

REVIEW

Vegetarian diets and their impact on athletes

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ABSTRACT

Introduction: Vegetarian diets have become prominent in recent years since the benefits that they provide to overall health and the body are brought to light. When their advantages are taken into consideration, the question of whether it might also be beneficial for athletes to keep themselves healthy and improve their performances.

Materials-Methods: In the search for scientific literature related to this review the US National Library of Medicine (PubMed) used MEDLINE and SportDiscus data and the terms “vegetarian diet”, “athletes” and “vegan diet” were used. The relevant literature has also taken its source from the research of relevant articles from reference lists derived from data studies.

Results: With suitable planning, vegetarian diets could be very effective for athletes. Therefore, the awareness related to their benefits on health and performance should be raised and athletes adopting these diets should be encouraged.

Conclusion: Studies show that vegetarian diets could assist athletes in protecting themselves against chronic, degenerative, and inflammatory diseases and controlling their body weight. Apart from it, since they contribute to the immune system function, the training and performances of athletes are not negatively affected by certain diseases.

Keywords: Vegetarian diet, athletes, vegan diet

INTRODUCTION

In recent years, vegetarianism, a lifestyle adopted by a great number of people from different parts of the world, has become prominent thanks to its reported benefits on health and its ideology depending on individual reasons. For this reason, as a part of vegetarianism, a vegetarian diet, which is mainly based on plants, has also been taken into consideration by researchers to understand whether it is also beneficial in the sports world or not. In this curiosity, various studies have played a role and thereafter, vegetarianism has gained popularity among athletes. These athletes, who are worldwide known, are, for instance, Meagan Duhamel (figure skater), Fiona Oakes (marathon runner), Lewis Hamilton (racing driver), Unsal Arik (boxer), Dustin Watten (volleyball player) [1], Venus Williams (tennis player), Tony Gonzalez (football player), Scott Jurek (ultramarathon and long-distance runner) [2].

First, it is crucial to grasp the basics of being vegetarian and the differences between its other forms, which are based on different choices of food sources. Vegetarianism is defined as *“...a diet that uses only or predominantly plant-based foods such as grains, vegetables, fruits, legumes, nuts, and seeds. Depending on the form of vegetarianism, products from live animals such as milk, eggs, and honey and all products made from them may also be included. Excluded are foods derived from dead animals, such as meat, fish (including other aquatic animals), and all products derived from them. Based on the consumed food, one differentiates lacto-ovo, lacto and ovo vegetarians as well as vegans, whereby the latter*

refuse all animal products, including honey and commodities from animal parts (wool, fur, leather, etc.) [3]. As it is pointed out in the definition, a vegetarian diet consists of several forms in itself depending on the animal-product preferences. For instance, in an ovo vegetarian diet, it is possible to consume eggs, whereas lacto vegetarians could also benefit from milk and dairy products. In addition, semi-vegetarians could consume meat depending on the specific type such as fish (pesco vegetarians), poultry (pollo vegetarian) or both fish and poultry (pesco-pollo vegetarians). On the other hand, veganism, the strictest form of all vegetarian diets, restricts the consumption of all animal- origin products and is only plant-based [4]. Although vegetarian diets are separated from each other related to the type of nutrition that they consume, they all are mainly based on plants such as whole grains, soy, nuts, vegetables, fruits, seeds, and legumes [5,6] apart from the type of meat that they are allowed to eat, which depends on the type of vegetarian diet. So, what are the advantages of a plant-based diet? How could they provide benefits for athletes?

To understand the essence of vegetarianism, to decide whether it is healthful or harmful, and to show an insight into it and its types in the world, a great number of studies have been carried out by researchers around the world. According to some of these studies, it is reported that vegetarian diets have several benefits on overall health and general well- being. First of all, animal-origin foods are generally processed [7], therefore they contain

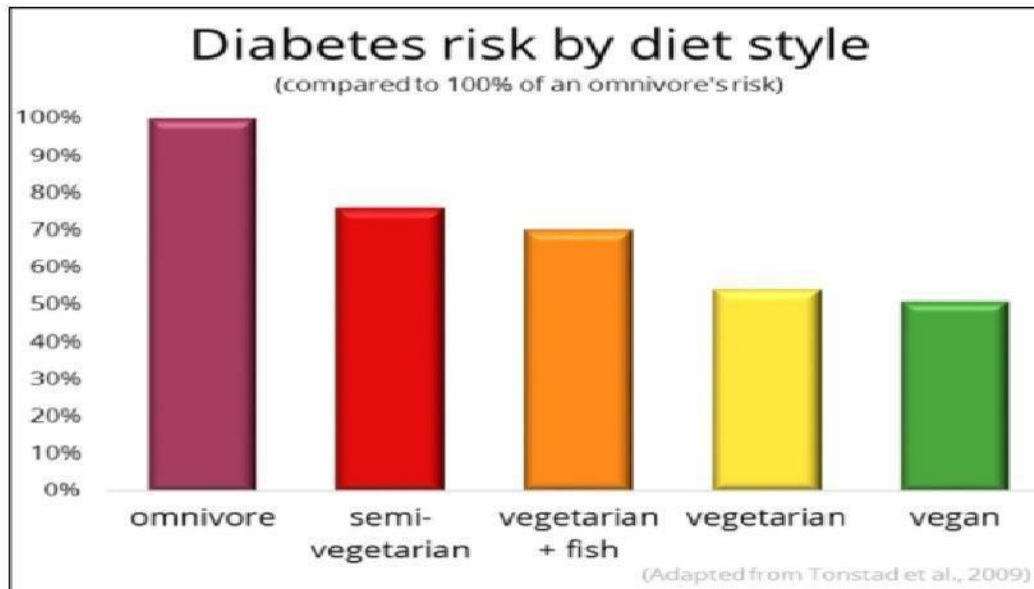


Figure 1. A figure showing the risk of type II diabetes depending on the diet style adopted. The risk of type II diabetes is the highest for omnivores, whereas the lowest risk is for vegans [18].

components such as sodium, nitrates, and nitrites which are reported to carry a risk of affecting health in a negative way [8,9]. Besides, in a study carried out by Mainardi et al., it is reported that two polyphenols, resveratrol, and quercetin, found in a considerable number of fruits and vegetables, have positive impacts on several cells existing in immune function [10], which shows us that a plant-based diet might also contribute to the function of the immune system and assist the body in being healthy. In addition, for instance, studies point out that vegan diets protect against chronic, inflammatory, and degenerative diseases. Such diseases might be stated as hypertension [11,12], diabetes mellitus type 2 [13,14] and cardiovascular diseases [15-17]. In addition, a study was carried out by Tonstad et al. with the participation of 60,903

Adventists, it was found that vegetarians and vegans, as a part of vegetarianism, had a slightly lower risk of type II diabetes (Figure 1) [18].

Besides, among other diet types, a vegan diet is regarded as the most beneficial one for health in terms of effectiveness against diseases [13]. Additionally, some health-related values of vegans such as blood pressure, cholesterol levels, and body weight are usually in a normal range [19]. Similarly, since the body weight and body mass index (BMI) of vegans are lower than omnivores [11,20,21], vegans have a slightly reduced risk of being overweight or obese [22]. Besides, some studies suggest that vegans might be more conscious of health-related issues and adopt this lifestyle by not developing harmful habits like smoking [19]. Therefore, when considering all these advantages of a plant-based diet, it is

possible to suggest that it has manifold benefits on overall health and the health of athletes as well. In the next chapter, the positive effects of a plant-based diet in the sports world will be discussed.

THE IMPACT OF A PLANT-BASED DIET ON ATHLETES

Although in recent years many studies have been carried out to detect the relation between sports and vegetarian diets and the number of these studies has been significantly increasing, it has already been implemented for a long time and its history of it dates back to ancient times [23]. In ancient times, gladiators and philosophers used to believe that vegetarian diets were suitable for physical and intellectual events [24]. As an example, gladiators adopted a certain diet, which is known as "gladiatoriam saginam" or "hordearii", to be strong and fit. These diets mostly consisted of nutrients such as peas, lentils, wheat, and so on, however, little or no meat [25]. In addition, it is suggested that the most successful fighters were vegetarians [24,25]. Considering these, it is not surprising to see that vegetarian diets have created a role for themselves in the sports world since then. Similarly, in 1982, mostly for endurance athletes such as runners, cyclists, and triathletes, a plant-based diet like vegetarian or vegan was advised for the first time [26].

Also, some events have aroused

curiosity among athletes and researchers and paved the way for new questions. For instance, in 2014, while adopting a vegan diet for a certain period, the German National Football Team won the World Championship [27], which also led to the question of whether a plant-based diet is beneficial for athletic performance.

Moreover, athletes prefer adopting a vegan diet since it is supposed that vegetarian diets possible contributions to carbohydrate intake, body weight control, and performance improvement [28] In vegetarian diets, there are more carbohydrates, fiber, antioxidants, and phytochemicals than omnivorous nourishment type [29]. Regarding the effect of carbohydrate intake, large amounts might improve muscle and liver glycogen stores and increase physical performance [30,31]. In addition, some endurance athletes may deliberately prefer a vegan diet so that their need for carbohydrates could be met by plants and they could control their body weight [28,32] Similarly, according to some nutrition guidelines in terms of sports, carbohydrate intake should supply 60-65% of total energy [33,34]. However, this does not create any problem for athletes adopting a vegetarian or vegan diet since they could consume adequate levels of carbohydrates from foods containing it. Apart from it, the intake of protein, which is believed to get from animal products and meat, could lead to a question mark considering vegetarian diets or vegan diets, in which the consumption of these products is either

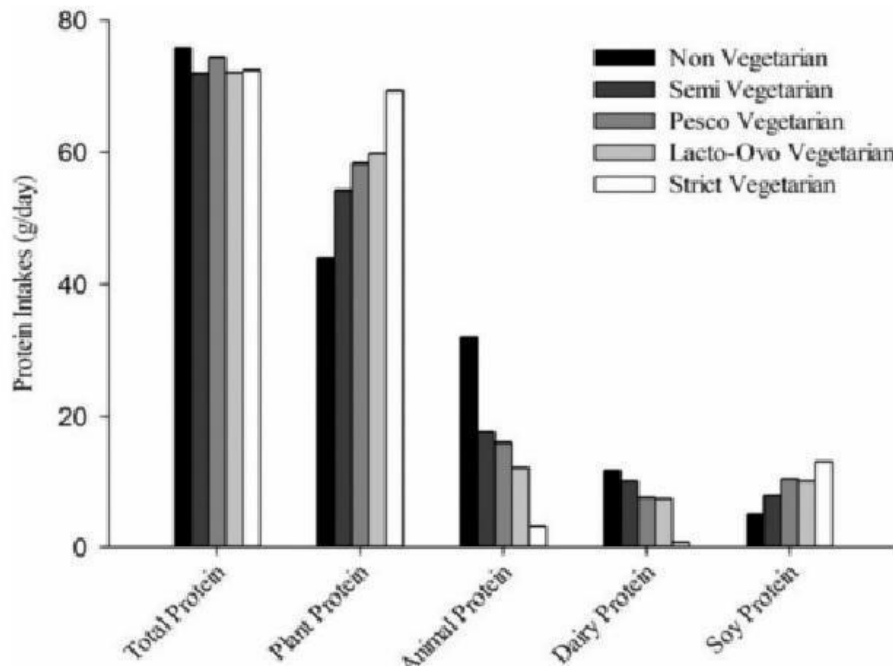


Figure 2. A figure showing the protein intake (g/day) depending on the type of vegetarian diets such as semi-vegetarian, pesco vegetarian, Lacto-ovo vegetarian, strict vegetarian, and non-vegetarian and the sources consisting of plant protein, animal protein, dairy protein, and soy protein [37].

limited or restricted. Protein helps the building and maintenance of body tissues and promotes the repair and renewal of damaged tissues such as muscles. In this sense, the intake of protein could be provided with various plant foods such as soybeans, lupins, peanuts, and so on, which are known to be high in protein. Surprisingly, contrary to popular opinion of the public, the protein levels of many plant foods are higher than animal foods in terms of calories [35,36]. Similarly, according to Adventist Health Study 2, it was demonstrated that the total protein intake (g/day) of vegetarians are very close to the daily protein intake of omnivores (Figure 2) [37], which is possible because other sources could provide adequate levels of proteins to

vegetarians depending on the type of diet.

Moreover, according to a study carried out by Trapp et al., phytochemicals and antioxidants in vegetarian diets could assist in reducing oxidative stress, which is linked to extended exercise duration, and contribute to the immune system [38].

When taking all these advantages of vegetarian diets, it is possible to highlight that they could be very effective on athletes with suitable nourishment planning and they could also improve the general health status of athletes in a very positive way.

DISCUSSION

According to a study that was carried out in the Mountain Bike Transalp Challenge 2004, consisting of eight consecutive stages, a high- carbohydrate vegan diet was 20% better than it was expected on the final performance [39].

In addition, according to the study carried out by Eisinger et al. between vegetarian and omnivorous runners, who participated in a 1.000-km race over 20 days, it was found that energy, carbohydrate, fat, and protein intakes showed no difference between the two groups, however, on vegetarian runners, higher intakes of dietary fiber and poly-unsaturated fatty acids and lower cholesterol levels were observed when compared to omnivorous competitors [40]. Another study points out that the consumption of flavonoids, existing in many fruits and vegetables, reduced the risk of upper respiratory tract infection (URTI) at a rate of 33% when compared to the control group [41], which concerns especially endurance athletes since they are generally immunocompromised [42].

In a study, carried out by Leischik and Spelsberg to evaluate the performance, cardiac status, and nutritional values of a male vegan ultra-triathlete and a control group including 10 triathletes, two groups were observed during a Triple Iron ultra-triathlon, consisting of 11.4 km swimming, 540 km cycling and 126 km running. According to the results, the values of the

male vegan athlete were not reduced, and had health problems. The VO₂ max value of him was higher than omnivorous athletes. The results showed us that a vegan diet could also assist in providing nutritional support for an ultra- triathlete as well [43].

Another study was implemented to determine the difference in heart morphology and function in vegan and omnivorous diets in amateur runners. According to the result of this study, it was found that the systolic and diastolic functions of vegans were better when compared to omnivorous athletes. In this study, the systolic function was determined by longitudinal strain and assessed as 20.5% for vegans and 19.6% for omnivorous athletes, whereas diastolic function was determined by E-wave velocities and assessed as 87 cm/s and 78 cm/s [44], which shows us that a plant-based diet has beneficial effects on cardiovascular function.

According to a field study of the National Runners' Health Study in 1997 regarding running and diet, 289 vegetarians, 62 vegans, and 8,891 omnivores, it was found that vegetarians ran significantly better, had improved BMI, consumed more fruit and less alcohol [45], which also shows us that as it is stated before vegetarians are more conscious of healthy habits.

CONCLUSION

Apart from its other motives, vegetarian diets might be considered a fine choice for

health considerations since it provides various benefits to the body from protecting against certain diseases to contributing to immune function. Since these advantages of a plant-based diet have recently been brought to light and continued to gain popularity in the public, the sports world has been curious about its possible benefits for athletes as well. As it is stated in this study, the history of this diet dates back to ancient times, in which conscious and appropriate planning did not exist for athletes. However, now, it is easier for athletes to adopt a vegetarian diet since studies already prove that there are a great number of sources and nutrients, that could meet the necessary components for their

performances such as carbohydrates and protein. Apart from it, as is stated, this diet could contribute to the function of the immune system and reduce the risk of many diseases such as URTI, which could negatively affect the training periods of athletes. In addition, it is an incontrovertible fact that vegetarian diets assist in regulating the BMI of athletes. Considering all these positive effects of plant-based diets, it is possible to suggest that awareness regarding its benefits on athletes should be raised, athletes preferring this type of diet should be encouraged and appropriate enlightenment and guidance should also be provided.

ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to Evangelia STAVROPOULOU for her very successful contribution to the literature research process and unique academic support in the publication during the process of this review article.

CONFLICT OF INTEREST

The author certifies that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

FUNDING

The author certifies that there is no funding from any financial organization regarding the material discussed in the manuscript.

AUTHOR'S CONTRIBUTIONS

All authors read and approved the final version of the manuscript.

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ΑΝΑΣΚΟΠΗΣΗ

Οι φυτικές διατροφές και η επίδρασή τους στους αθλητές

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ΠΕΡΙΛΗΨΗ

Εισαγωγή: Οι φυτικές δίαιτες συνιστούν την κυρίαρχη τάση τα τελευταία χρόνια, αφού τα οφέλη που παρέχουν στη συνολική υγεία και τον οργανισμό καθίστανται γνωστά στον ευρύ πληθυσμό. Λαμβάνοντας υπόψη τα πλεονεκτήματά τους, το ερώτημα είναι εάν μπορούν επίσης να είναι ωφέλιμες για τους αθλητές, ώστε να διατηρούνται υγιείς και να βελτιώνουν τις επιδόσεις τους.

Υλικό και Μέθοδοι: Στην αναζήτηση επιστημονικής βιβλιογραφίας που σχετίζεται με αυτήν την ανασκόπηση, έγινε χρήση της Εθνικής Βιβλιοθήκης Ιατρικής των ΗΠΑ (PubMed), δεδομένων από MEDLINE και SportDiscus και χρησιμοποιήθηκαν οι όροι «vegetarian diet» «athletes» και «vegan diet». Επίσης έγινε έρευνα της σχετικής βιβλιογραφίας και των άρθρων, που προέρχονται από μελέτες δεδομένων.

Αποτελέσματα: Με τον κατάλληλο σχεδιασμό, οι φυτικές δίαιτες θα μπορούσαν να είναι πολύ αποτελεσματικές για τους αθλητές. Ως εκ τούτου, θα πρέπει να αυξηθεί η ευαισθητοποίηση σχετικά με τα οφέλη τους στην υγεία και την απόδοση και οι αθλητές που υιοθετούν αυτές τις δίαιτες θα πρέπει να ενθαρρύνονται.

Συμπέρασμα: Μελέτες δείχνουν ότι οι φυτικές δίαιτες θα μπορούσαν να βοηθήσουν τους αθλητές να προστατευτούν από χρόνιες, εκφυλιστικές και φλεγμονώδεις ασθένειες και να ελέγξουν το σωματικό τους βάρος. Εκτός από αυτό, δεδομένου ότι συμβάλλουν στη λειτουργία του ανοσοποιητικού συστήματος, η προπόνηση και οι επιδόσεις των αθλητών δεν θα επηρεάζονται αρνητικά από ορισμένες ασθένειες.

Λέξεις κλειδιά: Χορτοφαγική διατροφή, αθλητές, φυτική διατροφή