Protein 101

RAMON SODANO: Welcome everyone to Protein 101. I'm glad you've all signed up and that you're here. My name is Ramon Sodano, and I am the coordinator for Fitness Service and Education over at the rec center. So I oversee the personal training, weight room, strength and conditioning, Wellbeing Online department, which is where I'm involved with Global Campus, where I kind of act as the-- not kind of-- definitely act as the Wellbeing coordinator for Global Campus within my job position there.

I also teach the kinesiology program here. I've taught classes-- right now, I'm teaching my Kines 311 class, which is the strength training class. And I have also taught Kines 305, which is nutrition related to fitness and sport.

We are going to be talking about protein today, just the basics, and what protein is. And, as I said, I've taught nutrition related to fitness and sport. So when it comes to nutrition, my background is much more in the development of protocols and guidelines for athletes, various different anaerobic sports, aerobic sports, wherever they need be at.

While that is where my background is with nutrition and developing those kinds of things with athletes, I do have a lot of experience within general requirements, and just a general population of those kinds of things as well. So I think I will be able to help with a lot of questions that we may have.

And with that, if you do have questions, feel free to type them the box. We're going to get the questions more at the end. I tend to have a tendency to go on tangents, so I believe if I get interesting questions within the lecture itself, I might go off for a while, and I don't want to get sidetracked and keep you all here for longer.

So with that, what we're here to talk about is Protein 101. Now, we're going to talk about just really what protein is, the basics of it, what it's not, a little bit of misunderstandings about it, and to try to really give you all an understanding of the mechanisms of it, why it's important, and why it's definitely over-utilized and kind of abused, and definitely-- not abused, but over-consumed.

So a lot of the basics. We aren't going to be diving deep into anything supplementation-wise or things like that. I'm not a big proponent of supplements, honestly. Hopefully, you've all had a chance to watch our Intro to Nutrition-- or, what was it called? Yeah-- Intro to Nutrition, "Three Basic Principles of Healthy Eating," that we had here. And one of the main concepts in there is this concept I have called JERT, which is Just Eat Real Food.

And I prefer to get-- for me, myself, my clients, anybody that asked me for recommendations for nutritional protocols, to get the nutrients I need for my body within real foods rather than supplements. It's important to remember that supplements mean supplemental. It's not what

you're supposed to be taking in the large quantities. If you do have difficulty getting your amount of protein, carbohydrates, or fats in, that's when supplements come into play.

So a lot of this presentation is going to be talking about how to do this through foods and those kinds of things. Not anything against supplements. It's just, typically, they're going to put you over the amount of protein that you would need, and definitely a lot of them-- which we'll get into a little bit later-- even their serving sizes having the amount of protein within them that the body can't even process and utilize all at one time. It's just it'll definitely digest it, but you're going to have a little bit of excess leftover.

So with that, I'll kind of get into what our agenda is for the day. And let's see if I can make this work. Cool, I made it work. So the first thing we're going to talk about is just protein misconceptions. And then we'll go into "Introduction of Macronutrients." So protein as a macronutrient, we'll talk about what that means real, real briefly.

We'll talk about the structure and function of protein, so really what protein is made up on the molecular level. We'll get into a little bit of biochemistry-- very, very minimal. I promise. We'll talk about protein metabolism. That's when we'll get into that a little bit of biosynthesis and biochemistry of protein. We will get into the weeds a little bit.

I'm going to-- it's important to understand what's happening at the metabolic level for you to understand when we are exceeding our limits of protein, why it's detrimental, and why it may lead to, say, fat gain or metabolic byproducts within the system that are not conducive to health, and those kinds of things. So the only reason why we're going to be talking about that is to give you an understanding about those things.

And I really we'll try to make it as simple as possible. There's no reason to actually try to really go down to like, we have a double bond here, and this breaks here, and we add it to alpha-ketoglutarate right here. We don't need to do all that. But we will talk about the basic metabolic factors. We'll talk about protein requirements then, so that's going to be talking about general requirements for individuals. And we're actually going to break it down, also, into active individuals, and also athletes.

Since my background is with athletes, if there's any parents here that have their kids playing certain sports, if you still are an athlete, and we'll talk about different requirements for different athletes, also within the different seasonal factors that take place throughout an entire annual training cycle for our athletes, and how those recommendations and requirements change.

We will talk about-- very briefly-- protein with muscular development and recovery. We will talk minimally about protein timing today. It's not as an important factor as many people think it is beneficial. But it's not the end-all, be-all. And then I'll get some quality protein sources for both your meat eaters and your vegans out there. And then with a quick review and time for questions.

So, first, before we get into anything, I like-- I call this a word from our sponsors. So this is essentially where I get my information from when it comes to nutritional protocols, protein protocols, requirements, and those kinds of things. I do utilize much more than just these kind of resources, but these are the main ones I use.

First and foremost, a lot of the requirements and recommendations that we have come from the American Council on Sports Medicine. A lot of articles I pulled specifically for this lecture was from the "Journal Sports Sciences." I used many-- that's one of my favorite journals, but I use a lot of other journals as well.

Then we see up here in the right is the International Society of Sports Nutrition. I'll get a lot of my position statements, position stands, requirements from them, especially when it comes to our athletes. I would say the dominant portion of information coming in this lecture is coming from the ISSN, and then also from the NSCA, which is the National Strength and Conditioning Association.

That is-- I'm a CSCS-certified NSCA Strength and Conditioning Coach and those kinds of things. And they have very good protocols when it comes to nutritional requirements for athletes. And then, the book that I utilized for my nutrition class here within the Kinesiology program, is this "Advanced Sports Nutrition." So I pulled some protocols from there.

So just so you know, I'm not pulling a bunch of things out of a bunch of bro-science here. I'm actually utilizing information that has been well-established for a long period of time.

And with that, things are constantly changing. We are actually seeing that the intake of protein can be much higher than what people originally thought, granted people still utilize it in a much greater amount. But things are always changing, right? And it's cool that we get these resources to pull information from.

But it's also important to stay ahead of the game. And a lot of the information I do actually utilize within my own practices, with my athletes and my clients, comes from practical application. A lot of this stuff is theoretical, granted they did research. But practically applied sometimes is just a little bit different.

So "Protein Misunderstood." So what we see in the field of nutrition, or in the field of athletics, or just in the field of general recreation, and people trying to work out and get, what I call, all buff and stuff is massive over-consumption of protein.

Individuals do have it set in their head that protein is the end-all, be-all for a nutrient. It's the most important thing to-- coming to protein synthesis and the anabolic factors in the muscle on those kinds of things, and they think, the more protein, the better. The more protein, the better. The more protein, the better.

And while protein is a very important substance and nutrient when it comes to the anabolic, which means to build factors of muscle-- and protein synthesis, and all those kinds of things-- you do have a point of diminishing return. You're only going to be able to get so much from a certain intake throughout the day, and also within an intake at one time.

So we do see that most athletes consume more protein than they really need to. And sometimes, we even see that this happens into as much as over 700% of the recommended amounts of recommended amounts for these individuals, whether it be an athlete or whether it be a gen pop kind of individual. We see massive intakes of protein.

And, also, with this, we see this massive intake coming from lots of supplementation. Again, I don't have anything against protein shakes, or anything like that. Again, we need to realize that supplements need to be supplemental to the diet. We should be giving the dominant source of our nutrients from real foods. It's how the body was meant to process these things, break them down. It understands how to utilize those nutrients coming in and its metabolic factors, and within its digestive system.

Also, what we do see from a lot of the protein sources out there when it comes to supplements is they are not nearly as nutrient-dense and in proper amino acid distributions as just simple meat. And an example that we kind of get from that "Advance Sports Nutrition" book is that one ounce of meat has about 7,000 milligrams of high quality amino acids. And amino acids are what make up proteins. And we'll talk about that more in a little bit.

But typical amino acid supplementations only have, per serving, around 500 to 1,000 milligrams of amino acids. They may have the same caloric density, so it means they're energy-dense. But you're not getting the same nutrition amount of those building blocks of amino acids, which is what we're trying to obtain from the protein.

So we'd see that an over-consumption definitely coming in the form of supplementation, which isn't even as nutrient-dense with regard to the amino acids that we're trying to utilize as the building blocks for those anabolic factors in our body. So we're just kind of shooting ourselves in the foot.

Also, we know that the body can only process so much protein at one time, and process-- it's going to digest it all, regardless. But it's going to only process it for the factors that we want-- protein synthesis and in the anabolic nature of our muscles from which so much at one time, and also so much throughout the day.

What we see is even on the high end, on the high end. And understand that protein intake and protein processing for those anabolic factors and protein synthesis is widely different between individuals. Someone who has a lot more muscle mass on their body, who's a much more highly active individual, who's consistently breaking down that muscle and trying to build it back up is obviously going to need to have a larger amount of protein coming in to support the means that they're doing.

Regardless, even with our high end strength and power athletes we see, we typically understand that the max amount of protein they're going to be able to take at one time, in one serving, to be able to utilize in an anabolic protein synthesis fashion is 50 grams-- which is a very, very large amount of protein that we'll see here. A lot of individuals only need to be eating 50 grams of protein throughout the day.

But for the most part, we have this range of 20 to 50 grams of protein at one time that's going to be properly processed by the body and utilized for those anabolic factors in the protein synthesis, and the build up of those tissues have been broken down, and things like that.

And that range is there for individuals of differing body sizes. Granted, I promise you, a Kai Greene or a huge bodybuilder out there, they're going to be able to process more protein at one time. But you're looking at individuals who are gigantic outliers. Most of us are not in the outlier range. So a lot of these implementations that we have are having that much protein in them per a scoop.

So if you only need 25 to 30 grams at one time for you to be able to have those anabolic factors take place, certain things are going to happen to these extra 20 grams that are coming in that is not necessarily beneficial to what you're trying to achieve through protein. And we'll talk about those things here in a little bit.

So, put simply-- and I took this quote literally from the book. It's put simply, eating too much of any nutrient, including protein, translate into eating less of another nutrient that may be equally important. And eating too much of a nutrient at one time, which fails to optimize it.

So another thing that happens when we're increasing our protein load to these high, high, high intakes is we're probably negating the amount of carbohydrates, or the amount of fats that we need to take in. And we're like, oh, well, we'll utilize protein as our energy source rather than carbohydrates.

While that can happen, we don't want protein to be our energy source. It is not-- it's not a great energy source. There's a lot of things that come-- a lot of byproducts that come from it. And it's not a clean, efficient way to do it. And we'll talk about that here a little bit.

So if you're consistently taking in too much of this substance, we're probably not getting the proper distribution of this other substance. And we want to have a good distribution of these things. So one of the things that we do see very, very, very, very commonly is that protein is just over-consumed. And we're going to now kind of get more into the weeds of what we can kind of do with these kinds of things.

But before that, we want to explain what macronutrients are, because protein is a macronutrient. And macronutrients are nutrients that the body needs in a large amount. And they're energy-dense. They're energy-dense because they have calories in them. So the

nutrients that we intake and that we need in large amounts are going to be our carbohydrates, our proteins, and our fats.

They are macronutrients because we need them at a large level, and because they are energy-dense. They have calories in them. Carbs and fat are dominantly what we want to be utilizing for our energy production, for the exercises that we do, for the requirements of daily life, for walking, doing X, Y, and Z.

And proteins, we want to be utilized for other functions, especially cellular turnover, cellular buildup, protein synthesis, the repair of certain structures within the body, transport of other substances in the body, hormone synthesis, and those kinds of things.

Our micronutrients are the ones that we need in smaller amounts, that are not energy-dense, like your vitamins and minerals. They act as kind of the enzymatic factors that allow metabolic processes and digest-- not digestion. Well, they do help with digestion-- but energy production to take place.

So protein is a macronutrient that is needed in larger amounts than our micronutrients, but it's not needed in as much amount, say, as carbohydrates. So just remember that protein is a macronutrient. And that's literally the basics of macronutrients we're talking about today. If you want to learn more about macronutrients, you can go into our Introduction to Nutrition webinar that we've done recently.

So now, getting into what protein is. And this is something that I feel is important, even for the general public, to understand what protein is. So the first thing that we can talk about is the chemical compound of protein. We're not going to write it out or anything-- well, I guess it's right there. But we're not going to go through what all these things mean, but there's a reason why I want to talk about the structure is because we're going to be hitting on something about it a little bit later.

So it's made up of carbon, hydrogen, oxygen, and nitrogen. And the fact that nitrogen is part of protein is a very special fact. It's the only macronutrient that contains nitrogen. And there are certain nitrogen molecules in the body that-- they're nitrogen-dependent. They are built off nitrogen that amino acids or proteins are going to assist with. So the fact that we have nitrogen in our protein, it makes protein special for certain functions. And again, we're going to talk about those here in a little bit. I'm not trying to jump ahead of myself too much.

Now, what needs to be understood is protein is made up of amino acids. So I'm sure that you've heard about this before. But amino acids are going to be, what we call, the building blocks of protein. And there's-- within the human body, and within our nutritional factors, there is going to be 20 amino acids. In nature, there's tons of amino acids. I think there's like 500 or something. But the ones that the body uses, there's 20 total. And there's 11 non-essential, and there is 9 essential.

So what essential and non-essential mean-- non-essential means that the body can manufacture it on its own. So it can be produced by the body. Essential means that it needs to be derived from the diet. We can not manufacture these things on our own, so we have to obtain it from some external source. That's what makes it essential. We need to consistently bring these things in our body, or the body is not going to function correctly.

Although non-essential amino acids are called non-essential, that does not mean that they're not essential. They're very important to the processes that take place in the body. They're absolutely needed in the body for the processes that we need to take place. And the body can deplete in non-essential amino acids over time.

There's actually a certain process-- that we're going to, again, talk about here in a little bit-- where when we have an abundance, or we have a leftover amount of the essential amino acids that come in the body and we don't meet any more of them, they're going to go through a process called transamination to turn them into non-essential amino acids that maybe we're low on at the time. So it is important for the body to have the correct pooling of our essential amino acid and non-essential amino acids.

Now, we spoke about how protein is an energy molecule-- or an energy nutrient. We see that by this having 4 calories per 1 gram of protein. And that's going to be important when we're talking about requirements and how to figure out how many grams of protein compared to how many calories a day that one should be eating-- because we're talking about, this individual needs X amount of grams per kilogram of body weight. And understanding how many calories per gram is going to let you know how many calories are in protein you're eating, and how many grams of protein that you're going to eat when you figure those kinds of things out.

It's also important to understand that, for-- let's back up a little bit. For things-- what we're trying to utilize protein for in the body is a myriad of things, but the main one is this whole kind of thing of protein synthesis-- so creating proteins and building back up the tissues in the body.

So say when we weight train, we put some sort of stimulus on the muscle, it damages the muscle, it breaks it down, and we need protein and amino acid-- or amino acids and protein sent there to be able to build that back up and make it stronger. So we're having protein synthesis take place.

If we want optimal protein synthesis to take place, we need all essential amino acids present at one time, simultaneously to be able to help with the protein synthesis, and to build backup of whatever it is that we're doing. Or even just a protein synthesis of other carrier proteins. We want all those amino acids, all those essential amino acids there at one time-- simultaneously, too.

And the reason I bring that up is a lot of individuals hear, well, I can take gelatin to make my hair better. And if I just eat a bunch of gelatin, which is a protein-- or an amino acid-- and intake that, it's going to make my hair better. However, you're just taking a single amino acid, and it's

not going to be as beneficial to what you're trying to do because the other amino acids aren't around at the same time.

So making sure to have the whole profile of amino acids to increase and have optimal protein synthesis is ideal for many of the functions, or all of the functions, honestly, that we're trying to achieve from protein.

So when you hear of individuals doing, I'm just going to take this one little thing for this, but it's not prescribed by a doctor-- a doctor didn't tell you to do it for X reason-- it's most likely not going to be as beneficial, or provide the same result that you would want if you were having an essential amino acid pool of all those things at one time. And that's just one thing I'd like to bring up, because a lot of individuals don't realize that.

I'm just going to-- well, let's talk about dietary protein before we jump to the functions of protein. So when talking about dietary protein and eating that we have these ideas of complete protein versus incomplete protein, or high quality versus low quality. All that really means is a complete protein is going to have a complete essential amino acid profile. It's going to contain all the amino acids. Or it contains all of them for simple terms.

These are complete. So we have all amino acids with them. An incomplete or a low quality protein is a protein source that is deficient in one or more of the essential amino acids. So we see that high quality proteins are usually of animal origin, and that low quality proteins are typically of plant origin.

This is where being our vegan athletes or our vegetarian athletes, they have to figure out how complementary proteins and those kinds of things to make sure to get the entire amino acid profile in there. And we'll talk about vegan athletes and individuals later, and how they can go about making sure to get all of the protein, or all the amino acids that they need in.

When it comes to the functions of proteins, there's multiple things that they can do. And we see that we have structural proteins up here, and we have working proteins up here. For the most part, we want our proteins to be used as structural proteins. These are going to constitute cell structures, develop tissue, repair tissue, and maintain tissue.

So I do a workout, I break down my muscle, it needs to be rebuilt up, I have the proper amount of protein in my body, it's going to be sent to that area to those target tissues, and it's going to rebuild, repair, and then maintain. It's not only going to rebuild and repair, it's going to optimize, as long as I put the proper stimulus on it to be able to get that little bit of adaptation to take place.

And working proteins are great as well. We definitely want our proteins to synthesize hormones and neurotransmitters. Some examples of that-- we have hormones that are going to help synthesize insulin. We have proteins and amino acids that are going to help synthesize the neurotransmitter serotonin. And both of these things kind of help control bodily functions.

I actually just taught our endocrine chapter in my 311 class recently, and everything when it comes to the hormonal system in the body is essentially bringing the body back to equilibrium, back to homeostasis. So having the proper proteins in there to be able to allow these hormones to synthesize is imperative to the health and the health system, this health of, essentially, this ecosystem.

Proteins also have the ability to be both alkaline and acidic, so they aid in optimizing blood pH. They also aid in maintaining blood fluid-- or, I mean, fluid volume. And they also do provide energy. Again, they are not a great energy source. They are not burned efficiently, nor are they burned without having metabolic byproducts. Regardless, though, about 5% to 15% of energy production, typically more on the low end, is going to come from amino acid oxidation-- so utilizing proteins as energy.

However, the dominant source of our energy is coming from carbohydrates and fats, depending on the energy levels of what we're doing. And we don't need to go down that route right now. So we don't want proteins to be sources of energy. We want them to build, to repair, to maintain, to transport, to synthesize, to do these things.

We don't want to be so low in carbohydrates or fat that we have to turn to protein to go through a process called gluconeogenesis to become a carbohydrate or a glucose to be burned as energy. We don't want that. We want to use the more efficient sources. It's a quicker step process with just carbohydrates and fat in our energy-- for our energy production.

So we've talked about the structure of protein. We've talked about the functions of it. And it's just important to remember that when we consume proteins, they're going to be turned into amino acids in the body. It's then up to the body to transport those amino acids to the target tissues that need them for specific reasons. And those amino acids are going to be synthesized into proteins that are needed for the target tissue.

And this is where our protein metabolism comes in, which is our next slide. OK. So when it comes to protein metabolism, when we eat proteins, again, they're going to be broken down into amino acids in our body. At that point, some of the amino acids are going to be transported in the blood to target tissues that need to manufacture certain proteins to do certain tasks, whatever it may be.

But for the most part, our ingested amino acids are going to go to the liver, which is the central processing unit to create and synthesize proteins to be sent out to target tissues that need to utilize them for certain functions. So the liver is where the dominant portion of this stuff is going to take place.

Granted, there's a lot of individuals out there that talk about that the liver gets too much credit for these kinds of things. But for the sake of this lecture, we're talking about the liver is the central processing unit for amino acids. And it is. It is, no matter what, no matter who you are, it's where the dominant amount of these processes take place.

So we break them down into amino acids. They're going to be utilized for the functions in the body. So we know that-- we know the functions of them. We know that they're going to used as structural proteins or working proteins. But what happens when we have an excess amount of protein? When there's-- we've already satisfied the functions-- the protein synthesis and muscle breakdown. So our goal-- let's use this example.

Our goal is to increase protein synthesis and muscle buildup of tissue, of our biceps. We did a bicep workout. So we did our bicep workout. Now, we consume our protein. And we've utilized all the protein that we can at that standpoint for protein synthesis and anabolic factors of the biceps to get built back up. But we took in an extra amount of protein. So we have some stuff left over.

So this is where we're going to kind of get into the weeds of a little bit of biosynthesis and biochemistry and things like that. But it's important to understand these things for some processes, or just the idea of over-consumption of protein that we talked about a little bit. So I have these extra amino acids in the body. And amino acids-- I have these extra alpha amino acids.

So what's going to happen to, essentially, any amino acid in the body is they're going to go through a process called transamination. All transamination means is the transfer of an amino acid into another amino acid. And we talked about this briefly earlier. So we talked about the structure, also, earlier of an amino acid. We said it has nitrogen, carbon, hydrogen, all those things on it.

So the amino group of the amino acid is what contains the nitrogen. And this is what makes the amino acid special. Nitrogen on its own is toxic in the body. So we have to attach to things to be able to make it nontoxic, all right? So what happens in transamination is it removes the amino group from the amino acid, and it attaches it to a carrier molecule that is going to be able to accept this amino group.

And for the most part, this carrier molecule is called alpha-ketoglutarate. It's an alpha-keto acid. And it's typically always alpha-ketoglutarate. And we don't really necessarily need to know that. You just need to know that the amino acid is given to a donor or a carrier molecule.

At this point, when the amino acid is attached to that carrier molecule, that carrier molecule becomes glutamate. Glutamate, then, is able to assist this amino group that has the nitrogen to turn into another amino acid that the body is low on. There's a few things that are happening within this process that I'm going to leave out, so if you are a biochemistry individual out there, I understand that. But we're just trying to get to the simple standpoint.

So essentially, in transamination, I'm able to remove the amino group from an amino acid, put it to a carrier molecule, turns into glutamate, and then glutamate is going to assist this molecule-- assist this amino group to turn into another amino acid.

And so if the body is low on other amino acids, and we have this excess of amino acid coming in, and we're no longer able to utilize these amino acids for the protein synthesis of our biceps, we're going to be able to go through transamination to be able to create another amino acid that the body, for lack of a better term, is low on.

So what also happens at this point is I remove the amino group, but there's still that carbon structure, what we call the carbon skeleton, of that amino acid. So what happens to that? It's going to turn into some other things that we don't need to get into. But it's going to either be burned as energy, or it's going to be stored as fat. If we already have our energy requirements covered, and we have this excess protein coming in, then it's going to be stored as fat.

Now, what happens when I'm taking in my excess protein? I have now satisfied all the needs for all those other amino acids that I was low on through transamination, but I still have excess amino acids coming in. Well, that's when they're going to go through the transamination and then the oxidative deamination process. So in the deamination process, this is when I need to get rid of these extra amino acids.

And now remember, the nitrogen that is on the amino acid in the amino group is what makes it special. So during oxidative deamination, I am going to remove that amino group, and I'm going to turn it into ammonia. It actually goes through transamination, becomes glutamate first, then glutamate turns it back-- all kinds of things. But we're just going to talk about that now. This amino group is being turned into ammonia.

Ammonia as toxic for the body, so we need to get rid of it. So the body is going to turn it into something else so it can be transported to where it needs to go. And it's can go through the urea cycle, and it's going to be turned into urea, which is now not toxic for the body. And we are able to pee it out, essentially. So that's what happens that extra amino group that was on the excess amino acids.

What happens with this, when it's consistently happening, is when we are creating lots of urea and we have to excrete it out because the body wants to get rid of it, we're also excreting out extra fluid of the body, which can possibly lead to dehydration.

So now, what's going to happen to the carbon skeleton or the carbon structure that was left over from the deamination process? Well, again, just like before, that's going to be either stored as fat, it's going to be converted to glucose, or it's going to be burned as energy.

If we are in a caloric maintenance or a caloric surplus, there is no possible way that that carbon structure is going to be burned as energy or turned to glucose, because we've already satisfied those needs. So we're going to turn it into fat. And it's going to be stored as fat on the body. So if you thought taking an excess amount of protein was only going to build excess muscle, you are incorrect.

That excess amount of protein is not only going to cause metabolic byproducts that are dangerous for the body, i.e. ammonia, and that are going to get excrete as urea, which is no longer dangerous, but takes along extra fluid out of it. You also have the ability to store more fat on your body due to the excess intake of those amino acids. And I have this little red note here at the bottom, because it's an important thing to remember.

So once all protein needs are met, the fate of all remaining amino acids is deamination, which, again, is going to create ammonia, which is going to turn into urea that needs to be excreted from the body, and it's also going to most likely be stored as fat if you have a sufficient amount of glucose coming in, or have carbohydrates coming in, or you are in a caloric surplus level.

So this can happen. It's not necessarily the most efficient way to do things. Additionally, utilizing those carbon structures as a fuel source is not an efficient way to get fuel. The carbohydrate turns into glucose or glycogen. Glycogen in the stored version of glucose. It's a much more efficient and easy way for the body to utilize fuel rather than going through some sort of amino acid oxidation.

Regardless, a little bit of amino acid oxidation is happening. We talked about that 5% to 15%. But we don't want the dominant source of our energy coming from it due to these metabolic byproducts, the possibility of dehydration, and also the storage of fat from those carbon structures.

So that's as deep as we're going to go into that kind of stuff. If you want learn more about transamination and deamination, stuff's online. It's interesting. It's a very, very complex process, and we're definitely not doing it justice here. But just remember, we can turn an amino acid into another amino group-- I mean, we can turn one amino acid into another, essentially, if we're low on it, and then utilize a carbon structure as energy, or possibly stored as fat.

And if we're completely stored up on the amino acids that we need, we'll go through deamination, and then we have ammonia developed, get rid of that, and then we're either utilizing the carbon structure as energy turned into glucose, which is going to be used for energy, or stored as fat.

So with that, we will move on to the next slide. And I wanted to talk about protein metabolism first before we got into the requirements of protein. And that's because I can go back and talk about-- I know, you love the slide, don't you? You just love your protein. But because we are going to see now what the levels are that we utilize for individuals for our protein.

So now you know, individuals who are eating above these levels, which may be surprising, because they may be smaller than what people have thought before, what's happened to that excess protein. So you know, metabolically, what's happening there. So when it goes at the protein requirements, I'm giving you a ton of different ways to look at it.

So general requirements are going to say, for a gram to kilogram ratio, which is a more accurate ratio than utilizing percentages, is going to be 0.8 to 1.0 gram per kilogram of body weight. And this is for general populations, not super active individuals or anyone like that, just general population. So I give an example up here to show you how much that might be for 175-pound male.

So first, I need to figure out what my weight, or what this male's weight is in kilograms. So to do that, you have to go divide by 2.2. And then I'm going to times that number by either 0.8 or by 1.0 to figure out what the distribution of protein is going to be.

So you see that the distribution is going to be 64 grams to 80 grams of protein, and that's going to be anywhere from 256 to 320 calories. So it's not a large amount. And this is what the body is going to be able to process throughout the day well.

And we're going to get on it here in a little bit, talking about distribution throughout the day. But it's much better and more efficient for the body to actually evenly distribute this protein throughout the day, or through whatever eating window that you may have. And we'll talk about that more later.

Now, the Institute of Medicine has developed what we call the AMDR, the acceptable macronutrient distributions. And this is going to utilize a percentage of total daily intake compared to your total caloric intake of how you're going to identify what your protein needs are. I definitely like doing things off weight, and I like doing them off lean body mass, which we're going to talk about here more a little bit.

But when we're talking about percentages, this is nice because we have a huge range in the AMDR. And I'm glad that somebody thought of this, because there is a certain reason why we have these ranges. And I've purposely left in the children ranges for any of you out there to have young children, or children aged 4 to 18, so you can see what the protein distribution can be for them.

So we see with children, according the AMDR, ages 1 to 3, that of their total daily intake, or total caloric intake, we want to have them at a 5% to 20% protein intake. Children ages 4 to 18, we're looking at 10% to 30% total daily intake, 10% to 30% of the total caloric intake of that individual. In adults, we're looking at 10% to 35% of the total caloric intake.

So the reason why we have these big distributions is due to the inverse relationship of caloric intake and protein. That means when you are actually eating in a deficit, or you're eating less calories for your body to support its natural function so you're going to lose weight, you actually need to increase the amount of protein that you're intaking.

And that is for the fact that while you are trying to lose weight, your bodily systems still need the same amount of protein to do the functions, to be able to optimize whatever it's doing,

transferring protein, or moving things, acting as protein synthesis, synthesizing hormones, and those kinds of things-- all the functions we already talked about.

Your body still needs those same amount of protein and amino acids to be able to do those functions, so if you're starting to bring down your caloric intake, you actually want to up the ratio of protein that you're taking. So when you're going to start seeing that 20%, 25%, it's actually when the caloric intake is going less, less, and less.

Another kind of nice thing with that, if you are trying to lose weight, protein has a high thermic effect. It's harder for the body to break down protein, so you actually expend more calories digesting protein than you would carbohydrates and fat. So it actually plays into your benefit there.

So a lot of people kind of get confused with that. They're like, why is there this huge ratio? Maybe people that are eating way more calories need to eat way more protein. It's actually the opposite. You still need that protein in your body to aid those target tissues, and those structures, and those synthesizing hormones, and those kinds of things, so you still need those proteins coming in, even though you're a record deficit.

So to give an example of just using these percentages, I give an example of 10% of somebody's diet. So, say, if you were eating-- if your diet was 2000 calories, and this is you eating at maintenance. So 2000 calories, you don't gain or lose weight. 10% of that would be 200 calories, which is going to be 50 grams. So now, remember, I'm figuring these numbers out. It's divided by 4, because remember, there's 4 calories per 1 gram of protein.

So that's how you're going to figure out the difference between your calories needed and grams needed. Because if you are monitoring your calories through like MyFitnessPal or something like that-- I wouldn't recommend it-- just eat a good distribution [? of food. ?] But if you are an individual that's prepping for a bodybuilding show, or you want to watch your calories, do X, Y, and Z, you're most likely going to identify that you need to eat X amount of grams of protein. You won't watch the caloric amount.

So now, we talked about general requirements for general populations. So let's talk about general requirements for our active individual and our athletes. And this is coming from the International Society of Sports Nutrition. What we just saw before came from the AMDR, and then, before that, came from the ACSM, which was actually developed from the AMDR. So what we see for general requirements according to ISSN for athletes is they want to have a larger distribution of protein.

They're going to actually need to utilize about 1.4 to 2.0 grams per kilogram of body weight. So we can see an example of this, our 175-pound man. He's around 80 kilograms-- it was like 79.56-- it was around-- it's 80, OK? So I see that the ratio, if I'm going to be on the low end, is 1.4. And on the high end is going to be 2.0. So 80 times by 1.4 is going to be 112 grams. And then 80 times by 2.0 would be 160 grams. So the difference there is 448 to 640 calories.

We still see it's not 300 grams of protein coming in. It's still not the amount of a lot of individuals having come in, especially our athletic folks, who think that they need to eat 250 grams of protein. Now, it's also important to state that we should definitely strive to at least have 65% of this protein coming from those complete sources, those complete amino acid profiles.

So if you're a meat eater, the easiest way to get by it is through animal sources, or some sort of animal flesh, because you're going to get a quality amino acid profile within there-- especially from your eggs and things like that. Also, I mean, lean meats-- honestly, red meats, too, have a good distribution-- or a great-- or have complete amino acid profiles for the essential amino acids.

We're going to here to talk about athletes in more depth on the next slide. And we'll talk about there really why athletes need that increased protein amount, even our endurance athletes.

But I wanted to give a little quick blurb for the protein needs for our active vegetarians and vegans, or our athlete vegetarians and vegans. So these individuals actually may require more than the 2 grams of protein per body weight, 2 grams per kilogram of body weight. And that's for the fact that a lot of times, they are not getting a complete protein source in. They're having to do it through a complementary source.

So complementary sources mean that this food has these essential amino acids. This food has the remainder of the essential amino acids that are in this food. So I eat them together, and now I have developed a complementary protein. So the bioavailability of these kinds of food sources is not at the same standpoint as meat is.

So they're not getting the same amino acid profile-- well, they're getting the same amino acid profile, but probably not in the same amount. And it's also not as easy for the body to digest or be able to utilize these things within the body. So a lot of times, that's one of the reasons why our vegan-- especially, our vegan athletes-- need a higher level of protein than 2 grams per kilogram of body weight.

Also, if they're not watching their caloric intake, a lot of individuals who are on a vegan diet-- they're very nutrient-dense diets, but they're not very energy-dense diets, which is fine. All of us Americans eat way too much energy anyways, way too many calories.

But if you're a vegan athlete, and they're not lowering their caloric intake, and they're eating til they're full, they actually may not be achieving the total caloric intake that they need for their athletic demands, which then-- and what we saw earlier with individuals in a caloric deficit-- we actually need to raise that protein intake to be able to allow the body to have the amount of protein and amino acids to support its basic functions, and also the anabolic functions that we want as an athlete.

And this is not to say that vegan athletes are difficult to do, or to be able to succeed. I know tons of individuals that are savage vegan athletes.

So we are talking about the complementary proteins. So when we talked about the increased risk of inadequate energy intake and one of the reasons why we need to increase that protein level, individuals who are vegan athletes also may be at increased risk of deficient calcium, iron, zinc, and B12-- any kinds of nutrients that you're going to be getting dominantly from meat.

There's lots of fortified grains and stuff out there that now have this kind of stuff in there. And vegans and vegetarians understand how to get these things. But if you don't understand, make sure that you're looking into figuring out how to get calcium, iron, zinc, and B12 into your diet. Also, there's going to be a decreased amount of creatine in the vegan athlete's diet, because creatine is maintained in meat.

Creatine in Greek means meat. Books always say that. I can't remember if that's exactly correct, but something around there. But you can easily fix creatine through creatine supplementation and those kinds of things, and other foods that are in the vegan diet do small amounts of creatine as well, just definitely not the amounts that you would want for athletic performance.

And just a brief overview of what the vegetarian types are. We have lacto-vegetarians. Those are individuals who are willing to put dairy in their diets. We have ovo-vegetarians-- individuals who are going to put eggs in their diet. These individuals are-- it's much easier for them to be able to get the protein needs they need. Because, honestly, egg protein is one of the best source of protein you can have. And then lacto-ovo is allows dairy and egg.

And then pesco-vegetarians are individuals who are putting fish and seafood into their diet. And then your vegans are nothing of animal source. And then there's levels of vegans as well. Am I still on this one? I am. OK.

So to continue on with the protein requirements for athletes-- what we do-- well, first, let's just talk about the reasons why athletes would need more protein. So we already talked about that amino acids contribute for about 5% to 15% of fuel burned during exercise. So the amount of protein needed for energy rises as our caloric expenditure rises.

So if I am doing some sort of activity-- I'm running, I'm sprinting, I'm doing whatever-- the energy expenditure that I have rises, which means, now, that even though I'm still only using 5% to 15% of protein, the amount of protein that's being used since the expenditure is higher is also higher. So that's one of the reasons why we need more protein in the diet for athletes.

And even so for our endurance athletes. Even though our-- endurance athletes are not breaking down-- they're definitely breaking down muscles, but they're not breaking down muscles and building them back up to the standpoint as our strength and power athletes. It's obvious in the body frames. Our high, elite endurance athletes are much more slim, Type I fiber type, more of that kind of thing.

But they definitely break down muscle, so they do need protein from that. But, also, since they are an athlete endurance athlete, whether they're an endurance athlete, that energy expenditure is rising due to whatever event they're doing, triathlon, iron mans, those kinds of things. So then the protein distribution that's coming from amino acid oxidation for energy is also increased, which is one of the reasons, besides protein synthesis and anabolic factors in muscle tissue, that an endurance athlete might need protein.

Another reason why athletes, in general, need increased proteins amounts is it's generally throughout the endurance-- oh, we already kind of talked about that. But throughout any kind of activity, you're depleting glycogen. And if you don't have any fuel stations or things like that to replenish the glycogen in your body, which is that main energy source that we're utilizing, we may need to rely on protein a little bit more. We don't want to.

If we can figure out a way to maintain our glycogen levels, that would be more ideal. But sometimes, you just can't get around it, and then glycogen depletion is going to happen. Also, exercise causes more than usual muscle damage, so we need that protein to build it back up, and all kinds of other factors that are going to take place within the athletic system.

Essentially, athletes are just doing more than what we're doing. And they're going to need more carbohydrates. They're going to need more fat. And they're they really need more protein. It's across the board.

So when it comes to protein requirements for athletes, I'm pulling this information, now, from the NSCA. So you see, I'm bouncing around a little bit. But certain organizations are going to have better protocols, or a better understanding of how to do things for different populations. And the NSCA is definitely-- and the ISSN-- are definitely going to be good for our athletes.

What's good about the NSCA is they provide nutrient periodization protocols. Now, in a sense, a periodization when it comes to strength and conditioning coaches, we talk about periodization in the fact of an annual training cycle for somebody. So say we have a year-long training cycle of a workout program. Throughout that cycle, we do not do the same thing every single day. We are going to progress, regress, lateralize, do all kinds of things.

We're going to do what be called periodize it. Different periods are going to focus on different things. Maybe one period focuses on hypertrophy, one focuses on strength, one focuses on endurance, one focuses on power, or whatever it may be. So you have to manipulate your training protocols with sets, reps, intensity, and those kinds of things to adhere to the goals that you're trying to achieve from that cycle.

Or even more simply, you're going to think about an athlete within the different phases that they have within their entire athlete career. Typically, they're going to have an in-season, an off-season, a post-- well, an in-season, post-season, off-season, and pre-season. Those are the four phases that we go through. And within each one of those phases, we're going to have

more training, less training. We're going to have training focused on this compared to this. And it's also going to depend on the kind of athlete that they are.

So what we do with our athletes, now, we are also going to create some sort of nutrient periodization to match the periodization that they're doing within their exercise protocols, or their practices, or whatever sport performance it is, so we're able to fuel them correctly for what they're doing at that standpoint. You don't want them just eating the same thing over and over and over again at the same caloric load if I have drastically increased caloric expenditure through whatever training protocols or sport performance protocols that I'm doing.

And on the other side, if I drastically reduced my training protocols because, possibly, I'm in a post-season, I'm letting people rest, I don't want those caloric intakes to be super high, because then that person is going to put on accumulated body fat that maybe I don't want.

So the seasons that I'm talking about within this lecture is going to be our preparatory phase, which is our pre-season, our competition phase, which is our in-season, and then our transition phase, which is our off-season. I'm not talking about post-season. Post-season, for us in the strength and conditioning world, usually only lasts max of a month, and it's a time to give the athletes some break, give them a break from what they've been doing.

They've been focusing on football this entire time. They've been going to practice. They been doing strength training. They've been focusing on the diet for it. They've just been so over-consumed with it that we just like to let them go. And just stay active-- maybe go do some yoga, go play open rec basketball, or do whatever you want. Stay active, but just kind of let yourself let loose.

And, typically, for me-- I know not all coaches do this, so don't get mad at me. I let them, don't go crazy on your diet, but have some fun. Eat. Do what you need to do. Don't focus on it. Don't stress about it. Stay relatively healthy at the best that you can. But let yourself have a mental break from what you've been doing. So that's why I'm not talking about post-season in this lecture, because that's typically how I handle it.

But going into our nutrient periodization, another thing for our athletes-- and this is the one reason why I really like NSCA and their protocols, because this is how I've done things. I base caloric intake and macronutrient distribution based off someone's lean body mass. Not their total body weight, but their lean body mass.

The lean body mass is essentially everything else in the body but the fat-- so the muscle, organs, skin, those kinds of tissues-- essentially, muscles, organs bones is the best way to think about it. It's your lean body mass. And then body fat would contain the rest. I understand there's fluids and stuff in the body, but let's not get super nuanced right now.

So the lean tissue in the body is really what calls for the dominant source of energy in the body. So for instance, there's ways to calculate people's basal metabolic rate and total daily energy

expenditure. A total daily energy expenditure is just the amount of calories that somebody burns in a day. So if you ate at your total daily energy expenditure, going to say it was 2000 calories, you would not gain nor lose weight, theoretically.

However, there's a lot of calculations that only look at somebody's-- maybe their sex, their age, and their height to identify what their basal metabolic rate is.

But there's ways to identify their basal metabolic rate based off those things. But in my opinion, and from what the research says, honestly, too, is if you're able to take into consideration their lean body mass, and calculate their total daily energy expenditure that way, you're going to get a more accurate number, because their lean body mass is really what's calling for that energy

And in the sense of protein, the lean body tissues, or the lean body mass, is also what's calling for that need of protein as well. So I'd really like to focus my protein distribution based off of somebody's lean body mass, which is what the NSCA does here. Now, to be able to identify somebody's lean body mass, you will need to identify their body fat. This is why it's not generally good with a lot of general populations, because you're not going to have that access of information.

A lot of our athletes are going through some body composition training-- or, body composition testing. A lot of our recreational athletes are coming to our rec center and getting their body fat taken. If you're working with a personal trainer, a personal trainer can do it. And you're going to be able to identify the difference between your body fat weight and your lean body mass.

So essentially, how you would do that is, say, if you have 175-pound male who's 10% body fat, you would just go 175 times by 0.10. That's going to equal their body fat, which I believe would be 17.5. And you just do 175 minus 17.5, and that would be the lean body mass. To do it even quicker, you would just go 175 times 0.90. I always like to identify body fat compared to lean body mass, though.

So going into our nutrient periodization cycle, we see in the pre-season, for our individuals, we like to see a distribution of 1.2 to 2.5 grams per kilogram of lean body mass. So this is a higher number than what we saw before but we were only taking into consideration entire body weight, not lean body mass, which is going to be a little bit less than total body weight.

We also see that, with our weight loss individuals in pre-season, that we're going to have higher numbers of protein for the exact same reasons that we already talked about-- because the body structures is need it. It actually increases the thermic effect, and then it's going to actually aid in that weight loss. And it also creates a blood sugar stabilizing effect. It controls the hunger response.

So we see-- and it's also important to remember that individuals of different sports, as we'll see here in the second, are going to call for different protein needs. Your strength and power athletes are going to need more protein than your endurance athletes. But within your

endurance athlete, your elite endurance athlete will need more protein than your less elite endurance athlete. So it's you figuring out where that person kind of falls.

And, again, it's widely distributed. Somebody with more muscle mass on their body is going to be able to utilize more protein. In our competition phase, or our in-season phase, we see that the distribution is 1.7 grams to 2.0 grams per kilogram of lean body mass-- again, of lean body mass.

So strength and power athletes, we like to see at the higher end of that. So 1.7 to 2.0. I apologize. This was supposed to be 1.2 to 2.0. That's a little typo on my part. And your endurance athletes are going to be 1.2 to 1.7 per gram of lean body mass. I apologize for that typo.

In our transition phase, for our off-season phase, we're looking at 1.5 to 2.3 grams per kilogram of lean body mass. And how we're going to look at this is we're going to have on the higher end of that, if they're doing a hypertrophy-focused off-season program, they're trying to increase muscle mass. We would do the lower end of that if their program is geared towards endurance or cardio, those more caloric-- the less building-of-muscle kinds of programs.

So to give you an example, we have an athlete who's 175 pounds again, who is 10% body fat. To figure out what his lean body mass is, I put it all together here in a nice little equation, because we need to get it into kilograms. So, essentially, you find that 175 times by 1.0. You subtract that number from 175, which-- whatever it equals-- and then you divide it by 2.2, and that equals 71.6 kilograms.

So to figure out the distributions now, we see that we're going to have 71.6 times by 1.5 on the low end of the off-season phase, which is 107 grams. And then for the high end of the 2.3 grams, we see 71.6 times by 2.3, which is 165 grams, which is 428 to 660 calories.

Now, if you remember the numbers that we had previously coming from our general requirements, these numbers aren't drastically different. They're very, very similar. So they work out well, even with not taking into consideration somebody's lean body mass. I just very much prefer to take it into consideration.

So we'll kind of bruise this a little bit. This is not necessarily what I'm super trying to get across with this lecture. But we'll talk about a little bit of muscular development and recovery timing of protein. So we've already kind of said this.

But to have the biggest effects from your protein synthesis, and the intake, and all utilizing the amino acids to the high standpoints so they cannot have any extra left over, and not develop into this metabolic byproducts, and all that crazy stuff that I already talked about, we want to try to evenly distribute-- distrusted, wow-- distribute protein throughout the day.

I'm sorry. I just finished this PowerPoint before coming here. It's been a busy week [LAUGH]. But we want to have them evenly distributed throughout the day. So if you had 80 grams, you try to distribute it-- if you're eating three meals throughout the day, four meals throughout the day, however you're doing it.

If you're an individual who intimate fasts like I do-- I intermittent fast. I have an eight-hour eating window. I try to distribute my protein intake throughout that eight hours evenly. I don't try to take it in all at one time.

Also, consuming foods with high quality protein is the way to go. We want to try to increase the intake of complete proteins, because this is going to aid in protein synthesis. Because we already know, having all essential amino acids-- we said this earlier-- at one time, simultaneously, is going to optimize protein synthesis.

So when it comes to post-recovery and intake, there's all kinds of crazy stuff that goes on with taking in protein before, during, and after workouts. There definitely is a benefit to having a mixture of a carbohydrate and protein meal, especially after your workout, that can aid in protein synthesis. But the whole thought process of the anabolic window, and you have to get something in within an hour, has been disproven.

Your protein synthesis is up-regulated for 48 hours after a workout. So you're able to utilize protein coming in at a higher standpoint than normal for up to 40 hours. Yes, getting it in at the earlier standpoint is going to be better. Also, more importantly after a workout, is repleting your glycogen stores. So it's more important, in my opinion-- not a lot of people's opinion-- to replenish your glycogen stores, which is the energy source that you've used throughout your workouts.

So the best thing that we do see post-workout for a drink or a shake is having a carbohydrate/protein mixture. And we see a 3-to-1 ratio or a 4-to-1 ratio as acceptable. So 3-parts carbohydrates to 1-part protein. And, again, we said that 20 to 48 grams at one time is kind of what we're seeing. And, again, if you're the smaller individual, you're not taking in the 48 grams. You want to be on the lower end of that.

And the reason I have this little picture here of a nutrient label is it's from a basic protein supplement, just-- I'm not going to name which one it is out there, but you see per one serving, it has 52 grams of protein.

So if you're an individual who's trying to gain weight, maybe you're a little bit skinnier, and like, I need more protein to be able to build up all this stuff, that extra 30 grams that's coming in is honestly just going to make you have really expensive pee is how one of my old professors used to say it. And it's going to cause those metabolic products to develop. It's going to aid in fat storage on the body, and all those kinds of things.

So we've already talked about individuals who may need increased levels of protein-- so athletes eating, and then deficit of your total daily energy expenditure, vegan athletes. Also, we didn't really get into it. I want to do my whole lecture on youth athletes some protein, because the whole idea of peak height velocity, peak weight velocity, and growth and maturation taking place along with strength training protocols and practice, and those kinds of things, actually is a crazy factor in protein intake, as well as overall caloric intake.

So we don't need to run through these hand-by-hand. I just provided some quality sources of protein on here. These are more sources for our individuals who are down to eat meat, seafood, and those kinds of things. We will have this saved on the Video Vault for Global Connections. So if you want to come back to it and see it, it'll be up there if you want to go through these. These are all quality sources of protein.

And I have good sources of plant proteins for you vegans and vegetarians out there as well, coming from grains, legumes, seeds and nuts, and vegetables. And there's all kinds of good stuff online about different sources of protein that you can eat. Again, in my opinion, just eat real food. Get your sources of whatever it may be from a natural food source because your body has adapted and evolved to be able to process it.

So this is just a quick review. Since we're running a little low on time, I'm not going to go through it. Essentially, what we need to talk about is that protein is meant to be an agent that's going to be aiding in anabolic processes to help build the tissues in the body, repair the tissues in the body, and maintain the tissues in the body. We want it to synthesize hormones. We want it for those things.

We don't want to as our main source of energy, because we saw all the negative effects with that. We also know that an inadequate caloric intake equals protein burning as fuel, which is not ideal. We talked about that at the beginning. So the protein requirements that I talked about are assuming that you individuals are having an adequate intake.

So the requirements given are believing that you have the proper amount of other macronutrients coming in, as well as the proper amount of calories coming in. And this is why carbohydrates have a protein sparing effect. If you are ingesting the proper amount of carbohydrates, they're going to be utilized that energy, thus sparing the protein to be utilized for the functions that we want to use them.

We already talked about what happens to the excess protein, I think, multiple times. I think you're all going to be geniuses in molecular [? thing-- ?] I don't know, whatever, and that kind of stuff. Sorry for going into the weeds there. We talked about protein intake depends on multiple factors, such an activity level, athlete type, body size, all those kinds of things. We also want it evenly distributed throughout the day and not all at once.

And protein timing can be beneficial. The way I explain protein timing and nutrient timing, in general, is there is a very, very small amount of the population that are going to need to do it. If

you think of a big bell curve. In that small little area over here, that's the small amount of people who are getting those scores. That's got to be a whole other bell curve.

And when you're on the small area on the other side, that's who I believe needs to utilize protein timing. As long as you're getting good nutrients and good macronutrients throughout the day, along with your micronutrients, and you're not eating til you feel like a piece of crap, and those kinds of things, you're going to be doing all right.

And with that, is there any questions?

SPEAKER 2: Any opinions on collagen?

RAMON SODANO: On collagen? So collagen can definitely be beneficial. I am not super versed on the utilization of it. I know that it can definitely help. It's a good source to be able to utilize as a supplemental factor. Just make sure to utilize it in the distributions and the intake recommended. Don't overuse it.

My girlfriend, who is a very, very, very high wizard when it comes to supplementation and utilizing those kinds of things, is a big proponent of collagen. I just haven't done too much research into it.

SPEAKER 2: I'm excited to hear you do interning fasting, because I do as well.

RAMON SODANO: Let's go. I've been doing it for seven years.

SPEAKER 2: BCAAs generally contain only three of the nine essential amino acids. This works because the extra of the three can be converted to the other six, question?

RAMON SODANO: So the benefit of the amino acids is not for the fact that they can actually be turned into-- yes, again, any essential amino acid can be turned into another non-essential amino acid or essential to acid. But when you are taking your BCCAs is we know that protein-- so this is where I would have talked more about the utilization of supplementation.

But BCAAs are the limiting factor when it comes to protein synthesis and the amino acids in the body. And then, of the BCAAs, it's leucine that is the limiting factor that is going to aid in optimizing protein synthesis. So while you're not getting all those essential amino acids in there, those other six are going to be doing other functions. But the BCAAs are what are really, really helping out with protein synthesis within the anabolic factor of the target tissue.

And of those three amino acids-- leucine, isoleucine, and valine-- leucine is definitely the limiting factor for those kinds of things. So that's really why, especially taking your BCAAs throughout your fasting cycle is going to benefit with that, and maintaining the anabolic factors that you want to take place, and those kinds of things.

SPEAKER 2: I take the BCAAs at 5:20, then do CrossFit at 5:30 AM. Is this a good idea?

RAMON SODANO: When do you break your fast? I think you'll be all right. So a lot of people-- are you having-- so that means you're getting a good amount of your food-- what window, what time do you close your fast at? So are you doing 16 hours, are you eating until like 7:30 PM? No-- no later than 8:00 PM. OK.

So in my mind, especially if you're getting a good amount of your calories at that 8:00 PM time, you will still be fueled enough. And I believe that the body is going to adjust to your fasting to utilize the calories that are coming in to do a 5:30 AM CrossFit class. And having those BCAAs is definitely going to benefit the protein saving effect on it.

I, honestly, am pretty crappy with my BCAA intake. I don't do it that much. And I do early morning workouts, too. And I have-- I've actually gained more lean muscle mass in the amount of time that I've been doing intermittent fasting. But N equals 1 doesn't mean that it works for everyone. But I think your thought process of taking the amino acid-- the BCAAs-- right before CrossFit would definitely help in not having so much degradation take place in your muscles, and those kinds of things.

I'd also say, if you want to get about it, too, to make sure-- even though the BCAAs are limiting factor when it comes to protein breakdown and degradation, and those kind of things, and aids in not that happening, you can also buy EAA, or essentially amino acid complexes, so you get all nine of those amino acids in there, essential amino acids as well.

All right. So thank you for coming today. We're going to get out of here. I'm going to go sit in a sauna, because it's been a long week for me. I'm going to relax. So we have intro-- or "Basics of the Ketogenic Diet" on-- what's our date? Do you remember off the top of your head?

SPEAKER 2: I don't. I believe it's in October.

RAMON SODANO: October.

SPEAKER 2: It's in October.

RAMON SODANO: So we will--

SPEAKER 2: It's coming up soon.

RAMON SODANO: Yeah. So we'll have one. I've already started the lecture on it. So please join us for that. This video will be posted on the Video Vault to make sure you can get those protein sources and things like that. If you ever want to email me directly, that's totally fine. I always answer questions, and my email is going to be wellbeingonline@wsu.edu.

If you ever have questions about any of this kind of stuff, or, hey, I thought about this, or something like that, please hit me up. I actually very much enjoy interacting with you all. And, yeah-- thanks for coming, and enjoy the rest of your night.