>> Rona Brynin: Okay, everything. Hi. This is Chapter 6 on proteins. So there's a lot to proteins that we're going to talk about. First of all, how proteins are different from carbs and fats that we've talking about is that proteins contain nitrogen, whereas the carbs and fats do not. So I know to you, that probably doesn't sound important, but when you eat a lot of meat, for instance, it has a lot of protein. There's a lot of nitrogen that your kidneys now have to excrete. And in some people, especially diabetics or those with high blood pressure, might have a problem with that. Now, when we think of protein for our body, eating protein, we normally think of, well, I need protein for my muscles, but there's a lot more that your body needs protein for. Your proteins, protein that you eat helps to make blood clotting substances so your, you don't bleed to death if you get a cut. It helps maintain proper fluid balance. It helps with hormone production, so your estrogen, testosterone, and thyroid hormone. This all requires enough protein in your diet. Digestive enzymes need protein. Your eyes. Transporting substances in the blood like we talked about in the last chapter – HDLs and LDLs – that's part protein. To repair your cells if you get cuts or scrapes or your organs need repair, you need enough protein. Your muscles, like I've mentioned. Your immune system needs protein to make antibodies. Of course, for your hair, your nails, your skin, you need enough protein. And a lot more, but don't just think protein for muscle. There's a lot more like I just went over that you need protein for. Now, please be familiar with the term "amino acids." Amino acids are what we call the building blocks of protein, and that will be a test question. Building blocks of protein. That means, what are proteins made from? What built them? Well, in your body, anything made of protein had to come from the amino acids. And the amino acids are found in foods with protein. So what an amino acid looks like – they all look the same – there's essential carbon bonded to a hydrogen. There's what we call an amino group, and you can see there's a nitrogen here. A carboxylic acid group – that's an acidic group. And then, there's a side chain that we call the R-group, and there are 20 different amino acids in your body. They're all the same as far as this, these 3, but each 20 amino acid is set apart from the R-group. Each R-group is what makes up each unique amino acid. So please know that. Building blocks of protein is amino acids. Also, what you need to know is that each amino acid is linked together in your body to form proteins, and they're linked together by a bond called a peptide bond. So P for protein, peptide bonds link together the various amino acids to form proteins. I'll show you what that looks like later on. So here's the different parts of amino acid. Just talked about the carboxylic group, carbon bonded to a hydrogen. There's the amino group, the nitrogen, and here's the R-group. So for example, like I said, there are 20 amino acids. Here's one of them, glutamic acid. Well, here's what's the same in all 20 amino acids. Here's that R-group. This is going to be different in each of the 20 amino acids. Okay, so amino acids, they, different combinations of these 20 make up the different proteins in your body. So like I said, there are 20 amino acids, and your body has lots of different proteins that your hair, your nails, your skin, your muscles, et cetera, and they're all made up of these 20 amino acids, but they combine in different orders, in different

combinations to make the hundreds of different proteins in your body. I kind of make the analogy of a set of LEGOs. You know, you might buy a box of LEGOs for your kids. Maybe there's 100 pieces in that LEGO box, but they, your kids can get pretty creative and make all kinds of different things with those, just those 100 pieces, and it's the same with this. Your body is very creative and makes hundreds of different proteins from these 20 amino acids. Now, of the 20, 9 are what we call essential. Eleven are nonessential. So the essential amino acids must be consumed in your diet because your body can't make them, and that's why they're called essential, okay. Your body can't make them. You have to make sure you're getting them. The key is, how do you know? And we will go over that. These are the 9 essential amino acids. You don't need to memorize these. Some of them might look familiar. First of all, the ones that are underlined – isoleucine, leucine, and valine – those are called the branched-chain amino acids. Those of you that are bodybuilders might be familiar with these. Many people that work out at the gym take branched-chain amino acids. They're just special amino acids that also help make fuel for your muscles as well as help build muscle. Lysine here – some people buy this separately as well in the health food store because it helps break, helps prevent herpes breakouts on your lips. Tryptophan – a lot of people have heard of this. This helps make the brain chemical or neurotransmitter called serotonin. Serotonin is very common. So some people have less serotonin than others. Some people with depression take medications to help build the serotonin. Foods with tryptophan like turkey, cottage cheese have a lot of tryptophan and therefore help make extra serotonin. The nonessential amino acids, you don't need to worry about getting them in your diet because your body does make them. And these are the 11 nonessential – again, you don't need to know this, but interests: Tyrosine, for instance, helps make the amino acid dopamine, which helps with a nice mood. It also helps make thyroid hormone. Glutamine helps build muscle. So there's a lot of different ones. Some people go to the health food store and buy amino acid supplements. If you, you know, you don't need to. If you buy whey protein powder, it has usually all of them. Or if you have certain situations where you might want to, you have an extra need, then you can buy them separately. Now, the thing is this – like I said, the essential amino acids you have to make sure you're getting in your diet. If you don't, then certain proteins that your body needs to be made can't be made. So for instance, if – this is where the classroom helps. I usually write this down on the board. Let's say for your hair you need a certain combination of amino acids and in certain orders. Well, let's say you're missing 3 of the 9 essential amino acids. You're just not eating enough foods that have them. Well, what does your body do? Well, it might slow production of new protein – in this case, hair. Maybe your hair will stop growing as fast, might start thinning, or you might start losing it. There are a lot of reasons why your hair doesn't grow or it starts thinning. There's, you know, it might be a thyroid problem, a hormone problem, a stress problem, but one problem could be that you're not getting enough protein. So the point here is if you're missing some of the essential amino acids, eventually your body's going to start breaking down. It may or may not be visible. If it's your hair, it's visible. If

it's something inside your body, an organ or a tissue, you may not see it, of course. Now, here's the key. Like I said, how do you know if you're getting all the 9 essential amino acids? Animal proteins have all the essential amino acids. So if you eat animal proteins, if you eat dairy, or meat, or chicken, or fish, you're going to get all the essential amino acids. This, when we see problems is if you're a vegan, or a vegetarian, or some other kind of health nut where you're not getting enough animal protein. Then, you might be looking into maybe trying to supplement with an amino acid supplement or whey protein powder, which, of course, comes from an animal source. But plant proteins do not contain all 9 essential amino acids. Well, what are plant proteins? Plant proteins are all vegetables, grains, nuts, and seeds. Foods like that are called plant proteins. But soy protein, anything from soy is the only plant protein that contains all 9 essential amino acids. So animal proteins have them all. Plant proteins do not, with the exception of soy. However, you probably have heard soy, in this country, any soy products – soy milk, soybeans, soy, anything made from soy – soy, 95% or so of the soy in this country is GMO, genetically modified, which means that a genetically modified plant has been modified to withstand heavy spraying of Roundup. Roundup is a weed killer. Well, if you spray the soy with Roundup, they'll die, so they have genetically modified the plan to withstand Roundup. But Roundup we know is a, increasing the risk of cancer and also Parkinson's disease. In fact, the government just passed a regulation with Monsanto, the company that makes Roundup, that they must now label it saying "probable carcinogen." So we see, you know, this is the problem with GMO foods, and corn, and soy, and a lot of other products in our country are GMO. But Roundup, if you're using it, I would try to use something more natural because it does increase risk of cancer and Parkinson's disease. They find that farmers that are exposed to a lot of it have increased risk. So anyway, long story short, I would avoid soy protein. Soy also interferes with your thyroid gland function, so, and it also has estrogen effects, which you definitely do not want to give to a child who's still growing. Okay, so please know that. Please know that the animal proteins contain all 9 essential. And because they do, they're called complete proteins. So please know that for the quiz. A complete protein is a protein that contains all 9 essential amino acids. Those are the animal proteins. Plant proteins are called incomplete proteins because they're lacking an essential amino acid. Now, there is something called complementary proteins. To complement means to add to, and in this case, a complementary protein is using 2 or more plant proteins to make a complete protein. So for instance, beans and rice is your typical complementary protein. And I think I have a slide, yes. Beans and rice. So here, we've got the rice. Rice is missing the amino acid lysine. And then, you've got the beans, and beans has lysine, but it's missing methionine. So if you have rice and beans, you have a complete protein now because now the beans is missing what the rice has, and the rice has what the beans are missing. If you have rice and let's say some shaved or sliced almonds in it, that is not a complete protein because both of these are missing the lysine, okay. But let's say you have a big bowl of rice with vegetables. Well, now, that's a complete protein. Or a bunch of vegetables with

nuts. That's a complete protein. And you get the picture here. So this is a great chart from your textbook. So if you're a vegan or vegetarian, this would be a good idea to keep handy to make sure you're getting all the essential amino acids. Okay, actually, I'm going to stop the video here, and we'll take off. This is a big topic. We'll finish Part 1 here, and please continue with Part 2.