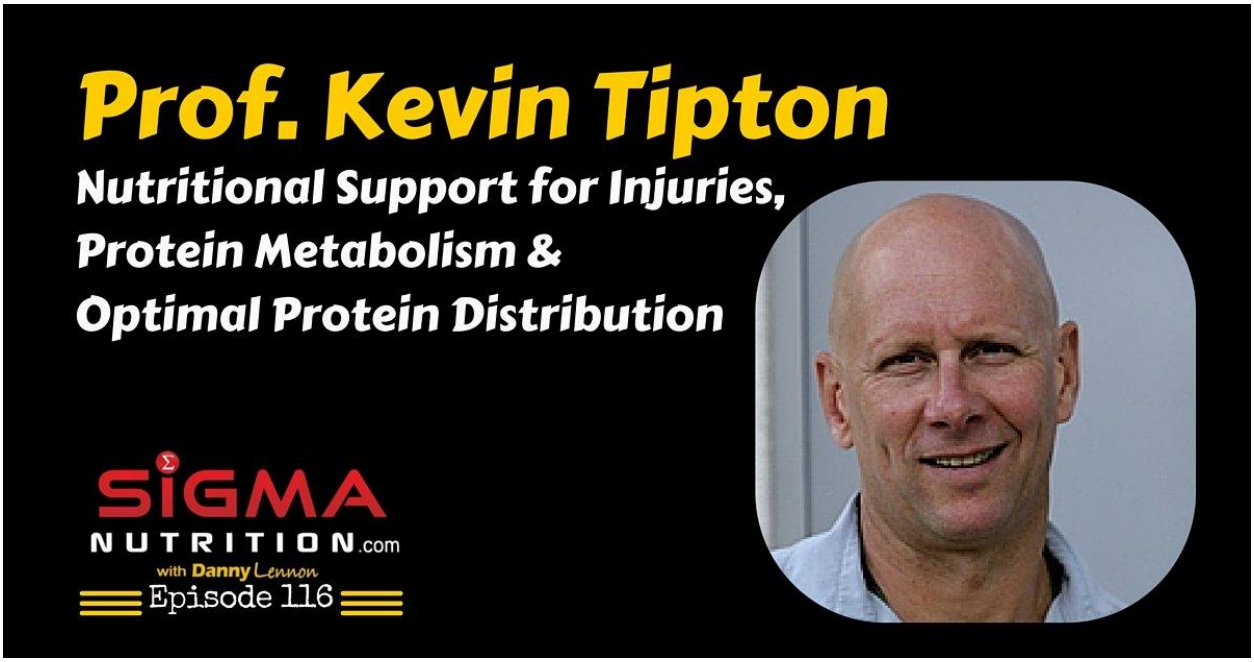

Danny Lennon: Hello and welcome to Sigma Nutrition Radio. I am your host, Danny Lennon and you are listening to Episode 116 today. For those of you newcomers to the show then, what you can expect from this podcast every week is in-depth discussions with some of the brightest minds involved in nutrition and performance research or those involved in promoting evidence-based practice and doing that as practitioners. So if that's something that you're into, then make sure you hit Subscribe on your podcast app right now so you do keep up-to-date with the show and you'll get through each new episode as it comes along.

So on today's show we're going to be talking with Professor Kevin Tipton, who is part of the Sport, Health and Exercise Science Department at the University of Stirling and really one of the true heavyweight researchers in this field. His work primarily focuses on exercise nutrition and muscle metabolism in metabolism in humans with particular emphasis on protein nutrition and protein metabolism within athletes as well as vulnerable populations like the elderly or obese populations as well.

And I hope you enjoy this episode. Remember, you can get the show notes to this particular episode over at SigmaNutrition.com/episode116, and there I will link up to any research papers that get mentioned throughout today's episode and all of the other good stuff including where you can find Professor Tipton on social media.

So let's not waste any more time and let's get straight into this week's show with Professor Kevin Tipton. Professor Kevin Tipton, welcome to the show.

Kevin Tipton: Well, thanks for having me, Danny. I'm excited to be on your pod.

Danny Lennon: No, I'm delighted to have you on, I know, because I really want to dig into a lot of the research that you and your colleagues have been doing, some really groundbreaking stuff really over the years and certainly work, like I've mentioned before, I've had huge respect for. Before we dig into some of the specifics on the research that your team has got going, maybe a good place to start would be just to dig in what your main area of research is and to provide context to people for what actually was the aim of the work that you do and work that your colleagues do in the lab.

Kevin Tipton: Well, my particular area is primarily focused around protein nutrition and metabolism. That's where it's been ever since I was a PhD student and I was lucky enough to do some of my PhD research in Bob Wolfe's lab in Galveston, which of course at that time was sort of at the forefront of all that kind of thing. But also, I have an interest in all different aspects of exercise and nutrition kind of research and dabble here and there in some other types of studies. And then our research group here in Stirling, we've got eight of us, well, nine right now and one of them is going to be leaving this summer, and it's a pretty broadly-based research program that we're very proud of because it wasn't there six years ago and I was brought in to help develop this program and we've got some great people, and of course you spoke to Lee Hamilton not too long ago, and he's just a star and he's just one of many.

Danny Lennon: Thanks very much, Kevin. That gives us I think a lot of context for where we're going to go with this, and I might jump around from place to place throughout this conversation because there are a couple of different areas that I would like to get into. One that I'm particularly interested on that I know that you've done some research and some reviews on as well is around the nutritional support available for athletes in times of injury, and there are some many different ways we can go with this so feel free to pick up on what you think are the most important, but I think maybe a good starting point is when we think of what happens immediately after an injury for an athlete. They begin that process of recovery and that's obviously kicked off by an inflammatory response. So in terms of what we're trying to do with the nutrition then, one thing that people often say is, "Well, how do we bring down inflammation after an injury?" whereas

we know that for that recovery process there's also a component of needing some inflammation there. So how do you approach that and kind of what did you kind of look at when you were looking at these supports in nutrition for injury?

Kevin Tipton: That's a great question. I think it's wide open. I don't think we know. As you rightly said, the assumption is that we've got to stop that inflammation and, you know, everything from NSAIDs to ice to everything else is all aimed at stopping the inflammation from an injury. But, as you correctly identified, the inflammatory response is part of the healing process and there are studies in animals showing that if you knock back that inflammatory response too much that the healing is actually slowed down. Now, what happens in humans we don't know, at least I'm not aware of it. I mean, one of the things that struck me when I was writing these various reviews on this topic was there are very, very few studies directly addressing nutritional interventions for injured athletes.

Danny Lennon: With that limited amount of research, it's probably about trying to piece together different components of what might be going on or what typically goes on with an athlete. For example, one of the most common things I come across when an athlete gets an injury, almost a default, and it kind of makes logical sense as well, their default is to say, “Okay, I need to reduce my caloric intake,” and generally they try and decrease their carbohydrate intake as well based on that activity. But then there's kind of this maybe counterproductive side of if we're drastically decreasing their caloric intake, can that interfere again with these processes we want to try and promote of repair and recovery.

Kevin Tipton: Yeah, let me just back up a little bit and say…when I said there’s very little direct research on this, and so what we tend to do is try to use other models to provide the information and then just apply that to an injury, for example, a bed rest model if we're thinking about…or a casting model to immobilize a limb as if that was an injury, but that's a healthy muscle without that initial inflammatory response and the trauma that goes with an injury. So what that combination would do and how that might be different we don't know, and I think that's an area that would be an interesting one for quite a lot of research.

And then, so the same thing would go for the energy. Yes, you're absolutely right that probably most people I know—I was injured a lot in my younger days and I would immediately try to back down on energy intake, and the question is, is that appropriate and how much? So for

example, if someone has an injured lower limb and they're on crutches, well, ambulation by crutching costs approximately two- to threefold the energy that ambulating by walking does, so depending on how much you crutch you may actually not drop your energy expenditure that much. So if you drop your energy intake too much, it could be an issue. Or, also something to consider is the injury itself often, at least in a transient period of time, at least for a short period of time, will increase energy expenditure from the trauma and it goes up as much as like…you know, surgery can double your energy expenditure. So, again, it's not quite so simple as get injured, you're not moving as much because you're not training, so stop eating as much.

And the other side of it is, one then solution could be to just say, "Okay then, I'm going to eat plenty, make sure I'm getting more. Don't care if I get a little bit fat because I'll just get it off when I start training again." But, on the other hand, you can actually get into some metabolic issues with excess energy as well. So I think your listeners that are nutritionists or athletes, they need to be very cognizant of their energy expenditure and try to match that as closely as possible with energy intake, would be my advice.

And then you mentioned carbohydrates. Depending on the athlete and what they do for training, what they eat, how much carbohydrate they eat for their training, sure, some, especially endurance athletes, might need to back down. The carbohydrate is mainly in the diet to support the training. If you're not training, then you obviously need less, so I think that that would be a safe way to drop some energy anyway.

Danny Lennon: Yeah, for sure, and I think it's just even being aware that with any healing or trying to repair from some sort of damage there's an energetic cost to some of those processes. So like you said, it's not kind of this, "Oh, I'm decreasing my expenditure by this amount, so I can just decrease my overall caloric intake by the exact same amount," or perhaps then the best way to go is for the athlete just to monitor things like body weight or body composition and just try and, maybe through trial and error, kind of match it through that recovery period so that they're not really seeing massive changes in their weight or body comp.

Kevin Tipton: Yeah, that makes sense to me. And also, I would urge injured athletes to try to exercise or train what they can. So if you hurt your right knee and you're in crutches and you're in a cast on your right leg, well then, do lifting with your left leg or do recumbent cycling with your left leg—I

know I did that when I had a ruptured Achilles tendon—or one of those stupid machines that you can get on and roll your arms – you put your arms on the low handles and you can go round and round. And that's the most boring ever, but it's probably better than nothing.

Danny Lennon: Right, a hundred percent. And I think that actually ties in really well with something that was covered on a previous podcast with Dr. Quinn Henoch and we were kind of talking about sometimes people when they have an injury or they talk to maybe a physiotherapist who isn't as involved with sports teams and they almost become too cautious, and it's like, "Oh, you've got a sore knee. That's no training for the next three weeks," whereas that's probably going to be more counterproductive to the rehabilitation than realizing there's a slight injury there but trying to see how much work can this athlete actually still do whilst repairing that injury.

Kevin Tipton: No question. The worst thing that you can do I think is to go completely inactive. If you look at, for example, one of the studies out of Stu's lab, well, he's had a couple recently now, these are in old people so it might not be quite the same as a young athlete, but even just two weeks of reduced activity, so they just lowered the step count for two weeks and they saw a decrease in protein synthesis and response to amino acids, to protein intake, and also increased insulin resistance, in just two weeks of reduced step count. And then, they followed that up with a study where they did the two weeks reduced step count but they had them lift weights, and then that countered all the bad things. So it's very clear that, again, these were injured people and they were old people but they were…I think it does suggest at the very least that yes, you want to try to do whatever you can during that time and the temptation will be to just, "Oh gosh, I can't train, I can't do what I want, so I might as well not do anything," and that I think is a mistake.

Danny Lennon: Sure. And so then when we look at things maybe outside of just maintaining a certain level of caloric intake and staying relatively active or as much as the injury allows, when it comes to the research on maybe potential other areas that the athlete can focus on when trying to maybe help that recovery process, what sort of stuff is out there? Because I know, like if you look at the supplement industry for example, they'll have you believe that there is no shortage of all these different supplements that could be useful. People will talk about, say, collagen or glucosamine. Other people talk about different dosing with protein, etc., maybe creatine. So outside of just making sure calories are sufficient and that they're

staying relatively active, what things have at least some evidence behind that an injured athlete can look to or should they consider maybe?

Kevin Tipton: Well, I would definitely, you know, if they aren't already on a sort of a higher protein intake, then I would probably have them on a higher protein intake. So we know for sure that if you decrease energy intake, if you're in an energy deficit, that that impairs protein synthesis. Now, that could be countered by exercise, but if it's an injured limb then you're obviously not going to be exercising that limb, but you can with a higher protein intake, you can protect that to some extent. So I think probably in the 2 to 2.5 grams per kilo per day range would be something that I would do. So if you're dropping your carbohydrates and you can substitute protein, that's probably not a bad way to think about it. Again, it's probably going to depend…you know, we're talking injured athletes as if it's this monolithic group as opposed to all sorts of different injuries, but if there is a reduction in energy intake and there is a danger of energy deficit, then higher protein would probably be a good thing to do.

And as far as some of those other things you mentioned, collagen and creatine and whatever, I think there probably is some rationale for some of those in some situations but, again, not all injuries are the same and probably in general most of those things are worthless.

Danny Lennon: So if we then turn to protein itself, obviously there's been a lot made of what constitutes an "optimal daily intake for protein for various different populations, and I mean right now it's maybe common to see suggestions starting to emerge of that figure of like 2 grams of protein per kilogram of body weight, maybe plus or minus half a gram for people who are training or athletes or at least from a lot of the reviews in the sports science literature that have come out the past few years, and I mean we could spend all day discussing the variables involved that may change that specific number for a given individual, but what I'm perhaps maybe more interested is this issue I see starting to emerge of people maybe putting their sole focus purely on hitting a daily protein intake at the expense of thinking about the timing and distribution of those feedings across the day or the dose of protein or, maybe more specifically, the branched-chain amino acids and leucine in those meals. Now, obviously both things matter, but do you think that there is a scenario where someone could get the same or even a better anabolic response from a day's set of meals that are maybe distributed across the day evenly, let's say four meals, each one having 30-plus grams of high-quality protein, compared to someone that maybe has a higher daily protein total intake but has it maybe within a

tighter timeframe, one or two large bolus doses, and isn't kind of paying any attention to distribution or timing?

Kevin Tipton: There's certainly that theory out there and there are a couple of studies supporting it. There are a couple of other studies which argue against that but I think they have some questions that aren't necessarily there. And so what we're basing that on is the response of muscle protein synthesis. And so if you assume that that is an indicator of your best chance to increase or maintain muscle, then I think you do have a good argument that you need probably three, four, even five meals of protein and that there is a maximum amount in any given meal that is going to be able to be utilized to make new proteins in the muscle. And we're talking muscle now so, if you look at some of the whole body stuff, it seems like on a whole body level that maybe that's not necessarily true that much more protein can be utilized, but we do know that if you…in the studies that we did and Stu Phillips did, and Luke's done a couple, that if you give more than about 20, 25 grams, so 0.25, 0.3 grams per kilo, you start seeing a really dramatic increase in amino acid oxidation and urea production. And we measured urea production in our study, not just urea excretion, I'm talking about metabolically production using stable isotopes, so we know that a lot of the amino acids from that protein that you're eating, if you're eating too much, is just going to be oxidized and/or broken down and then the nitrogen's going to be excreted. So that makes sense then to not have too much in any one given meal.

And then two, it seems like, and this started…the first evidence of this was sorted back around 2000 I think when Mike Rennie was working in Bob's lab in Galveston. Mike was there for almost two years and he did a couple of studies. In one of them, he used a square wave kind of infusion. So what I mean by that is they infused amino acids up and got it to a hyperaminoacidemic level so that then protein synthesis was stimulated, but then they kept the infusion going for several hours and that's, in those days at least, and I still hear people saying this that in those days that's what bodybuilders always wanted to do, they wanted to get constant protein meals to keep their amino acid levels in their blood high. Well, what Mike showed in this study, and I should give credit to Julian Bohè who was the first author on that study, and what they showed was that after a while the protein synthesis goes down despite the fact that the amino acid levels stay up in the blood. So from that standpoint, it argues for having a meal, waiting a bit, having another meal, and not having too much in any given meal and spreading those out. So that's the distribution

that you were talking about. As of now, that seems to be the consensus recommendation, is to—and then the other side of that is, if somebody says, “Well, oh no, that doesn’t work,” well, it's not going to hurt anything to try that.”

So from that standpoint, if someone—and I've made this argument before—if someone was to eat the same amount, let's say 120 grams in a day, let's say they're twins, right, and are identical twins, they eat the exact same amount in a day but one of them eats four doses of 30 and the other one eats 10, 30, 50, and 30, then the argument would be that the first twin would have a better anabolic response for the day and if he carried that out over a long period of time that the muscle gains would be better. That's the theory.

Danny Lennon: Right, yeah, and I think it comes back to something really interesting that you actually touched on right at the start of that point, was that when what we're basing a lot of that on is this response in terms of muscle protein synthesis or muscle protein balance, quite rightly then we have to remember that that’s just a proxy measure for actual muscle hypertrophy. So where do you stand on how we should view this relationship between, say, muscle protein synthesis and then actually long-term muscle hypertrophy?

Kevin Tipton: Yeah, I mean, obviously the ideal thing to do would be to do a proper study and whatever question you're asking, let's say the distribution question, do a proper study where you measured muscle gains and that would be ideal. However, those studies are very, very difficult to do and the control of, say, long-term, so how long is long-term, 12 weeks, 16 weeks, eight weeks, six months? So you got to go a long time and it's very difficult to control enough variables of just having real-life live people doing these studies so that often what happens is you come up with these kind of nebulous results or two studies don’t agree because there have been variables or confounding factors that have come into play.

So I think it's situational, Danny. I think that probably it's a good way to make a guess, and then ideally what you do is you do some studies with muscle protein synthesis to narrow down the field. So let's say you want to try distribution patterns. Well, you've got three or four different ones you want to do so you do some muscle protein synthesis studies, see which one comes out best, and then do your study with muscle mass gains in a longitudinal fashion that way, and that's sort of the way that we've always advised it. Now, let me just go back and say that people forget about some

data from Stu's lab from the late nineties, mid-nineties even, showing some really strong correlations of muscle protein synthesis and not only muscle mass but muscle strength.

And then, the final point would be, you know, we do these studies and we see 50% and 100% increases in protein synthesis. That is not in any way meant to suggest that you're going to see a doubling of muscle mass. There are so many other factors that go into it that there needs to be caution. But I think it is indicative and it can give you some information that you can then use to make some decisions and then follow up with some other studies.

Danny Lennon: Okay, cool, and I just wanted to turn slightly in the direction of talking about high-protein diets for fat loss because there's plenty of literature out there showing that we can get a benefit for increasing protein intakes, so going from say these very low-protein, high-carbohydrate diets to one that's higher in protein. So, essentially, someone doing an isocaloric switch of X amount of calories of carbohydrate for that same amount in protein and we can kind of see some better body composition improvements as well as tons of other studies that essentially just show increased protein intakes or a diet that's higher in protein tends to lead to better fat loss outcomes as well and a better body composition in general. Now, in terms of the reason behind this, particularly when we're talking about weight loss or fat loss, there's obviously the basic explanation that higher-protein diets will just lead to higher satiety levels and so then someone going on a higher-protein diet will consume fewer calories due to that increased satiety. But then we also have this like scattering of research pointing to other potential factors that may have some contribution like protein potentially stimulating fat oxidation to a greater extent than other macronutrients or the well-known higher thermic effect of feeding that protein has or the extra energy that's used in gluconeogenesis, etc., etc. So what's your overall evaluation on the literature in terms of higher-protein diets being beneficial for fat loss? Is it simply a matter of them decreasing caloric intake or does this potential ability to increase energy expenditure actually mean anything in pragmatic terms?

Kevin Tipton: That's a really good question. I don't know…I think probably most of it is an energy balance thing, but there is some indication as you suggested that if you eat protein that some fat oxidation might go up. And I think there are some fundamental problems in the way that people do these studies, and in fact I've got two honors project students doing an undergraduate project with a similar question, and the confounding factor that you have

is most of the time these kind of fat oxidation studies are done using indirect calorimetry but then they do a nonprotein RER assumption, so they assume that RER is calculated without any protein oxidation yet we know that if you eat protein that you're going to oxidize more. And so if you put people on a higher-protein diet or if you give them protein supplements, probably at least transiently you're going to see an increase in protein oxidation. So what does that do to your RER? And I've had them looking and I've looked, and I really can't find where anybody has done any kind of careful evaluation of that, so I kind of wonder about the veracity of these fat oxidation kind of numbers that people are using when they switch around the macronutrients.

So I think there's still a question about that. I think it's interesting. Certainly, like you said, satiety seems to be something going on. Yeah, and when we think about energy or fat loss, we tend to, especially with this big push for low-carbohydrate high-fat diets that it's not about energy intake, it's not about energy intake, and ultimately—our energy balance, sorry—but ultimately it is, and what happens is people just forget about all the various factors. For example, as you said, protein requires more energy to digest and absorb and utilize then carbohydrates, so the net energy that you get from the protein is less. And so if you calculate it based simply on 4 grams per kilo, it's not really going to be exactly that, and so people tend to miscalculate what they think their energy balance is. So I think all those factors together are something to consider as to whether or not high protein is important for fat loss.

And then the other side—one more thing—if you want to talk about energy is one possibility for why the energy balance might not be right is because protein synthesis is an energy-expensive process, and so if you do stimulate protein synthesis with higher protein intake or more often protein intake, well, then you're going to have a greater energy expenditure as well. And so you put all that together and maybe that's an explanation for what sort of differences some people have seen with fat loss and high protein.

Danny Lennon: Even when we have the potential for these different mechanisms to contribute to that and increase energy expenditure and maybe play a role at being beneficial, it's never going to be anywhere near enough to override energy balance like we just said there. So it's never going to be something where, “oh yeah, you can just go into a super-high-protein diet and then forget about overall net energy”. It's still going to be something

that, maybe helps with that and maybe play a small role towards that, but the number one driver's still going to be overall energy balance, right?

Kevin Tipton: I would agree with that, absolutely.

Danny Lennon: So with that then, I think one important consideration I wanted to get to was, and this is particularly focusing in on athletes, and as we just mentioned there's a lot now of the benefits of high-protein diets and certainly they can be very useful, but then there becomes an issue, not so much with general population but then with athletes in particular, where we know that a certain level of dietary fat and a certain level of carbohydrate can have big impacts on actual performance, so with them we might get to a point where if someone who thinks, "Oh, well, high-protein diet's the way to go," so just the higher the better, there comes a point where we're likely to reach this point of diminishing returns, right, in terms of how it's going to affect the intake of other macronutrients in order to maintain energy balance? Outside of, say, clinical issues like preexisting kidney disease or PKU or something like that, what kind of circumstances could it be potentially advantageous for someone to think about reducing their protein intake as opposed to always thinking more is better?

Kevin Tipton: You've got to get your macronutrient balance right and for each athlete it's going to be different. So that's why if you read some of the things I've written over the past five, 10 years, I keep arguing that these broad uniform recommendations for this much protein, this much carb, for all athletes or some category of athletes, endurance athletes versus weight-trained athletes, I think that's silly and I've said that over and over again. I think it's important to, if I were a nutritionist working with an athlete, I would not go, "Oh, you're a runner? Well, let me look. Okay, there it is. It says in this paper, 1.5 grams per kilo." I would work out individually for that person the macronutrient balance, and then it's not just that simple either because it's going to need to be, you know, you do periodized training, why aren't you doing periodized nutrition? And if you read Trent Stellingwerff and Inigo Mujika, they've written some things on this in the past far, far more eloquently than I can go into. But so I think the danger is that people oversimplify all the time and people want an exact number, and I don't think that's possible and I certainly, if I were an athlete, I would be changing things depending on the time of the season it is and what my training's like. And so I think that's really where your protein intake may go up and down even during a season.

Danny Lennon: Yeah, a hundred percent. I think even one of your papers that I remember reading explored this kind of idea of whether an increased protein intake could offer a benefit during training phases where an athlete is going to be purposely overreaching, right?

Kevin Tipton: Well, yeah, we did a sort of proof-of-concept study a few years ago—Olly Witard was the…it was when he was doing his PhD in Birmingham—and we had cyclists and we tried to double the intensity and volume of their training. So we put them way up—now, we didn't quite get them to double, but it went way up—and these guys were shattered. And then, I mean, the amount of work that Olly did on this study was incredible because he was also doing immune function, so that meant he had to have fresh blood and he couldn't freeze it. So it meant he would start it like six in the morning to get the athletes in the lab and have them on the bike, and then he would do all the trial, and then he would have the blood and he'd have to go over to the hospital and do the immune responses, and he probably wouldn't finish until about midnight most times. So what we did was we doubled the training and then they either had their normal diet, which we evaluated their diet and then we controlled it, we fed them everything, but we gave them back...tried to keep them in energy balance. And so we clamped the carbohydrate at about 6 grams per kilo in both trials and in one trial they had a high protein intake, 3 grams per kilo.

Now, because we tried to match their energy expenditure with their energy intake, of course they were eating a lot more during that high-intensity training period in the sort of control situation, not group. It was a crossover study. We had to get more fat into them. We substituted with fat. So we tried to clamp the carbohydrate in that study. And as you know, whenever you do these studies where you're manipulating one macronutrient, you're going to have to manipulate another one. And so the trick is, do you manipulate the carbohydrate or the fat? And we chose to clamp the carbohydrate in this case because in earlier work in Birmingham that Asker [Jeukendrup] had done some stuff with carbohydrate.

Now, what happened was, in the higher-protein group…both groups of course, their performance went down. They did a time trial before and after the high-intensity training and their performance went down dramatically, and so we knew they were overreaching or overtraining, if you will, depending on what the definition of each is, but it didn't go down as much in the high-protein situation. So it's possible that that means that you could get a high protein intake.

Now, let me just say though that these guys were cyclists and they were all competitive. A couple of them were even sort of national caliber. They all raced, but they did not like this high protein. They really struggled with it. So it's not…this is a proof of concept. We went for the…as…I don't know if Lee Hamilton, I can't remember listening to your pod whether he said it in this study but I've heard him say it before, it's the sledgehammer effect, because if you don't see an effect with 3 grams per kilo, well, then there's no use trying 2 or 2-1/2. So we went big. And we did see a slight effect, so the interesting thing would be to see if we could drop it down and still get similar things.

And then the other thing I'd like to mention is—we talked about this in the discussion of the paper—you could argue that for as much as training as they were doing, the 6 grams per kilo could be argued that for at least some of them if not most of them that that's a relatively low carbohydrate intake, and so we're seeing a protective effect of protein in the context of a relatively low carbohydrate intake given that amount of training. And so what we kind of speculated about is we wondered if maybe there was some gluconeogenesis and that possibly these guys were going into their time trial with a slightly higher glycogen level in the muscle, and that may be one reason that they did better in the time trial. And that'd be a really fun little study to do to try to…in fact, we were talking about that the other day to see if we could repeat that just to…and measure muscle glycogen to see if that's actually what happens.

Danny Lennon: Yeah, that is really, really fascinating and it even throws up even more questions like you said off the back of that. Obviously, with all the work that you're currently involved with, where are you going now over the next couple of years in terms of the research? Where are the gaps that you see in the knowledge base that your work is trying to fill in and what would you ideally like to cover with your work over the next several years?

Kevin Tipton: [Chuckles] There's so much to do. Well, we just had a paper come out last week in physiological reports on fish oil. So I know a lot of athletes are taking fish oil and taking it, at least some of them, with the idea that it's enhancing their muscle anabolic response, and so Chris McGlory did a study and we measured the muscle anabolic response after eight weeks of fish oil supplementation. So we had the guys do the eight weeks. They came in, they did an exercise bout and 30 grams of protein, then we measured the muscle protein synthesis, and what we saw was that there was no difference between that and if they did eight weeks of coconut oil.

And there were some studies a few years ago from St. Louis. Bettina Mittendorfer's lab with Gordon Smith was the first author that suggested fish oil does enhance the response of muscle protein synthesis to amino acids, but they used a different model. They used a hyperaminoacidemic clamp. So they infused the amino acids. So we tried to do it in a more physiological manner and with the exercise. So that study, which as I said, it's open-access so everybody can get it now, that study that we did shows that really for…these were weight-trained 20-, 22-, 23-year-old guys that there really is no advantage to taking this fish oil from a response-of-muscle-protein-synthesis standpoint.

Now, back to your original question, but I still wouldn't sort of ditch the fish oil as far as an anabolic potentiator standpoint because it's entirely possible that in another population, for example in old people or another situation, for example, immobility, that fish oil could enhance the response. And I think that Chris has now…Chris has gone on and he's doing his postdoc with Stu Phillips in Canada and I think that that's what he's working on now, is an immobility study, or reduced activity anyway, to see if fish oil can actually enhance the response of muscle protein synthesis. But in the young guys in our study, in our recent study, it didn't work.

So that would be one thing, is to follow up some of this fish oil stuff in other situations to see when it might be effective if at all from an anabolic standpoint. We have some new data that we've just submitted the paper to Journal of Physiology, and so with any luck, knock on wood, it'll be accepted and be out soon, suggesting that maybe that this 20-gram max is not in all situations. So we've got data now suggesting that 40 grams in some situations might actually give you a better response than 20, which is of course opposite of what we've all been saying for the last few years. So we're writing a grant now to try to follow that up to see where we can go with that.

We recently repeated the Sam Mettler study with two weeks of really heavily reduced energy intake so that energy, it had a deficit of 40%, so they're at 60% of their balance levels, and we did this in females because we wanted to see if the response was similar in females to males. And we kind of made a mistake I think in hindsight, 20/20, in that we did it as a percentage of calories, and so we ended up, the females, the protein intake wasn't as high as the males in the previous study. And we did see sort of roughly the same type of response, but it wasn't quite as clear. So then that

asks the question: well, what if we did it with actually higher protein intake for those two weeks?

And then you've got Stu's study that came out—Stu Phillips—came out a month or so ago, again, with the same general notion of if you give protein and you exercise, if you give a high protein and exercise, then you can protect that muscle during an energy deficit and primarily lose fat. So I think those kind of things are up there, and then some other interesting questions. I've always wondered about this, you know, people are starting to claim that vitamin D is also a potentiator of protein synthesis and people have been making that argument without any evidence. So I think that that needs to be followed up as well.

Danny Lennon: I'm particularly interested in, like you mention, looking at things like fish oil or other nutrition interventions for other population groups. So for example, we've had Brendan Egan from UCD on the show before talking around that they're planning and hopefully looking at omega 3 and does that help in, say, the case of sarcopenia where it can reduce that anabolic resistance, which is again something where there's still a big question mark over. But it's really fascinating to see all those different areas that your work is kind of spanning across. And just with...given we're kind of close on time, before I get to the final question, just let people know where they can find out more about your work, where they can maybe find your ResearchGate profile, where they can find you on Twitter, that sort of thing.

Kevin Tipton: Yeah. I do have a ResearchGate profile and I keep telling myself I need to get on there, and I'm not very good at updating that but most of our papers are on there, but the university has a site where all of my papers will be available. So if you just would have your readers, if they're interested, just go Kevin Tipton, University of Stirling, and they can get to my website and with all the papers if they…and the university makes them available. Of course, I'm on Twitter, @stirproftip, and I tweet about nutrition and exercise.

Danny Lennon: Yeah, perfect. So just for those listening, I will link up to everything that Kevin just mentioned there in the show notes (sigmanutrition.com/episode116) so you can click through, like I said, check out his profile. I'll put links to the papers that we've brought up during this episode as well in case you do want to go and read those and get hold of them, and of course then make sure you follow him on Twitter. So with that Kevin, that brings us to the very final question I always end

the show on, and it can be to do with pretty much anything—it doesn't have to necessarily be in line with the theme of today's show—and it's simply, if you could advice people to do one thing each day that would have a beneficial on some aspect of your life, what would that one thing be?

Kevin Tipton: Well, I was going to try to come up with something clever and everything, but I think I'm just going to go with the one that I do believe, is absolutely the one which is "be physically active." The more I see, the more I read, I cannot see anything that is more beneficial for people than to be physically active and whatever that means, you know, for different people, different thing. I used to run 50 miles a week and now I'm lucky if I run 50 steps a week. But lift weights, go to the gym, go—I walk with my dog every morning up in the hills and that's fantastic. So whatever it is, get out and do something.

Danny Lennon: Completely agree. It's certainly something everyone listening to this should certainly be in line with, but I think just how much that spans across even just being active outside of formal training or a specific sport they're doing is just huge and the payoff from even like the mental aspects from it is amazing. That brings us to the close of the show. Kevin, honestly, it's been an absolute honor to be able to talk to you. Massive respect, like I said, for the work that you continue to put out and the research that's going on in the lab. And so it's been an honor and I really appreciate you taking the time to come on today.

Kevin Tipton: No problem, Danny. Thank you very much for those kind words, and I enjoyed it. I think your podcast is great and I'm very happy to have been invited to be on there. Thank you.

Danny Lennon: That was Professor Kevin Tipton of the University of Stirling. I hope you took a lot of cool information from that episode and learnt something new. In the show notes, remember, I will link up to all the papers that we mentioned throughout today's show. And if you are an avid follower of Sigma Nutrition Radio and you do find the podcast to be helpful to you or that you learn something from listening to them or you derive enjoyment from regularly putting them into your earbuds every week, then I would be honored and humbled if you considered supporting the show on the Patreon platform. And if you want to see what that's about and get involved in supporting the show officially, then if you head over to Patreon.com/sigmanutrition, you can find it there. And then you can find out that it's a way of just supporting the show each and every week. You'll

also be notified first of when the show is out, and we're also starting from this month our brand new scheme with the transcripts for every episode and they will be posted first to the Patreon platform for people to check in on and there will also be an email list for people to get them, that you can get them free, but all the details will be up on Patreon there if you want to get involved in supporting the show.

So, with regard to this particular episode, I would love to hear what you thought of it. You can hit me up on social media somewhere. And so if you decide to share the show somewhere on Facebook or Instagram, etc., then please tag me in that post so I can go and see it and I can see what people are saying and maybe say thank you for you doing so. So if you're on Twitter, then just a handle is NutritionDanny; Instagram, it's dannylennon_sigmanutrition. If you're on Snapchat, then it's lennondanny, all the one word, and then on Facebook just search for Sigma Nutrition and the page should show up, or feel free to go over and type up my name and you'll find my personal account there somewhere. And that's it. That brings this week's episode to a close and I like to say that hopefully something was useful there. Hopefully, you go and check what we're doing on Patreon and hopefully then you go and see what we're all about with the upcoming transcript. So that's pretty much it. Thank you so much, again, for listening to the show, guys. It really makes a big deal that everyone continues to download it in the numbers or doing…and they have such positive things to say. So thank you. It means a lot. And I will talk to you next week.