DANNY LENNON: Arthur, how are you doing?

ARTHUR LYNCH: I am doing great Danny. How are you today?

DANNY LENNON: Excellent. I am really looking forward to this. It's been a while trying to get you to finally agree to come and spread your knowledge, get you out the lab. So maybe just to give people some context of your own background, can you explain what you are currently doing in academia and then some of your background outside of that as well?

ARTHUR LYNCH: Sure. My undergraduate degree is in sports and exercise sciences here at the University of Limerick and I am currently now pursuing my PhD in exercise physiology, so specifically we are looking at the metabolite of Leucine HMB and its effects on muscular adaptations in conjunction with resistance exercise. So that's broadly speaking what I am looking at right now.

DANNY LENNON: Awesome. And that was definitely going to tie into one of the papers we look at today, the second one we are going to look at is going to be very important in that area. Before we get there, the first paper we are going to look at is another that you've picked out that is titled the role of Fat Free Mass accumulation and skeletal muscle architecture in powerlifting performance. So for those interested, this is a 2002

paper by Brechue and Abe. I hope I am pronouncing that correctly, probably not. I will link to this in the show notes for those of you listening if you want to get the text this paper we are going to discuss. So Arthur, with this paper in particular, maybe to start us off, what is the whole idea of this paper from the researchers, what were they setting out to examine, what were they trying to tease out by doing this study?

ARTHUR LYNCH: There's a strong correlation between the cross-sectional area of the muscle and its capacity to produce force. But prior to this study, that had been really only examined in sort of isolated kind of single joint movements, so for example, like an isolated knee extension or isolated arm curl. So this study kind of set out to examine its effects and kind of a whole body scenario or more applied setting, using elite level powerlifter. So it's cross-sectional in nature so essentially they just took a group of 20 elite powerlifters, examined their fat free mass and their muscular architecture and specific hypertrophy in a few different muscles, so for example the triceps and the vastus lateralis which is the lateral quad muscle and the gastrocnemius and looked at the correlation between those factors and their performance in powerlifting, so their max squash, bench press, deadlift and total.

So they grouped them into three categories, so there was lightweight, 67.5 kilo class and below; middleweight, 70 to 100; and then heavyweight was 110 and above. They had 13 national level lifters, three national champions and four world champions, all with an average training age of about nine years. So the measures taken were – so they obviously body massed limb lengths, skeletal muscle distribution, muscle thickness at various different sites and then just total fat free mass which is all mass that's not fat mass essentially, and then they looked at the associations with their competition performance.

DANNY LENNON: Awesome. So a few things I just want to get into a bit deeper there for people, one of the things important is the level of lifters that was in the study which is probably one of the reasons it's so interesting because, as I am sure you know, even in studies where you typically have a "well-trained" population, that might

not be as well trained people might believe that typically the barrier for entry to be classed as a well-trained subject and a lot of studies can be relatively low compared to what's here.

ARTHUR LYNCH: Yeah. There's no other way describing it like a trained subject is someone who benches 50 kilos, it's just really, it's too broad of a spectrum I guess.

DANNY LENNON: Yeah, sure. So here we are dealing obviously with elite level lifters, if they are at a national level and like you say a few world champions. The other thing you mentioned in addition to the fat free mass was muscle architecture. So for maybe people who haven't come across the definition before, what are they talking of when we class this muscle architecture in general?

ARTHUR LYNCH: When we are looking at hypertrophic adaptations to strength training, one of the things that will usually get – and this is true primarily through the centric portion of a contraction, so it's an increase in fascicle length, so the fascicle is like a bundle of muscle fibers, and as your muscle grows, one of the adaptations is that you add new sarcomeres or new contractile units in series, so effectively, increasing the effect of length of the muscle and that's seen as a favorable adaptation, for example, in field sport athletes. So if you can increase the fascicle length of your hamstrings, it will reduce the likelihood of it straining or tearing as well. So that's where a lot of the research on, say for example, Nordic Hamstring Curls comes from, where you accentuate the eccentric portion of the movement to try to attain this adaptation. Another thing then as well is pennation angle. It's kind of difficult to explain without actually having a visual in front of me.

DANNY LENNON: Yeah, sure and I think especially with something like a pennation angle, it's difficult to explain without someone seeing visually a muscle and where we are actually talking about the angle. But to maybe try and make it basic then people can visualize different, maybe bodybuilders or anyone that's kind of fairly well muscled but they just look different, so they might both be building similar amounts of fat free mass even at similar body weights, but that look is different. Is that down to maybe some of these muscle

architecture things of where they have insertion points or stuff like that that's nothing to do with just how much muscle they've built, it's how that's actually put on the scale?

ARTHUR LYNCH: Just looks visually, yeah, quite possibly.

DANNY LENNON: And we will probably come to this within results later. In general then, based on that would more force be produced with higher or lower level or angles of pennation?

ARTHUR LYNCH: So at lower level of pennation, so it's an adaptation to allow you to pack more sarcomeres into the muscle but it's not necessarily advantageous because it's not the most efficient way of exerting force. Now that said, in this particular study, so they looked at pennation angle and saw if there was any correlation between pennation angle and performance and there was none, so it's pretty much not even relevant for the sake of this discussion.

DANNY LENNON: Okay, perfect. To get on some of the other ones, you just mentioned performance was something they measured. What were they measuring in terms of performance? Obviously with powerlifting it could be – are they basing it just on their total or are they looking at their Wilks score, or are they are looking at where they are placed in the competition, what were the determinants as performance in the study?

ARTHUR LYNCH: So, for the purpose of this study, they literally, just looked at their max squash bench press and deadlift and then categorized them, as I said, within those three categories of light, middle and heavyweight. Now, the heaviest guy was at 170 kilos, which was actually more, like 176 kilos with a 113 kilos of fat free mass. So that's a lot of human.

DANNY LENNON: Yeah, like that's bordering on like Ray Williams. I am pretty sure he's around that.

ARTHUR LYNCH: Yeah.

DANNY LENNON: So if we go to some of the results they found, what are kind of the first few things that sprang out to you from

the results and what kind of associations will be seen here?

ARTHUR LYNCH: There wasn't a whole pile of difference between the middle and lightweight competitors in terms of, so for example, percentage body fat was similar when they looked at isolated muscle thickness, it was roughly similar between the middleweight and lightweight competitors. But the heavyweight competitor was considerably bigger, so they had much more fat free mass, much higher fat mass, isolated thickness of particular muscles so that the triceps, the gastrocnemius which is your calf muscle and the lateral quad muscle, the vastus lateralis, that was significantly thicker in the heavyweight guys, which you would imagine given their body weight. And then, the main take away from this one being the strong correlation, like really strong correlation between squat, bench press and deadlift and fat free mass accumulation. So the correlation was between 0.86 and 0.95. So for anyone who's not familiar with the correlation of 1, that would be a perfect correlation, so perfect linear association between two variables.

Now, I guess critics of this paper, cross-sectional nature – no, obviously logistically it wouldn't be the easiest thing to track this kind of thing longitudinally. I think maybe, as we were discussing off air before hand if they categorized them, maybe by weight class instead of just three light, middle and heavyweight categories, it might have been a fair comparison, because there was quite a discrepancy in the bodyweight between the heavyweight and the middleweight and lightweight lifters.

DANNY LENNON: Yeah. Just on that, I think one of the things that, for me was, like I mentioned to you, was the definition they have of powerlifting performance being the absolute total as opposed to the total relative to their bodyweight, which I mean, for someone that's not competing in weight class based sport, makes sense – because, like how do you get as strong as possible? You put on as much fat free mass as possible is what we are seeing from this paper, which stands to reason. But I am just wondering then for people who are competing in a weight class based sport, what does that tell them? Because for someone who's in a super

heavyweight class, there's obviously no restriction and these guys are obviously just huge human beings, they are going to have more fat free mass but because they are just so big they are also going to be lifting more anyway regardless of whether they are like a high-end competitor versus like the example I said to you, a mediocre guy in a super heavyweight is still going to, in an absolute level out lift the best 59 kilo lifter in the world probably. So, I think maybe one of the interesting ones was what you pointed out is also they looked at fat free mass divided height as one of the markers to correlate with performance, which I think to some degree or not perfectly probably controls that because it's at least going to have guys of similar stature compared along that line. Would you do anything to add on that of how they are defining performance in this study?

ARTHUR LYNCH: It's almost as if it's biasing them towards that conclusion whereby the bigger guys lift more, but one of the questions I would have would be to kind of – so let's just say if these guys – let's just say that they were all training nine years for example, which is actually what they were. What I would like to know is over the nine years they've been training, have a look at how much fat free mass they've all accumulated within that nine years and then correlate that with how much strength they've gained. That would be a question I would like answered I guess, yeah.

DANNY LENNON: I think because that has good implications for people who are saying, okay, if you go and start putting on more fat free mass relative to your starting point, that's going to lead to you getting stronger as opposed to like a guy who's just like ginormous and like 6'8" and walks around 150 kilos, who doesn't really train, is still going to have a significant amount of fat free mass in an absolute sense, just because he's just so absolutely big. Whereas someone who could spend a lifetime training may never get that amount of absolute fat free mass, right? So yeah I thought it was interesting how they chose their metric for performance, especially when you are trying to compare guys in different weight classes. It was just an interesting way to look at it. But regardless of that, like you said, because they did the fat free mass divided by height as one of the measurements that can

tell us something. So from that what were your main – so if you were to look at the study and say, okay, we have some of these conclusions that we've just talked about, what would, for a practical sense, in terms of what you may recommend to people, what would this tell you in terms of those looking to maximize performance if anything at all or do you think it's something that's just more interesting rather than actually informative for a practice?

ARTHUR LYNCH: I would probably put this paper more in the pile of thought provoking, it kind of tells you what your intuitively already know that the bigger guys tend to lift heavier weight, it doesn't tell you that the guys who've put on more muscle over their training career have increased their strength considerably more. That's I guess more so the question we would like answered. So let's just say we have two identical people, we have two identical twins who are both pursuing powerlifting and one of them over the course of 10 years puts on – let's keep it simple, let's just say 10 kilos of lean body mass versus the twin who puts on five kilos of lean mass. Is the lifter who puts on 10 going to be that much stronger than the identical twin who puts on five? Are there other factors which could negate the differences? That's I guess the question.

DANNY LENNON: Yeah, it tends to get a bit murky then when you have the weight class difference like we said as well. If everyone is compared off just who's going to lift the most, it's probably going to be an easy question to answer, versus if we have – that's why I think maybe the fat free mass over height is an interesting result, because maybe that indicates that for whatever weight class someone ends up being in, they are typically probably going to be more grouped on, on height as well. The lower weight classes are generally shorter guys than the higher weight classes. It might be an idea for whatever weight class you do end up being having as much muscle as possible. I mean, that sounds like something intuitive but as you know there's probably at least one or two people that are disagreeing with that over the last one.

ARTHUR LYNCH: Yeah. Or perhaps even looking at your stature how much muscle mass should you aim to attain if that makes sense or like if you are 5'10" what kind of

muscle mass should you be in around or what kind of fat free mass level should you be in around versus someone who's 5'4" or 6'3" you know what I mean. Incidentally, the researcher, I think you are referring to, he actually has his name on another paper, 2013 paper that was trying to get hold of for the life of me, I couldn't, looking at pretty must a similar type of design to this one.

DANNY LENNON: Yeah, one of the interesting things I think for this area is probably because we know other things outside the fat free mass absolutely do affect your total strength, just like generally someone's genetic potential to be strong, their technique, their training experience, all these types of things outside of fat free mass, it's not going to be a direct comparison anyway. And I am sure, when a lot of people here that there's a strong correlation between just how much muscle you have and how strong you are going to be, there's going to be at least some people that point to, well, hold on a minute, I know such and such a person who has less muscle than this other guy but is actually stronger than them. And then the obvious problem there is they are comparing two different individuals based on this one marker whereas maybe – and again it would be interesting if you agree – what this is probably indicating is for just anyone individual your best bet to get stronger is to put on as much muscle as you can, but that's not necessarily going to say, between this group of individuals, the one with the most muscle mass is always going to win every weight class.

ARTHUR LYNCH: Yeah. That's a very valid point. And I guess, the other way of looking at it, I guess, if you flip the question a little bit, will there be any detrimental effects of trying to put on as much muscle as possible – I don't think so to be honest. At the end of the day, the contractile units are housed within the muscle. That's what produces force. There's obviously the drive from the nervous system to initiate that and that's obviously something that's trained over time as well. At the end of the day, the more contractile units you have there, the more capability you have to produce force and you see that from a lot of the more isolated type studies. So when they actually isolate individual muscle fibers, the large ones are the ones that produce the most force.

But yeah, that probably is an overly simplified way of looking at specifically powerlifting performance, because there's actually – so there's a mate of mine who's based within this university as well and we've often chatted about this and that – perhaps a 1 RM squat for example isn't a measure of strength, it's a performance measure, it's not measuring how much force you are producing, it's actually measuring the minimal force you need to move X weight, that's probably beyond the scope of this discussion.

DANNY LENNON: Yeah, I think it's time to move onto our second paper. The second paper that you have brought to our attention today Arthur is, like I mentioned at the outset of the show, something that's very much related to your current PhD work in exercise physiology, and this is titled Effects of Leucine and its Metabolite Beta-Hydroxy-Beta-Methylbutyrate – or HMB as most people abbreviate it to – on human skeletal muscle protein metabolism. This is a paper by Wilkinson & Colleagues, 2013 and again for people listening, I will link to this in the show notes if you want to pull up the full text to the study. So, again Arthur, with this study in particular, I suppose what is the importance with this paper or why you decided to pick this and what are the objectives from this research group's point of view and why is this an important paper?

ARTHUR LYNCH: This is kind of a fairly seminal paper in my field looking at HMB and what adaptations you might be able to draw from supplementation with HMB. Now, unfortunately, a lot of the work in HMB has been kind of tainted by various – certain individuals that we will just kind of allude to a little bit. But if we were to kind of ignore that and just focus on this paper and its implications, so if you know anything about protein and amino acids, you'll probably be aware that leucine is a fairly important amino acid. So within amino acids, you have essential amino acids, you have branched-chain amino acids within that and of the three, branched-chain amino acids, leucine appears to be the most important from a muscle protein synthetic point of view. So leucine is kind of the known trigger for anabolism in human muscle if you like the light switch to turn on protein synthesis.

So knowing that the question that these researchers asked was, well, if leucine is anabolic what about metabolites of leucine? One of the metabolites of leucine is in fact HMB. Now, one of the things that's important to know is that in order for you to derive an effective dose of HMB, you need to consume about 60 gm of leucine, which is just not really feasible, from a practical perspective. So you are just better off supplementing directly with HMB [if the goal is to increase HMB in muscle]. And so what they looked at was the effects of either leucine or HMB on muscle protein synthesis and then they also looked at the effect of HMB on muscle protein breakdown. So for those that may not be familiar with the net protein balance, is essentially the balance between muscle protein synthesis, so the growth of new muscle minus muscle protein breakdown, so the breakdown of muscle. And there are various time periods when muscle protein balance would be negative. So for example, fasting, various disease states or cancer and cachexia and that kind of – any kind of disease where breakdown is accelerated, muscle protein balance is going to be negative. So where HMB might come in, in that scenario is attenuating that breakdown.

So this story had kind of two arms, the leucine side of the study was conducted at the McMaster University in Canada and the HMB was conducted at the University of Nottingham in the UK, and so for the purpose of looking at muscle protein breakdown – so that was only looked at in HMB. The group at McMaster didn't look at the effects of leucine on muscle protein breakdown, the reason being is because leucine is what's termed insulinogenic. So it leads to the secretion of insulin. And so that then becomes a confound because you don't know if the suppression of protein breakdown was due to the fact that insulin was secreted or a direct effect of leucine itself. Then the subjects in both labs were brought in after an overnight fast into the lab and then a tracer was infused, they can identify that after they take a muscle biopsy, so when the examine it and they can see the incorporation of that particular amino acid, and then that's used in as an index of muscle protein synthesis.

So after the tracer was infused they were fed either leucine in the McMaster group or HMB in the Nottingham group. The results then, leucine feeding led to a marked rise in plasma HMB, but no change in intramuscular HMB. So this is getting at what I was saying earlier on, so you are better off to supplement directly with HMB even though leucine has the capacity to produce HMB endogenously, it's just not a very efficient way of doing it.

DANNY LENNON: So essentially what's going on there is when you mentioned that you need like 60 gm of leucine to get that HMB is once and the body can obviously be catabolized and broken down, and one of the things that gets broken down into is this HMB, and that's probably not going to be very efficient for how much it produces, number one; but number two, from at least what that result I think you are saying is it's not been able to incorporate into the muscle itself because of that low dose?

ARTHUR LYNCH: Yeah. So essentially if you feed leucine at this dose – sorry I didn't mention that, so the dose was 3.42 gm of leucine and HMB, so the same dose. So essentially, with the leucine feed you will see a rise in HMB in the plasma but not in the muscle. Obviously if it's not in the muscle, it can't – these are the defects in the muscle. The HMB feeding then on the other hand led to a marked rise in HMB in the plasma and intramuscular HMB, no change in insulin levels with the HMB, a marked rise in insulin levels with leucine as you would expect. Biopsies were then taken, 150 minutes post ingestion of either leucine or HMB, so we had similar levels of muscle protein synthesis, both 70% increase with the HMB group versus 110% in the leucine group. So both of them are anabolic in nature, so they both have the capacity to increase MPS and muscle protein breakdown was suppressed by 57% in the HMB group.

Overall, quite an intriguing study, it's kind of the only one in its area to date in vivo if you like, so most of the HMB research to date, looking at – well, its effects within muscular, it's anabolic effects and anti-catabolic effects, they've been done in vitro, just in a cell model, and usually diseased state as well, so they might have cells and induced like a tumor or

something within them, and then just see what effect HMB might have there. This is a model that's more pertinent to healthy human subjects.

DANNY LENNON: Certainly interesting, there's a few things I just wanted to kind of go back over, because obviously there's a lot in there to piece through. Just so to refresh people's memory, we are saying here – you mentioned that, number one, they used 3.42 gm of either HMB or 3.42 gm of leucine and you also mentioned there was a tracer used which is basically just a way to determine how much of that dose actually ends up in the muscle as opposed to being somewhere else, and then they took blood samples and biopsies at different intervals after that ingestion. One of the things maybe we can mention is they used HMB free acid in this particular study as opposed to HMB which is usually like bound to a calcium salt in a lot of other studies. Was there any reason why they used the free acid as opposed to a more standard version of HMB?

ARTHUR LYNCH: So up until 2011, all HMB research was using, as you mentioned, the HMB bound to calcium. Then in 2011, Fuller released a paper showing that HMB free acid actually had favorable bioavailability kinetics. So what that necessarily means is, when you feed the HMB free acid versus the HMB bound to calcium, you will see a much sharper rise in plasma HMB levels. So within the blood the peak HMB concentration will be much higher and peaks an awful lot earlier as well, so peaks 30 minutes post ingestion. So from that study on, it's been pretty much exclusively HMB free acid that's been used and I guess that's why these researchers decided to follow suit.

DANNY LENNON: One of the things I was going to ask you about was the effect on MPS you mentioned was the HMB had like an increase of, like, you said 70% and the leucine was like 110%. Did that reach statistical significance you remember? And does that tell us or at least even if it doesn't, it probably is at least leaning in the area to show that in general could we count leucine as something that's going to be – have a stronger trigger for MPS than HMB alone?

ARTHUR LYNCH: There wasn't a statistically significant difference between the two, but the trend was for leucine to have a stronger or more robust stimulation of MPS and all the signaling factors associated with the mTOR pathway, which is kind of the main anabolic pathway leading to muscle protein synthesis. And all those signaling factors were turned on for longer in the leucine group compared to the HMB group, so not statistically significant, but I would say there was a trend for the leucine to have a stronger effect.

DANNY LENNON: Sure. You mentioned there are some of the anabolic markers and looking at mTOR and I think that you looked at some other, maybe enzymes and molecules that indicate anabolic signaling. I think based on that, one of the things was in the paper was about how some of these effects of HMB on MPS and just general anabolism seem to be different or at least distinct from how leucine is having its effects.

ARTHUR LYNCH: Yeah, hasn't really been looked at or at least to the best of my knowledge.

DANNY LENNON: One of the things I would be interested in – and again, there might not be answers to this, but just based on what you've read in this area, like you mentioned the leucine, because of its effect on insulin and that rise in insulin in general would cause some suppression of muscle protein breakdown, whereas on the other hand the HMB can have the suppression of muscle protein breakdown without any insulin involved, which is seen maybe as a benefit. But in a real world scenario, is that of any benefit, if you are going to use leucine or some protein or even carbohydrate that's going to have enough elevation of insulin to suppress muscle protein breakdown? And I mean, I suppose the only way we'd worked out is – and I don't know if there's anything in this area that would indicate this, but is it possible that this suppression of muscle protein breakdown via HMB could be something that'd be on top of suppression via what insulin gives or is it going to be – have no additional benefit if that makes sense?

ARTHUR LYNCH: Well, see, the thing of course with this study is that the subjects were fasted overnight, so the effects of HMB to suppress muscle protein breakdown in this

context, they are looking at it in a fasted model, so if you were to have HMB with your breakfast for example, would it have an additive effect knowing for example that just a fairly modest rise in insulin would pretty much blunt muscle protein breakdown? I don't think so to be honest. As of now, there isn't an answer to that question, but I can't see how it would.

DANNY LENNON: Okay, so beyond that then, because HMB is still something being looked at, obviously are going to be looking at some of the questions people are trying to answer, where do people feel is maybe the biggest potential for use of HMB as a supplement? Do you think that it could actually end up being some sort of practical role in some sort of setting?

ARTHUR LYNCH: I still think that the primary application for it is going to be more in a clinical setting. So, for example, like I was referring to earlier on, so, there's cell work from about 2007-2008, essentially showing that HMB will suppress breakdown induced from cancer induced model in a cell and it will attenuate the suppression of protein synthesis in a cancer induced type model in a cell, and then on top of that as well, there's in vivo research showing that after 10 days of bed rest, HMB can suppress – the muscle lasts over that period. That could be important for example in a clinical setting, so say, if someone gets a fall or something, if we are talking about an elderly person say and they are in the hospital and they are bed bound for a while because they've fractured their hip or something, that might have some application there. It could also have an application for an athlete who's injured and their arm is in a sling or something like that. It could help ward off some of the muscle wastage.

In terms of the effect in like more sort of performance based or muscular adaptations, it still remains to be seen. One of the things that I found intriguing about this paper was this is actually the closest thing we have to like a dose response study, so previous research was just give subjects some HMB – give them 3 gm of HMB and give them a training program, and then we will see what happens over whatever 8 or 12 weeks or something like that. This is the first study to actually look at actual changes within the muscle itself. So one of the questions, the follow-on questions

I had from this study was right, well, if this is the effect we get with 3.4 gm, does that max out the effect? Like, would we get a greater effect with 6 gm or maybe is 3 gm overkill, like maybe would we get the same effect with 1 gm. And they are just kind of questions we just don't have answers to yet.

Your inclination is to think, well, this ought to be dosed based on lean body mass, so the dose you would give to a 70-kilo person would be different to the dose you would give to someone who's 110 kilos. Just intuitively you would assume that what we don't really have an answer to as of yet. When there hasn't really been anything since this paper which is four years old now, so we will just have to wait and see. Even though it may seem like a fairly simple story in nature, because you are only bringing subjects in for a day, but like the cast of – so for example like the biopsies and then storing them and then getting them analyzed, and if you are using like a tracer or another thing as well that we've used out of the labs here in University of Limerick, which is called heavy water or D2O deuterium oxide, so they drink this "heavy water" and do their exercise session or nutrient feed or whatever, then take your biopsy and then measure the incorporation in the muscle. And you are talking thousands and thousands of Euros (€) just to get that done, so yeah.

DANNY LENNON: Yeah, I think maybe sometimes people miss not only the expense like you mentioned but also the importance of these types of mechanistic studies of that. They don't see the value if something is not like a direct measurement of something that's similar to in the field performance and this directing shows this effect, like some people can miss the importance of doing some of this mechanistic research, but it's basically the foundation for everything else that follows.

ARTHUR LYNCH: Yeah, like Eric was mentioning the last time he was on the podcast to both, like the research chain, how you move from mechanism and then you know right, this is how this particular nutrient or whatever intervention works. And then you move to the more applied setting, having that prior knowledge rather than just going in blindly and then saying, all right,

well, I guess we will try this dose and see what happens, rather than knowing okay, we know the effects of this dose in the muscle, now we carry that forward into the applied setting.

DANNY LENNON: And so before I let you go, for people listening, where can they find you on social media and if they are interested in finding out more about you or availing your coaching services where can they contact you online?

ARTHUR LYNCH: Sure. Well, I am quite easy to find in social media, because I don't use any fancy Instagram names. So my Facebook is Arthur Lynch, my Instagram is arthurlynch, all one word. You can find me through the Sigma Nutrition and Performance website, and so if you look up coaching services, and you scroll down, I am sure I am there somewhere.

DANNY LENNON: Perfect, yeah, so I will link up to that stuff in the show notes for people listening. If you want to start following Arthur on social media, seeing what he's up to, what he's lifting, and then also if you are interested in coaching, I will put that information there as well. With that, I think that pretty much does a good job. Arthur, thanks so much for breaking down these papers for us and for taking the time out to do so.

ARTHUR LYNCH: Hopefully, I wasn't too awkward.

DANNY LENNON: No, I think we did a good job. So yeah, thanks for the time.

ARTHUR LYNCH: You are more than welcome Danny.