
Danny Lennon: Chad, thank you so much for joining me on the podcast today. How are you?

Chad Kerksick: I am doing very well. Thanks for having me. I'm very excited to be here.

Danny Lennon: Let me get into a bit about your background to kind of give listeners some context for the rest of this discussion. Can you maybe give people an idea of your academic background and how that has led to kind of your career today in the area you're involved in?

Chad Kerksick: I currently work at Lindenwood University, which is a private school in St. Charles, Missouri kind of a northwest suburb of St. Louis, so we basically live in St. Louis, Missouri here in the United States. I was born and raised in Southern Illinois, so just basically nearby state went to undergraduate education at Truman State and got a Bachelor's degree in Health and Exercise Science, and then got my Master's at University of Memphis down at Memphis, Tennessee. And then I went to Baylor University in Waco, Texas and got my PhD there in Exercise, Nutrition and Preventive Health and at that point my first faculty job at University of Oklahoma worked there for 6 years, and then I went to University of New Mexico, I worked there for five semesters or 2.5 years. And in spring of 2015 I moved essentially back home to St. Louis and started working at Lindenwood University and again I am an associate professor here and I direct the Exercise and Performance Nutrition Laboratory.

Danny Lennon: Sure. I definitely want to ask about some of the specific work you've published in recent years, but as of right now what are your main current interests in research and what kind of projects do you have ongoing at the moment?

Chad Kerksick: We try to focus on doing basically high quality exercise and nutritional interventions with just general outputs of health, performance and recovery. Obviously, those are fairly broad terms, but we just try to kind of keep it fairly broad at this point. Now, current studies we have ongoing we are doing some immunity work with some beta-glucan fibers or carbohydrates. We got some interest in doing some muscle damage work with probiotics. We're going to do some protein comparison work for resistance training adaptations in college-aged men doing resistance training. We've got some graduate students that are examining caffeine timing on lower-body resistance training performance. Got other graduate students doing some physiological response to heat exposure in active women and kind of looking at changes heart variability. So, we've got kind of a different mixture of some things, and then we also kind of have an ongoing model – one of the things I was attracted to coming back to Lindenwood is we have an outstanding relationship across athletics, so we regularly are working with different teams trying to apply many of the different concepts that we learn within the lab and try to push it out to coaches and so forth. And we've recently kind of published couple of studies we did kind of a year-long study with our women's basketball team looking at energy balance and energy availability, body composition changes and so forth. We did a very similar study with our synchronized swimming team that we did some work with, got a paper out with International Journal of Physiology and Performance, and then did a year-long evaluation of our women cross teams. So, we're trying to do some things with athletes, and then we're certainly trying to cross over into some of the non-athletic populations as well, so we're busy.

Danny Lennon: Sure. You mentioned some of the work that you are doing in relation to energy availability in these athletes, and that's certainly a topic that has – from various different positions people have heard about whether that's female athlete triad or more recently this classification of relative energy deficiency in sport. And there's been more attention, thankfully, been drawn on it and there's still a lot of questions up in the air. From your

perspective and the work that you guys are doing what are those big questions that you're trying to address with your work in the area of energy availability?

Chad Kerksick: The message is that we try to push down with just a very beginning information that we gathered from our women's basketball and our women's cross team and it serves such valuable lessons, and I think such a great thing for just listeners to hear, particularly if they're working with people on the ground level, working with coaches and what not, because I think many times in nutrition you really get caught up in some type of a fancy bio-chemical mechanism or some type of a fancy nutritional supplement. But the things that we're seeing are just very basic messages of, I mean like our female athletes across the season I mean are largely under-eating. They're not matching their calories with what they're burning, their energy availabilities. They are not in like danger zones, but they're certainly not in an area where you know training adaptations could certainly be optimized as well. So, it's just very – for us at this level like it's been very simple messages of just saying we're not diving into what type of carbohydrate is better than the other or what type of protein is better than the other. It's more of like you know how can we get more food in you, I mean what are your challenges there and those types of things have been very insightful for our – from our dining services, to our administration, to our sport coaches, and strength coaches and everything else. So, that's really kind of the first thing that just kind of pops into my head when we think about energy availability. I mentioned we did some work with our synchronized swimming team, and so here is a sport that is largely aesthetic, I mean very, very high training volumes. They just kind of have all of the elements of their sport which certainly put them as one you'd want to kind of keep track of, and sure enough you know the energy availability levels that we estimated were alarmingly low that serves as again an entry point just so the administration to try to talk and stimulate some discussion and so forth. We haven't done much on the men's side and generally you kind of think if they were a strength athlete they're just eating, eating, eating but again I still think that you have hard-gainers you know other ways to classify people, and I think that the work with energy availability will continue to spill over into other areas, I mean you know the work that Emma, Louise Burke and Trent Stellingwerff and those folks have done with the level of athletes that they have, it's just fascinating. You start to look at the different things that they do, so our athletes aren't quite on their

caliber but I think it definitely helps to evaluate at different levels because there are a lot of athletic individuals out there, and performance, recovery and health are certainly key to what they want.

Danny Lennon: For sure. And I think the big issue here is that how often this can fly under the radar like I am sure as you've pointed out with some of your work, how prevalent this can be in various different populations where it's almost, for certain sports at least, can be more of a norm than not having low energy availability which is kind of crazy, and especially if someone is not noticing immediate performance detriments or at least they haven't been able to compare it to what it's like to be properly fueled, it may be hard for them to see these negatives until it's way down the line and you start to see a lot of the metabolic and health related issues crop up?

Chad Kerksick: Yeah. And that's such a key and critical point if you really dive into some of that literature and you know the old kind of the more traditional energy balance work, and I mean endurance populations as a whole they operate for weeks upon months upon potentially calendar years of training in kind of some level of an energy balance deficit to highlight to coaches and athletes that I mean that these levels aren't where they need to be, the work that we do hopefully I mean just kind of heightens their awareness, and then they want to learn about different things. I mean like I said for us many of the discussions just turn into just simple like food access. You know it's like what can we do, and so the work drives conversations and they'll say like well you know yeah it's certain nights of the week the cafeteria might be closed or they can't get certain foods and we don't know where the kids are going or you know one of the ways that we deal with our women's basketball we actually were able to classify the different days, so we monitored each – we had 12, 13 or 14 athletes we measured them for five days in row at four different times throughout the season. So, we went literally from September through April, so it kind of spanned across their pre-season to evaluation periods throughout the season, and then one of the post-season and we were able to actually compare across the phases as well as from like rest days to game days to practice days. And for us that was a fairly powerful message to show to the girls just you know on days where you've very, very active you need to be aware of these types of things and you need to try to figure out ways to add an extra snack to your day or a day or two

leading up to it to try to help to make up for this impending negative. We're certainly optimistic that – we've had conversations with them about the training program to see if we can kind of retroactively look back on like energy data, and illness data just maybe something like number of reports to an athletic trainer and does that correlate with energy availability and you know because there are certainly some indications that it might. So, I feel like we're really just kind of getting our feet planted on with some of the different things that we're hoping to do with different athletic populations. I'd say another really, really interesting paper and a metric that we've captured a lot of interest in is fat-free mass index. So, if you just take what we know as body-mass index, which is body mass divided by height meter squared, you just replace body mass by fat-free mass. So, like you do a DEXA or you do some form of body composition and get fat-free mass and just divide it by height squared. We were very fortunate over the last three years we've been regularly doing DEXAs and following standardized protocol on every single one from – I mean you're making sure that they are hydrated, make sure they're coming in same time in the morning, trying to do the best we can. And we have a dataset with like I said, under review with Journal of Sports Sciences now that has close to 400 female athletes in it, and one of the really cool things that we did is we took – of all the 400 data points we calculated percentiles, so the 50 percentile the median. Eric Trexler at North Carolina and Abbie Smith their group they did a male database where they calculated the upper limit at the 97.5 percentile. We kind of categorize that in men, but then what we've tried to do we thought was pretty cool within females because in females we're a little bit more concerned about the lower-end of fat-free mass index and are they getting too low. So, we actually calculated the lower limit and kind of put that out there as a potential was is it going to relate to low energy availability, will low fat-free mass index relate to greater incidence of red or things along those lines, because when you compare most people have some form of body composition assessment. And assessing dietary intake is a struggle across the board, and so we have a level of excitement for it because it was just a massive dataset and sure enough we took like a cross country girls, we took our synchronized swimming girls. There is a large group of those that were at or below the lower limit for the entire population, so it kind of worked across the population specific scenario. So, that's an area that's you know we kind of feel would hopefully maybe make some contribution as well.

Danny Lennon: Yeah. That would be really cool to get something that we have a measure that can correlate with, at least, to some degree of accuracy with low energy availability because one of the difficult things that can often arise is that it doesn't really seem to, at least in a direct sense, correlate with fat mass all the time and we can have people of higher body fat percentages exerting low energy availability and someone who is leaner, not so. So, trying to see can we have other biometrics that can potentially give us more insight will be really cool. So, that's fascinating to see that kind of going on.

Chad Kerksick: Yeah. And then just another key point to bring up when we sit there and just talk about it there's always a little bit of – some groups get a little bit concerned about doing like body fat testing on gymnasts or cross country athletes or swimmers or divers you know these different aesthetic population that maybe a little bit more kind of predisposed or have a little bit greater incidence of the psychological challenges associated with kind of where their physique is and what not. The fat-free mass index for us is – we kind of feel like you can change the conversation a little bit and you can say well it's not a body fat test. We're actually testing how much fat-free mass you have, and maybe if that would just kind of take the edge off of what this is all about and stimulate a little bit more discussion.

Danny Lennon: Cool. I definitely think that on a practical level of trying to communicate to some of these athletes that's probably going to be where the money is, is how can we in their mind tie some of this lower energy availability to problems they'll have with actual performance and recovery and their lean body mass, because to a certain degree many of them are probably willing to forgo a lot of the long-term health implications of this. At least for the short term reward if there could be of a athletic performance. So, trying to tie in these things that maybe matter could have more of a efficacious effect?

Chad Kerksick: Athletes in general are – they are willing to undergo I mean short term challenges and stress that may not necessarily be the most helpful thing for them if it means that they're going to perform better, so I think that's a very good point.

Danny Lennon: We could talk a lot more about energy availability, but there are couple of things I am very interested to ask you about, a work that

has came out of your lab in the last couple of years. One is quite recently published pilot study actually that I think came from the lab looking at protein feeding before fasted exercise. If any of that is fresh on top of your mind can you maybe give people an insight into what you were trying to answer or investigate with this particular study?

Chad Kerksick: Yeah. So, that was a study that we did, you know, we had some interest in it. Rob Wildman I'm with and who is a very good friend, who is a Chief Science Officer for Dymatize Nutrition, the conversation started with there is still an interest in things like faster cardio even though that Brad Schoenfeld has done some work and there are a number of acute studies that really kind of show that there's not a kind of a benefit or what not. But the bottom line is I feel just doing it it's still out there in the culture, but we're just kind of positive to the idea that well if you're fed with different things before a fasted exercise bout would it affect things like fat oxidation or would it affect calorie burning rates, and if so to what extent. So, that was honestly just a very innocent take on we got started with it, so it's really one of the first projects that we did here at Lindenwood, and had some students work on the project for a better part of the year, and essentially we recruited just young healthy college-aged men and they came into the lab under basically four different testing conditions and they did a very, very basic bland generic exercise bout on a treadmill. It was like 60% heart rate max for 30 minutes, I mean it was kind of a fast walk or very, very slow job for some people. They came in fast. They did in one condition, they didn't get anything, they basically got like a flavored water, another condition they had carbohydrate, another condition they got casein protein 25 grams, and another condition they got a whey protein isolate also 25 grams, the carbohydrate dose was also 25 grams. So, from a design standpoint everything was randomized double-blind placebo controlled. All the supplement groups were isocaloric to protein groups or isonitrogenous, so we had things kind of nicely buttoned up there. We measure metabolic rate before they had any form of exercise or feeding, and then we did some metabolic rates right when they got done. They had metabolic gases collected through indirect calorimetry for the entire 30-mnute exercise bout, so they had a mouthpiece turned on basically for 30 minutes while they were walking on treadmill, and we were still able to just try to get a very crude estimation of changes in energy expenditure. And you know one of the things in hindsight that you know this is – that's kind of popped up with

some of the feedback from people like Kevin Tipton and I think some others on like Twitter and Facebook is we just use respiratory exchange ratio numbers to quantify carbohydrate oxidation and fat oxidation. So, we didn't perfectly account for protein oxidation and that certainly is a kind of shortcoming and a limitation of our conclusions. But we feel like we made it pretty clear – I mean just with our title that it was intended to be a pilot approach to it. And I mean in general we saw that with protein feedings overall caloric expenditure rates went up very, very nicely, fat oxidation rates were actually the highest within casein protein. I think the biggest conclusion that we found was actually like pre-exercise feeding with protein did not negatively affect fat oxidation that you will see within just kind of a traditional fasted cardio scenario. So, we're trying to look around this angle of I mean can you improve the overall fueling scenario of a – potentially leverage a little bit more fat oxidation. I'm being pretty careful with my words because like I said there are a number of different limitations to our conclusions. We've already talked about doing a follow-up study, like I said, the exercise bout was only 30 minutes, should we got to 45 minutes, should we go to 60, should we do a larger dose of protein, should we add in females, should we add in resistance exercise with the exercise bout, and then certainly I think the next go round we're going to sample some blood and just get some different hormones, free fatty acids to help to quantify a little bit better of some of these potential fuel things. And then, we'll also kind of do some additional calculations to account for protein oxidation as well. But yeah I mean overall it's a really, really fun project. It was small. Really, really just tight focus design and we were excited by the outcomes I think a little bit more kind of excited to do the next one you know it's like you get that first one done, and like there's interesting little story here we certainly can't get too excited yet, so let's do another one. Let's probe a little bit deeper and start to see we find, so that's kind of where we're at with that paper.

Danny Lennon: Yeah. It certainly is super interesting and I very much enjoyed when it came up and reading through some of that. So, just to kind of recap for people and just to make sure I have it right, so correct me if any of this is wrong. You said you were looking at essentially comparison of three different conditions – well four if we include the non-calorie control then you also had carbohydrate powder, some maltodextrin I think you said, then you had casein and whey. Each of those was 25 grams consumed before a session, 30 minutes on the treadmill, beforehand people

been fasted for what was it? Eight or 10 hours and you measuring energy expenditure, and then fat and carbohydrate oxidation, and used indirect calorimetry for the energy expenditure, and from the results you saw that for the two protein fed conditions that fat oxidation was the same as if the session was done completed fasted. But then with the implication that maybe you're having a beneficial impact maybe on lean body mass because we have amino acids available versus nothing at all or what were kind of some of the potential implications that you now want to investigate next?

Chad Kerksick: Well, I think really for us it was where we were kind of at with it is you know – so somebody hears our paper, hears our discussion I think in general pre-exercise protein feeding before some bouts of exercise that might otherwise be performed with the purpose of burning calories, managing weight, leveraging fat oxidation. We kind of feel like our results might help to say well pre-exercise feeding with protein may not necessarily hurt any of those goals, and then also we know from the abundance of work that people like Stu Phillips and Kevin Tipton and a number of others have done, I mean hey – so again if we take this individual if they're in and relatively maintaining you know somewhat of a hypocaloric state to help augment their physique and what not. You know getting in good healthy feedings of high quality protein sources, and the amino acids they provide are certainly beneficial from maintenance of a fat-free mass or helping to promote positive protein turnover adaptations. It would certainly be premature to extrapolate our findings in to that somebody is going to be able to get leaner doing pre-exercise protein feeding versus nothing because it's just one bout, it's just one dose and that's why kind of need to do a second study. Certainly some others may try to do some more things as well. We're really not the first ones to do this. I know Abbie Smith at North Carolina had done a similar project where she combined different types of exercise like a resistance training versus a cardio versus a mixed, and I think she did carbohydrates and proteins. She didn't do different protein sources, but also supported our results, support of her I think that was published by Wingfield. So, that's really kind of where we're at. I think it's just that potentially if you're interested in maximizing physique changes and what not that pre-exercise protein feedings may not necessarily knock off any fat oxidation or fat loss goals that you have, like I said, our results are – you need to have a little bit of an extra buy-in just because we didn't fully account for protein oxidation. We covered carbohydrate and

fat oxidation, but we didn't fully cover protein oxidation with our calculations and that's certainly something that we'll do on the next go round.

Danny Lennon: Sure. So, for the energy expenditure as well as the substrate oxidation what was the times that was measured? Was that just for the 30 minutes of the exercise or was there additional time allotted for that?

Chad Kerksick: Right. So, we did a baseline resting metabolic rate before the exercise bout, and then we did another basically like traditional resting metabolic rate when they finished the exercise bout. So, they were kind of under a metabolic hood prior to the exercise session, and they did their feeding, and they did exercise bout where they had mouthpiece – metabolic calculator out the entire time, then they finished, and then we did another metabolic rate measurement afterward. So, we were able to kind of compare the changes in metabolic rate or calorie burning from pre-exercise to post-exercise, and then we also have the during exercise data too. So, we've all the data that's coming out while they're actually exercising, so if you can look at the paper we've got some graphs that are kind of comparing some delta responses and that's just for the pre-exercise responses compared to the post. And in those situations again we saw some favorable shifts in respiratory exchange ratio to kind of suggest that with the protein conditions post-exercise or there might be some greater levels of fat oxidation. And that was actually kind of somewhat aligned with the during exercise data, particularly with the casein group as well.

Danny Lennon: Sure. I like what you said about – we remember that this is a pilot study, it's throwing up some interesting questions, and it's not really set up to say this is a practice that's going to go and improve your physique per se or anything like that. But what it is very interesting for is that, if this does go on and get replicated, is that you'll have a situation well if someone is claiming that they are doing fasted cardio purely on the basis of well mechanistically it's going to mean I'm going to have greater fat oxidation. Now, you have something that's at least getting people to question is that actually the case. Never mind that kind of secondary conversation we could have about its relevance in the big picture, but at least it addresses one of these mechanistic things, right?

Chad Kerksick: Yeah. I think overall. So, for us it was – it's always nice when you can do a study that you can really quickly kind of point to individuals that are – I mean athletes, various forms of athletes that your design can directly relate to. I think most people tend to appreciate that. I mean I am a sucker for reading a paper that's diving in deep, deep mechanistically, but not all people really kind of find the same level of value in those types of studies, and this is just one of those that – it was a really straightforward question and it was kind of a different take on what some people have been doing or that are very, very commonly doing. So, for that part of it we really liked it.

Danny Lennon: Sure. Before I start to wrap up Chad, let me ask you whether this in relation to your own lab or maybe just in general with sports nutrition. If I were to ask over say the next 5 years in the various different research going on is there a particular line of research you're most excited about or particular questions you are hoping to see kind of answered with some of the more emerging literature, like I say, that can be from within your group or elsewhere?

Chad Kerksick: So, the first thought that comes to my mind is with the gut I think that there's a lot more interest in microbiome, and probiotics, and prebiotics, and symbiotics and all those types of things and it's a huge area for health. I think the American public and world public is starting to definitely recognize it from a health angle. It's starting to come around about maybe the potential implication for athletes and helping for them to – not necessarily competitive athletes, but just for active individuals. So, I think that will be an area where we're going to see a lot more work because there is – the thing I will tell my students when I was learning digestion it was just more of just this is the digestive anatomy, this is where things are absorbed, and we didn't really dive into it that much more. We kind of went off into another direction. So, I think there's just a lot more of things you know we begin to understand. I would certainly love for all the scientists out there to continue to do more work with things like creatine within – again just I love it to see the work that's being done with that supplement in non-athletic and clinical populations that work just inspires me to know and to think that really something that's been popularized within sport that make somebody crank out a few more reps or do a little bit more work on a bike. But also may help – I mean there are studies on autistic patients and neuromuscular patients, and so I think those types of things are –

that's always very, very awesome to see that – again you do some work and kind of like one of your initial questions you asked me, and then people start to say well what about this population or what about this one? And honestly – another one that my group will try to tackle a little bit more and Bob Newton and Gaver and those folks over in Australia have – I mean they've blown everybody away with the work that they're doing with prostate cancer patients and androgen deprivation therapy and the terrible changes that we see in strength and body composition, and metabolic health, you know there are very few studies that have been done with nutritional interventions. They've done a good bit of exercise related work, so I think there are a number of areas where various nutritionists can take what they know and start to apply it backwards into some clinical populations, because there are many situations where the clinical world just turns their nose a bit at different aspects of sport nutrition and doesn't really give it a full good look, and I think these types of things where you help to inform those individuals of how some of these interventions and adjuncts maybe helpful is always there. And then, another one we've always done some stuff with basically is with muscle damage. I think that it was soreness and recovery, and are there some nutrients out there, are there a combination of types of things that can speed up recovery and really put an athlete on a fast-track to kind of getting back to where they need to be after a high volume unaccustomed bout of exercise that makes them sore and not able to perform the way that they usually could.

Danny Lennon: Yeah. I think it's going to be really exciting to see where all of those fields go into the future. Like you say, there's lots of potential applications in many areas and really excited about those too. Before I get to the very final question Chad, for people that are looking to find more about you or your work online where is the best place for them to go to check out more of your research, find you on social media all that type of things?

Chad Kerksick: Yeah. So, nearly all my social media stuff is just my first name and last name, and so c-h-a-d-k-e-r-k-s-i-c-k I mean that's how you find me on Facebook, my Twitter handle is just @chadkerksick, Instagram is @chadkerksick now admittedly I am not very active with social. We've got and we're working on kind of get some more activity going with our lab account. I just don't have the time to do those types of things. Whenever I sit down and talk with Brad Schoenfeld I'm like I don't know how the hell you do it?

Doing all the different posts and everything else, and it's something that I certainly recognize the ability to do that but from the social standpoint that's where we are. And then, we've got really nice lab website that's how still we are greater university website and that's just Lindenwood – lindenwood.edu/epno which is Exercise and Performance Nutrition Lab.

Danny Lennon: Perfect. For everyone listening I will link up to all of that in the show notes, so you can go and click through it and check all of the stuff that Chad has just mentioned as well as I'll link to some of the research that came from the lab that we've discussed throughout today's episode too. So, that brings us to the final question I always end the show on Chad, and this can be quite a broad generic question so forgive me for putting you on the spot with this, and it can be completely distinct from anything we've discussed previously and it's simply if you can advice people to do one thing each day that would have a positive impact on any area of their life what would that one thing be?

Chad Kerksick: Work to find value through helping other people – like solve other people's problems and just generally be helpful in all aspects of what you do. I mean I think many times within – even within our field with publishing work and everything else it's very easy to get self absorbed with the number of publications or grant dollars or things that you are bringing in. But in general I mean if I am doing my job best I'm helping students, I'm inspiring students to become better at something, and I am writing papers, and informing trainers and everything else to be better at their job. I've done different podcasts, we've worked with a lot of other people that work in the physique world and other types of coaches and that's a message that I hear quite a bit you know make it less about you and make it more about somebody else, and what their goals are and their value in that, and you'll get more and more opportunities. And I've tried to do that more since I've been at Lindenwood, I think it's probably a little bit of me growing up, becoming a father and those types of things you start to see the world a little bit differently. But that I think overall would help everybody across the board, across discipline.

Danny Lennon: With that let me say thank you so much for taking the time to do this, for your conversation I very much enjoyed talking through some of this with you, and then for the great ongoing work that you have going on, just know it's very much appreciated.

Chad Kerksick: Well, thank you very much again for having us. Like I said, it's a thrill, it's always a honor to get on here and talk about the stuff that – I just love the stuff to death. So, I tell people all the time, I mean, there are many, many days that it doesn't feel like work, and so it's a lot of hard work but I really enjoy all the conversations I get to have with students, and people like yourself and everything else. Like I said, we're working pretty hard to try to do different things to put work there that can add some value.