Protein Consumption in Sports: Enhancing Strength and Endurance

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1. Abstract

There have been numerous studies on what the diet of an athlete should consist of, however there are controversial opinions in this regard, raising further questions, whether it is proteins or rather carbohydrates that really enhances the performance of physically active individuals. Athletes are usually associated with significant protein intake, and it is generally believed, that proteins should be the main components of their diets and the carbohydrate and fat intake should be reduced as much as possible. According to some studies, the highest source of energy lies in carbohydrates and fats, suggesting that athletes are in great need of these nutrients, as their body uses up significant amount of energy during exercise. They not only place a big emphasis on carbohydrate and fat consumption, but it has also been proven in certain experiments that the body cannot utilize proteins, no matter the amount, unless it is consumed together with carbohydrates and fats. Other studies have elaborated on the fact that the necessary protein intake cannot be generally stated, since it is highly dependent on different aspects, such as the gender of the athlete, or whether the individual is an endurance or strength athlete. It has been investigated as well, that although some plants have a high protein content, the proteins that can be utilized by the body to the highest extent are of animal origin, such as meat and dairy products.

Keywords: protein, athlete, diet, carbohydrates, fat, nutrition

2. Introduction

Proteins and their building blocks, amino acids, play essential roles in numerous physiological processes, including hormonal regulation, immune function, coagulation, and cellular metabolism. It is then not surprising that, given the increased physical demands placed on athletes, they require a higher daily protein intake than an average human.

We may question, however, whether these, nowadays very popular high protein diets, are really what the body of an athlete needs or if there are other nutritional requirements to increase performance.

In this review we are going to investigate how much protein the body of an athlete needs in order to maintain high performance and body weight, taking into consideration multiple influencing factors, such as intensity or the type of physical activity the muscles and body are subjected to. It will also be discussed how carbohydrates and fats affect our bodies and the utilization of protein and whether they are necessary or harmful for the physical activity of athletes. A question will be raised regarding what the best sources of protein are, and proteins originating from animals and plants will be compared.

3. Role of nutrition in athletic performance

The composition of the diet of athletes differ greatly depending on whether the individual is occupied with endurance (e.g.: running) or strength (e.g.: weightlifting) training, as not every sport is characterized by a high level of energy expenditure. While a low-energy intake might be beneficial for strength training, it might be harmful for endurance training, where there is constant need for energy.

3.1. Protein requirements for athletes

In response to exercise, the rate of muscle protein synthesis and breakdown are stimulated and additionally, new muscle mitochondrial proteins are synthesized. Although exercise appears to be among the biggest driving forces of muscle protein synthesis, without a great amount of amino acids, the skeletal muscle cannot be switched from the catabolic state, during which a temporary muscle protein loss takes place, to the anabolic state, where the temporary muscle protein gain takes place. During endurance exercise, approximately 6% of the total energy used up is derived from the oxidation of amino acids, as endurance exercise has proven to increase the rate of amino acid oxidation. Thus, we can state, that dietary proteins have a key role in facilitating the repair of damaged proteins and the synthesis of new muscle proteins of endurance athletes.

According to the World Health Organization (WHO) the general protein intake of an adult, independent of gender, should be 0.83 g/bodyweight kg/day. For those undertaking endurance training, the protein intake should be between 1.2 and 1.4 g/bodyweight kg/day, whereas for strength-trained athletes a higher protein intake is recommended, namely 1.6-1.7 g/bodyweight kg/day, although it is generally believed that the protein recommendations and dietary requirements should be individualized for every athlete.

A study aimed at examining the physiological response of athletes to protein intake from various sources has found that there is no direct relationship between protein intake and muscle strength, however it may positively influence endurance performance, especially when consumed together with carbohydrates. Other studies also suggest that athletes at the beginning of a new training cycle have higher protein requirements compared to those, who have already adapted to an intense exercise and that a higher protein supplement dosage is only reasonable in specific training situations and for limited periods of time. Based on this, the harmful effects of excessive protein intake need to be taken into consideration as well. Although the European Food Safety Authority (EFSA) has not set upper limits regarding the

tolerable intake level of protein, excessive protein intake for an extended period of time might have harmful effects on kidney function. This is due to the fact that as the amino groups of amino acids in proteins are converted to urea for detoxification and are excreted from the body in the form of urine, a loss of fluid in the body takes place, therefore it is crucial to ensure an adequate amount of fluid intake as well.

3.2. Importance of carbohydrates and fats

Nowadays it is becoming ever more popular to consume high-protein and low-carbohydrate and fat products, however according to some studies both carbohydrates and fats play a key role in the proper utilization of proteins and in maximizing performance. A large amount of the energy requirement of training is met by the oxidation of fats and carbohydrates. Thus, we can say that carbohydrates and fats cannot be replaced by proteins during endurance training, as it does not improve performance, nay, it may even result in a reduced performance.

During exercise, glycogen is used up from the liver and the resynthesis is greatly influenced by the amount of carbohydrate supplied through the diet. During periods of intensive training around 8-10g/bodyweight kg/day of carbohydrates should be consumed, however this may differ depending on the volume and intensity of the training. As the rate of glycogen synthesis is the highest immediately after training, recovery can be enhanced by consuming carbohydrates at this time. To further increase the rapidity of recovery, high-glycemic index foods may be consumed, although it is generally believed, that the amount of carbohydrates consumed is more important than the type and quality.

Similarly, during an intense exercise, high levels of energy will be needed, and after the intensity of energy derivation from the oxidization of carbohydrates is reduced, the energy obtained by the oxidation of fatty acids will have an increased role in maintaining the energy supply. Therefore, the necessary energy intake can be met through the consumption of proteins and carbohydrates supplemented with fats.

3.3. High quality protein sources

The quality of proteins can be best described by their amino acid composition and their digestion and absorption rate. Based on this, animal proteins are considered high quality proteins, as they contain a high amount of essential amino acids that need to be obtained through diet. Due to their digestible-indispensable amino acid score, dairy proteins are accounted for as the highest quality proteins. Generally, vegetables are considered to be low

quality protein sources, as their essential amino acid content is low, however soy protein can be categorized as a high-quality protein.

According to some studies, on the other hand, no single protein source significantly outperforms another in stimulating muscle protein synthesis. Thus, it is recommended for athletes to incorporate different sources of protein into their meals to insure a varied and balanced diet. However, complete proteins, having the highest proportion of essential amino acids, should be prioritized by athletes, otherwise incomplete proteins should be combined carefully to achieve a complete amino acid spectrum. The study also states that no evidence can be found that animal proteins would prove to be more advantageous in comparison to plant proteins, and it places an emphasis on plant protein consumption as plants are also rich in fibers and vitamins, although they have a lower percentage of essential amino acids.

4. Conclusion

This review has examined the role of protein consumption in athletic performance, particularly focusing on how dietary protein supports muscle maintenance, strength, and recovery in both endurance and strength-trained athletes. It is evident that while proteins play a vital role in muscle protein synthesis, their function is largely influenced by the total dietary intake, exercise type, and training phase.

A key point has been, that increased protein is required for athletes, undergoing intensive training or initiating a new training cycle. A frequently suggested beneficial intake range of protein is 1.2–1.7 g/kg/day for most athletes, depending on the nature of the activity. However, exceeding this intake may result in no additional performance benefit and can cause damage to the kidney function, particularly in the absence of adequate hydration.

This review has also emphasized the interdependence between protein, carbohydrate, and fat intake. Although protein is essential for muscle recovery and synthesis, it is not a primary energy source during exercise. Both carbohydrates and fats are crucial substrates for energy metabolism and are critical for optimizing athletic performance. The recent trend toward high-protein, low-carbohydrate diets may therefore overlook the need for these macronutrients in both performance and recovery.

In terms of protein sources, while animal-derived proteins generally contain a higher percentage of essential amino acids and exhibit greater digestibility, recent studies indicate that no single protein source is significantly more beneficious than others in terms of the promotion of muscle protein synthesis. This suggests that balancing both animal and plant proteins leads to a more balanced protein intake.

Although there have been numerous studies aimed at the investigation of the role and importance of proteins, the findings have proven to be inconsistent. There is constant debate about the necessity of increased protein intake for athletes and whether it is reasonable to consume protein in the form of supplements or if it is sufficient if the required amount of protein is consumed through a diet rich in high-quality protein.

5. References

1. König, D., Carlsohn, A., Braun, H., Großhauser, M., Lampen, A., Mosler, S., Nieß, A., Schäbethal, K., Schek, A., Stehle, P., Virmani, K., Ziegenhagen, R., & Heseker, H. (2020). **Position of the Working Group Sports Nutrition of the German Nutrition Society (DGE): Protein intake in sports**. *Deutsche Zeitschrift für Sportmedizin*, *71*, 192–198. https://doi.org/10.5960/dzsm.2020.450

2. Maughan, R. J. (2002). **The athlete's diet: Nutritional goals and dietary strategies**. *Proceedings of the Nutrition Society*, *61*(1), 87–96. https://doi.org/10.1079/PNS2001132

3. Zhao, S., Zhang, H., Xu, Y., Li, J., Du, S., & Ning, Z. (2024). **The effect of protein intake on athletic performance: A systematic review and meta-analysis**.

4. Witard, O. C., Hearris, M., & Morgan, P. T. (2025). **Protein nutrition for endurance athletes: A metabolic focus on promoting recovery and training adaptation**.

5. Pasiakos, S. M. (2015). **Metabolic advantages of higher protein diets and benefits of dairy foods on weight management, glycemic regulation, and bone**. *Nutrition Today*, *50*(4), 190–198. https://doi.org/10.1097/NT.0000000000000102