel

good during the day and not have this up and down blood sugar roller coaster. I don't really want to eat super low carb. I want to eat reasonably but maybe if I took this supplement along with it, I could have some of the ketogenic diet benefits." Do you think that that person might benefit from this?

Dom: Yeah. I think they may benefit the most like your average everyday person even the business executive who just wants to have steady, more or less fuel flow to the brain in your body throughout the day. When you're on a ketogenic diet that's really the benefit is that your glucose and your hormones are pretty much stable throughout the day. You have this sustained focus and energy and that can come in handy. You don't want your glucose to drop right before a meeting or you have to write a paper or something like or get some kind of report in. So I know if I'm following a ketogenic diet and I'm going into a pretty demanding day at work, I know that my energy is going to be sustained throughout the day and my focus will be sustained. I think in the beginning it may be a little rough and maybe you'll be drinking more coffee or whatever to get you through periods of glucose withdrawal that your brain is going through but once you're adapted, the benefits are really pronounced I think for most people. Then you get people that the ketogenic diet can just be difficult for them to follow. There are some people who just can't tolerate the high fat of the diet. Some people can't tolerate MCT at all. Also once you become keto-adapted, very subtle variations can make a big different for some people. There's some people that even a little bit of carbs can throw them off and then they start getting hypoglycemic responses. I'm not one of those people but I think some people are like that. Other people have commented, there's women who have concerns about hormonal alterations with carbohydrate restriction. I think females, their physiology tends to be reactive to stressors and if they become hypoglycemic and they start a ketogenic diet, it can throw maybe their hormonal balance off a little bit. This needs to be studied. I get this question asked a lot. If I'm a woman and athlete, can I follow a ketogenic diet? Just from the observations that I've made in the lab with students and everything, when some of them will just try fasting, basically more than half of the women have been unable to fast or it's the guys. I don't know if it's an ego thing or what but they chalk it up and grit through it. Some of the women, they'll just faint. It'll be really difficult for them to power through the carbohydrate restriction or fasting. I think men just tend to be hardwired for that a little bit better. I think that needs to be studied especially if women are interested in using the ketogenic diet for weight loss or health benefits or performance enhancement. Now, we are actually doing studies. The National Institutes of Health, the NIH, is actually requiring investigators do male and female. So, maybe it's not known in the general community but all scientific research almost all of it is done in males because if you study females they have the estrous cycle and it gives more variability to your data. For years, investigators they'll buy male mice or male rats but now the NIH realized women are important I guess, so now we need male and female in our experiments. It makes things more expensive because we need more animals but we are starting to get more information now on the effects of nutritional ketosis on females and that's really important.

Krissy: Why are women so complicated?

Dom: I don't know. I just say they're more variable.

Krissy: That's a nice way to put it.

Nick: So this person that we're talking about who seems a normal person with a normal diet, normal goals, very, very normal, would they see the same benefit from just adding a bunch of MCTs to their diet as they would from taking the next exogenous ketone supplement?

Dom: Yes. They would see some benefits for sure, but I don't think they would get optimal benefits

unless they were low carb, really. I think when you're adapted to low carb, you become keto-adapted so I think it's assisting with the transport and utilization of the ketones that the MCT is making. That's my hypothesis but we haven't really studied that so I'm just speculating, based on feedback but regardless I don't think a clinical-type strict ketogenic diet is probably a good idea for athletes out there but a modified ketogenic diet that's supplemented in some way with ketogenic fats and that could be coconut oil, MCT or the C8 oil. Parrillo Nutrition makes one. KetoSports makes the C8. Dave Asprey sells Brain Octane. That's C8. There's a couple versions of the powerful. More or less, you can think of that as the most ketogenic MCT out there. That's really beneficial. I mean, you can get your ketones up. I can get up to about 2 millimolar which is pretty high relatively speaking with just an MCT. You feel that. especially if you're in a fasted state and you take a dose of MCT, I mean you feel it hit your brain.

Nick: Really?

Dom: Yeah. It's not hard to convince someone. Once your body is hungry and you take an MCT or ketone supplement, you can feel it, the effects.

Nick: There it is, my brain.

Dom: I think it's actually further enhanced with a little bit of caffeine. That's something that we want to do research on and start formulating these things so you have various types of exogenous ketones in a formula with various co-factors that help the cell transport and utilize them more efficiently and then maybe some mild stimulants that could further augment the bioenergetic energy-producing effects with the ketones. I have various things on paper that we're formulating and we want to test. It's mostly for military applications but hopefully you can envision bodybuilding supplements coming out that are formulations of this.

Krissy: I want to touch on real quick any possible preventative effects of either the diet or ketone supplementation. For someone like myself or I would say a lot of people, we may not be dealing with seizures ourselves or I may not be necessarily a bodybuilder who's using this site to get lean or trying to improve my body composition. Is there any other reason why this diet or lifestyle would be beneficial because I believe I've heard you talk about or mention before some protective effects on the brain for possible brain injury and I could be completely wrong so please just stop me when I am or if there's any benefit. Let's say I have cancer that runs in my family, is there a benefit of me taking the step ahead and getting on the diet or getting on supplementation and potentially reducing any increased risk?

Dom: Absolutely. Just going back to brain health, I'm really a believer that your long term brain health has a lot to do with inflammation. We know from scientific literature anything that's healthy for your heart is going to be healthy for your brain. We know that the work from Richard Veech's lab who is a student of Hans Krebs, you know the Krebs cycle?

Krissy: Yes.

Dom: He did some elegant study showing that ketones enhance ATP production and reduced free radical production in the heart in a working perfuse heart preparation so you generally get more ATP per oxygen molecule consumed up to like 25, 30% more. We published a study. Actually I formulated a diet with a ketone ester and the study was run by Deep Dixit at Yale University looking at the effects of inflammation on cancer. Dr. Dixit at Yale that did a lot of remarkable work on the

effects of fasting and fasting reducing various inflammatory pathways. He found that just simply elevating ketones suppressed an inflammation pathway associated with chronic illnesses and it did it in a metabolic independent mechanism which means the ketones were functioning purely as a signaling molecule, independent of the known metabolic pathways which is very interesting to me because it's very interesting that these exogenous metabolites actually have drug-like effects. They function as class 1 and 2 histone deacetylase inhibitors, HDAC inhibitors, and the pharmaceutical companies all over developing these HDAC inhibitors for Alzheimer's, for cancer especially. It just makes sense. These exogenous metabolites that our body makes have important signaling properties. As it pertains to brain health, being in a state of nutritional ketosis will provide an alternative energy substrate for your brain that will likely enhance bioenergetic function in the brain cells. That's been established pretty well in animal models and in vitro and in vivo. It will lower inflammation and chronically keeping inflammation low will probably pay big dividends as we age. I think chronic inflammation, you could probably trigger the formation of amyloid and tau plaques with chronic inflammation. That happens with concussions. Repeated concussions or sub-concussive events which can happen during football contribute to the formation of amyloid and tau plaques which are the pathological hallmark for Alzheimer's disease. Yes, I think being in a state of ketosis could be prophylactically protecting the brain. We know that as it pertains to cancer, being in a state of nutritional ketosis requires suppression of the hormone insulin and low blood glucose and high ketones. Insulin, if you already have cancer which most people do in some way shape or form our immune system has pretty good checkpoints to deal with pre-cancerous cells and cancer develops very slowly overtime. It's not that it's just spontaneously forms. We are cancering. It's like a verb really. If we do a therapeutic fast or we follow a nutritional protocol that puts us into nutritional ketosis and we do what's called a glucose ketone index which is the glucose in millimolar over ketones in millimolar. Thomas Seyfried wrote a paper on this, and we basically for simplicity, we get our ketone levels up to the level of our blood glucose. If we do that, 2 or 3 times a year, I think we could potentially purge our self from existing cancer or pre-cancerous cells that we have. I think it's my theory and other people could theorize this is that that could be a very effective preventative approach to a lot of diseases especially cancer.

Nick: That's really interesting. That's one thing I wanted to ask you about as well. It's so easy to think of this as a lifestyle but what about a periodic reset 2 to 3 times a year. Do you think that's something that's going to have value as well?

Dom: Yeah, I definitely think so. It's been shown by investigators like Mark Matson at the National Institutes of Health that intermittent fasting or even periodic fasting can have long-term health benefits even from an epigenetic standpoint. We have the acute effects. We have a profound decrease in inflammation. Elevation of blood ketone levels, suppression of hormone insulin, things like that but that can activate a genetic program that can confer protection against a plethora of chronic illnesses. I think doing that periodically could be very beneficial. When cancer cells are healthy cells that gradually transform to what's called a Warburg phenotype. A Warburg phenotype is basically the cells are fermenting in the presence of oxygen. They continue to ferment and they suck up massive amounts of glucose and in some cases glutamine too. Doing a therapeutic fast or getting into nutritional ketosis would lower their preferred fuel source and elevate the fuel source that they can't use. That would put tremendous metabolic stress on these pre-cancerous cells and they would likely trigger what's called apoptosis: program cell death. If a cancer cell cannot meet its energy needs, it activates a pathway that causes the cancer cell to basically, spontaneously die. We call that apoptosis. They're very sensitive. Even a tumor that's growing healthy, there's all sorts of necrotic and apoptotic cells inside the tumor. If you can cut it open and see it. Cancer is a very complex topic and it's genetically very heterogeneous but it has this same metabolic phenotype. At

least 90% of the cancers do. It has a very high appetite for glucose. The growth and proliferation of cancer is driven by the hormone insulin and IGF-1. And that's suppressed when you do the therapeutic fasting and nutritional ketosis. I think that's definitely could be a beneficial thing for people to periodically do short-term fasting or maybe periodically just do intermittent fasting or just the ketogenic diet. There's different approaches that they could take.

Nick: You see many different approaches online where people are like, "Oh yeah," once a week or once a month. I saw a lot of attention recently once a month for 3 days, you basically have broth and have a little light fast. Do you think it needs to be that often or can somebody do it? You know what, it's New Years. I'm going to fast my annual fast and actually see any benefits from that.

Dom: I think it becomes more important as we age because as we age these things, it's inevitable these chronic illnesses tend to creep up on us and I think our carbohydrate tolerance decreases with age. It's probably a good idea to transition more into low carb as we age into this eating lifestyle. When you're 19 in your early 20s, your carbohydrate tolerance is so high, unless you have type 2 diabetes in your family or you're an obese child, you generally ... Especially if you're an athlete, a young athlete, can tolerate carbs really well and probably doesn't need to do this but as we age, I think it's a good way to stave off chronic illnesses that tend to creep up and especially inflammation. That's probably the biggest thing that I see. Even gut health. I don't know. The ketogenic diet is like an elimination diet too because you're eliminating some foods that could be problem foods but I get several emails every single day about how ketogenic diet restored a person's gut health or decreased inflammation associated with their gut. I think that's the real thing that needs to be studied. What the ketogenic diet does to the gut microbiome is something that we need to study.

Nick: From an athlete's perspective what else do you think we need to study next? What do you think is exciting that's happening in that direction?

Dom: I think from a basic science point of view, we need to determine how nutritional ketosis impacts metabolic physiology. We need to do metabolic card studies and understand how the fuel source changes with time from the initiation, you take carb-burning athletes and put them on a ketogenic diet and you measure week 1, 2, 3 all the way out to ... Well, if it was unlimited funding, all the way up to 6 months and find out how their body, their rates that their keto adaptation and how that changes. Even do a genetic profile on them with 23andMe to determine what snips maybe preventing keto adaptation or enhancing it and what athletes may benefit most. We get to study endurance athletes, sprinters and power athletes like powerlifters. Of course this is all great in a world where there's unlimited funding. The military does have a pretty keen interest in transitioning their guys and understanding the benefits of the ketogenic diet. I know the Defense Science Board put in a recommendation at the level ... The President essentially, put in a recommendation to look at ketones and low-carb diets for the military. I've given talks at NADC and I've given talks to the military and they're serious about doing this but there is some entrenched dogma that they need to overcome before that happens.

Nick: There is a world of unlimited experiments out there happening online every day, it seems like you said. Every type of athlete has a keto discussion happening online but the problem of course being anything that can happen online can be totally butchered. What would be your parting words maybe to that person online like here's how you can stop butchering the ketogenic diet?

Dom: Are you talking about people that are promoting it or dissing it or both?

Nick: I would say promoting it.

Krissy: Promoting it but not for what it really is. For example, I see a lot about keto cycling or where your keto for a week and on the weekend you eat the carbs again. You come back to it. Just a lot of misinformation I guess is what we see a lot of. Probably some of it is good.

Nick: I imagine if you look around online at the casual literature online, you probably see something every once in a while and you go, "Dude, that's not keto. I don't know what you think you're doing."

Dom: Absolutely. First and foremost, people need to be educated if they want to give this an honest try. Jeff Volek has a great book, Art and Science of Low Carbohydrate Performance. It's like the go-to book. It's like mandatory reading for students that come to my lab. I think it's really important to check your ketone levels. A lot of people do this process and they don't check their ketone levels or they don't even track their macros. There's a misunderstanding that if I do the ketogenic diet, I don't have to track my macros. I could just eat this and I'll be in ketosis or whatever. I think especially for a person who's serious about their fitness to track their macros with a simple app or just write it down on paper or whatever and then once you do that, you don't have to be obsessive about it but you understand ... Right now, I can look at a meal and calculate the macros in my head so you don't have to go around with a calculator but a lot of people when they start the ketogenic diet, because it's so energy dense, they underestimate actually how many calories they're eating. They'll sit down in front of the TV with a big tub of cashews and eat it. I'm eating ketogenic or whatever or macadamia nuts. They don't realize it. It takes a while for your stomach to tell your brain that you just eaten a lot of calories. You can pack away a lot of fat pretty fast. It's really important, if you're going to set up your meal to set aside X amount of food and not force-feed yourself a ketogenic diet. You need to pay attention. You don't throw calories out the window or macronutrients out the window. A lot of people think you don't have to calculate that. If you do the cyclic ketogenic diet, it should be in a calculated way, not a free-for-all, all-you-can-eat carbs on the weekends because that can do a lot of damage. You need to have it calculated and do more of a slow carb approach, be picky about the kind of carbs that you're consuming preferentially and just not an all-you-can-eat sugar frenzy because you could do a lot of damage as far as taking in excess calories if you don't have some kind of control over it. I remember years ago being on a restrictive diet and then giving myself a cheat meal. I've seen a person consume about 7 to 8,000 calories I think in one meal when they've come out.

Krissy: You can do a lot of damage on that thing.

Dom: They don't realize it.

Nick: Just feel terrible.

Dom: It's really unhealthy. If people are doing the cyclic ketogenic diet, and then call it a cheat meal or cheat day, I think they should calculate how much they're going to eat and not restrictive but a little more reserved in their carbohydrate feedings and understand too that if your liver glycogen is topped off, it's going to take you about 2 or 3 days to get back into producing ketones naturally again. That gap in time may be a good opportunity to use ketone supplementation. You probably are less likely to feel the effects of hypoglycemia but if your liver glycogen is topped off, you probably won't go hypoglycemic. It does take a while for you to get the benefits of ketones again after you've given yourself significant carbohydrate feeding.

Nick: Good. I think that's a great way to wrap up a conversation. Thank you very much for talking with us. I feel like that's some great takeaways at the end there.

Krissy: Absolutely.

Dom: Glad you guys are covering this topic. Probably most of my emails I get are from the fitness community.

Nick Collias: I think that's a great place for this topic to grow too, organically in the future. Great. Thanks again.

Krissy: Thank you so much, Dom.

Dom: Thanks for having me. Take care.

Krissy Kendall, Ph.D.: Thank you, too. Bye-bye.

Dr. Dominic "Dom" D'Agostino: Bye-bye.



[KETOGENIC DIETING: FREQUENTLY ASKED QUESTIONS](#)

Ketogenic dieting can be a game changer for many people, but it can be frustrating and counterproductive if done incorrectly. Have your burning keto-queries answered by Dr. Jake Wilson!