



Health effects of the consumption of high-protein diets in strength athletes

Efectos en la salud del consumo de dietas hiperproteicas en deportistas de fuerza

Flor Betzabet Morocho-Quinchuela¹✉ , Ronelsys Martínez-Martínez¹ , Melany Yamilex Reascos-Chalacán¹ 

¹Universidad Regional Autónoma de los Andes. Ambato, Ecuador.

Received: July 18, 2023

Accepted: October 05, 2023

Published: November 20, 2023

Citar como: Morocho-Quinchuela FB, Martínez-Martínez R, Reascos-Chalacán MY Efectos en la salud del consumo de dietas hiperproteicas en deportistas de fuerza. Rev Ciencias Médicas [Internet]. 2023 [citado: fecha de acceso]; 27(2023): e6214. Disponible en: <http://revcmpinar.sld.cu/index.php/publicaciones/article/view/6214>

ABSTRACT

Introduction: hyperprotein diets are characterized by a higher protein intake compared to the usual dietary recommendations, so that it has achieved an enormous diffusion especially in the sports field as a way to increase muscle mass and improve sports performance in strength athletes.

Objective: to describe the health effects of the consumption of high-protein diets in strength athletes.

Methods: a bibliographic review was carried out using articles obtained from a search of information in the SciELO, Scopus, Redalyc and Dialnet databases. An advanced search formula was used.

Results: the consumption of this type of diet can vary significantly depending on the type of sport and the energy needs of each athlete. Although protein is an essential nutrient for growth, development, maintenance and muscle repair, a high protein intake can have negative effects on health, the main ones being: damage to renal function, alteration of electrolyte balance and bone metabolism.

Conclusions: high protein diets favor muscle growth in strength athletes, however, their unregulated consumption causes side effects that produce renal and bone damage and alter the acid-base and hydro-mineral balance.

Keywords: Athletes; Diet; Nutrients; Proteins; Health.

RESUMEN

Introducción: las dietas hiperproteicas se caracterizan por un mayor consumo de proteínas en comparación con las recomendaciones dietéticas habituales, de modo que ha logrado una enorme difusión sobre todo en el ámbito deportivo como una forma de aumentar la masa muscular y mejorar el rendimiento deportivo en atletas de fuerza.

Objetivo: describir los efectos en la salud del consumo de dietas hiperproteicas en deportistas de fuerza.

Métodos: se realizó una revisión bibliográfica mediante los artículos obtenidos de una búsqueda de información en las bases de dato SciELO, Scopus, Redalyc y Dialnet. Se empleó una fórmula de búsqueda avanzada.

Resultados: el consumo de este tipo de dieta puede variar significativamente dependiendo del tipo de deporte y las necesidades energéticas de cada deportista. Si bien la proteína es un nutriente esencial para el crecimiento, desarrollo, mantenimiento y la reparación muscular, un consumo elevado de proteína puede tener efectos negativos para la salud, encontrando entre los principales: el daño en la función renal, alteración del balance electrolítico y del metabolismo óseo.

Conclusiones: las dietas hiperproteicas favorecen el crecimiento muscular en los deportistas de fuerza, sin embargo, su consumo no regulado causa efectos secundarios que producen daños a nivel renal, óseo y alteran el equilibrio ácido-básico e hidromineral.

Palabras clave: Atletas; Dieta; Nutrientes; Proteínas; Salud.

INTRODUCTION

Nowadays, due to the changing perspective of health care and body care of each person, various methods of nutrition and physical exercise have been implemented over the years. The goal of having a healthy body and mind is increasingly promoted through social networks or the media. The message manages to reach millions of adolescents, young adults and middle-aged adults who decide to implement exercise routines and diets without a scientific basis.⁽¹⁾

Proteins are essential nutritional elements for the formation, repair and recovery of muscle tissue. Their consumption decreases the time needed for muscle repair. A high-protein diet is one that is characterized by a higher protein intake compared to the usual dietary recommendations.⁽²⁾

Current protein recommendations for reference daily intakes (RDI) for the general population are around 0,8 grams of protein per kilogram of body weight. In addition, an appropriate intake for a sufficient nitrogen intake for actively physically active subjects is estimated to be between 1,0 and 1,2 g/day per kilogram of body weight in women and 1,2 to 1,4 g/day per kilogram of body weight in men.^(3,4)

Optimal intake of energy, macro- and micronutrients and fluids are essential for good performance in all sports. According to sports guidelines, protein intake should be 1,2 to 2,1 g/kg/day, but higher values are observed in athletes and bodybuilders who strength/power train.⁽⁵⁾ Thus, protein has become a controversial topic of interest.

So for a 180 pound (82 kg) athlete, this would mean consuming more than 130 grams of protein per day, which is significantly more than the recommended daily intake of 0,8 grams of protein per kilogram of body weight.

The hyperprotein diet becomes a commonly used nutritional recurrence in the sports arena. However, despite its common use, there is a risk of ignorance of the effects that it causes, mainly the harmful effects.⁽⁶⁾ Or, despite knowing them, the lack of awareness of its harmful effects. A high-protein diet can have various effects on strength athletes, depending on how it is implemented and the type of sport they practice. While protein is an essential nutrient for muscle growth and repair, consuming too much protein can have negative as well as positive health effects.⁽⁵⁾

Because of this, coupled with the dispersion of existing scientific literature, and the need for updated scientific literature, the present research was developed with the objective of describing the health effects of consuming hyperprotein diets in strength athletes.

METHODS

A literature review was conducted between February and April 2023 at the Universidad Regional Autónoma de Los Andes, on the health effects of the hyperproteic diet in strength athletes.

In order to carry out the review, a search for information was made in the SciELO, Scopus, Redalyc and Dialnet databases. A search formula was structured using terms of relevance ("Diet", "Protein", "Hyperproteic diet", "Athletes", "Athletes") and Boolean operators (AND and OR).

DEVELOPMENT

Strength and/or endurance athletes need to consume more protein, because protein is necessary for muscle protein synthesis, reduce its degradation and repair muscle damage caused by training.⁽⁷⁾

Positive effects of protein intake

Adequate nutrient intake is essential to maintain athletes' daily activities and optimize their performance. So much so that, in sports, nutrition is often referred to as invisible training. Protein intake should be tailored to the individual circumstances of athletes, depending on the mode and intensity of exercise, the quality of protein ingested, and the level of energy and carbohydrates consumed.^(3,8)

One of the effects of high-protein diets is increased muscle mass gain. A high-protein diet can help strength athletes increase their muscle mass, as long as it is accompanied by proper training. In addition, they are the building blocks of muscles, so a hyperprotein diet can help increase muscle protein synthesis and thus promote muscle hypertrophy.⁽⁶⁾ This is especially true if protein is consumed after training, when muscles are most receptive to protein synthesis.

Strength training significantly increases muscle mass, strength and power, but it is also an effective tool that reduces body fat levels, increases HDL cholesterol levels and lowers LDL cholesterol and triglycerides, with a consequent reduction in cardiovascular risk.⁽⁹⁾ Similarly, increased protein intake can help strength athletes improve their strength, endurance and recovery after intense exercise.

Protein is more satiating than carbohydrates and fats, so a hyperprotein diet can help control appetite and reduce overall caloric intake. This can be beneficial for athletes who need to maintain a specific body weight or who want to reduce their body fat percentage. As for the satiety effect it varies with the type of protein, in the case of milk protein it has been reported that whey proteins produce greater satiety effect when compared to casein and soy, an effect not observed with egg albumin. The digestion of whey proteins in the gastrointestinal tract favors a more rapid absorption of bioactive peptides and branched chain amino acids, mainly leucine, which stimulate the secretion of gastrointestinal peptides, enteroendocrine cells and act on the regulation of intake and energy expenditure.^(4,8)

Similarly, these diets can help reduce body fat in strength athletes, which can improve their body composition and physical appearance. The consumption of a diet rich in lactoserum protein decreases fat storage and increases skeletal muscle mass, more effectively promoting weight loss.^(4,6)

While it is true that a diet rich in protein can be beneficial for athletes, it is important to keep in mind that excess protein can have negative effects on health, and therefore should be followed with caution.

Negative effects.

Excess protein in the diet can overload the work of the kidneys and increase the risk of kidney damage, especially in people with genetic predisposition or pre-existing kidney disease, this being one of the main risks of a diet rich in protein.

Excess protein puts pressure on the kidneys, which are responsible for filtering waste products from the blood. Over time, this can lead to kidney damage and even kidney failure. These high-protein, low fruit and vegetable diets generate a significant amount of acids, mainly in the form of sulfates and phosphates. The kidney responds to this acid overload with an increase in net acid excretion in the form of ammonium and titratable acidity.^(10,11)

It has been shown that these diets can cause glomerular hyperfiltration and hyperemia, proteinuria, diuresis, natriuresis, kaliuresis and increased risk factors for the production of urolithiasis (hypercalciuria, hyperuricosuria, hypocitraturia and decreased urinary pH). In patients with varying degrees of chronic kidney disease, it has been shown that hyperprotein diets contribute to the acceleration of renal function deterioration.^(3,10)

Protein metabolism produces toxic by-products that need to be eliminated through urine. Thus, increasing renal excretion of urea-solutes and other nitrogenous wastes requires increased water consumption. This process may increase the need for water.⁽¹²⁾

This process can increase the body's need for water and lead to dehydration if sufficient fluids are not consumed. In addition, a high-protein diet can also lead to dehydration, as the body needs more water to metabolize protein than to metabolize carbohydrates or fats. This can be particularly dangerous for athletes who may already be dehydrated from intense workouts.

Increased dehydration can manifest itself through muscle cramps, listlessness, weakness, disorientation and also affects the maximum amount of oxygen the body can absorb, transport and consume in a given time, i.e. VO₂. Continued exercise will lead to exhaustion and heat stroke marked by increased body temperature, lack of sweating and unconsciousness. The loss of body fluid is reflected in the reduction of plasma volume, which causes blood pressure to drop and ultimately results in less blood flow to the muscles and skin.⁽¹³⁾

If too much protein is consumed and the caloric requirement is exceeded, weight gain in the form of fat can occur. Like carbohydrates and fats, when consumed during an excess of calories, excess protein can be converted to body fat, leading to weight gain.⁽¹⁴⁾

If the variety of foods in the diet is limited and animal protein is emphasized, deficiencies of essential vitamins and minerals may occur. Likewise, a high-protein diet can unbalance nutrient intake if other important food groups, such as fruits and vegetables, are neglected. In addition, the intake of other nutrients such as carbohydrates (rice, pasta, potato, bread, fruits and legumes) is decreased.^(15,16)

Another risk of a diet rich in protein is an increased risk of osteoporosis. Calcium is necessary for bone growth and maintenance, but a high-protein diet can cause the body to excrete calcium, leading to weaker bones over time. Based on logical biochemical theory, bone would aid in the modulation of acid-base balance by acting as a buffering and regulating system through calcium release.⁽⁹⁾

The citrate and calcium carbonate in bone are mobilized to neutralize these acids, hence, theoretically, when protein intakes increase, bone mineral density decreases (as a consequence of the release of its main mineral constituent: calcium) and urinary calcium concentration increases (with the consequence, already mentioned in the renal section, of the increased risk of calcium oxalate kidney stone formation. Therefore, given that a high intake of animal protein is acidogenic, it would promote the phenomenon of bone resorption.^(17,18)

The long-term consequences of a small change in calcium balance are significant: an increase in urinary calcium loss of 50 mg daily will result in a loss of 18,25 g per year or 365 g over 20 years. Since the calcium content of the female skeleton averages 750 g at its peak, this loss represents 50 % of its total calcium reserve. For the male skeleton, whose peak calcium content is 1000 g, this loss would represent one-third of its total reserve.^(3,19)

At the same time, serum albumin levels increase in parallel with increased protein intake, as there is a temporal relationship between the discontinuation of a protein-rich diet and the normalization of transaminases, thus, albumin suggests an association between this diet and metabolic abnormalities, hyperprotein intake may increase albumin synthesis by approximately 30 % and increase insulin-like growth factor-1 levels, elevating endorphins, as a result of vigorous exercise which may potentially stimulate albumin synthesis possibly through a direct effect on opioid receptors. Speculating that the observed hyperalbuminemia was likely due to the combined effects of high protein intake (amino acid availability) and a high level of exercise (b-endorphins).^(20,21)

It is also worth noting that not all protein sources are equal, as animal proteins, such as meat, poultry and dairy products, are often high in saturated fat, which is a risk factor for heart disease. Whereas plant-based proteins, such as beans, legumes and nuts, generally have less saturated fat and more fiber and other nutrients.

It is important to keep in mind that the amount of protein needed for athletes varies according to the type of sport or physical activity to be performed, the intensity and duration of the exercise, as well as the age and gender of the athlete. Endurance athletes, such as long-distance runners, may require less protein than strength athletes, such as weightlifters.

CONCLUSIONS

It is important for athletes following a high-protein diet to control the quantity and quality of the protein they consume. These can have positive effects on athletic performance, recovery and muscle mass, but can also have negative effects on health if consumed in excess. This diet may not be sustainable in the long term and can lead to a deficiency in other important nutrients, such as vitamins and minerals, so it is recommended that the diet be balanced and adapted to the individual needs of each athlete.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution

All authors participated in the conceptualization, formal analysis, project management, writing - original draft, writing - revision, editing and approval of the final manuscript.

Funding

The authors did not receive funding for the development of this research.

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