the Power of Protein

A symposium on protein in performance and recovery: from science to practice

Scientists unlock the secrets of the food matrix

Research is revealing the role played by the food matrix in stimulating muscle protein synthesis and aiding its recovery after exercise, according to Luc van Loon, Professor of Physiology of Exercise and Nutrition at Maastricht University Medical Centre, The Netherlands.

The findings underpin a growing body of opinion among experts that more attention should be directed towards the importance of whole foods and the diet, rather than the use of supplements, to support muscle health.

A major determinant of protein digestion and absorption, the food matrix is governed by a host of factors that interact within a whole food to shape how the protein behaves in the body, said Professor van Loon.

Speaking about the central role of dietary protein in driving the process of muscle rebuilding, Professor van Loon underlined the importance of considering the food matrix when giving dietary guidance.

***Lausanne, Switzerland**, was the venue for the 31st European College of Sport Science Annual Congress, held 7-10 July 2026. Nearly 3,000 delegates from around the world registered for this major event, which also hosted the Danone Research sponsored symposium, **The Power of Protein in Performance and Recovery: From Science to Practice**. Here leading experts shared how advances in protein science are creating new opportunities for athlete support.*

Anabolic response

Muscle tissue remains in a continuous state of turnover, allowing the body to adapt to training, recovery, and daily physical activity. Research has shown that consuming around 20 g protein can stimulate muscle protein synthesis for up to six hours, while larger amounts may prolong the anabolic response even further.[1]

But it's not just how much protein we eat that's important, Professor van Loon said. The body's anabolic

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It's time for a fresh look at protein

The research world has entered a new phase of protein science – shifting away from understanding proteins in isolation and instead focusing on protein within the matrix of the foods we eat.

'Due to the food matrix, the protein in whole foods can have a different effect on muscle protein synthesis rates from what can be expected from the total of the individual amino acids,' said Dr Andrew Holwerda, Senior Team Leader Muscle at Danone Nutricia Research, The Netherlands.

Introducing the symposium, Dr Holwerda said that Danone, with its track record of innovation in muscle health in frail older people, is focusing on gaining insight into the impact of food matrices of its consumer products – and how this affects muscle performance and recovery. 'We want to assess the specific impact of our products, rather than extrapolating benefits for athletes and active people from generic science,' he said.

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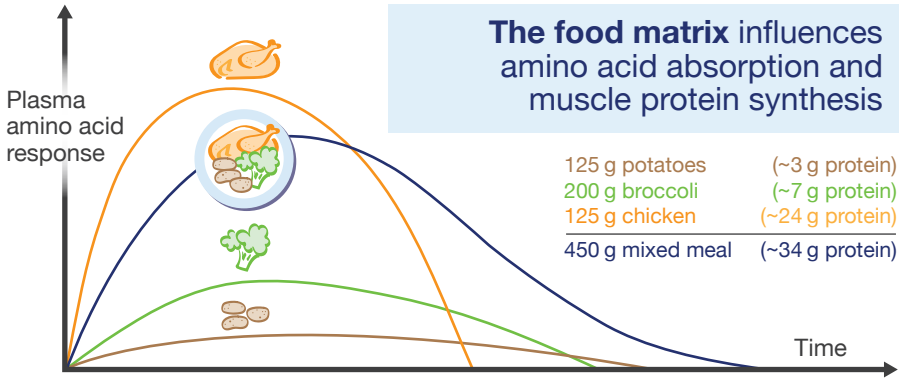
Secrets of the food matrix



The food matrix influences amino acid absorption and muscle protein synthesis

125 g potatoes	(~3 g protein)
200 g broccoli	(~7 g protein)
125 g chicken	(~24 g protein)
450 g mixed meal	(~34 g protein)

Professor Luc van Loon

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response also depends on protein quality, digestion, and the food matrix via which nutrients are delivered.

'Protein sources that are more rapidly digested and absorbed – and which contain a balanced profile of essential amino acids – generally stimulate muscle protein synthesis to a greater extent,' said Professor van Loon. For example, whey proteins in dairy products are especially effective for recovery and muscle adaptation, he explained. They are rapidly digested, quickly entering the circulation and becoming accessible to muscle tissue.[2]

> ***"The metabolic response to eating protein also depends on the matrix in which the proteins are encompassed."***

Food preparation

As well as protein content of a food, food preparation – meaning anything that is done to food before you swallow it – can alter how quickly amino acids appear in the bloodstream. Not only is industrial manufacturing of foods important, so too is what we do to our food in our own homes. Chopping, blending, and cooking can all affect protein bioavailability and functionality.

Cooking eggs, for example, denatures proteins and makes them easier to digest and absorb. In contrast, heating milk proteins in the presence of carbohydrates may lead to their glycation, hence reducing the bioavailability of certain amino acids, Professor van Loon said.[3]

Even the way we eat our food can make a difference. 'Sitting upright and chewing well both contribute to more rapid protein digestion and amino acid absorption.'

Food priority

Despite growing consumer interest in protein supplements, Professor van Loon cautioned against focusing too heavily on supplemental protein. It's better to prioritise protein intake from regular meals.

'Often, athletes, coaches and dietitians are interested in the amount of protein they consume as supplements, but don't know how much protein they consume in their normal diet,' he said.

'The protein in your normal diet should be the majority of the protein you consume.'

While protein should be included in every main meal, protein-rich snacks and supplements may still have a useful role, particularly after exercise when rapidly digested proteins can provide amino acids quickly to recovering muscles.

Future research

'We know a lot about protein concentrates and isolates, but we know much less about how the body responds to meals and whole food products,' Professor van Loon said.

So the future challenge for researchers is to understand how different proteins interact within real-world eating patterns. Most current research examines isolated proteins in people who have fasted overnight, so it does not reflect the real world where people typically eat a mixture of foods during meals and snacks throughout the day, he explained.

'Every meal has a food matrix, every supplement has a matrix, but then those matrices also overlap. How protein supplements interact when we consume them together with, or in between, normal meals is unclear.'

Practical advice

For now, Professor van Loon believes the key practical advice remains simple: stay physically active, consume sufficient protein across regular meals and remember that nutrition works best within the broader context of an overall healthy lifestyle.

References

1. Moore DR, Robinson MJ, Fry JL, *et al.* *Am J Clin Nutr.* 2009;89(1):161-168.
2. Pennings B, Boirie Y, Senden JM, *et al.* *Am J Clin Nutr.* 2011;93(5):997-1005.
3. Fuchs CJ, Hermans WJ, Smeets JS, *et al.* *J Nutr.* 2022;152(11):2376-2386.

Myths de-bunked

Research has dispelled longstanding concerns about high protein intake, according to the symposium experts, Professor Phillips, Professor Rodriguez, and Professor van Loon.

Do high levels of dietary protein contribute to kidney failure?

No: Most evidence is neutral, showing no association with protein intake either for or against kidney health.

Does high protein intake increase blood acidity and cause calcium loss?

No: This theory has largely been disproven. Current evidence suggests that, when calcium and vitamin D intake are adequate, protein intake may support bone health.

Are high levels of protein intake over time associated with a shorter lifespan?

No: The relationship between protein intake and longevity is complex. While some animal studies suggest low-protein diets may extend lifespan, this is not supported by human data.

Rethinking protein: why quality and quantity count

The trend for eating more protein than is recommended in guidelines is backed by science and gaining the support of experts as the evidence strengthens, according to Stuart Phillips, Professor of Kinesiology in the Faculty of Science at McMaster University, Canada.

But it's still important for health professionals to tailor protein advice according to an individual's physical activity level, health status and overall dietary quality, he said.

Speaking on the protein variables that matter most for muscle health, Professor Phillips said that both quality and quantity should be considered when it comes to giving advice on dietary protein.

Alongside physical activity, stepping up protein intake above the minimum recommendation can help support muscle growth, athletic performance and healthy ageing. But so too can the type of protein sources, he said.

Protein trends

High-protein foods have gained popularity in recent years as a way of increasing satiety, encouraging weight loss and building muscle mass. Growing evidence suggests many physically active adults and older people benefit from consuming more protein than the standard recommended daily allowance of 0.8 g/kg body weight.[1]

'For older people and athletes, daily intakes of around 1.2 to 1.6 g/kg body weight are associated with better outcomes,' said Professor Phillips.

These higher protein intakes can help athletes optimise both aerobic fitness and muscular development, recovery and performance. For older people, higher protein intakes may help slow the natural decline in muscle mass and physical function that come with ageing.[1]

Increasing protein intake does not mean having to take supplements, he said. The increased levels can all be achieved through eating 'real' foods – for example, adding a high protein yogurt to breakfast.

But protein can't do it alone – it's important to remind people that exercise remains the primary stimulus enabling the body to use dietary protein effectively for muscle synthesis, Professor Phillips said.[2]

> *"Optimal protein intake – up to 1.6 g/kg body weight per day – can usually be achieved through real food, which contains other nutrients that your body needs."*

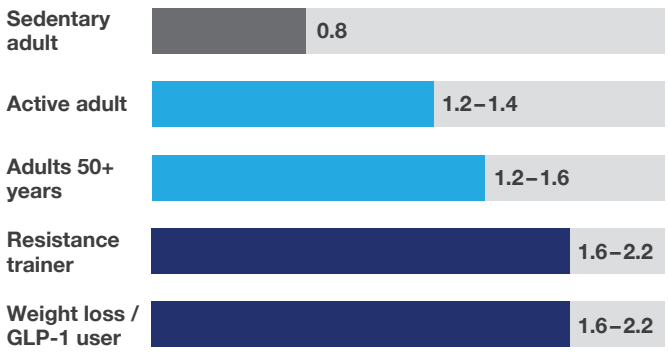
Weight loss

This relationship between exercise and protein is especially important in populations vulnerable to muscle loss, including older adults and people using GLP-1 weight loss medications, having low energy intake. Rapid weight loss can result in significant reductions in lean body mass unless the strategy includes exercise and adequate protein intake.

Individual needs

Among the nine essential amino acids, leucine in particular stands out as playing a critical role in stimulating the anabolic process of building new muscle. In younger people, the delivery of leucine fires up an efficient response. But in older people, this response is muted, so more high-quality protein may be needed to achieve the same effect.[3]

Protein needs by population group
g/kg/day



Professor Stuart Phillips

Endurance sports

While protein is associated primarily with strength training and muscle building, Professor Phillips pointed out that endurance athletes may also need more protein due to the large amounts of energy they expend during prolonged exercise.[2]

'Ironically, leucine – the amino acid responsible for stimulating muscle protein synthesis – is most readily used as fuel during endurance exercise,' he explained. 'So it makes sense that endurance athletes would benefit from more protein.'

Quality matters

Not all protein sources provide the same balance of essential amino acids. Dairy proteins are especially high quality because they naturally contain high concentrations of leucine and other essential amino acids, making them particularly effective at supporting muscle protein synthesis, Professor Phillips said.

Apart from soy, plant proteins generally contain lower amounts of some essential amino acids. This means having to eat larger portions or complementary sources of plant protein. Combinations such as grains and legumes can balance each other out with respect to their limiting essential amino acids, allowing protein needs to be met.

Whole foods

Professor Phillips cautioned against assuming that more protein is always better. Protein remains only one component of a balanced diet, and eating whole foods provides a wider range of nutrients important for overall health and performance.

References

1. Nunes EA, Colenso-Semple L, McKellar SR, *et al*. *J Cachexia Sarcopenia Muscle*. 2022;13(2):795-810.
2. Lin Y-N, Tseng T-T, Knuiman P, *et al*. *Clin Nutr*. 2021;40(5):3123-3132.
3. Szwiega S, Pencharz PB, Rafii M, *et al*. *Am J Clin Nutr*. 2021;113(2):410-419.

Protein matters most when athletes cut calories

Protein plays a critical role in helping athletes maintain their performance, recovery, and muscle mass when they're curbing calories, according to Nancy Rodriguez, Professor Emerita in the Department of Nutritional Sciences at the University of Connecticut, USA.

Speaking about nutritional strategies for athletes managing their body weight, Professor Rodriguez called for carefully designed weight loss programmes to avoid compromising their muscle and athletic performance.

She warned that when athletes rapidly lose weight, aggressive energy restriction can put the body into a catabolic state, where muscle protein is broken down to meet energy demands.

'Energy restriction should be managed so that athletes are not wasting their muscle in order to meet their fuel needs,' Professor Rodriguez said.

> *"Applying the basics of macronutrient metabolism and energy balance will best guide sports dietitians to their successes with individual athletes and teams."*

Protein recommendations for athletes generally range from around 1.2 to 2.0 g/kg body weight per day, she said.[1] This range gives dietitians flexibility to tailor meal plans depending on the athlete's sport, training demands, and energy needs.

For athletes, protein intake is particularly important when trying to preserve or build lean muscle mass during demanding training schedules or periods of calorie restriction.

If overall energy intake drops too low, amino acids from muscle may be used by the body as fuel instead of supporting recovery and adaptation.[2]

Professor Rodriguez said, 'If you want to build muscle, you need a positive energy balance. With an energy deficit, we're trying to reach a state that minimises protein use as a fuel – higher protein intake can help.'

Nutrient balance

However, she warned that higher protein intake should not displace carbohydrate in the diet of most athletes. Even while athletes are needing to restrict energy intake, carbohydrate remains a priority fuel source for the body, particularly for replenishing glycogen stores. Fat is also important as a concentrated energy source, especially during rest and lower-intensity activity.

'When glycogen is not available from carbohydrate intake, muscle may be broken down to provide energy,' she said. Whether an athlete's muscles will be spared during calorie restriction depends on how much they cut calories and for how long.[3]

'If carbohydrates are not meeting an athlete's needs to replenish glycogen, the athlete may need to reduce protein intake a bit and increase carbohydrate intake.'

Food first…

Rather than focusing solely on nutrient targets, Professor Rodriguez advocated for a practical meal-based approach that integrates protein throughout the day.

Although evidence remains inconclusive about whether evenly distributing protein intake maximises muscle protein synthesis, she believes that providing regular high-protein meals and snacks can help athletes meet their protein targets without needing to take supplements.

'When an athlete eats every four to six hours and protein is dispersed throughout those meal patterns, theoretically their muscle will be better maintained and their recovery enhanced,' she said.

As for food choices, dairy products are a versatile source of high-quality protein, said Professor Rodriguez. Dairy foods contain fast- and slow-acting proteins that provide both rapid and sustained increases in essential amino acids.

Professor Nancy Rodriguez

…Supplements second

Protein supplements can play a role when integrated appropriately into an athlete's overall eating pattern, Professor Rodriguez suggested. For example, there may be times when it is more convenient to have a protein supplement – or the athlete may just be struggling to eat enough during periods of intense training.

Supplements should complement rather than replace balanced meals, and practitioners guiding athletes should keep a close eye on the calorie contribution from supplements. It's easy to under-estimate the additional energy provided by protein-fortified products, which can contribute to weight gain if not incorporated carefully into the diet, Professor Rodriguez pointed out.

Back to basics

Successful nutrition strategies depend on support not only from the athletes themselves, but also from their coaches, trainers, and nutritionists. Professor Rodriguez suggested that sports dietitians effectively translate foundational principles of metabolism and energy balance when working with athletes during prescribed or unintentional periods of negative energy balance.

References

1. Thomas DT, Erdman KA, Burke LM. *Med Sci Sports Exerc*. 2016;48(3):543-568.
2. Longland TM, Oikawa SY, Mitchell CJ, *et al*. *Am J Clin Nutr*. 2016;103(3):738-746.
3. Howarth KR, Phillips SM, MacDonald MJ, *et al*. *J Appl Physiol (1985)*. 2010;109(2):431-48.

Five steps towards successful dietary strategies

1. Estimate overall energy needs
2. Define recommended protein intake (1.2 – 2.0 g/kg/day)
3. Distribute calories among macronutrients (protein, carbohydrate, fat)
4. A whole food approach should be prioritised, supplements coming second
5. Example breakfast: 3 starch, 1 whole-milk, 1 fruit, 2 medium fat protein