



Animal Protein versus Plant Protein in Sports Nutrition

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Introduction

In sports nutrition, protein is one of the most crucial nutrients since amino acids derived from dietary protein can be used to facilitate muscle protein synthesis, recovery from exercise, tissue repair and adaptation to exercise. But the nutritional value of a protein source is not only dependent on the total protein content. The protein source's ability to support exercise adaptation can be affected by its essential amino-acid composition, Leucine content, digestibility and bioavailability as well as protein intake. Protein can be derived from both animal and plant sources like milk, dairy products, eggs, fish and meat, pulses, peas, beans, cereals, nuts and seeds.

Animal Protein

Animal proteins tend to be high quality proteins as many contain all the nine essential amino acids in favourable proportions, and are easily digested. Dairy protein, especially whey protein, is fairly rich in one of the essential amino acids, leucine, which is important for stimulating muscle protein synthesis. Protein is also a valuable nutrient in eggs, fish, meat and dairy products, which are part of an athlete's diet. Animal proteins are easy to use for athletes, especially when they need a concentrated

protein, because they are also high in protein with a good digestibility and amino-acid composition (Ashtary-Larky, 2025).

Plant Protein

Plant protein sources include soy, pea, lentil, chickpeas, beans, cereals, nuts and seeds. The nutritional value of the sources is very different. Some plant proteins contain all the nine essential amino acids while others have relatively less quantity of some amino acids. These proteins might be less digestible than some animal proteins as proteins are present inside the plant cellular structures and may be broken down along with fibre and other foods that can affect protein digestibility and availability of amino acids. However, the protein intake, as well as the type of foods, the processing, and the combination of proteins can be helpful in addressing these differences.

Amino Acids and Leucine

Athletes are especially dependent on certain aminoacids because the body cannot produce enough of the nine essential amino acids. Leucine is one of these and has a very special function in controlling muscle protein synthesis. Some animal proteins, such as whey, have relatively high levels of leucine. The quantity and the protein quality, in terms of leucine, are

especially important when planning an athlete's diet, as some plant proteins supply less leucine per gram of protein.

Recent studies have shown that the leucine is the muscle protein synthesis response that is influenced by the content of protein. A plant protein isolate with added leucine showed improved muscle protein synthesis response compared with the non-supplemented plant protein in the randomized crossover study, though the response to the leucine-enriched protein was similar to whey protein. The differences in amino-acid composition could be solved by the proper formulation of plant proteins (Lim *et al.*, 2024).

Digestibility and Protein Quality

Another factor to consider is digestibility of animal and plant proteins. For tissue synthesis, protein has to be broken down into amino acids and then absorbed. The digestibility of many protein sources of animal origin is high, while digestibility of plant proteins is widely different. The availability of amino acids may be affected by various factors including the plant matrix, fibre content, process and other food components. However, for athletes the quality of protein should be taken into account along with the quantity and diet patterns. If protein and essential amino acids are supplied with a varied diet, the digestibility or concentration of a particular plant protein may not be a factor of protein inadequacy.

Plant protein vs animal protein

The main differences between animal and plant protein are in their amino acid composition, digestibility and leucine content. Plant proteins are low in the essential amino acids and animal

proteins are usually rich in leucine. Pea, brown rice and canola proteins in combination caused a similar stimulation of post exercise myofibrillar protein synthesis to whey in resistance trained adults (Van der Heijden *et al.*, 2024). Plant-protein supplementation has also been linked to improvements in athletic outcomes; however, the effects can differ depending on outcome and protein source (Zhao *et al.*, 2024). Another systematic review also reported no negative impacts on body composition or athletic performance, but highlighted a lack of evidence in elite athletes (Presti *et al.*, 2024).

On the other hand, a meta-analysis indicated there was a small overall effect of animal protein on muscle mass, though there was no significant difference between the muscle strength and physical performance of plant and animal proteins (Reid-McCann *et al.*, 2025). Likewise, in a resistance training study, similar gains in lean mass, muscle size and strength were observed with soy-pea protein and whey protein (Hindermann Santini *et al.*, 2025). In general, both protein sources can be used to support sports performance as long as adequate protein and nutritional needs are achieved. Athletes who are consuming plant proteins should ensure they are consuming sufficient amounts, practice using a variety of sources of protein and spread them out over the meals. Individual preference, nutrition and overall diet should therefore be taken into account when deciding between animal or vegetation protein.

Conclusion

As long as they are part of a balanced diet and consumed in appropriate amounts, all animal and plant proteins are effective in sports nutrition. Animal proteins often contain protein that is

easily digested and has all of the essential amino acids and contains a high amount of leucine, a crucial component in muscle growth, whereas plant proteins may contain protein in addition to fibre, micronutrients, and also bioactive compounds. The nutritional quality of plant proteins varies according to the source, therefore two or more plant proteins may be combined to enhance their amino-acid adequacy. Therefore, the focus for athletes needs to be on total protein intake, quality of the protein, the amount of leucine, digestibility, protein spread throughout the meal or day and on overall protein in the diet and not on just one protein source. Either animal or plant protein or a combination of both, in an appropriate dose, can facilitate muscle protein production, recovery from training; adaptations to training, and athletic performance, a varied diet can accomplish all these goals.

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