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Nutrition guidelines for competitive tennis

Linii directoare privind nutriția în tenisul competitiv

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Abstract

To provide evidence-based nutritional recommendations for performance tennis players.

Players should particularly focus their exercise program on the adequate and appropriate consumption of four primary nutrient categories - electrolytes, carbohydrates, protein and fat. For most players, the International Tennis Federation recommends a minimum of approximately 2500 calories a day, although some players may require in excess of 3500 calories.

The American College of Sports Medicine and the National Athletic Trainers Association have recommended that athletes should consume in general 30-60 g/h CHO during exercise.

It is important for tennis players to eat plenty of complex carbohydrate foods, especially those with a low glycemic index to help boost glycogen stores.

Protein is crucial for maintaining, building and repairing the tennis players' muscles. Players should consume 15-20 g of protein within 30 minutes after a tennis match. Fat takes the longest time to digest, and thus, it is not a good source of quick energy during exercise. Vitamins and minerals do not provide a source of energy but are needed to derive energy from nutrients that are consumed.

Keywords: nutrition, electrolytes, carbohydrates, protein.

Rezumat

Scopul acestui studiu este de a oferi recomandări nutriționale bazate pe dovezi pentru jucătorii de tenis de performanță. Jucătorii ar trebui să își concentreze atenția în mod deosebit asupra consumului adecvat al celor patru categorii principale de nutrienți - electroliți, carbohidrați, proteine și grăsimi. Pentru majoritatea jucătorilor, Federația Internațională de Tenis recomandă un minim de aproximativ 2500 de calorii pe zi, deși unii jucători pot solicita peste 3500 de calorii. Colegiul American de Medicină Sportivă și Asociația Națională de Formatori în Atletism recomandă ca sportivii să consume în general 30-60 g/h CHO în timpul exercițiilor fizice. Este important pentru jucătorii de tenis să mănânce o mulțime de alimente care să conțină carbohidrați complecși cu un indice glicemic scăzut pentru a ajuta la creșterea stocurilor de glicogen. Proteina este esențială pentru menținerea, dezvoltarea și refacerea mușchilor jucătorului de tenis. Jucătorii ar trebui să consume în interval de 30 de minute după meci 15-20 g de proteine. Grăsimea necesită mai mult timp pentru a fi digerată și prin urmare, nu este o sursă bună de energie rapidă în timpul exercițiilor fizice. Vitaminele și mineralele nu sunt o sursă de energie, ci sunt necesare pentru a obține energie din substanțele nutritive consumate.

Cuvinte cheie: nutriție, electroliți, carbohidrați, proteine.

Introduction

In preparing for junior competitions or senior grand slams, optimal nutrition is essential to increase tennis performance. For players who participate regularly in tournaments, this is even more of a must as they need to recover quickly and play again the next day or even later the same day. Scientific nutrition now plays an integral role in every professional tennis player's daily routine.

Food is the source of nutrients, and to get the required nutrients, a varied and well-balanced diet is necessary. A good selection of foods, electrolytes and supplements may help players to obtain good performance and gain a competitive edge.

There are six classes of nutrients that include water, vitamins, minerals, proteins, fats, and carbohydrates. Each nutrient is very important and has an immediate effect on performance.

For most players, the International Tennis Federation (ITF) recommends a minimum of approximately 2,500 calories a day, although some players may require in excess of 3,000 calories. Pro players are predicted to need between 3,500 and 5,000 calories/day (1).

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General macronutrients for tennis

Players should particularly focus their efforts on the adequate and appropriate consumption of four primary nutrient categories – carbohydrates, protein, electrolytes, and fat.

a) Carbohydrates

Carbohydrates are the best source of energy, providing fuel for the muscles, brain, and organs. They are stored in the body in the form of glycogen, but too few carbohydrates lead to glycogen depletion, which may result in early fatigue on court. Carbohydrates should represent about 60% of dietary calories (Itftennis.com/scienceandmedicine/nutrition/eating-right.aspx).

It has been understood for many years that a high carbohydrate diet leads to increased muscle glycogen stores (Bergström et al., 1967), which contributes to optimal performance particularly in endurance activities (Hargreaves, 2004).

Sufficient amounts of carbohydrates should be provided from diet (Gidu, 2008).

As a general guideline, elite-standard tennis players should have a habitually high carbohydrate diet of 6-10 g/kg/day to ensure adequate glycogen stores, with women generally requiring slightly less than men. This recommendation should be tailored to suit daily energy expenditure (Ranchordas et al., 2013).

According to the American College of Sports Medicine and the National Athletic Trainers' Association, it has been recommended that athletes should consume in general 30-60 g/h CHO during exercise. CHO can be in the form of glucose, sucrose, maltodextrins, or some high glycemic starches. Fructose should be limited because of the possibility of gastrointestinal discomfort.

This rate of CHO ingestion can be accomplished by drinking 600-1200 ml/h of a solution containing 4–8% CHO (4-8 g/100 ml) (Kovacs, 2006b).

The importance of carbohydrate (CHO) as a substrate for contracting skeletal muscles and central nervous system function (Bergström et al., 1967), as well as the importance of glucose concentrations in endurance performance (Coyle, 1999) have been recognized (Kovacs, 2006a).

During general training, when intensity is moderate to high, athletes are recommended to consume 5-7 g/kg CHOs on a daily basis (Burke et al., 2001).

If training is intense and during tournament weeks, this should be increased to 7-10 g/kg daily to maintain sufficient energy stores for performance and to aid recovery (Costill & Hargreaves, 1992).

For tennis players, the glycemic effect can be very important, and it is critical that players understand which carbohydrates they should consume and when (Panait et al., 2013).

It is generally recommended that complex carbohydrates, especially those with a low glycemic index, should be consumed because they have high fiber and vitamin content and give a sustained energy release over a long period of time (ITF).

They are found in cereals, bread, pasta, potatoes, rice, legumes, fruit, vegetables and sport products (energy bars and sport beverages).

b) Protein

Protein is crucial for building muscle and organ repair in the tennis player's body; it provides a small source of energy for muscle exercise, but is not the ideal energy source on the court.

The consumption of 20-25 g protein after exercise is recommended in order to stimulate muscle protein synthesis and possibly lower the rate of muscle protein breakdown (Phillips & Van Loon, 2011).

Latest research shows that players should consume an easy-to-digest form of protein within 30 minutes after tennis play (1).

The recommended timing for protein ingestion is as soon as possible after exercise, particularly if optimum muscle adaptation and performance are a high priority (Kovacs & Baker, 2014).

It is recommended that tennis players who train daily at a high intensity should consume - 1.6 g protein/kg/day in 24 h between the training sessions (Ranchordas et al., 2013).

Phillips claims that protein intakes in the range of 1.3-1.8 g/kg/day consumed as 3-4 isonitrogenous meals will maximize muscle protein synthesis (Phillips & Van Loon, 2011).

Increasing the amount of protein to 1.8-2.0 g/kg/day, depending on the caloric deficit, may be beneficial in preventing lean mass losses during periods of energy restriction to promote fat loss (Phillips & Van Loon, 2011).

It is important to reiterate that tennis coaches and players should take into account the individual needs and preferences of athletes (Kovacs, 2014).

The ideal source of protein for tennis players is: meat (beef), poultry, fish (tuna), eggs, dairy, vegetables (broccoli, spinach) and nuts.

c) Fat

While carbohydrate is the predominant fuel that is used in tennis, fat oxidation will also contribute to energy provision, especially as the duration of the match or training session increases.

Fat intake as a percentage of total energy intake has been reported, with 70% of athletes consuming >30% of total energy per day from fat. The suggested amount of daily fat required to ensure adequate intramuscular triacylglyceride stores for an endurance athlete training for >2 h per day is 2 g/kg (Stellingwerff et al., 2011).

This recommendation should not be directly applied to tennis, where matches involve many high-intensity exertions (<75% VO2 peak) with carbohydrate acting as the main fuel (Ranchordas et al., 2013).

The International Tennis Federation appreciates that fat should represent about 20-30% of dietary calories (a minimum of 30-40 grams/day), and up to 80-100 grams/day for the energy needs of elite players.

There are two main types of fats: saturated (found in animal fats, except fish), and unsaturated (found in vegetable fats, oil, and fat fish). Vegetable fats such as avocado, nuts are considered essential - small daily amounts are needed to help make hormones, to maintain healthy skin and hair, and as a secondary energy source for training.

Fat takes the longest time to digest; thus, it is not a good source of quick energy during exercise.

While there is no scientific evidence to show that low body fat levels are required to become a successful tennis player, the successes of highly lean and muscular tennis

players provide the evidence that there may be an advantage in having low body fat (Ranchordas et al., 2013).

d) Electrolytes/minerals

Fluid and electrolyte balance is an important factor for optimal physical exercise performance especially in sports such as tennis, where players often compete in hot and humid environments (Rodriguez et al., 2009).

Sweating rates in tennis players have been reported to range from less than 0.5 to over 2.5 L/h (Bergeron, 2003).

Tennis athletes should be on an individualized hydration schedule, consuming more than 200-400 ml of fluid every change over (approximately 10-15 minutes). Optimum hydration and temperature regulation will reduce the chance of tennis related muscle cramps and performance decrements (Kovacs, 2006b).

At high temperatures, tennis players should be well hydrated before matches and drink enough fluids during and after matches or exercise, to prevent dehydration and play at an optimal physical level.

Runners generally drink only 500 ml/h of fluid and thus allow themselves to dehydrate at rates of 500-1,000 ml/h (Coyle & Montain, 1992).

In collegiate tennis players, the athletes' water consumption was at an approximate rate of 1,000 ml/h (Bergeron et al., 1995).

Sodium is the essential electrolyte and main extracellular mineral lost in sweat, and it is important to increase its consumption in the nutrition of tennis players. Too little sodium may lead to fatigue, headache, dizziness, muscle cramps and heat illness (ITF).

In a tennis tournament or repeated days of practice in a hot and humid environment, the cumulative effect of repeated high Na+ losses over several days may result in a low extracellular Na+ level, especially if daily Na+ ingestion is low (MacLaren et al., 1998).

Drinking plain water can lead to hemodilution and enhanced urine production, followed by a reduced drive to drink (MacLaren et al., 1998).

Exercise-induced muscle cramping has multiple factors, and it has been shown that dehydration and electrolyte loss are not the sole reasons for muscle cramping (Jung et al., 2005).

The ingestion of a carbohydrate solution did not improve performance in a three-hour tennis match/practice situation (Mitchell et al., 1992).

This result is contrary to previous results (Coyle et al., 1983; Hargreaves et al., 1984; Mitchell et al., 1988).

If a tennis player has to follow up with a practice session or match within one to two hours, it is recommended that a CHO-electrolyte beverage that contains Na+ and Cl- concentrations of 30 to 40 mmol/L should be consumed (Gisolfi & Duchman, 1992).

The International Tennis Federation recommends beverages and foods that count toward daily water intake: water, seltzer, club soda, mineral water, flavored water, 100% fruit juices, lemonade, tomato and vegetable juices, low-fat milk, and does not agree that caffeinated beverages and alcohol are diuretics and count toward water intake.

e) Supplements

Vitamins and minerals do not provide a source of energy, but are needed to derive energy from carbohydrates, proteins, and fats that are consumed.

Calcium is also a mineral lost in sweat, as well as the key mineral for strong bone density in tennis players. It is found in cheese, milk, yogurt, ice cream, fish bones, watercress and spinach. The recommended daily intake is 1000-1200 mg.

Iron is another key mineral because of its importance for the production and release of energy. It is found in hemoglobin, which carries oxygen from the lungs to working muscles. The recommended daily intake is 10-12 mg.

Potassium is the main intracellular mineral, so it is often misunderstood as a key electrolyte to increase in order to minimize heat illness risk. It is found in all fruits and fruit juices (especially bananas and melon), tomato juice, meat and dairy, green vegetables and bran. The recommended daily intake is 2500-3000 mg.

Pre-match recommendations

Just as it is important to eat a well-balanced diet on a daily basis, it is equally important to eat the right things before, during, and after competition and training.

The goal is to maximize energy stores so as to meet the energy demands throughout the playing duration and to aid subsequent muscle growth and repair.

The major goals of the tennis player are to gradually increase muscle glycogen stores and to stay hydrated. It is important to eat plenty of complex carbohydrate foods, especially those with a low glycemic index to help boost glycogen stores.

Up to four days before competition, in addition to maintaining a high carbohydrate and fluid intake, it is important to have a little extra protein, up to 1.5-2 grams/kilogram, to ensure that all tissues are fully repaired, and to support the production of creatine (Itftennis.com/scienceandmedicine/nutrition/eating-right.aspx).

The pre-competition meal should be high in carbohydrate, low in fat, low in protein, low in fiber. If athletes really do not feel like eating, they should try to have a liquid meal such as a carbohydrate drink or dairy and fresh fruit.

Recommended

- oatmeal, eggs, ham, roast beef.

Match recommendations

Recommended

- cold fluids on each change over to replace lost fluids and cool the body temperature;
- sports drinks are helpful to replace lost minerals and provide energy;
- moderate to high glycemic index foods, such as high carbohydrate energy bars or non-caffeinated energy gels that are low in fat and protein digest rapidly and are a good source of quick energy;
- nutritional bars between 300-400 calories, including 8-12 grams of protein.

Discouraged

- acidulated drinks;
- fatty snacks such as a chocolate candy bar: they are slow to digest and will sit in the stomach causing a feeling of fullness and reducing fluid absorption by the body (1).

After match recommendations

Post-match nutrition is very important. Glycogen stores can take 24-48 hours to refill; therefore, it is important to start replenishing carbohydrates immediately following exercise to accelerate the recovery process.

The first step is to rehydrate and resupply sodium.

It is equally important to drink water.

Immediately after match, research suggests the intake of 25-30 g protein.

Recommended

- within 1-2 hours after match: eat a well-balanced meal including a variety of carbohydrate sources, a protein portion, and fluids;
- high-carbohydrate sport drinks, sport bars, and other high-carbohydrate foods with a high glycemic index will facilitate the rapid restoration of muscle glycogen;
- chicken with rice and vegetables or;
- fish with potatoes and salad or;
- steak and potatoes with vegetables (Itftennis.com/scienceandmedicine/nutrition/eating-right.aspx).

Conclusions

1. Pro tennis players should focus their efforts on the adequate consumption of six classes of nutrients: water, vitamins, minerals, carbohydrates, protein and fat.

2. Water and sports beverages with electrolytes are essential for maintaining hydration and body temperature during intense play, and decrease the risk of dehydration.

3. Carbohydrates are the best source of energy during the matches.

4. Protein is essential for maintaining, building and repairing the tennis players' muscles. Immediately after the game, players should consume 15-20 g protein (after short matches) and 25-30 g protein (after long matches) because protein synthesis is more efficient immediately after the effort.

5. Fat oxidation will also contribute to energy provision, but fat takes the longest time to digest and thus, it is not a good source of quick energy during exercise.

6. Vitamins and minerals are important to derive energy from nutrients that are consumed.

Conflicts of interest

There were no conflicts of interests.

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