

VIDEO_ Diet Doctor Podcast with Ryan Lowery (Episode 20)

Dr. Bret Scher: Welcome back to the Diet Doctor podcast with Doctor Bret Scher. Today I am joined by Ryan Lowery, Dr. Ryan Lowery, who has a Master's degree in exercise physiology and nutritional science and a PhD in health and human performance and is the president of ASPI, Applied Science and Performance Institute.

Ryan is an expert in human performance and in ketogenic diet, but also bridges this gap between science, academia and implementation for the everyday person, for health and performance not just from an athletic stand point but from just an overall life performance. He has over 100 published articles in peer reviewed journals, book chapters, and then he has also published his own book "The Ketogenic bible".

Ryan is a wealth of information and can talk on a lot of different topics from authority, and I really appreciate about that, I really appreciate that about him, so I hope you enjoy this conversation. We touch on a lot of different topics and go a lot of different directions, but there's a bunch of nuggets in here that you can walk away with, to really help you in your daily life.

So if you want to learn more and see the full transcripts go to DietDoctor.com, otherwise sit back, relax and enjoy this interview with Dr. Ryan Lowery.

Ryan Lowery, thanks so much for joining me on the Diet Doctor podcast today.

Dr. Ryan Lowery: Thanks man, it's an absolute honor to be on here.

Bret: I've really enjoyed learning more about you and listening to your talks and you do a fantastic job of sort of bridging the gap between the academics, the research and the practical implementation on how to be healthier, how to use low-carb lifestyle, how to train like an athlete, or just be an average every day person and be healthy. So tell us a little bit about your journey, how you got to this point, and how you got to the point where you can sort of blend these worlds so well.

Ryan: Yeah, well thank you, I really appreciate that, a lot of it stems from a passion for us. So, I grew up playing sports my entire life and really wanted to figure out how to take my performance to the next level, so I started really reading some of these research papers, these influential bloggers for a long time and I was like oh, this is really interesting.

And then as I went throughout college I started diving more and more into the actual literature, actual research and soon after traveling to all these different conferences, I started realizing there is so much great information, but the challenge is scientists speak at this high, high level, it really just goes over people's heads.

And I'm like, how do you take that information, that such high quality information and not, I don't like to use the term dumb it down, but how do you make it relatable, how do you take that information and translate it, and be able to put it into practical, meaningful use. And ultimately, that's what we do at ASPI, the Applied Science and Performance Institute, we said, you know what, how do we take this cutting edge research, look at everything from the full spectrum of performance, high level athletes to people with neurological conditions... how do we take that research and then be able to get that message out to the world?

Bret: Yeah, you see, at ASPI, you're working with professional athletes who every half of a second could make the difference between victory or defeat, and you're working with sort of the everyday person, who just wants to think a little clearer, be a little healthier, live a little longer, and then you're dealing with people with significant severe diseases, whether it's Alzheimer's disease, Parkinson's disease, it must be a very unique mix where you're not sure who you're going to see, or what you're going to do in your day.

Ryan: Exactly, we see a whole host of different people and I think at the end of the day it stems from optimizing human performance.

And a lot of the time, people think performance and they think-- and they immediately go to athletes, and like you said, we work with the most elite athletes in the world and for them a millisecond can mean the difference between gold and not even placing, so, it's very intense, but also, at the same token, performance also is a grandfather being able to get up and play around with his grandchildren, like, that's performance as well.

So how do we work both ends of the spectrum and use the science and the technology to be able to apply it to both? And that's what we are trying to do today at ASPI.

Bret: Yeah, that's a great perspective. Now, one of the things you talk about is I think when you first started getting involved in the research was, can you build muscle on a ketogenic diet? And everybody was saying, no, you can't. And you did a couple different studies showing that yes, you can build muscle on a ketogenic diet, and then, it brings in the whole concept of protein.

The thought is we need more protein to build muscle and one of the things I've ever heard you say is we need less protein on a ketogenic diet. So tell us a little bit about

what you learned about building muscle on a keto diet, and how protein plays into that.

Ryan: Yeah, absolutely, I think it was a big question, it was something I was really concerned with. And I was like, "If I do this keto thing, am I just going to melt away and lose muscle?" Because everyone, my entire life, I was taught you need carbohydrates, insulin is anabolic, it helps promote muscle growth, you need it in order to gain any muscle.

So we were really one of the first ones to look at this and we say, what if we take two groups, and we took a Western diet group, and like we took people who were eating a healthy Western diet and a ketogenic dieting group, we matched them for protein intake.

So, both groups had about 20% of their calories from protein, and then we trained them for eight weeks, and at the end of that period, we looked at muscle mass and we did a dexta body composition, and we looked at their lean body mass and there were no differences between the people who were eating carbohydrates and the people that were eating a well formulated ketogenic diet.

And their protein was matched and so it was kind of like this eye opening thing, and people were like, "There's no way... How's that possible?" So, we took a deeper dive and started doing more animal studies looking at things like muscle protein synthesis, muscle protein breakdown, we know that ketones themselves prevent the breakdown of like leucine, which is a very important amino acid for maintaining muscle.

We also found out that-- and this is pretty new, is that ketones themselves can stimulate muscle protein synthesis. So, kind of to your second point is... Do we need more protein? Do we need less protein? I think that two reasons; one because of the elevation in ketones themselves being anabolic in nature you likely probably need less protein than a normal individual.

And two, just from general research we know that the more insulin sensitive you are, the more likely you are going to respond to a lower dose of protein to trigger muscle protein synthesis. It's one of the reasons why, if you take a 20-year-old, who is highly insulin sensitive and take a 70 year old, who might be more insulin resistant, in order to turn on the switch, or trigger muscle protein synthesis, the 20 year old might only need 20g of protein, the 70 year old year might need double that, 40g of protein.

So what if you were to have that 70 year old be at the same degree of insulin sensitivity as the 20 year old, maybe that's the difference, in-- the more insulin sensitive you are, likely the lower the amount of protein that you need to initiate that response.

Bret: So there is some protective effect from the ketones itself, but beyond that it's the insulin sensitivity that can affect the degree of protein. Has that study been done, you have 10% of calories from protein, 20% and 30% and train them and see their muscle synthesis and--

Ryan: That would be really interesting and I think that there's a lot of factors, but I think insulin sensitivity is one of the overarching factors, is the more you can be insulin sensitive, the more likely you're going to respond to lower doses, have a lower threshold for triggering muscle protein synthesis.

Bret: Yeah, and when we talk about muscle building, we're not just talking about the professional athlete to the weight lifter, we're talking about the 70-year-old who wants to get off the couch, or falls down and wants to get up off the floor and avoid sarcopenia and not fall and break your hip and so when you're talking about muscle building, you're talking about sort of the whole spectrum.

Ryan: Exactly and I think that a lot of times when people hear muscle building, they immediately think body builder and weight, but sarcopenia, like age related muscle loss, females, you want to have muscle mass, a lot of times they think, "I'm going to start training and I'm going to gain too much muscle, so I'll look too bulky." No you need muscle mass because the more muscle mass you have, the more insulin sensitive, you'll likely be.

You need a place to have that storage, you want to prevent sarcopenia, because we all know that the minute that you fall down and break a hip, it's like things start spiraling downhill from there. So how do you maintain? And if you're trying to improve it, minimum keep the amount of muscle mass that you have, I think those are two very important things, when it comes to how do I keep muscle mass and utilize a well-formulated ketogenic diet to do that.

Bret: Yeah, so in the keto community a lot of people come to low-carb and keto to lose weight. Their first thought is not muscle mass, their first thought is not even cardiovascular health or whatever, their thought is lose weight, so as they're losing weight, a lot of them are also losing muscle, do you think, in the beginning?

Ryan: So, I think a lot of it depends on... well they lose lean body mass... And so it's important to understand that muscle, like actual dry muscle, is a component of lean body mass, but like glycogen is another component of that.

Glycogen is stored inside muscles and when you first start a ketogenic diet, sometimes that can be attributed to the water that's coming from the fat mass, lean body mass, whatever that may be, that can contribute over time, as you adapt you start to replenish and upregulate pathways to increase glycogen, so it's like about the

same as it was prior to doing it, but I think if you're on a well-formulated ketogenic diet, and you're having an adequate amount of protein, people won't see muscle mass loss.

Bret: Yeah. Do you see risks of too much protein?

Ryan: I do, I think at some level there probably is a risk of having too much, like body builders. When I was younger, and I was on a carbohydrate-based diet, I was eating everything in sight, the worst, worst diet you could ever imagine. I was probably having 250 g to 275 g of protein per day. I was eating Greek yoghurt like in between classes, everything. And I was adding protein on top of that.

Bret: I think you thought more was better.

Ryan: I always thought, if I want to put on as much muscle as possible, I need to be eating 300g of protein a day. I think at some level yes, you will have some conversion over into like getting some gluconeogenesis from some amino acids, if you're having too much. I'm more concerned, especially with-- females and males, but I often see it in females, is them not getting enough.

Because when people switch to a ketogenic diet and then they're eating that way, a lot of times people feel less hungry all the time, so they might only eat one or two meals a day and they're not used to getting in enough protein, and so sometimes I see people eating one meal per day, they might be getting in 20g of protein in that meal and people are like, "Why's my hair falling out? Why am I getting keto rash?"

I'm like, those are clear signs of protein deficiency. So, I encourage people to get enough, I'm like make sure you're getting enough, but just don't go overboard with it, there's no reason to go body builder, 300g per day.

Bret: Right and then you probably work with a lot of body builders who are trying to go keto and do they cycle, do they--? A lot of your athletes, let's not focus on body builders, but athletes, do you cycle a lot of your athletes in and out of the keto, in and out of carbs depending on the season and the competition and so forth?

Ryan: Yeah, a lot of the athletes that we work with use more of a like targeted approach, and I think it's an interesting approach for people that are performing at that high level is they use carbs as a tool, it's not a necessity, they're utilizing it as what we call an ergogenic aid. So, if we have someone who's about to go do an event, they might have 30 g to 60 g of glucose right before their event, but they're burning through immediately.

It's not like they're taking that in and they're doing a cheat day, sitting on their butt and watching TV, it's like they're actually going in and utilizing that fuel source and utilizing the carbohydrates for what they're meant to be, which is this tool or a potential ergogenic aid not as a necessity that I'm just having because.

Bret: Right, right. So, when you look at athletes, I mean we can't talk about athletes as one thing; there's the ultra-endurance athletes, there's the sprinter, the weight lifters, there's people doing the jujitsu, so some are the more steady continuous exercises, some are the repetitive glycolytic type exercises, do you find some are going to do better or worse on a low-carb ketogenic lifestyle?

Ryan: Yeah, a lot of times people think that people who are anaerobic versus people who are aerobic, people who are anaerobic like doing those short high intensity animal type training, they think they'll suffer. We haven't seen that yet. It's possible in like sprinters, we don't work as much with like sprinters, like if you're doing like, hey you only have a straight away sprint, there is a possibility that your performance may not be as well.

If you're fully adapted, I don't know that yet, because I think that ketones can provide some quick energy, but certainly in the aerobic sports, I think being a ketogenic fat adapted in some capacity is way better than running into the wall or hitting the wall and running out of glucose, having all those gels and goo's and everything and it messes up your stomach and I think for aerobic it's very clear. In between is what people-- like I think that Brazilian Jujitsu, we work with a lot of Brazilian Jujitsu, MMA is starting to get a lot of attraction for it.

It's very big in sports, that where the weight to power ratio becomes very important, wrestling, things like that, because your goal is how do I fight or compete at the lowest weight possible, yet maintain or maximize my power and output in strength, how do you do that? I think that being on a well-formulated ketogenic diet ultimately allows that, because when you cut down and you're not on a ketogenic diet, you're at risk for muscle mass loss, you're losing strength, you're losing power, what if you can preserve that?

And like we were talking about, maybe due to the elevation of ketones, maybe even preserve that muscle mass when you're dieting down to a different weight class and still be able to perform.

Bret: Right, that's a great point. Now you mentioned the term adaptation. So, we talk about keto adaptation from a lifestyle standpoint and there's that first week or two of the keto flu and you feel terrible and you need to hydrate with those electrolyte supplement. But from a sports standpoint and a physical performance

standpoint, that adaptation is a lot murkier in terms of how long it is. Some would say six months, some would say a year.

How do you gauge whether someone is adapted and how do you know when they reach that point? Is it their respiratory quotient on a cardio metabolic test or is it some other testing you can do? Because this seems very vague at this point.

Ryan: It is, it really is big... I wish there was a-- you know what? One of these days someone has to develop a way to measure like MCT transport capacity. I think that would be the best way to look at it, we don't have that technology yet, but to your point, I think looking at things like RERC, where they're at, they're closer to like 0.7 or if they're still up at like 0.9 or 1.0, meaning that they are primarily utilizing carbohydrates or they are primarily utilizing fat, and we also do like pre-- and then every week we kind of do these follow-ups of looking at different measures of performance, vertical jump power, bench press power, see like how much they dwindle and then how quickly it takes to come back, and for everyone it's so individualized.

We know that the keto adaptation, there are ways to accelerate it, doing things like intermittent fasting, making sure you're supplementing with the proper electrolytes.

Doing high intensity interval training, depleting muscle glycogen levels as fast as possible, it's one of the things I tell our athletes all of the time, is like if you're going to do this, like fight through it, like try and do it as quick as possible, like I know you're not going to-- you're like hey I want to have my best work out, but fight through it, deplete that muscle glycogen, because what's on the other side is a lot better, so the quicker you can get through it, the quicker you can adapt, the more you're likely to sustain this and be able to make it a lifestyle.

Bret: So, that's for an athlete. What about another everyday Joe, who says, "I want to go ketogenic, I've heard terrible things about the keto flu, so I'm just going to take it easy for the next couple of weeks, and drink my bone broth and get plenty of electrolytes." Would you tell him the opposite, even-- not the athlete, but just say you need to get out there and you need to burn that glycogen and you need to be more active during this week or two weeks even though you feel like crud?

Ryan: I still think that's the best approach. And I know it's tough because people want to take it the easy route and if that's the mindset, if you really want to embark on this, I'd say go in and you've got to make sure this is something you want to commit to and go, "Hey, I'm going to go out", even if it's not, "I'm going out and do high intensity training."

Just go on a walk, get moving, try and deplete muscle glycogen levels, maybe incorporate in some intermittent fasting, make sure you're supplementing with electrolytes and having things like bone broth, make sure you're incorporating those things in, because the quicker you can adapt, the less likely you are to be like, you know what, I'm just having a headache and this isn't worth it.

And you go back to eating a pop tart or something else and then you just fall into this vicious cycle that you're like, "I could never do that, I can never get over keto flu." I want people to bow through it, get through it as quickly as possible and then realize the long-term benefit. **Bret:** I haven't thought about pop tarts in a while, you know. Do you know how many pop tarts I ate on my bike, going like just hours and hours, fueled on pop tarts after pop tarts... it makes me sick!

Ryan: S'mores were the best. We've got to make a keto one.

Bret: Right, keto pop tarts! Actually, that brings up an interesting topic right there. All these keto products that are popping up, I mean I'm a big proponent of a real food keto diet and for some people that still just doesn't cut it and they want the products, they want the cookies, they want the packages and some of that is a mixed bag. I mean not all of it, our bodies are not going to respond as it should to a lot of that, depending on some of the ingredients.

Now I heard you're doing a whole certification process now with your company, to certify these. So, tell us a little bit about your concerns of what's in these keto package products and how your certification process is going to help with that.

Ryan: Definitely and I'm the same way, like I advocate whole foods, real foods as much as humanly possible, but I understand the dynamic that people are like, "I want a cookie, occasionally", or "I want a brownie or something." And that's fine as long as the product is built the right way, or as long as it's created the right way. So, it's not utilizing things like sorbitol or maltitol, which are sugar alcohols, but we know not only they have problems with GI issues, they also can spike glucose and insulin, which isn't very good.

Bret: So they can be low-carb, they can be keto, but still spiking glucose and insulin.

Ryan: Right, I don't even consider them keto if they have high amounts, like you go down your traditional grocery aisle, and I've made this mistake very early on when I first started the ketogenic diet, I was like wow, all my friends were going out to the movies, all my friends were grabbing the regular Reeses, Kit Kats, things like that, I go down there and I'm like wow, this is sugar-free candy, and I look at the back and I'm like, this is weird, it has 30g of carbs, but 28g of sugar alcohol. So I was like, oh so it's only two less carbs because you subtract it out.

So I go to the movie theatre and I have like four pieces of this sugar-free Reeses going in and I was like, oh gosh, my stomach was-- it was killing me, I was like, "There's no way I'll do that again", but people don't know that.

And I think it's sad to see products like that, that have so much sorbitol and maltitol, so that's my biggest concern, is not only are there sugar alcohols that can cause a spike, there's also various different sweeteners, but there's also like fibers, it's not like fibers are all created equal, and I think we're starting to see some regulations starting to change. It's just not fast enough yet.

So I hope it's not malicious on the company's part, I hope it's just a lack of understanding on the RND. Yeah, it's easier to make something with sorbitol and maltitol, yeah, it's easier to use a fiber known as isomaltose oligosaccharide.

Bret: IMO.

Ryan: IMO, but that actually gets digested, it actually causes a glucose and insulin response, we published a paper on that, versus like soluble corn fiber, which doesn't. So, a lot of times they take the easier route because it's all they know, but the companies that are doing it right, that's who we're trying to reward, we want to make sure the companies are protected, but the consumer is protected in going out and being armed and saying, "You know what? There's going to be this explosion of keto products, it's going to happen."

It's all about the intent and the research and development behind the product, to make sure it's done the right way and so we want to be kind of a voice, a reason to help further that and say, we'll not only test these out and look at all the ingredients, but we're actually going to test this out and do blood testing to make sure these things are tested properly.

Bret: Right, blood testing, I heard you mention both glucose and ketones. Right, because if the glucose doesn't go up but the ketones go down, that could be a sign that the insulin is going up. So you got to make that jump.

Ryan: Exactly right.

Bret: So for our listeners here, who are going to go out tonight and look for a cookie, a keto cookie, look for a keto snack, what ingredients should they be looking for, in terms of the fiber? You mentioned soluble corn fiber and some of the sugar alcohols. What are some of the good ones that they should be able to look for, if there are "good ones"?

Ryan: Yeah, when it comes to sugar alcohols I would like to stay with like erythritol, xylitol is okay, it's a lower GI. I don't keep it in the house, just because I have a pet and you have to be careful. Xylitol is like poisonous for pets.

But erythritol is probably one of the better ones, stevia, monk fruit, things like that. I'm starting to see a new trend, which I'm excited about, because we're starting to do research on this, it's actually a rare sugar and people freak out because they hear the word sugar, but it's called allulose, and we're starting to see it pop up more and more, but it tastes just like sugar.

But we've actually done research where 92% to 97% of it is completely excreted out of the body and it causes no glucose response, no insulin response. We're actually collaborating with someone overseas that is working with type 1 diabetics and just giving them allulose and their glucose is dropping and no increases in insulin.

Bret: Really?

Ryan: Very, very fascinating stuff, it's very new, but I think we're going to start seeing more and more of that emerge and I hope that one day we'll start seeing these big soda companies start switching over to utilize something like that, because it literally tastes just like sugar but doesn't have the same metabolic disaster that tons of sugar has.

Bret: Yeah, that's so interesting because you can look at it from two ways. You're getting rid of the metabolic disaster of sugar but you're still creating that slippery slope of wanting the sweet taste in training our taste buds for the sweetness.

And that's partly why I recommend whole foods only and I understand that people are still going to crave that sweet tooth, but I love it when someone comes back to me and says, "Carrots taste so sweet now", whereas before they could just pop carrot after carrot and not even blink, but now even a carrot tastes sweet, I'm like yes, you've trained your taste buds, you're doing it right, so I think that's so interesting.

So, we talked about athletes and athletic performance and one of the other things you've talked about is longevity and that's a huge topic right now, not just longevity but also health span, living healthy as long as we can. And so there's some thoughts that a ketogenic diet and ketones have a positive benefit for longevity, obviously we don't have 20, 30, 40 years studies on it, but tell us your thoughts on where the science is for that, and where the hypotheses are for that and what you're most excited about for ketosis for longevity.

Ryan: Sure, and if you type in keto for longevity or keto for health span on google, you'll get a very different message, because most of the people misinterpret the data.

And a lot of the things, there's meta analyses done on these long-term studies that's kind of like, oh low-carb isn't going to be good for you, it's going to cut your life expectancy, but in reality if you dig into those studies, they're using 30, 40, 50% carbohydrates in deeming that low-carb.

So that's one thing, if you'd just be careful with what information you're taking in, that's why the Diet Doctor does an amazing job, you do an amazing job, putting out this information that's legitimate information, not something that's just, "Hey here's a study. Let me misinterpret it from media and press and pump it out there."

Bret: Right.

Ryan: But what we're seeing in longevity is a completely different picture, so we're seeing, there's early studies with like ketones in *C. elegans*, which is like a worm type model extending lifespan. We did a research study where we actually took animals and about the human equivalent of about 20 years of age, we took them at that point and placed them on a ketogenic diet and carried them out for their entire lives and just looked at what happened.

We looked at everything, we looked at every marker you can think of-- we're still looking at markers inside of tissue, everything you can imagine and what we found was that animals that were on a ketogenic diet, their half-life, meaning that the amount of time it took for half of the animals in that group to die was almost double the amount from the Western dieting group.

Which was very, very interesting and these animals lived significantly longer, and we just carried them out, let them live throughout entire lives and fed them a ketogenic diet versus like a traditional Western diet and even though protein was matched, they still lived longer.

Bret: Yeah.

Ryan: So, there seems to be something unique about these ketone molecules that like being in a state of ketosis itself, and not having that rollercoaster of glucose and insulin all the time, seems to promote that. I wish that we could do a study on humans, but none of us would be around to see it.

Bret: Right. What's so interesting is that the benefit of the ketone, the ketogenic diet from the ketones themselves or from the reduction in carbs, the insulin resistance or the combination of both, so there's studies showing that ketones can affect genetic expression, and HDAC inhibition and what is the level of science for ketones themselves as being a beneficial marker of health and longevity rather than the diet?

Ryan: Yeah, I think it's a combination. I think it's tough to titrate out which it is, I think it is the suppression of insulin, chronic elevated levels of insulin, I think it's lowering inflammation, there's a lot of systemic inflammation that happens.

And both ketones themselves can help with that via through a ketogenic diet or even ketones themselves, partly because if you look at studies on ketones, it downs, it shuts off the NLRP3 inflammasome, it blocks the NLRP3 inflammasome, which is the main marker of inflammation, so it's tough to titrate it out, but it seems to be, just being in a state of ketosis seems to be driving that response.

Bret: Yeah, because it's so interesting for people to try and figure out, "Do I need to be in ketosis? Is a low-carb that's not quite ketosis, good enough?" Of course it depends on your goals, where you're coming from and I think there's still a lot that's unanswered about that, but certainly interesting to think about.

Ryan: Yeah, and I think it's a moving target for everyone, like I know people who are a weave of athletes that can be eating 80 g to 90 g of carbs and still be registering 1.0 mmol. But their calories are go high and they're burning so much because they're working out three times a day, but then you also know people who are probably eating 20 or 30g and that's what they need in order to stay in ketosis.

It's very individualized when you're talking about like low-carb versus ketogenic, but like 40% or 30%, which is what some of those studies are doing, like mortality studies, I wouldn't even consider that low-carb. To me is still a really high carb.

Bret: It's sad that it's considered low-carb compared to the standard Western diet here, and also there's the observational studies that do food frequency questionnaires and there's tons of confounding variables and the healthy user bias... That's not science.

Ryan: Right.

Bret: I mean, that is not science, and that's why I'm glad you're doing, the science you're doing really is sort of more rigorous and controlled and more useful from an investigative standpoint, so I hope you do more of that, for sure. So, then there's this whole field of exogenous ketones, so when we talk about is there something unique and special about ketones themselves, then the question becomes, should we just be pounding extra ketones, and there I think it's important to separate a couple of different concepts.

There's treating different diseases, like traumatic brain injury, Alzheimer's or Parkinson's, there's athletic performance, and then there's general health, how

exogenous ketones fit into those three categories, because they're very different. So, tell us a little bit about how you see and how you use exogenous ketones.

Ryan: Yeah, that's a great point, I like bucketing them out into three different buckets. To look at ketones, I think ketones-- exogenous ketones came out into the market in a bad light. I think people were being marketed, it was like, "Hey just drink this and you'll lose 15 pounds, "it doesn't matter if you go eat a Big Mac or you eat whatever, you're just going to lose weight doing it", and that wasn't the right approach.

And I think it's been refined since of understanding like, it's not a magic supplement, it's not going to magically melt body fat off of your body. If you're talking about general health to your point of like inhibiting HDAC and somebody's longevity, there's a possibility that ketones themselves, there are studies, like in the *C. elegans*, they were utilizing just exogenous ketones.

They weren't putting them on a certain diet, they were utilizing exogenous ketones. We've done studies in animals, utilizing both a combination of a ketogenic diet and exogenous ketones and saw a slightly better result for like things like increasing brown fat, decreasing food deficiency, which is the amount of weight you gain over the amount of food you consume. So, for general health that's really the application.

The other application where the weight loss can come from consuming exogenous ketones it's when people consume exogenous ketones they seem to feel more satiated, so the thought process is like, if you're consuming exogenous ketones and you're extending that fasting window, if that's something, it's the same reason why if you have a little bit of MCT oil inside of your coffee it can extend your fasting windows, so you're eating less within that window, that ultimately long term will help with body composition and weight loss.

So, I think a lot more people are starting to report seeing that and utilizing it for that benefit, versus hey just drink this and then I'm going to go and eat a ton of carbs on top of it, but to the other aspects we're starting to see more and more research on performance, there's some early studies with the ketone ester on performance, we're starting to see some now with ketone salts, looking at athletic performance, so there is potentially an application there, and then to your point I think starting to utilize some of these interventions for things like neurological conditions, where there's an energy gap, right.

We're starting to call Alzheimer's type 3 diabetes, and the problem is the receptors in the brain are insulin resistant, they're not able to properly take up and utilize glucose as effectively as they used to, prior to having that diagnosis. So, how do you provide a

fuel source to the brain that allows individuals to get something to there? Doctor Marian Newport, has a great, great TED talk, she wrote a book on this, talking about how with her husband-- He wouldn't go on a ketogenic diet and it's tough when you're dealing with family members.

He wouldn't eat it, but what she would do, is she would give him spoonfuls of coconut oil at the time and then the ketone supplements started becoming more and more readily available and she started giving those, but her, she was just like, "How do I get some type of elevation of a substrate that his brain can actually utilize?"

And she saw amazing improvements, even with just coconut oil, utilizing that to try and get that fuel source to the brain. So, to your point, I think there are different applications and it's just using it in context as a tool, not a crutch.

Bret: Do you have research studies ongoing at this point, for a neurological disorder in athletic performance so we can actually study it, so we can see some evidence coming out of it in the future?

Ryan: Yeah, we have a case study that we've just published on Crohn's, because of the anti-inflammatory aspect of it. So, lowered CRP, which we tend to see with exogenous ketones. We're working right now, I'm fascinated with Parkinson's and traumatic brain injury mainly and Alzheimer's falls within that realm, but we have a case study on Parkinson's, which is pretty amazing.

We're starting to replicate that and see it more and more, where again I think it's an energy gap, and so if you're providing these individuals with a fuel source, that they can utilize, one of the reasons I think exogenous ketones can play a role is, say you're taking a professional athlete, we work with NFL athletes, if they're not on a ketogenic diet during the season, what can you give them... boom, they take a huge hit, they have a concussion, something immediately after, yeah you can fast them but we just talked about, it takes time to adapt, but they have to play again the following Sunday.

How do I give them something that will give their brain a fuel source immediately, versus delaying that process, all of a sudden, the brain starts starving and we start building towel plaques, we start developing CT? How do you provide a fuel source immediately after that trauma? I'm interested in seeing that, I think one day we'll see on the side lines of some of these contact sports, like rather than drinking a huge sugary drink, we'll start seeing some incorporation of like exogenous ketones to be able to provide a fuel source to the brain that it can take up and utilize.

Bret: Yeah, that would be fascinating in some way to measure that the concussion symptoms or the duration of the concussion is lessening and then hopefully having further long-term effects as well.

Ryan: Right, and we see that in animal models, we see in in animal models, we just haven't been able to look at it yet in humans, but like in animal models, they do models where they can induce concussions in animals, but they've like given them ketones before, and then looked at the duration of how long it's taken to recover, and it's improved.

Bret: Interesting.

Ryan: Even on a ketogenic diet, if you're able to get them on a ketogenic diet or utilizing exogenous ketones.

Bret: Right. So, they're already on a ketogenic diet. Theoretically they would have the protection built in.

Ryan: Exactly.

Bret: Very interesting, okay, so you'd also mentioned fasting. Fasting is very popular now and for good reason, but more sure of the time restricted eating, not necessarily, you know, a 5 day, 10 day fast, that's its own thing that we can talk about, but the shorter fast, the 16 hour, the 20 hour fast, probably more in line with sort of how we evolved, it helps our insulin levels stay low, it helps us to lose weight, it definitely seems to be beneficial for promoting health.

Now when it comes for exercise and fasting, it can have different effects on the body depending on what our goals are, so how do you think about fasted exercise versus fueled exercise and who's it right for?

Ryan: Great point, I think it depends on the goal of the individual. If the goal is more fat loss, then exercising, whatever that exercising is in that fasting period, it probably won't be, it's probably a good idea, probably not a bad idea to---. If your goal is to maintain performance or increase muscle mass, eating around that time where you are exercising it's probably beneficial, so you just shift that time point or that window in which you are eating.

I think one of the most incredible studies that I don't think is out there yet, that would be done, and I have a theory on this, but like I when I intermittent fast, most people do this, they tend to skip breakfast, they might eat sometime in the afternoon and then they'll have something for dinner, just because it's convenient, it's the convenience.

Based on non-ketogenic studies, if you look at studies that have given a larger breakfast meal and a smaller dinner meal, there seems to be more benefits. Eating a larger amount earlier on the day, versus later on in the day, in non-fasting, non-ketogenic conditions, seems to be more ideal. I think if it were more feasible for most people, eating in the morning and then eating at lunch and then probably not having anything at night would probably yield better results than not eating in the morning, eating at lunch and eating at night.

It's just my theory based on the fact that you're more active throughout the day. You're going to be utilizing those calories and then a lot of those times people will eat a big meal at dinner and then two hours later be laying in bed or sitting on the couch, watching Netflix or something.

Bret: Right.

Ryan: So, it's just a theory I have, something that I want to do at some point for research study but the window itself is variable depending upon the context and the goals.

Bret: Yeah, and that makes a lot of sense, I mean Satchin Panda has done a lot of work on circadian rhythms of insulin sensitivity, and you're less insulin sensitive in the late afternoon and evening and if that's when you're having your biggest meal, maybe that's not ideal, and also you look at the "Mediterranean diet", so it has to do with the Mediterranean culture, which is sort of a lunch, you know, a mid-afternoon big meal and not in the evening, a smaller meal in the evening.

But a lot of these things seem to go along with that, but logistically and socially, it's just hard when the big meal, you know, is the social meal with the family and the kids and you're going to skip it, it makes it hard.

Ryan: Exactly right.

Bret: And a lot of people are more rushed in the morning, they don't want to have time to make breakfast, so logistically it's so much easier to just skip breakfast for the time restricted eating and I think it's a good question... does it make a big enough difference when you have it, that it's worth the extra, sort of logistical challenge to make it work?

Ryan: Exactly, that's the big question. I'd rather like people do it as long as they can sustain it, I'm one of those people where it's like I'm sitting down with friends or family, like it is more convenient to sit down at dinner time at night and be like cool, I just got home from work, like it's, it's calm, it's... boom, I'm just going to have dinner... with family and friends, it's like you said interesting, it would be very, very

interesting to look at how big is that difference, if there is a difference between morning and lunch versus lunch and dinner.

Bret: Right and a simple change, if you're having the lunch and dinner, just make the lunch the bigger meal and dinner the smaller meal. Yeah but so, if I can summarize what you said though, if fat loss is your goal then working out fasted is definitely beneficial, if added performance and muscle gain is your goal then you recommend eating something prior to your workout, and any particular composition of the food you recommend eating before the workout?

Ryan: Yeah, it could be before or after, just eating around that window. Around that workout period, because you want to train, you want to initiate muscle growth, you want to provide recovery for that exercise belt, likely you're going to be resistance training, if that is your goal for performance or muscle building. So, you want to fuel that, and I think just getting in a high-quality meal, I sometimes people over complicate it and be like, "Oh I need a protein shake or something after that." No, it's fine, just go get real food.

Bret: Right.

Ryan: Get a whole meal, get something that you can get in that has ample amounts of protein, maybe 20, 25, 40 g of protein and just enjoy your meal.

Bret: Yeah, so when we talk about fasting and health and longevity and protein, the topics that come up again and again are mTOR and IGF1 and tough to measure, tough to know what the right balance is, but the thought is you need some stimulation of mTOR and IGF1, they promote growth, muscle growth health and vitality too much and it promotes cancerous growth and shortens life span and health span. How do you see using ketogenic diet, intermittent fasting, protein intake to sort of balance these concepts of mTOR stimulation, IGF1 levels and how that applies to health?

Ryan: Yeah, it's so interesting, because, it is very, very difficult to measure, it's I think one of the aspects like intermittent fasting being on a ketogenic diet. It gives you this break from constantly stimulating mTOR all the time, and I think there's a lot more to be studied and people just think that protein like initiating mTOR with protein, if I stimulate it all the time, it's going to be cancerous.

I think there are other aspects to mTOR, because mTOR is a very complex pathway that multiple things can stimulate it. But I used to be of the thought process, like when I was literally trying to put on muscle mass, I used to set an alarm in the middle of the night at like three in the morning and get up and drink a weight gainer shake and a bunch of protein, because I was like, I need to hit this threshold as much as possible.

And it was like this crazy mindset like I'm trying to hit this as many times as possible throughout the entire day. And I was eating probably six meals a day with branch chain amino acids in between like each meal. And I was trying to keep it elevated. Now doing intermittent fasting, being on a ketogenic diet, I think I'm probably stimulating it, maybe two three times per day, but I think from my goals and what I'm trying to accomplish now, that's plenty. I mean, I think it's giving my body a break from all of the digest and giving it some time to rest as well.

Bret: Right, right. Now, we've covered a lot today. Give us an idea of what is the day in the life of Ryan Lowery look like?

Ryan: Yeah, so I'm a morning person, I like to wake up early, I think the hours for me, like I usually wake up at five o'clock in the morning and from five until like eight o'clock in the morning is when I have my best working time, whether it's like writing articles or reading new research, I use Google scholar and I go through and try and find-- I get these alerts for ketogenic or beta hydroxybutyrate and I kind of look at this new study just came out and I love diving into it and being-- because I think we're starting to see an explosion of more and more research, which is amazing.

Then I go and get a workout in, I like getting my workout in early, just because by the end of the day I'm tired and I want to go home and have dinner or something, so I get my workout in and go into the office and either have a bunch of meetings or just crank out some more work, and I usually finish around five or six o'clock at night and then I get home and I usually have my meal, which is like a moderate meal.

My lunch is typically, it's fairly small-- it's big in volume and I think it's one of the biggest challenges that people forget about on a ketogenic diet it's one of the reasons why people incorporate in salads or vegetables, is to get more volume.

So, like my lunch hack for people that are listening is, I usually, if I'm on the go, if I'm in meetings, I like just having MCT powder with protein, some creatine, sometimes unsweetened almond milk and if I were to put that inside a blender or like a shaker bottle, or just blend it up, it might be a small amount of volume. But if you take that same amount, add some ice into it and throw it into a blender, you're adding air into the equation.

So that little amount now becomes this huge amount of volume that I pour into this huge styrofoam cup, and it takes me like 20 to 30 minutes just to drink it, because it's so much volume, but it's keeping me satiated all the way until the end of the day.

I think there's different ways or different hacks to increase volume that I think, it's sometimes when people struggle with overeating, I was one of those people where I came from eating six to seven meals a day and then all of a sudden cutting that back

to two, is like wow, I need to figure out ways to increase the volume of my foods on a ketogenic diet, using a blender, and increasing that can help significantly.

Bret: It's a good hack and what kind of protein do you use in that? Is it a protein powder?

Ryan: I use a protein powder, just I use a whey protein powder, and just blend it together, 25, 30g and just drink it, it's delicious.

Bret: And what kind of workout are you doing in the morning?

Ryan: I usually do resistance training, sometimes it's resistance training combined with some high intensity interval training, I don't do as much cardio. We've actually done research looking at high intensity interval training versus long duration cardio, and if you do high intensity interval training correctly, it's the equivalent of like 60-- you can do five to 15 minutes of high intensity interval training, it's like the equivalent of 60 minutes of long duration cardio.

And you don't have the muscle loss that sometimes can be attributed to like long, long, long duration cardio. So, I usually just do resistance training and high intensity interval training.

Bret: Right, and then your meal in the evening, what does that usually look like?

Ryan: Usually it's, I like do a salad, sometimes with like some croutons, like pork rind croutons... people are like, "What are pork rind croutons? ...on top of it, and then some type of meat, and usually a little bit of vegetable, that kind of just goes along with it, I'm like a creature of habit so it's just easier for me, I just prepare it, it's a done deal.

Bret: Yeah, sounds great, sounds good. Well, any other last thoughts you want to leave our viewers and our listeners with, and of course where can they find you to learn more about you?

Ryan: Yeah, absolutely and I think that the one thing I just say is always go back to why you're getting started. I think a lot of times people will get frustrated if you're like, you know, "I don't know why I'm doing, I haven't lost as much weight as my friend" or "I've struggled and I fell off."

Always go back to your why and I think that's one of the biggest things to anchor people into this, you've got to think long term. A lot of times people look at temporary and then they're just like-- or they want immediate results, I'm just like play the long game.

Understand that this is something that you want to ultimately help you 5, 15, 20, 40 years from now, you want it to be able to help and the decisions you're making today are ultimately going to contribute to that. So, yeah, I think on social media, you can follow me on Instagram, it's @ryanplowery. Sometimes people say "plowery" but my middle name is Patrick, ryanplowery and then on Facebook, doctor Ryan Lowery, we've just started to do some YouTube stuff on Doctor Ryan Lowery on YouTube as well.

Bret: Awesome, well Dr. Ryan Lowery, thank you so much for joining me.

Ryan: Thank you very much, it's been an honor.