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This week, I spoke with Luc van Loon, PhD. He is regarded by many as the world's leading expert on human protein needs. The other person at the top of the list is Stuart Phillips, who I interviewed in [episode 11](#).

Your skeletal muscle is remade constantly, broken down and built up. It renews at a rate of about 1-2% per day, which means that in 50-100 days you've made a completely new muscle.

Both eating and exercise stimulate muscle protein synthesis, and there is a synergy between these. There are different protein needs for general health vs for supporting training adaptations. For health, you require about 0.8 g of protein for every kilogram of body mass (0.8 g PRO/kg/d). For an athlete in training, 1.2-1.6 g PRO/kg/d is needed to meet the additional requirements.

The conclusion of many years of research is that 20-25 g PRO can be absorbed and metabolized every 4-5 hours. This is because you can utilize 20-25 g for synthesis in muscle, but you can't use much more at one time. Consuming more protein than you can use does not have negative health consequences as far as we know. Your kidneys appear to handle the excess without any problems. About 10% of the protein you ingest will go into skeletal muscle protein synthesis (2.0-2.2 g PRO on a 20 g meal) within 6 hours after

the meal. Excess is oxidized (used for energy) and possibly converted to fat. Generally, about 5% of our energy comes from protein.

Nighttime?

It's long been thought that muscle protein synthesis at night is quite low. That's true if you don't eat before bed. Dr. van Loon's research group discovered that protein consumed immediately before bed is synthesized just as well as it is during the day. What does this mean for you? Time your protein meals throughout the day as outlined above and include a protein meal before bed. It doesn't matter if it's immediately before bed or up to an hour before, just have the meal near bedtime. Dr. van Loon's group also discovered that your bedtime protein meal doesn't affect utilization of protein in your breakfast meal. So, you can start your next day with 20-25 g PRO at breakfast.

Intake of other macronutrients, carbohydrates and fats, does not affect the utilization of the protein. So, don't be concerned about whether you have carbs or fats as part of the meal.

For long training sessions, it may be a good idea to consume some protein during exercise because protein synthesis is stimulated within an hour into your run. It may be useful to consume some protein thereafter to stay on track with spreading out your daily intake and to maximize the opportunity to use it for synthesis. However, that's Dr. van Loon's hypothesis; there is very little data on this specific topic.

Sex?

Should female athletes think differently about protein? Recommendations for women are not different than for men. Post-exercise synthesis is similar and long-term training adaptations are similar between men and women. Your focus should be on your own body mass and the amount of muscle active during your training session.

Age?

Sensitivity to exercise-stimulated muscle protein synthesis appears to be similar across ages for the same absolute workload, like for running the same route at the same pace. But, it's important to appreciate that the same absolute workload in elderly athletes will often be a higher relative effort than the same workload for a younger athlete because our maximum capacity tends to decline

with age. So, to get the same stimulus for protein synthesis, the older athlete will have to train at a higher perceived effort than they did when they were younger.

Quality?

Does each protein meal need to include all of the essential amino acids (a complete protein)? Not necessarily. Incomplete proteins, and even a limited number of amino acids, will stimulate muscle protein synthesis. However, to make proteins in the muscle, all (or most) amino acids are required. While you're better off eating complete protein meals if you can, don't stress too much about it as long as you're getting complete protein balance throughout the day.

Plant or animal protein?

Dr. van Loon's group has shown that there is no difference in protein synthesis whether it comes from plant or animal sources as long as the same amount of protein is consumed with all the needed amino acids.

Detraining?

In just one week of bed rest, you will lose 1.0-1.5 kilograms (2.2-3.3 pounds) of muscle. Bed rest decreases the sensitivity to both exercise-stimulated and eating-stimulated muscle synthesis. If you must be on bed rest, your caloric intake will decrease, and the absolute amount of protein you consume will also decrease. In this case you should consume a higher percentage of your calories from protein to restore (or nearly restore) the absolute amount of protein intake as during training; this may help to slow the loss of muscle mass. It does not appear that exercise of one muscle group can save muscle in an immobile group. For example, exercising your upper body does not stimulate protein synthesis in your legs. You have to contract each muscle to stimulate its maintenance.

Your take-home recommendations:

- Consume 1.2-1.6 g PRO/kg/d ([Dr. Phillips recommended 1.8 g PRO/kg/d](#))
- Divide this into meals of 20-25 g PRO but no more because excess won't be used efficiently for protein synthesis in the body
- Separate those meals by 4-5 hrs throughout the day. The time between meals should be proportionally less if the amount of protein in the meal is

less

- Have a protein meal right after exercise
- Have a protein meal at bedtime

Below is a list of some of the papers we discussed during the episode.

For a full list of Dr. van Loon's research on protein, click [HERE](#)

1. [Post-Prandial Protein Handling: You Are What You Just Ate](#)
2. [Protein ingestion before sleep improves postexercise overnight recovery](#)
3. [Pre-sleep protein ingestion does not compromise the muscle protein synthetic response to protein ingested the following morning](#)
4. [Strategies to maintain skeletal muscle mass in the injured athlete: nutritional considerations and exercise mimetics](#)
5. [Skeletal muscle disuse atrophy is not attenuated by dietary protein supplementation in healthy older men](#)
6. [Prolonged Adaptation to a Low or High Protein Diet Does Not Modulate Basal Muscle Protein Synthesis Rates - A Substudy](#)
7. [Habituation to low or high protein intake does not modulate basal or postprandial muscle protein synthesis rates: a randomized trial](#)
8. [Ingestion of Wheat Protein Increases In Vivo Muscle Protein Synthesis Rates in Healthy Older Men in a Randomized Trial](#)
9. [What is the Optimal Amount of Protein to Support Post-Exercise Skeletal Muscle Reconditioning in the Older Adult?](#)
10. [Dietary protein for athletes: from requirements to optimum adaptation](#)

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All the Best,

Shawn

Chief Running Officer, [Science Of Ultra](#)

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