



Episode 319: Everything You Need to Know About  
the Keto Diet With Dr. Dominic D'Agostino

Child: Welcome to my Mommy's podcast.

This episode is brought to you by Beekeepers Naturals - superfood products from the hive that help support your family's health. Right now, their Propolis has been a lifesaver with all of the sniffles and coughs going around where we live. Propolis is a resinous mixture that bees make in the hive and contains over 300 compounds including polyphenols and compounds that are antibacterial and a compound called pinocembrin that acts as an antifungal. Some studies have shown that propolis can speed wound healing. It's natural antibacterial and antifungal properties also make it great for fighting the sniffles. At first sign of any sniffles, sore throat or coughing, I spray propolis in the throat and it almost always helps us bounce back quickly. I also use propolis before flying to avoid picking up anything on the plane. You can save 15% on propolis and all beekeepers naturals products at [beekeepersnaturals.com/wellnessmama](https://beekeepersnaturals.com/wellnessmama) with the code wellnessmama

This podcast is brought to you by Four Sigmatic - my source for superfood mushrooms. Four Sigmatic makes delicious mushroom infused coffees, teas and elixirs that I use daily. From their lower caffeine coffee and coffee packets infused with lions mane that I drink in the morning, to chaga and cordyceps for focus while I work and Reishi to wind down at night... these products are a regular part of my routine. Here's a tip... I've found that for deep sleep, a packet of reishi with a splash of macadamia milk and a tiny sprinkle of salt and a drop of stevia helps me get more deep sleep and I've seen this consistently and measurably in my sleep tracking. As a listener of this podcast, you can save 15% by going to [foursigmatic.com/wellnessmama](https://foursigmatic.com/wellnessmama) and using the code "wellnessmama"

Hello, and welcome to "The Wellness Mama Podcast." I'm Katie from [wellnessmama.com](https://wellnessmama.com), and this episode is everything you need to know about the ketogenic diet and everything that goes with it, including if it is safe for women or not, its practical applications, how to know if you're doing it correctly, and what the emerging research says about it. I am here with one of the top experts in the world, whose research I have followed for a very long time, and it was an honor to talk to him.

Dr. Dominic D'Agostino is a professor in the Department of Molecular Pharmacology and Physiology at the University of South Florida, and a research scientist at the Institute for Human and Machine Cognition, the IHMC. His laboratory develops and tests metabolic-based strategies for neurological disorders, cancer, and for enhancing safety and resilience of military personnel in extreme environments. He was both a researcher and a participant in NASA's NEEMO project, and his research is supported by the Office of Naval Research, the Department of Defense, private organizations and foundations, and many of us in the health community who value what he does.

And I'm gonna talk about it in a little bit in the episode, but he also very much walks the walk when it comes to health. In fact, he broke the world record for the most weight squatted in a 24-hour period, and he has also

deadlifted 500 pounds on day seven of a fast. So he is both academically and physically an incredible human being, and it is an honor to join him today. So, without further ado, let's jump in with Dr. D'Agostino.

Katie: Dom, I'm so excited to chat with you. If what I read is true, you broke the world record for the most weight squatted in a 24-hour period and who have lifted 500 pounds after fasting for a week. Which is astounding to me. And I have fasted for that many days but I have not ever tried to work out on the last day. And you obviously walk the walk when it comes to health. You are well known for your research in the ketogenic diet and I want to go deep on the practical and scientific applications of that today. So to start broad and then narrow down, what are some of the emerging applications of the ketogenic diet that you're finding in your research?

Dr. Dominic: Yeah, so the ketogenic diet started as a medical therapy for epilepsy 100 years ago, and not a lot of people know that. But over the last decade, the use of dietary ketosis has been applied to a wide range of disorders and that includes a number of neurological disorders, metabolic disorders, and even psychological disorders too. In our lab, we study a broad range of things. I would say half of what we do is cancer research, and we do that at the Moffitt Cancer Institute. It's a very large cancer treatment center near the University of South Florida. It's its own separate entity. But I would say that in our lab, that's probably one of the biggest emerging applications and probably more controversial applications of nutritional ketosis is this idea of using food as medicine to treat something as serious and as complex as cancer.

And when I got into this field, there was maybe two clinical trials on [clinicaltrials.gov](https://clinicaltrials.gov), registered clinical trials, and now there is about 38 or 39 clinical trials I think the last I checked using the ketogenic diet as a therapy for cancer treatment in most cases as an adjuvant to further enhance or augment different forms of therapy. And in some cases when the standard of care has failed, the ketogenic diet is used. So we've studied in the past Alzheimer's disease and different animal models of Alzheimer's disease and the biggest project we actually have going on in the lab is developing a ketogenic strategy for dietary ketosis or supplemental ketosis to delay oxygen toxicity seizures which limits the Navy SEAL operations because they use a closed-circuit re-breathing device in their covert operations.

So what we do is with the various technologies we have in the lab, we can simulate what a Navy SEAL will experience under certain conditions. And then we test everything from the perspective of a cell to tissues, we've used various animal models, and we have human clinical trials at Duke University right now where we dive subjects inside of conditions and push them to the edge of the seizure in and out of ketosis. So that's kinda like the main projects we have going. We have like a lot of little pet projects on the side, like targeting glucose control, which has implications for Type 2 diabetes, which I think is a very big emerging application of dietary ketosis.

Katie: That's so fascinating. And before we go further, I'd love to have you define what is the ketogenic diet as there's thousands of different definitions floating around, and recipes. So what definition are we using for this podcast?

Dr. Dominic: Yeah. I think that's part of the problem too is that nutritional ketosis is a term used by people marketing different books to food supplements to bars, which are essentially candy bars. The ketogenic diet is the only diet to my knowledge that's defined specifically by an elevation of a biomarker that we can actually measure with commercially available technology. And you can buy a blood ketone meter at a CVS or Walgreens or you can go on Amazon and buy one. You can get it at Walmart. These devices will typically measure blood glucose and also measure the ketone body beta-hydroxybutyrate. So if you decide to do a ketogenic diet or medical management of, you know, whether it be epilepsy, which was the original application, or weight loss, which is a really popular application in the ketogenic diet for Type 2 diabetes, which has actually over the last five years been very well documented.

You can go to a drug store or online and buy a blood ketone meter and implement, start the ketogenic diet. There are many different...there's tons of resources online that did not exist at all when I first started studying this over a decade ago. And they tell you there's recipes on how to, you know, develop, you know, put together meals for a ketogenic diet. So you can start the ketogenic diet and monitor your blood ketone levels and that can guide you on how to best plan your meals and construct your meals with the different types of foods and ratios of fat to protein to carbohydrates, and it's really that macronutrient ratio that defines the ketogenic diet.

We know if we eat a certain ratio of fat to protein to carbohydrates, which the fat level has to be between 90% to 65% fat and protein levels typically range from between 10% to 25% or 30% with carbohydrates being restricted 10% or below of non-starch, non-sugar, fibrous carbohydrates that essentially have a very low glycemic index. When a diet is constructed in this way, it will produce some degree of ketosis depending on the individual and depending on how those ratios are calculated.

Katie: That makes sense. So some versions of the ketogenic diet can be considered unhealthy. Are there things you can watch out for or guard against when trying a keto diet?

Dr. Dominic: Yeah, for sure. There's a lot of, you know, ready-made ketogenic meals on the market. There's a lot of recipes out there that claim to be ketogenic and they may be low in carbohydrates but they deviate from what I would call a clinical ketogenic diet. And to get the full benefits of dietary ketosis, an individual typically has to elevate their blood ketone levels within a range that's characteristic of being in dietary ketosis. And there's a little bit of confusion and I think people are using the term ketogenic diet and they're really just marketing a low carbohydrate diet, which actually has a lot of benefits in regards to controlling your blood glucose, perhaps weight loss, it has an appetite suppressing effect.

Many people believe that a high protein diet is a ketogenic diet and that's really not the case because if you eat too much protein, the protein can convert to glucose and it can also stimulate the hormone insulin. And this can push you out of the state of ketosis or basically prevent you from making ketone bodies, which we know are beneficial for our brain and our heart and a number of other organs. And it's that level of ketones,

which is indicative of the suppressing of the hormone insulin. And once you stabilize and lower the hormone insulin, that puts your body into a fat-burning mode and it's the excess burning of fat that actually contributes to elevated ketones.

So your ketones are actually like, sort of, a surrogate marker that can predict how much body fat you're burning. And I think, from a general perspective, a lot of people are interested in the ketogenic diet for weight loss. And so I think dietary ketosis monitoring that is a very effective tool to basically inform the person how efficiently they are burning fat for energy and their own body fat. As they restrict overall calories, they'll be liberating, you know, their own body fat but also it's a combination of the dietary fat because you're eating more fat too. So that is making ketones, but when you restrict total calories, which it's easier to do on a ketogenic diet and that's a big advantage of it because of the appetite suppressing effect, then you're really tapping into your own fat stores too.

Katie: That makes sense. Is there an ideal range for ketones in something like weight loss and is that different from, for instance, in the ketone levels in something like fighting cancer?

Dr. Dominic: Yeah, that's a good question. And we don't know really all the answers but, generally speaking, if your blood ketones are between...from feedback that I get, anywhere between 0.8...if you're above 0.5 millimolar, and that's little m big M, it's also represented as mMol over liter, millimole per liter, and that's the units that you're measuring typically in these devices. If you're above 0.5, you're clinically in a state of ketosis and it would be difficult, very difficult to achieve that eating a standard diet, if not impossible, you typically have to fast, you know, about 18 to 24 hours to get your ketones into that level. So if you can formulate a diet where you're in a state of ketosis 0.5 to typically 3 or 4 millimolar max, my belief is that that's kinda like the optimal level.

For me, if I stay between 1 and 2 millimolar ketones, I feel like I have the most energy, the most mental clarity, my inflammation is lowest and if my ketones get a little bit higher, I typically have to do things that I have to have follow a diet that's more restricted in carbohydrates. And I feel better having a little bit of carbohydrates in my diet from things like a little bit of berries, vegetables and, you know, have a little bit of dark chocolate every day. So you can have these things on the ketogenic diet. The more carbohydrates you put in, it can knock you out but the more you experiment with the diet, the more you begin to realize like how much you can add in. And I think there are a lot of benefits to some of these, you know, plant-derived foods and I like to incorporate some of them into the diet.

And some ketogenic diets eliminate that completely. And I know the carnivore diet has been a big thing and a lot of people are advocates of that and I'm not fully convinced that that diet really is superior to a well-formulated ketogenic diet which would have vegetables. A lot of people with autoimmune disorders, you know, whether it be skin disorders or things like Hashimoto's disease or other things have emailed me and basically said that a ketogenic diet that's devoid of plants, that's more of a keto carnivore diet has been the only thing that has worked to cure their autoimmune disorders. So I think people need to look into this and it's just not studied enough.

There's a group in Hungary called Paleomedicina and they have treated like thousands of patients with autoimmune disorders and everything from epilepsy to cancer with a paleolithic ketogenic diet and we've recently visited Hungary and saw some of the patient records. And I have to admit that, you know, a paleolithic ketogenic diet, which is basically just all animal products and no vegetables at all, seems to be very effective for certain autoimmune disorders. But from my perspective, I'm still not completely sold on it for like the person who just wants to implement a ketogenic diet as a lifestyle. I think incorporating a more well-formulated balanced ketogenic diet that has vegetables and fruits into it would be ideal. At least I feel it is for me.

Katie: What does that look like? Based on your experience your research, what would you consider the best version of keto diet and can it be done with low saturated fat? I ask because I have the APOE4 gene, and so I'm cautious with consuming saturated fat. And I tend to lean towards mono-unsaturated fat. So can you do ketosis without the saturated fat?

Dr. Dominic: Yeah, that's a really good question and one I get quite often. Yeah, you can definitely do a ketogenic diet that's low in saturated fat. So what you want to do in that case is really get more monounsaturated fat. And one way to do that is to probably limit dairy because the biggest contributor to saturated fat in a ketogenic diet is dairy. The early ketogenic diets developed by the Mayo Clinic and Johns Hopkins were almost a dairy-based ketogenic diet because it made it palatable for kids. They were able to get in the calories required for growth. But a ketogenic diet that's lower in saturated fat would include things like eggs. The fat in eggs is mostly oleic acid so that's more of monounsaturated fat. So you have, you know, eggs and fish and nuts and nut butters, olive oil, of course.

And then you want to have...you know, if you have APOE4, then you're right, saturated fat is something you may be concerned about. It does contribute to factors that could negatively influence, you know, your outcomes. But the science is kind of unclear. So shifting from more of a dairy-based ketogenic diet to fish, eggs, and I'm kind of of the opinion that steak is also okay although it does have saturated fat, but you know, steak that's from grass-fed animals. Pork and poultry would probably be okay too. But from my perspective, and I did follow a dairy-based ketogenic diet when I started this like 12 years ago and some of my markers got really high different fractions of LDL and I got a little bit concerned and I did kind of minimize the dairy to a certain level. I still have it in and I do have dairy every day, but I significantly decreased it and fill the gap, the core gap from fat mostly derived from monounsaturated fats and that made a big difference.

So typically like today, for example, I don't always do this but I skipped breakfast and had my first meal around noon, which was salmon, and I tested various products people send me were cookies that were made from almond flour and they were lightly sweetened, and that was like my first meal. And that's kind of all I had eaten today. And then tonight we're having grass-fed beef by a company called ButcherBox that only sells like grass-fed beef. It's a service that we subscribe to. They have an excellent selection of meats. And typically a salad and, you know, cauliflower mash or broccoli or something like that. We usually have some kind of beef, fish, and vegetable for dinner and pretty much always have a salad with little amounts of fat.

Katie: Got it. There is a lot of opinion on this as well, but what about the need for an occasional carb refeed or if people should eat carbs once in a while to keep the body from adapting to not having carbs, is that something you'd do and what does the research say?

Dr. Dominic: Yeah, I think people really need to experiment with what diet works best. And you know, I'm an advocate of the ketogenic diet or nutritional ketosis, that could also mean supplemental ketosis, for a wide range of things. And if, you know, for cultural reasons and people have different metabolisms in different body types, where like everybody's like an individual metabolic entity and various food choices associated with the ketogenic diet, they might not be able to tolerate. And I've met people who just cannot tolerate the fat content associated with the ketogenic diet. But for me personally, I tend to feel best and I do my best work, whether that be writing or just, you know, cognitive tasks, and even physically, I tend to feel better in some degree of ketosis and not...I don't follow the level of a medical ketogenic diet, which is like anywhere between like 80% to 90% fat, but I'm typically somewhere around 60% fat.

And just as an example, yesterday I probably had a little more carbohydrates than normal. We have fruit trees on our property so I had a grapefruit at night and I had some blueberries and a pretty big salad and some stir fry vegetables too and like one or two pieces of dark chocolate. So my carbohydrate for the day yesterday was probably about 100 grams of carbs and probably about a third of that was fiber and I was still in a state of mild ketosis because I was fairly active like throughout the day. And now, that may not be the case for everybody. I know some kids that follow the ketogenic diet for epilepsy or other things, the amount of carbohydrate they could have is maybe like one strawberry throughout the entire day. Strawberries are very high in fiber, like, you know, a minimal glycemic response.

But I'm in contact with many different parents, I've seen, you know, hundreds if not thousands of dietary plans and I've seen the blood levels of different people from kids to adults and I have to say that there's a lot of variability. And I've also conversed with some elite-level Olympic athletes who follow nutritional ketosis and they can stay in a state of ketosis eating about 200 to 250 grams of carbohydrates a day, but they're also exercising like four to six hours a day and they're probably at a caloric deficit too. So you have a lot of extremes in this and it really comes down to food preferences.

So figure out what kind of food you like and incorporate more of those foods and that could be...you know, typically most people like fish and chicken and beef and pork things like that, and eggs. And if you are baking, you can use different types of flours that are on the market now. Some of them are nut flours and you can make muffins and cakes, and we make pancakes in our house occasionally. So you can have the comfort foods too. And there are a lot of entrepreneurs scrambling to really enter this space and they're developing everything from low-carb ketogenic brownies to cookies, to hamburger buns, to barbecue sauce. I mean, there's so many different products.

We hosted the Metabolic Health Summit just like a few weeks ago and the amount of stakeholders in this space is growing like exponentially, and that's in academia to clinical medicine, to industry, to media, to just general public. So this space is growing quite rapidly and a lot of these companies are developing products that are really serving the community that I'm networked in. And that includes the epilepsy community, which is like the diet it has a very good track record for, and a number of these other emerging applications, Type 2 diabetes being one of them.

And there's a lot of different...you know, not one ketogenic diet. It's not a one size fits all so when you read a study about a ketogenic diet produced a positive effect or a negative effect or no effect, most importantly, the most important thing is to figure out what kind of ketogenic diet this study used. I mean, there's an infinite amount of ketogenic diets. The early ketogenic diets were heavily based on hydrogenated fats, believe it or not, or even Crisco. And we've just, we know a lot more about nutrition now and I believe there's ways to formulate a ketogenic diet that could be healthy for everybody but it may not be for everybody depending on your dietary preferences, I would say.

Katie: So what about exogenous zones? This is something I actually have not personally experimented with but I actually have some on their way to me now and I am really curious about and I know you've done some research on. So what is the role of exogenous zones in a keto diet and what do we need to know about using it?

Dr. Dominic: Yeah, that's maybe what I'm known for because when I first started studying the ketogenic diet, my goal was to use the ketogenic diet for oxygen toxicity seizures, which are sort of a military problem. The program officer in the military at the time did not like the idea of putting someone on a high-fat ketogenic diet. It was too restrictive and they knew people just wouldn't do it. So they asked me to develop kind of a ketogenic diet in a pill. So many years ago, you know, I started developing different strategies and one of the strategies would be a ketone ester and the development of ketone mineral salts, which is basically taking a ketone body that your body makes naturally, like a bioidentical molecule, and then combining that with an electrolyte like sodium, potassium, or magnesium.

And then you can actually make these things in a laboratory and develop a powder out of it and then you can consume this orally in a shake or a drink and it can elevate your ketone levels. Beta-hydroxybutyrate is what we measure with a meter. And then that is clinically the state of nutritional or what we call therapeutic ketosis. So it's elevating an energy molecule in the blood that kind of has a superior energetic value. If your body can make more ATP, which is the energy currency that our cells use, it can make the ATP more efficiently with ketones. And we also know that these ketone bodies have hormone-like effects and their sigma [SP] molecules that can influence certain pathways, for example, inflammation. They can suppress the levels of inflammation, kind of, in the body.

So there are many different types of exogenous ketones on the market. We test them but, you know, we do not sell them. I think some people out there market things like my supplement. So just for the record, I do not have any ketone supplements myself. We do develop various patents and certain companies have gotten



those patents. I do like to test the ketone products that are on the market if I know they're safe and from a reputable company. And then some of those products I've put on the website, [ketonutrition.org](http://ketonutrition.org), just to direct people to reputable companies that are making ketone supplement products that at least have a very good certificate of analysis that are clean products that will actually elevate your ketone levels more or less.

So the benefits of these supplements are that when you consume them, they can give your body energy and I view them as just a ketogenic food. They're calorie-containing food supplements that when you consume them with a ketogenic diet, they can further elevate your ketones and probably further augment the therapeutic efficacy of the ketogenic diet. Now, there are some situations where someone is unwilling or unable to follow a ketogenic diet. For example, some of the disorders that we study in the lab, you know, kids with different disorders like Angelman syndrome or autism or Kabuki syndrome. That's another thing.

And I don't have to get into explaining, you know, these disorders but the kids who have some of these disorders, it's difficult for them to follow certain types of diets. So a ketone supplement that is formulated, and the flavoring agents can make it to taste good, can offer a lot of benefit to kids with these disorders. And you want to target disorders where the ketogenic diet has already shown to be efficacious, where there's clinical trials and published studies to share, for example, that a ketogenic diet can treat glucose transporter deficiency syndrome, which is something that we study.

So, many kids, they find it hard to follow that diet. So a supplement which elevates ketones, which is therapeutic molecule that can help individuals who have glucose transporter deficiency, that supplement really maybe almost, I'm not going to say the magic bullet, but it can be the therapeutic thing that can help to manage that particular metabolic disorder. And that's where we really try to direct a lot of our energy and time and effort into not only working on military applications of these ketone supplements but using that science to really develop things that can be used in the clinical field too. And we have a study, there's an ongoing study at Vanderbilt University that uses ketone supplementation for Angelman syndrome, which is a rare genetic disorder that just happens to be responsive to the ketogenic diet. So there's an ongoing study right now in kids with Angelman syndrome that's using ketones supplements.

Katie: That's fascinating. And speaking of electrolytes, is that something that we need to be aware of and supplement with on keto diet long term, I know there are some sources say you need more electrolytes if you eat low carb and are keto and are there other supplements that we should know about as well?

Dr. Dominic: Yeah, that's a good point because when you're in a state of nutritional ketosis just by adjusting the macronutrient ratios, we know that you're suppressing the hormone insulin. And when you do that, you tend to excrete more water and more electrolytes with that, including sodium and maybe potassium and magnesium, so you tend to maybe get a little bit dehydrated in the beginning. And at the same time, a lot of people go through what they call the keto flu. And the keto flu is feeling a little bit of a headache, you might be a little bit lethargic, and you just don't feel great. That could be dehydration and what we call hyponatremia, which is low sodium. So it's actually really important to stay well hydrated and actually make sure you're getting enough sodium, which there's initial sodium loss, especially the first two or three weeks.

You don't necessarily have to, you know, go buy electrolyte supplements. They may help some people but what I tell people is to have like a good quality bone broth or make your own bone broth. You might want to literally salt your food, whether that be a salad or beef that you're cooking, and that should be more than enough. The diet tends to suppress your appetite and also your thirst so you want to make sure that even if you're not thirsty that you're consuming enough water, especially during the initial two to three weeks of the diet because you're probably gonna be a little bit dehydrated and you might get some cramps and feel a little bit lethargic. So it's extra important to get, you know, water and electrolytes during that first few weeks.

Katie: Gotcha.

This episode is brought to you by Beekeepers Naturals - superfood products from the hive that help support your family's health. Right now, their Propolis has been a lifesaver with all of the sniffles and coughs going around where we live. Propolis is a resinous mixture that bees make in the hive and contains over 300 compounds including polyphenols and compounds that are antibacterial and a compound called pinocembrin that acts as an antifungal. Some studies have shown that propolis can speed wound healing. It's natural antibacterial and antifungal properties also make it great for fighting the sniffles. At first sign of any sniffles, sore throat or coughing, I spray propolis in the throat and it almost always helps us bounce back quickly. I also use propolis before flying to avoid picking up anything on the plane. You can save 15% on propolis and all beekeepers naturals products at [beekeepersnaturals.com/wellnessmama](https://beekeepersnaturals.com/wellnessmama) with the code wellnessmama

This podcast is brought to you by Four Sigmatic - my source for superfood mushrooms. Four Sigmatic makes delicious mushroom infused coffees, teas and elixirs that I use daily. From their lower caffeine coffee and coffee packets infused with lions mane that I drink in the morning, to chaga and cordyceps for focus while I work and Reishi to wind down at night... these products are a regular part of my routine. Here's a tip... I've found that for deep sleep, a packet of reishi with a splash of macadamia milk and a tiny sprinkle of salt and a drop of stevia helps me get more deep sleep and I've seen this consistently and measurably in my sleep tracking. As a listener of this podcast, you can save 15% by going to [foursigmatic.com/wellnessmama](https://foursigmatic.com/wellnessmama) and using the code "wellnessmama"

Katie: And now for a somewhat controversial question, there are a lot of opinions about whether or not women should do a keto diet at all and if we can modify it in certain ways based on our hormones. I know personally I feel like I can do it fine especially if I cycle it and I test a lot of different markers and I handle it well, but I also handle fasting really well and some women don't. There's a very personalized aspect to this. So based on your research and experience, do you think that the keto diet is also effective and/or safe for women?

Dr. Dominic: Yeah, I can't make that recommendation. I'll give you my opinion. But so you may have trained your metabolism to be...and I think what I've observed is that there are women who simply initially they cannot fast at all. They get lightheaded and I mean, we've had individuals like almost faint in the lab, if not,

you know, faint and just like can't stand up after fasting. Women, their physiology is very responsive to changes and they could have orthostatic hypotension. They could have, you know, changes in just their brain energy levels. The female physiology, in my opinion, is that it's much more reactive to low levels of glucose and insulin. So if your glucose gets low, that may have sort of a greater exaggerated response in a female compared to a male.

Males maybe tolerate fasting a little bit better. I don't know if it's a male thing to just kind of power through it but I definitely feel that there are physiological differences between females and males that make it harder for females to become robustly fat adapted. And one way to train your metabolism to be more fat adapted or keto adapted is to do things like intermittent fasting and then transition more gradually to eating low carbs and over time I feel like you could train your metabolism. But many women just tend to feel better adding some form of carbohydrates to the diet and I would say I'm of the opinion that a lower-carb diet would just be much healthier long term than a high carb diet and women who just cannot do the ketogenic diet for any reason I would advocate for them to at least do a lower carb diet or lower glycemic index diet and then capping carbs at like, you know, a one gram per pound, you know, or less if they really want to get metabolic benefits.

But I think people...I'm a big believer in self-experimentation. So I think people need to try the diet and see if it's for them, and to honestly try a ketogenic diet, you have to stick with it for really six to eight weeks. A lot of people don't want to hear that but you really have to honestly stick with it for six to eight weeks and measure your ketones to validate that you're actually in a state of nutritional ketosis because once that blood ketone level gets elevated, that's giving your brain an alternative form of energy and that's where you really start to...the lights kind of come off and you start to feel a lot of the benefits of the ketogenic diet.

And for me, I went through, sort of, a learning curve to this and it probably wasn't until the third month where I was like really myself totally, because I started with the Johns Hopkins protocol of like more of a dairy-based ketogenic diet and then I started transitioning off of that and was just doing more like whole foods and less dairy and I just had to find not only the macronutrient ratios but the types of foods that were working best for me. And also, it was kinda hard to get the calories. My metabolism was pretty fast, so it was kinda hard for me to get all the calories that I needed and that initial calorie deficit caused me to lose weight over time, especially the first...I think I lost about 10 pounds the first...without trying. I was actually trying not to lose weight. It was almost impossible not to lose weight.

So that side effect may be a benefit to a lot of people. They like the idea that they can eat and feel fully satiated and still continue to lose weight. And I don't know of any other diet that can really allow you to do that unless you're doing like a raw vegan diet, and that's really hard to do, but a ketogenic diet I think has greater weight loss benefits than a raw vegan diet and it's actually more practical from my perspective.

Katie: That brings up another point that I'm just personally interested in right now. Well, obviously the keto diet assists in weight loss and I have lost a significant amount of weight in the last year, not from only low carb, I've used a variety of methods and eat more food than I previously had. From your own experience, do you

have any research or tips on how to gain muscle while still either losing fat or maintain fat loss? This is a balance a lot of people have trouble finding the sweet spot for.

Dr. Dominic: Yeah. So you are hitting on all great questions. So that's a topic of debate, especially on social media in the fitness forums. Like, can you gain muscle on a ketogenic diet? There's absolutely...I mean, we published a paper with our Italian colleagues back in 2012, I believe, and it was elite-level gymnasts that used a ketogenic diet and they were able to maintain their strength and they had more remarkable body composition alterations over time. So basically, you know, at the end of the study, they preserved their muscle and they lost more body fat. They did not gain any more muscle than the gymnasts that were following their standard dietary protocol, but so they had a very intense training routine and the amount of muscle that they gained was the same, actually they just maintained. So being able to maintain your muscle while you're losing body weight and losing fat, like that's actually a gain because, you know, if you lose weight but still have the same amount of lean body mass, that's actually pretty significant.

So we established that early on and what we've learned over the years is that protein is actually really important. So the standard ketogenic diet requires, you know, a level of protein that's restricted and in athletes, that's probably not the best thing to do. So the data, as I understand it right now, from all the data that's available, suggests that, you know, from a clinical ketogenic diet perspective, they tell you to have one gram per kilogram of body weight and you don't need more than that. But for an athlete, you definitely need more than that, not only to maintain weight but if your goal is to gain muscle and strength, I would say 1.5 grams per kilogram at least, especially if you have a fast metabolism.

So I'm kind of heavy. I'm 100 kilograms, so for me, that's 150 grams protein per day. And if someone, a clinical practitioner of the ketogenic diet, was to look at my diet and see me getting 150 grams of protein a day, well they would say, no, you're nowhere near a ketogenic diet. But I am doing a ketogenic diet because my ketones would be elevated. So I think if someone's a bit heavier and has more muscle and body mass, they can get away with more protein and they're actually gonna need more protein to be able to retain that muscle and their need to increase protein higher than what would be a normal ketogenic diet to gain muscle over time.

So proteins are very, very important, obviously, for gaining muscle and the amount of protein you need. If your goal is strength and performance, if you're an athlete, the amount of protein you need would probably be into that 30% of your diet range as opposed to a clinical ketogenic diet, which is like 10% to 15%. Like you literally need about double the amount of protein. And this gets into, you know, what is a hot topic now even in clinical medicine is the modified ketogenic diet. And that was actually advanced by Dr. Eric Kossoff at Johns Hopkins and the modified ketogenic diet, also called the modified Atkins diet, but the modified ketogenic diet is actually used for adults with epilepsy. And that's like double the amount of protein than the diet that's used for kids. And like I said, it's much higher in protein, about 20% to 30% protein, relative to the pediatric epilepsy diet, which is like 12% to 15% protein.

Katie: Okay. That's good. And I think that raises another question is what about fasting? I mentioned this earlier in the episode, and again, of course, with the caveat that some women will not handle this well. I feel

like I do. I'm actually on day three of a water fast right now and my ketones are about 3.5 and I also pole vaulted this morning. But I'm curious, I know that you intermittent fast and you've also done longer fasts from what I've read. So what is your take on fasting for overall health and also for things like cancer prevention and all the other applications?

Dr. Dominic: Yeah. I'm a fan of fasting for many years. When I was really into weightlifting and strength training, I was eating like six meals a day and I would get anxiety if I went more than like three or four hours without a meal. So thinking that my body needs energy for growth and repair and that I would be taking a step backwards if I didn't have that meal. But over the years, I've learned that once your body is adapted to burning fat and ketones for fuel that the ketones are very protein sparing and that has resulted in the whole area of science that we're really focused on now with cancer cachexia, so muscle-sparing effects of ketones.

So my Ph.D. student that just graduated did a whole Ph.D. dissertation studying the anti-catabolic effects of ketones. So what that means is that, you know, if you are following a low-carb diet or doing a ketogenic diet and you do periodically fast, whether you do intermittent fasting or short-term fast or even long-term fast like a week or more, your body is more metabolically tuned to spare that muscle protein. And I think there's clinical evidence to support this. And also, well, we have some work to be published, once you fast and once you do it a few times, you can actually enter the state of ketosis faster. So if you do fasting or you did the ketogenic diet and get off of the ketogenic diet, do like a standard diet and go back to fasting or go back to a ketogenic diet again, your body will make ketones much faster.

It's almost like you know when you work out, you have muscle memory and you work up to like a certain level of bench press, you take time off...it may take you two or three years to get up to 200-pound bench press, but if you take a couple of months off, you're going to lose a lot of that strength but if you start back up again, instead of two years, you can get back up to that level in like two months. Your metabolism is the same way. If you train your metabolism to burn fat and make ketones and burn ketones and you do it over time, the more you do it, the easier it gets and the more benefits you derive from it but also the faster your body jumps back into that fat-burning mode when you start fasting again or when you do a ketogenic diet. So that has pretty important practical implications.

I'm a fan of fasting. In the beginning, I was not. I had to be sold on it. And it was actually the scientific literature, reading paper after paper of the benefits of periodic calorie restriction, intermittent fasting, and ketones, which got me thinking as an academic scientist, you know, I'm doing this in the lab and I'm seeing the benefits. We solve very real benefits in the lab, even survival from things like metastatic cancer that I had to do this myself and I had to experience it myself and I'm kind of a self-experimenter. So over the years, I've done up to a seven-day fast, you know, and periodically, I like to do it when I'm traveling, and my wife and I travel together most of the time, but if I'm traveling alone and I know she's not with me and having to eat because she doesn't really do a lot of the crazy things I do. If I'm traveling alone, I like to just fast occasionally and traveling, that can be kind of convenient.

So I personally do it, I've experienced benefits from it that I've documented, and I've been in touch with many other people who do this. And I think it really does have real benefits. I think some people take it a little too far, but if you were to do a short-term fast for a couple of days, you know, every few months, I think that'll really translate to real-world benefits.

Katie: As we get close to the end, I'd actually love to do a round two with you one day, I know that you're very much in the research and a lot of people listening are women, but I'd love if we could talk about some practical takeaways that we can all learn from your research. So moms, parents, those of us who may not be lifting heavy weights, what are some of the things you're seeing in the data right now that we can all learn from and adopt and benefit from doing?

Dr. Dominic: Yeah. Well, for women specifically, I think it's really important for women when they start a ketogenic diet or they do intermittent fasting, a lot of times this scenario presents that women will start a new exercise routine so they'll bump up their exercise, they will calorie restrict, and they'll start the ketogenic diet all at one time. And so you have a lot of variables contributing to things that could potentially slow down your metabolism and decrease YOUR thyroid level. So if you are experimenting with a ketogenic diet, I would say keep all variables sort of the same and do not restrict your calories. So just adjust the macronutrient ratios to ratios that would be ketogenic and keep your training the same and see how it affects your body and let your body adapt to that because there's gonna be some initial stress, you know, associated with the adaptation. And once your body adapts to that, then start, you know, adjusting the calories or ramping up your training and things like that.

So I think that's really an important practical takeaway because it seems like so many women who start a ketogenic diet or start intermittent fasting also start, you know, they do it for contest preparation or they do it for a sport or to just to lose weight for a particular event. They like shotgun a lot of things at once. So they do ketogenic intermittent fasting, calorie restriction, and overexercising, and simply just overexercising can, sort of, drop your metabolism if you're over-trained. So I think it's important to kind of ease into this, more important for women than for men. So kind of say that off the bat. And also the exogenous ketones that are on the market right now really can help people transition into that, help people get through that initial keto flu, as some people call it, or that transition from a carbohydrate-based metabolism to a ketone-based metabolism.

So for intermittent fasting, for example, they may want to break the fast not with a big protein meal, but maybe with a ketone supplement and they can extend the benefits of the fast I believe because your glucose level would still stay low and your ketones would be elevated. And then maybe, you know, two or three hours later, have a balanced meal or a ketogenic meal, you know, for example, they may want to do that. And that has made transitioning into these things a little bit easier for them. And there's so many resources that are available too online whether it be recipe books, even snacks.

So I do have the opportunity to test a lot of foods that are emerging on the market. Some of them are not on the market yet, but I can tell you there are a lot of, you know, ketogenic chocolates that are coming out,

ketogenic brownies, ketogenic cookies, and some of them are ketogenic and some of them are not. But the good thing is that there are legitimate forms of chocolate bars and brownies and cookies and things that are entering the market. I'm a big fan of just whole food nutrition, but some of these snacks are really...these comfort foods are important to have time to time because otherwise a lot of people may feel deprived. And I know it certainly helps for kids because some kids that follow the diet kind of feel ostracized if they're not able to eat certain foods. So that has made the transition for kids who need to follow it for a medical reason, it has made it much easier for them.

So there's a lot of practical things that we've sort of garnered over the years, knowledge that we've learned, and also companies are developing technologies that are making the diet easier to implement and also easier to monitor. For example, Readout Health has a device that's a breath acetone meter that I used all day today to check my own ketone levels. So BioSense is the device and instead of having to prick your finger and draw blood, you just simply blow into this device and it tells you your breath ketone levels. And I could blow into it hundreds of times and not have to go buy strips. You just buy the device and it's super easy to use. You can download the app and it tells you, it tracks all your ketone levels, and breath acetone is a very good marker of fat oxidation. So the higher that breath ketone level, you know you're really cranking out, you're really burning lots of fat if that level gets higher.

So for people, you know, the everyday person, and I know many people are looking at, you know, this approach to burn fat, something like the breath acetone meter by BioSense, you know, without having to stick your finger and pay for all the strips would be a very useful practical device for people.

Katie: Got it. I'm curious, what are you excited for in the future of research? Are there trends that you're seeing right now that you think are up and coming that we should be excited about in this area of research?

Dr. Dominc: Yeah, there's a lot of activity in this area and it's kind of surreal to see because when I started studying this, it was pediatric epilepsy was the only application and it was very marginalized even at the American Epilepsy Conference, but now there's just so much buzz all over. And the things that I think are gonna be most important in the future are like big health issues. Obesity we know is kind of a big problem but Type 2 diabetes is like a huge problem, especially in the over-50 crowd and it's a huge healthcare burden. So Virta Health is doing a lot of work and the Virta Health website really documents all the studies that they've published.

And you know, a lot of people when they hear that a ketogenic diet can treat Type 2 diabetes, of course, they become skeptical that you can get patients off insulin or their medication but they do and, you know, they've proven this. And that's been really interesting to see that science evolve. And we're in a completely opposite direction. We're working with the military and our company, Ketone Technologies, we sponsor research, working with NASA on various projects. And at this point now, it's really understanding extreme environments and ultimately, you know, trying to formulate metabolic-based strategies including nutritional strategies that can optimize performance and safety of the warfighter, but also the astronaut.

So my wife and I had the opportunity to participate in the NASA extreme environment mission operations where we're on a crew with astronauts and we're under the Atlantic and we actually do research for a week or more underneath the water. We were living in a hyperbaric environment and I had the opportunity to do the ketogenic diet for 10 days submerged underwater. And if it was...you know, we're still analyzing the data from that a couple of years later and we're preparing for more space analog missions, you know, with NASA this year.

So that's a big part of what we're doing now and a lot of time, effort, and money and resources are being kind of channeled into understanding these extreme environments and developing what we think could be a ketogenic strategy for optimizing performance in these environments.

Katie: Definitely. I follow your research really closely and I think it's amazing just to see everything that is coming up right now, and I'll definitely keep watching in the future. Like I said, I'd love to do a round two one day if you're willing, but I'm really grateful for your time today and sharing your expertise.

Dr. Dominic: Absolutely, I will. Thanks for having me on, Katie. Appreciate it.

Katie: And as always, all of you for listening and sharing one of your most valuable assets, your time, with us today. We're so grateful that you did and I hope that you will join me again for the next episode of the "Wellness Mama" podcast.

If you're enjoying these interviews, would you please take two minutes to leave a rating or review on iTunes for me? Doing this helps more people to find the podcast, which means even more moms and families could benefit from the information. I really appreciate your time, and thanks as always for listening.