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FUELING A FOOTBALL TEAM

Jacqueline R. Berning, PhD, RD, CSSD | Professor/Chair Health Science Department | Sports Dietitian: University of Colorado, Colorado Springs Athletic Department, US Lacrosse Sports Science and Safety Committee | University of Colorado | United States of America

KEY POINTS

- Despite the fact that many football players focus their dietary intake on large amounts of protein, at the expense of carbohydrate, their repeated bouts of high-intensity movements throughout a game are dependent upon muscle glycogen and ultimately carbohydrate intake.
- Kilocalorie requirements for players are based upon multiple factors, including body composition, height, weight and position on the football team.
- Football players benefit from consuming enough protein to stimulate muscle protein synthesis (MPS); however, consuming more than what the body can handle does not offer any further benefits for stimulating MPS and the excess amino acids are oxidized by the body.
- Due to their increase in energy intake, players meet or often exceed the dietary recommendations for fat. Additionally, saturated fatty acid intake tends to be high in football players and puts them at risk for cardiovascular disease.
- The pre-game meal should supply enough energy so that players are not hungry during the game and should be composed of mostly carbohydrate with moderate protein and limited fat.
- New recommendations for carbohydrate intake during exercise for intermittent bouts of activity, as seen in football, recommend small amounts of carbohydrate intake along with mouth rinses to maximize carbohydrate intake for both muscle and brain function.
- The post-game meal should focus on healthy portions of vegetables and fruit, lean protein, whole grains and healthy fats and fluids for rehydration.
- Hiring registered dietitians (RDs) as team dietitians has improved the food selection at training tables and increased nutrition education with players, allowing them to perform at their athletic potential.

INTRODUCTION

The way football players are fed has changed dramatically since the late 1970s and early 1980s compared to the practice and evidence-based science approach that is used today. If you walked into a professional football organization in 1980 and asked how they fed their players, they would have most likely walked you to the back door where the food truck, like a mobile canteen, was parked. The mobile canteen usually showed up just as the team was finishing the morning viewing of films and meetings before players changed into practice uniforms for drills in the afternoon. Most players bought their "noon time meal" from the truck while others would sometimes run to a local fast food restaurant to eat. Generally, the meal from the truck or fast food restaurant was the player's first meal of the day. Their second meal of the day was either consumed on their way home after practice, which again could be fast food, or something they purchased at a restaurant that was heated up in their home microwaves.

Fast forward to 2015 and professional football organizations are now building full-size kitchens and dining rooms in their facilities. Most have hired full-time chefs and full-time sports RDs and serve 2-3 meals a day in addition to pre-practice snacks and recovery meals. While food trucks are still delivering food, they are now coming from farms and facilities that provide local and sustainably grown vegetables, fruits, dairy products and meats. No longer are players going most of the day without eating or eating only one meal a day. Additionally, the food that a player is served and consumes before, during and after training or a game is now based on evidence-based science to help improve health and performance.

ENERGY SYSTEMS

It is important to review the physiologic energy systems used by football players, as it determines what fuel they need to consume and replace before and after training and competition. While American football has not been studied like soccer or rugby, extrapolations can be made regarding the physiologic energy systems used during football games. In rugby, Duthie and colleagues (2003) found that about 85% of the game was spent in low-intensity activities while 15% was spent in high-intensity activities. Of the high-intensity activities, 9% was running and 6% tackling and wrestling for the ball. Williams and Rollo (2015) reported that both the anaerobic and aerobic energy systems work together during intermittent, team sport activities. During high-intensity sprints or tackles, energy is provided by anaerobic metabolism, while simultaneously aerobic metabolism continues to supply energy to the vital organs. The predominance of the energy system that is used during football is determined by the player's position. For example, wide receivers, linebackers and

defensive backs will rely more heavily on aerobic metabolism than linemen, who will rely more on the anaerobic metabolism. Anaerobic metabolism is fueled by intramuscular phosphocreatine (PCr) and glycogen, while aerobic metabolism is fueled by glycogen and fatty acids. It is important to note that glycogen or carbohydrate is a substrate for both aerobic and anaerobic activity and is the substrate of choice for high-intensity activity.

If a player is not eating adequate amounts of kilocalories or carbohydrates or the correct proportion of macro and micronutrients, then ATP cannot be made and over the course of a game or season, a player may not be able to maintain athletic performance. For example, in the fall of 2014, the offensive line for the University of Colorado football team was complaining of fatigue and tiredness during the training week. Coaches also stated that their performance in games for the first half of the season was declining and many of the players were losing weight. The offensive line coach was a firm believer in having his players participate in very intensive workouts during the week, and as a result, they were tired after practice and did not consume enough kilocalories and therefore carbohydrate. After several sessions with sports RDs, the players increased their carbohydrate intake and body weight returned to their playing weight, and performance improved for the second half of the season.

DIETARY RECOMMENDATIONS FOR FOOTBALL PLAYERS

Kilocalories

The determination of energy needs for football players is based on many factors including their physical characteristics and their position on the football team. For example, defensive linemen, particularly defensive ends, are generally smaller than offensive linemen while running backs, linebackers, wide receivers and defensive backs are generally the same size and have common physical measurements (Pincivero & Bompa, 1997; Pryor et al., 2014). In terms of body composition, similar findings are also found. Linemen generally have a higher percentage of body fat than linebackers, running backs, defensive backs and wide receivers (Pryor et al., 2014). Thus, the wide range in body size and composition can make kilocalorie requirements extremely variable among a football team. In addition, different teams may emphasize different weights and body composition for certain positions. Table 1 lists an estimated range of kilocalorie intakes for football players based on their position and body composition.

Resting metabolic rate (RMR) is the energy required to maintain bodily functions such as heart rate, respiration and circulation while the body is at rest. It accounts for approximately 60-80% of total energy expenditure. It is measured by indirect calorimetry, where oxygen consumption (L/min) and carbon dioxide production (L/min) are collected and analyzed for a specific amount of time. Because most practitioners do not have access to the equipment to actually measure RMR, a number of prediction equations are used to estimate RMR. Thompson and Manore (1996) compared predicted RMR equations with measured RMR and found that the Cunningham (1980) equation provides an accurate estimate of RMR when determining energy needs of active individuals.

Position	RMR* (RMR = 500 + 22) LBM kg)	PA Factor**	Thermic Effect of Foot (TEF)	Estimated Range Kilocalories
Defensive Lineman (DL)	2,777	2.0 – 2.1	1.1	6,100 – 6,400
Offensive Lineman (OL)	2,839	2.0 – 2.1	1.1	6,200 – 6,500
Running Back (RB)	2,478	2.1 – 2.2	1.1	5,700 – 6,000
Tight End (TE)	2,632	2.1 – 2.2	1.1	6,000 – 6,300
Linebacker (LB)	2,542	2.1 – 2.2	1.1	5,900 – 6,200
Quarterback (QB)	2,352	2.0 – 2.1	1.1	5,200 – 5,400

Table 1: Estimated Range of Daily Kilocalorie Intake Based on Player Position and Body Composition.
*Cunningham (1980): **American Dietetic Association (2009); RMR, resting metabolic rate; PA, physical activity; LBM, lean body mass

Carbohydrates

Carbohydrates are the primary energy source for the exercising muscle when exercise intensity reaches 65% of maximum oxygen consumption (VO_2max) or greater (van Loon et al., 2001). Carbohydrate is the fuel of choice for high-intensity aerobic exercise and also for so-called anaerobic exercise, where sprint and ballistic-like movements occur. Because football players have high-intensity and vigorous workouts for sometimes more than an hour a day, they may need as much as 5-7 g of carbohydrate/kg/day of body mass in order to maintain and replenish muscle and liver glycogen stores (Burke et al., 2011, Coyle, 1991). In the past, carbohydrate recommendations have often been expressed as a percentage of total kilocalories; however, this percentage is poorly correlated to both the amount of carbohydrate actually eaten and the required fuel needed to support an athlete's training and competition.

National Football League (NFL) teams are allowed to have 53 players on their roster. Not all 53 play in the weekly games, but may have an active role during training sessions throughout the week. It is important to match the players' carbohydrate intake to their fuel needs for games, training and recovery. This concept has been defined as carbohydrate availability and attempts to match increased carbohydrate intake specifically to training and competition needs (Burke et al., 2011). When players fail to consume adequate carbohydrates and energy during daily training, muscle

glycogen levels decrease and training and competition performance may be impaired. Because football players practice at least 5 days per week, consumption of carbohydrates needs to occur every day, otherwise performance may be impaired.

Generally, a variety of whole grain pasta, breads and rice along with fruits and vegetables like potatoes not only provide the carbohydrates that players need, but also a variety of essential vitamins, trace minerals and fiber. Too often players choose carbohydrates with higher amounts of fats and sugars (such as french fries and cakes, cookies or candy). While football players are expending more kilocalories from carbohydrates and can afford to consume more kilocalorie dense foods such as sports drinks, gels and other simple sugar-containing food products, they should consume these types of foods for pre- and post-game refueling rather than including them in their daily meal pattern.

Protein

Of all the nutrients that could impact health and performance, consuming enough protein is a major focus for most football players. Long and colleagues (2011), along with Jonnalagadda and colleagues (2001), found that collegiate freshman football players were primarily concerned about consuming enough protein and believed that protein was the main source of energy for the exercising muscle. Additionally, young football players believe that the consumption of protein supplements is necessary for synthesizing new muscle (Jonnalagadda et al., 2001). Proteins are in constant flux in the body as they are involved in the processes of synthesis and degradation. Athletes, like football players, benefit from consuming enough protein to stimulate muscle protein synthesis (MPS) and repair muscle damage.

Protein recommendations for strength athletes, which would include football players, range from 1.6-1.7 g protein/kg body mass (Phillips, 2012). This is more than double the requirements for the sedentary adult. While protein is important for football players to facilitate muscle synthesis and repair, a word of caution needs to be heeded as many players exceed their protein requirement due to the added protein they consume in shakes, powders and protein bars. Most players can easily meet their protein requirements through a well-planned diet that includes high quality protein that is spread throughout the day rather than consumed in large amounts in one single meal. For example, Moore and colleagues (2009) found that consuming over 40 g of protein in a single meal had no additional benefits in further stimulating MPS and the excess amino acids were simply oxidized by the body.

In addition to the amount of protein that needs to be consumed, the quality of the protein also influences the body's ability to synthesize protein. The quality of a protein is partially dependent upon its digestibility, but primarily on its essential amino acid profile including both the specific amount and the proportion of essential amino acids. Branched chain amino acids (BCAA) are absorbed faster than smaller amino acids, and essential amino acids (EAA)

Body Mass in lbs. (kg)	Range of protein requirement lbs. (kg) 0.73 – 0.77 g/lb. BM (1.6 – 1.7 g/kg BM)	Approximate amount of foods to eat throughout the day to meet protein requirement
100 (45.5)	73 – 77	6 ounces chicken (42 g) 12 ounces low-fat milk (12 g) 1 peanut butter sandwich (12 g) 1 carton yogurt (8 g)
120 (54.5)	88 – 93	2 egg whites (8 g) 2 slices bread (10 g) 6 ounces ham (42 g) 2 low-fat string cheese (16 g) 12 ounces low-fat milk (12 g)
140 (63.6)	102 – 108	1 cup Greek yogurt (20 g) 8 ounces meat sauce (56 g) 2 cups pasta (30 g)
160 (72.7)	116 – 123	1 cup cereal with 1 cup milk (12 g) Yogurt smoothie (28 g) 1 ounce almonds (7 g) 2 ounces tuna (14 g) 8 ounces turkey (56 g)
180 (81.8)	131 – 139	2 eggs (8 g) 4 tacos with 2 ounces meat each and 1/2 cup pinto beans (63 g) 2 ounces shredded cheese (16 g) 1 cup Greek yogurt (20 g) 4 ounces chicken (28 g)
200 (90.1)	146 – 154	Greek yogurt smoothie (20 g) Tuna fish sandwich (24 g) 8 ounces lean pork (56 g) 2 cups rice (10 g) 2 ounces mixed nuts (10 g) 1 cup Gatorade shake (20 g) 4 ounces hummus (5 g)
220 (100)	161 – 169	1 cup low-fat cottage cheese (25 g) Lean ham sandwich with 8 ounces ham (66 g) 1 cup Gatorade shake (20 g) 2 boiled eggs (14 g) 6 ounces grilled chicken (42 g)
250 (113.6)	183 – 193	Egg white bagel breakfast sandwich (20 g) 1 cup Greek yogurt (20 g) 1/2 cup granola (10 g) 6 ounces turkey sandwich (52 g) 2 ounces almonds (12 g) 6 ounces salmon (42 g) 1 cup pasta (15 g) 1 cup Gatorade shake (20 g)

Table 2. Recommendation for Protein Requirements for Football Players based on Body Mass

are absorbed faster than non-essential amino acids (NEAA) with leucine, isoleucine, valine and methionine being the most rapidly absorbed (Adibi et al., 1967). These physiological properties give BCAA, which are found in dairy and meat products, a high protein digestibility-corrected amino acid score (PDCAAS). Evidence from Wilkinson et al. (2007) and Tang et al. (2009) has shown that dairy products, especially milk, stimulate MPS. Lastly, the BCAA leucine can activate key signaling proteins of the mammalian target of rapamycin (mTOR) pathway which plays a crucial role in turning on MPS (Baar, 2014; Drummond & Rasmussen, 2008; Drummond et al., 2009).

Ideally, a mix of protein sources should be included in the diet of a football player. The National Health and Nutrition Examination Survey (NHANES) is a large survey conducted in the U.S. and Canada to determine what people are eating (Center for Disease Control and Prevention). Results from these surveys have shown that 2/3 of the protein consumed in a typical North American diet comes from animal sources (Abbot & Byrd-Bredbenner, 2007). This increased consumption of animal products can lead to a higher intake of saturated fat, which can put individuals at risk for cardiovascular disease (Dixit et al., 2011) and metabolic syndrome (MS). Table 2 can be used to plan protein requirements for players based on body weight.

Fat

Dietary fats supply a source of essential fatty acids and fat-soluble vitamins that are important to a football player's diet; however, most players either fall within the range for recommended fat intake or exceed it. Players who consume a high-fat diet will not only have adverse health effects but may also displace the storage of carbohydrates by fat (Coyle et al., 2001). On the other hand, players who eat a very low-fat diet (less than 15% of total kilocalories from fat) do not have any additional performance benefits (Stellingwerff et al., 2006). So, neither a high-fat diet nor low-fat diet is advised.

Despite the fact that most players fall within the recommended range of fat intake, players of all ages should be encouraged to consume more heart healthy fats, which include more fats that contain monounsaturated (olive and peanut oil) and polyunsaturated fatty acids (safflower and soybean oil) and lower amounts of saturated fatty acids (butter, lard, cream) and trans fats (processed foods like cookies and crackers) with the addition of fruits, vegetables and whole grains (ADA, 2009).

Bosch and colleagues (2014) found that as body mass increased, abdominal fat accumulation increased in NFL players. Another study conducted in 1994 by Baron & Rinsky found that offensive and defensive linemen had an increased risk of cardiovascular disease when compared with players at other positions. Consuming too much food (especially high-calorie food from fat) can result in the accumulation of abdominal fat, which puts linemen at risk for cardiovascular disease. In particular, linemen had a 52% greater risk of cardiovascular death when compared with the general population and three times the risk of dying from heart disease when compared to non-linemen. Additionally, Miller and colleagues (2008) investigated the evidence of MS in retired NFL players and found that linemen exhibited a high prevalence of MS, which was almost double the prevalence of their non-linemen counterparts. These studies could partially help explain the higher risk for cardiovascular death observed in retired linemen. Clearly, behavior and lifestyle changes, including dietary intervention, need to be implemented with retiring NFL players.

EATING FOR COMPETITION AND TRAINING

The foods consumed before, during and after competition and training can affect performance and how quickly the body can recover. Specific guidelines exist to provide athletes with the best recommendations to ensure maximum performance.

Pre-game Meal

One of the goals for the pre-game meal is to keep the player from feeling hungry before and during the game. Other reasons to consume a pre-game meal include refilling liver glycogen and to continue to replenish muscle glycogen from the last workout. Allowing for personal and psychological factors, the pre-exercise meal should be high in carbohydrates, moderate in protein and low in fiber and in a form that is readily digested (Rehrer et al., 1992). Foods with high fat content delay emptying time from the stomach and take longer to digest while foods with high carbohydrate content empty faster, with liquid carbohydrates emptying the fastest out of the stomach.

The meal consumed before exercise should be large enough so that players are not hungry during the game, but not so large as to leave undigested food in the stomach. Guidelines suggest that smaller meals should be consumed closer to the event to allow emptying of food and absorption of nutrients (ADA, 2009). Generally, carbohydrates should compose most of the pre-exercise meal and 1 g carbohydrate/kg body mass is appropriate 1 h prior to the start of the game, whereas 3-4 g carbohydrate/kg body mass can be consumed 3-4 h before the game (Burke et al., 2011).

In some cases where adrenaline levels are increased before the start of a game, a liquid meal replacement high in carbohydrates or carbohydrate drinks with a small amount of solid foods work well for the player. Note that consuming a pre-game meal does not make up for poor nutritional intake in the days leading up to a game or competition. Preparation for competition includes nutritional strategies to replenish energy stores in the week leading up to competition and includes the pre-game meal and the foods or beverages consumed just before the game starts.

The evidence-based guidelines below can be used as the basis to make pre-game recommendations to players.

What Science and Practice Recommends for Pre-game Meals

- 5-60 min before competition, it is suggested to consume lower amounts of carbohydrates that digest quickly. Try consuming:
  - Liquids that contain 30-60 g carbohydrates from a sports drink or gel
- 2 h before competition, solid foods can be introduced if it sits well with the player. Examples could include:
  - Small bowl of a whole-grain cereal and low-fat milk
  - Whole-grain toast or a small low-fat muffin
  - 1/2 whole-grain bagel, low-fat yogurt and fruit
  - Fruit smoothie made with low-fat yogurt or milk
- 3-4 h before competition, larger meals can be consumed. However, watch the amount of fat consumed because it takes the longest to digest. Try pre-game meals like:
  - Turkey sandwich on whole-grain bread with low-fat cheese, yogurt, fruit or granola bar
  - Pasta with 3-4 ounces of meat sauce, bread sticks, low-fat milk
  - Steamed rice with vegetables with 3 ounces of chicken and a piece of fruit
  - French toast or small stack of pancakes with limited syrup, 1 egg, low-fat milk and a piece of fruit

Eating the Hour Before the Game

In the past, there was a concern that if players ate carbohydrate foods or beverages immediately before the start of a game, insulin levels would rise and cause a decline in blood glucose and players would take the field in a hypoglycemic state. The notion of creating a hypoglycemic effect by eating carbohydrates immediately before exercise came from a study published by Foster et al. (1979). While these authors did find a reduction in exercise capacity when subjects consumed glucose the hour before exercise, in most athletes, this transient hypoglycemia is not detrimental to performance. In fact, most studies now find that carbohydrate consumption in the hour before exercise has no detrimental effects but rather provides an improvement in performance (Coyle, 1991; Hawley & Burke, 1997). It is suggested that within the hour before the game, players may benefit from consuming liquid carbohydrates, such as a pre-game beverage or gel (25 g carbohydrate/4 oz or 118 mL) or sports drink (~14 oz or 400 mL of solution containing ~6% carbohydrate).

Fueling During the Game

American football is an intermittent sport that can be riveted with long breaks between offensive and defensive plays in which players may have variable rest periods throughout a game and these variables can change from game to game. Along with questionable actual playing time, environmental conditions such as temperature, altitude and humidity change from game to game and can also differ from the beginning of the season to the end of the season. All of these factors, along with whether a player consumed a pre-game meal and at what time, can affect carbohydrate consumption during a game. Because studies have not been performed specifically using football players and how they tolerate carbohydrate intake during a game, extrapolations from other studies using intermittent exercise are used to make recommendations on carbohydrate consumption during a game. Several studies investigating carbohydrate consumption during intermittent sports lasting about an hour found an enhancement in performance with carbohydrate ingestion (Nicholas et al., 1995, Phillips et al., 2012). Jeukendrup and Chambers (2010) reported that for higher-intensity exercise with shorter durations, a mouth rinse containing carbohydrates can improve performance, potentially by stimulating centers in the brain related to fatigue, pleasure and/or motor control. Recently, Jeukendrup (2014) suggested new guidelines for carbohydrate intake that are dependent upon the duration of exercise. He suggested that athletes ingest smaller amounts of carbohydrates (that could include simple mouth rinsing) for shorter bouts of exercise, whereas exercise of longer duration would require more carbohydrates and the use of multiple transportable types.

Whether players may benefit from a carbohydrate beverage over water depends on a variety of factors, especially the duration of the exercise. Consuming a carbohydrate-containing beverage during exercise may be important for players who:

- Have not consumed a pre-game meal
- Skipped a meal throughout the day
- Participate in intense training or at a moderate intensity for a prolonged period
- Participate in two-a-day practices
- Train in the heat, cold or altitude

Post-game Nutrition

Traditionally, NFL football games are played once a week on Sundays or Monday nights, while college football games are played on Saturdays. Whether it is a professional or college game, players usually have a week before their next competition and a full day off before resuming practice. In this case, they do not necessarily need to practice immediate post-game recovery after the games, as long as they go home and eat regular meals. However, most football teams practice 4-5 d/wk and it is important for them to practice recovery nutrition after practices. In-season recovery nutrition has been covered in another American-football themed Sports Science Exchange paper, (SSE #144) but football players do need to consume post-game meals that provide nutrients that will maintain health, well-being and healing, and replace the energy that was expended during the game.

At Home: Consuming a post-game meal in players' homes is much easier than when the team is traveling on the road. Generally teams will provide post-game meals in an area close to the locker room at the stadium. In the past, the post-game meal was more of a smorgasbord of food focusing on massive amounts of protein. However, that has changed. The post-game meals are now planned

by the team RD with a focus on healthy foods and fluids for hydration. Some players may then go and eat at restaurants or at home with families.

On the Road: Football teams usually spend between 24-36 h on the road per week. Typically, teams leave the day before a game and return immediately after the game. Meals on the road usually include a dinner the night before the game, maybe a late evening snack and the pre-game meal, which is provided by the hotel. After the game, fluid is available and possibly a small post-game snack. The main post-game meal is most likely served on the plane returning home. Football teams usually leave right after the team has showered, cleaned up and answered media questions. The team's post-game meal can be catered by the airlines or from a local restaurant. Again, in the past this meal was high in protein and fat; however, under the direction of the team's RD the post-game meal is now a meal that focuses on healthy portions of vegetables, fruit, lean protein and whole grains, and the fat that is found in the meal is a healthier fat such as monounsaturated or polyunsaturated fatty acids.

TRAINING TABLE

Just about every professional football team in the NFL has adopted the concept of properly fueling football players for optimal performance. The largest change over the years in feeding football players has been in hiring RDs and their influence on what foods are being served at the training table. Today's training tables are no longer dominated by protein and saturated fat. For example, here is a menu from the Denver Broncos training table for a lunch served this past season:

- Pistachio encrusted salmon with lemon caper reduction sauce and micro greens
- Bison Bolognese over pasta
- Sweet potato gnocchi with walnuts
- Albert Bartlett red potatoes
- Asparagus and heirloom tomatoes
- Salad bar

The Broncos' new kitchen and dining room is approximately 6,200 square feet of professional-grade equipment and includes dedicated areas for a smoothie station, an area for fresh fruit, a fuel bar and a recovery station. The staff includes an RD as director of team nutrition, an executive chef and a culinary team that replaced a catering company that served the team in the past years. The kitchen and dining room are open 11 months of the year and during preseason training camp, serves three meals/day plus two snacks that feed both players and coaches. During the season the staff will prepare breakfast and lunch with snacks.

Other NFL teams have similar setups. In fact, one team has a cafeteria line based on the American Heart Association Guidelines. Many of the team RDs use the food served at the training table as a means of nutrition education. For example, some team RDs have used a color-coded system to identify the best foods for optimal performance. Others RDs use the foods offered on the training table as a way to educate players about the correct proportion of food to eat for body composition changes, recovery and healing from injuries. Other means of nutrition education include signage around the dining room that identifies foods to eat that will provide fuel, help with recovery, build muscle mass, help with healing, and boost the immune system.

The benefit of having an RD with a football team and this greatly improved food served on the training table is that players are getting the nutrients they need to physically perform at their genetic potential, but more importantly they are learning how to eat for the rest of their lives and reduce the risk of a cardiac event at a time when they should be enjoying their retirement.

PRACTICAL IMPLICATIONS

- Football players not only need to meet their energy needs to support training and competition but they also need to focus on the quality of their diet by consuming healthy carbohydrates and fats and appropriate amounts of protein.
  - The more consistent a player can be with their daily eating pattern, the better they are at performing day to day, week to week and throughout the season as they have built a base on which they can perform at their potential.
- The energy systems used to fuel football players rely upon glycogen and therefore carbohydrate intake.
  - Players need to consume adequate carbohydrates daily to maintain glycogen levels.
- The pre-game meal should be consumed 1-4 h before the start of the game.
  - The pre-game meal should be composed primarily of carbohydrates that will enhance liver glycogen, continue to replenish muscle glycogen and provide energy to the brain. Additionally, the fluid consumed will help with maintaining hydration.
- Carbohydrate consumption during intermittent sports like football has been shown to enhance performance.
  - Consuming a sports drink during exercise may be important for athletes who have not consumed a pre-game meal, skipped meals throughout the day, train in the heat or cold, or have multiple workouts during the day.
- Post-game meals for professional football players have changed.
  - The foods served are now focused on healthy portions of vegetables and fruit, lean protein, whole grains and the fat that is found in the meal is a healthier fat such as monounsaturated or polyunsaturated fatty acids.

CONCLUSION

Fueling a football team has moved into the era of evidence-based science and the employment of RDs and professional chefs.

Educating football players about what foods to eat, how much food to eat and the timing of pre-game and post-game meals is of prime importance for athletic performance. These guidelines can apply to football players of just about any age, and instilling good nutrition habits early in a football career can teach players how to eat for a lifetime.

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