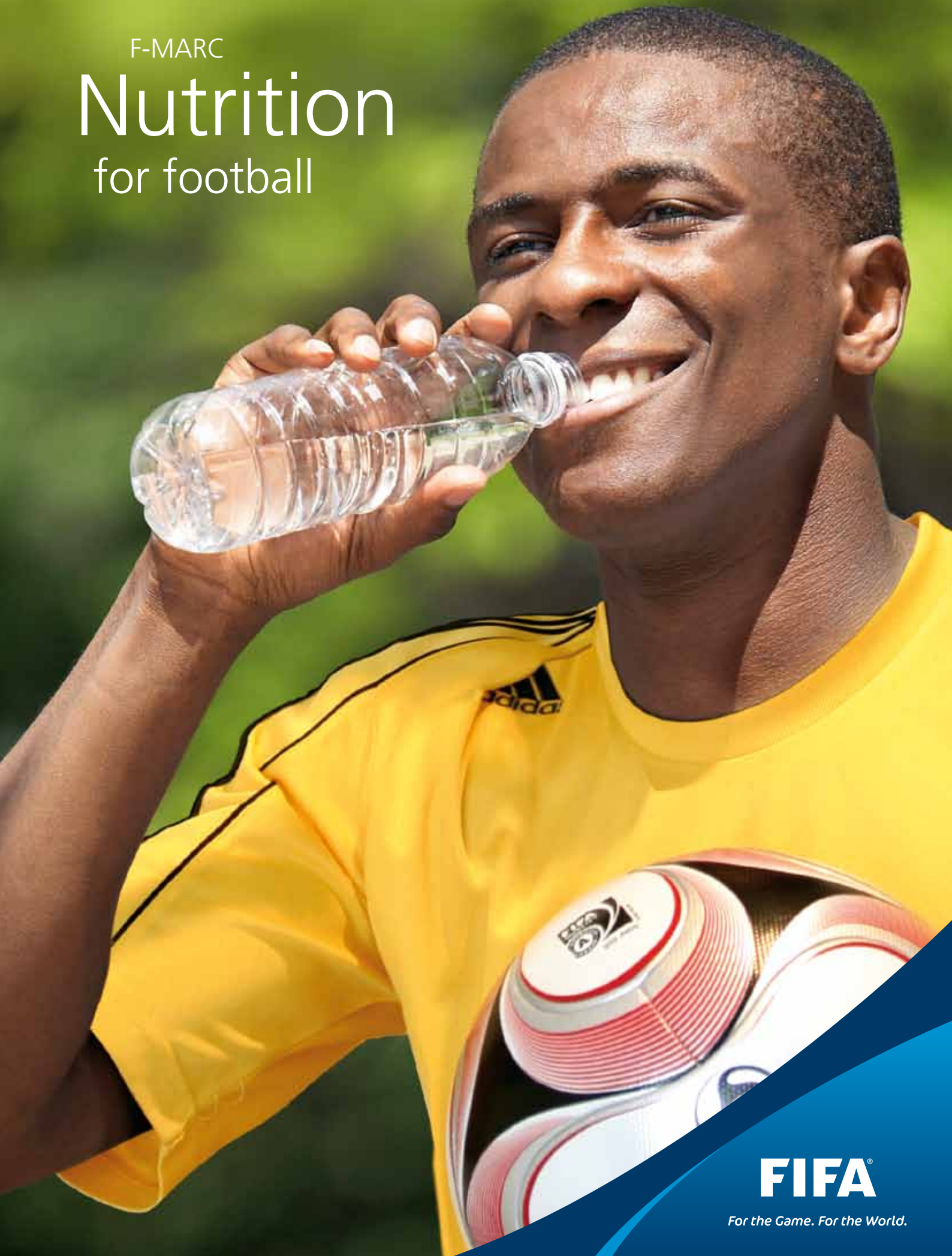


F-MARC

Nutrition

for football



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F-MARC

Nutrition for football

A practical guide to eating and drinking for health and performance

Based on an International Consensus Conference held at the Home of FIFA in Zurich, September 2005
Updated January 2010

Nutrition for Football

A practical guide to eating and drinking for health and performance

Publisher

Fédération Internationale de Football Association
Member Associations and Development

President Secretary General

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Editing and production

F-MARC, FIFA Production

Graphic design/layout

Sven Müller Design, 82319 Leutstetten/Munich, Germany

Photos

Kurt Schorrer, Markus Ulmer, foto-net, FIFA archives,
Getty Images, Coca-Cola, Stockfood, iStockphoto, Fotolia,
shutterstock, Associated Press, Stockbyte, dreamstime

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*All players should choose foods wisely
to help achieve their goals in sport.*



"The foods and drinks that players choose to consume can affect how they perform in sport and help them to stay fit and healthy. All players should choose foods wisely to help achieve their goals in sport.

We must also remember the important social and cultural aspects of eating and the pleasure that we gain from food. A healthy diet that is good for performance can also be a source of enjoyment.

FIFA is committed to helping all players to achieve their goals. This booklet is part of that commitment. We see the practical guide to eating and drinking for health and performance in football as an integrated part of the 'Football for Health' programmes initiated by F-MARC in order to maintain the health. For many it is also to improve their health conditions by playing football as a very efficient physical exercise and to also tackle many non-communicable diseases.

A healthy diet and an appropriate intake of fluids are very important pillars of the programme 'Football for Health'."


Joseph S. Blatter
FIFA President

Staying committed to a balanced nutritional diet is key to achieving peak-level athletic performance. To help you in this regard, The Coca-Cola Company, through our POWERADE brand, is proud to partner with FIFA and the FIFA Medical Assessment and Research Centre (F-MARC) to create this nutrition guideline brochure for all players, including those elite players who are competing in the 2010 FIFA World Cup South Africa™.

The Coca-Cola Company's POWERADE brand can help athletes refresh, revitalize and perform at their optimum level whenever they compete, by helping to prevent dehydration and by delaying the onset of fatigue during exercise.

Coca-Cola has a rich heritage of support for football at all levels, from youth development activities to the FIFA World Cup™. On behalf of our 700,000 Coca-Cola associates in 206 nations around the world, we wish you the very best at the World Cup, as you compete and establish friendships with people from other cultures and countries who share your passion for football, friendship and goodwill.

Sincerely,



Muhtar Kent
Chairman & CEO
The Coca-Cola Company



Keymessages

Whenever highly talented, motivated and well trained players meet in competition, the margin between victory and defeat is small. Attention to detail can make that vital difference. [Diet affects performance](#), and the foods that we choose in training and competition will affect how well we train and play. Every player needs to be aware of their personal nutritional goals and of how they can select an eating strategy to meet those goals.

[Every player is different](#), and there is no single diet that meets the needs of all players at all times. Individual needs also change across the season and players must be flexible to accommodate this.

Diet may have its biggest impact on training. [A good diet can help support consistent intensive training](#) while limiting the risks of illness or injury. Good food choices can also promote adaptations to the training stimulus – this can lead to more improvement for the same training load. The right diet is also important in preparing for games and in hastening recovery afterwards.

[Getting the right amount of energy](#) to stay healthy and to perform well is key. Too much and body fat increases: too little and performance falls, injuries increase, and illness results.

Carbohydrate supplies the muscles and brain with the fuels they need to meet the stress of training and competition. [Players must be aware of what foods they should choose to meet their carbohydrate needs, how much should be eaten, and when these foods should be eaten.](#)

Foods rich in protein are important for building and repairing muscles, but [a varied diet containing everyday foods will generally supply more than enough protein](#). Well-chosen vegetarian diets can easily meet protein needs. Eating a small amount of protein just after training may help promote adaptations in response to the training stimulus.

[A varied diet that meets energy needs](#) and is based largely on nutrient-rich choices such as vegetables, fruits, beans, legumes, cereals, lean meats, fish and dairy foods should ensure an adequate intake of vitamins and minerals. Excluding any of these food groups means that more careful food choices must be made.

[Maintaining hydration is important for performance.](#)

Fluid intake before, during (where appropriate) and after exercise is important, especially in hot climates. When sweat losses are high, foods and drinks consumed must contain sufficient water and salt to replace these losses.

[Players are cautioned against indiscriminate use of dietary supplements.](#)



Nutrition

for football

This booklet contains information that will help players at all levels of competition to make informed choices to meet their nutritional needs in different situations. This booklet tries to give practical information that will be of use to the serious player, but is not a substitute for individual advice from a qualified professional.

*Every player is different,
and there is no single diet
that meets the needs of all
players at all times.*





The benefits of eating well

Football is structured so that the two opposing teams are closely matched: a one-sided game is no fun for players or for spectators. Every player and every team therefore has to strive to achieve the advantage that is necessary to win. Hard work in training and sound tactics are vital, but a well-chosen diet can offer many benefits:

- Optimum gains from the training program
- Enhanced recovery within and between workouts and events
- Achievement and maintenance of an ideal body weight and physique
- A reduced risk of injury and illness
- Confidence in being well-prepared for match play
- Consistency in achieving high level performances in matches
- Enjoyment of food and social eating occasions

Despite these advantages, many players do not meet their nutrition goals. Common problems and challenges include:

- Poor knowledge of foods and drinks and inadequate cooking skills
- Poor choices when shopping or dining out
- Poor or outdated knowledge of sports nutrition
- Inadequate finances
- Busy lifestyle leading to inadequate time to obtain or consume appropriate foods
- Limited availability of good food and drink choices
- Frequent travel
- Indiscriminate use of supplements and sports foods

The information in this booklet is designed to provide players and coaches with an overview of the latest guidelines in sports nutrition. While there is no such thing as a magic diet or food, there are many ways in

which eating and drinking well can allow players at all levels of performance to achieve the special goals of their training and competition programs. It makes no sense to train hard if you ignore the benefits that follow from good food choices.

Nutrition for Football is based on the conclusions of the FIFA/F-MARC Consensus Conference on Nutrition for Sport, held in Zurich in September 2005. We gratefully acknowledge the contribution of the conference participants as the expert scientific sources for this booklet.

This booklet was prepared for the FIFA Medical Committee by

- Professor Ron Maughan, UK
- Professor Louise Burke, Australia
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The booklet was revised and updated in January 2010. We thank all of those who have made helpful contributions to the revision process.

We thank all the participants in the FIFA/F-MARC international consensus conference for their insight and comments in the preparation of this booklet.



Prof Jiri Dvorak, MD,
Chairman F-MARC, FIFA Chief Medical Officer

Energy demands

of training and match play

Most serious football players play in one or more competitive games per week for a large part of the year and will train most days of the week, sometimes twice a day, throughout this time. The energy demands of training must be met to maintain performance capacity and prevent the development of excessive fatigue. Those who play for fun and train occasionally will find this a good way to stay fit and control weight, but they do not face the same nutritional challenges.

Energy for match play

Football is a game of intermittent work. Players generally perform low intensity activities for more than 70% of the game, but heart rate and body temperature measurements suggest that the total energy demand is high. The high energy demand may be partly explained by the repeated high intensity efforts that players are called upon to perform. A top class player performs about 150-250 brief intense actions during a game. These efforts place high demands on the anaerobic energy systems, and are a major factor in the fatigue that occurs at all stages of the game.

Carbohydrate is stored in the muscles and in the liver as glycogen. This is probably the most important fuel for energy production and fatigue towards the end of a game may be related to depletion of glycogen in some of the individual muscle fibres. If even a few of these are unable to contract, then sprinting ability is reduced and skill may also be impaired. Free fatty acid (FFA) levels in blood increase progressively during a game and partially compensate for the progressive lowering of muscle glycogen, but this is a less effective fuel source. The physical demands during a game vary greatly between players and are related to physical capacity and tactical role in the team. These differences

should be taken into account in the training and nutritional strategies of all serious players.

The total distance run by a player during a game depends on many different factors, including the level of competition, the player's position, the playing style, and fitness level of the individual. At the elite level, male outfield players typically cover about 10-13 km, making football an endurance sport. The physical demands are increased by the fact that more than 600 m are covered at sprinting speed and about 2.4 km at high intensity. Over the whole duration of the game, heart rate is about 85% of the maximum rate and the oxygen demand is about 70% of the maximum oxygen uptake (VO₂max). These values suggest that the total energy cost of a game for a typical player weighing about 75 kg would be about 1800 kcal (about 5.5 MJ). The value for players at lower levels of the game is somewhat less than this; because the VO₂max is also lower, the total energy expended will be less. Of course, heavier players need more energy for a given distance run, and energy needs also vary greatly between individuals.

Energy demands of training

The energy demands of training will vary depending on the intensity, frequency, and duration of the training sessions, but they will also change over the course of the season. Most players will follow a weekly cycle that involves a reduced training load to allow recovery from the previous game, days of harder training, and a reduction in training load in preparation for the next game.

In pre-season, the training load is usually at its greatest as players strive to reach full fitness for the opening games of the season. Energy demands in a training session focused on fitness may exceed those of a hard game. In sessions where the emphasis is on recovery and regeneration or on skill, the energy cost will be much less.

Energy needs

The foods we eat and the fluids we drink provide for the immediate energy needs of the body as well as influencing body energy stores. Energy stores play a number of important roles related to exercise performance, since they contribute to

- Size and physique (e.g. body fat and muscle mass)
- function (e.g. muscle mass)
- fuel for exercise (e.g. muscle and liver carbohydrate stores)

The energy needed for training and match play must be added to the energy required for normal daily activities. This will depend on physical activity at work and on other lifestyle factors.

How much food a player needs will depend largely on the total energy needs, and there is no simple formula to predict this. Energy needs depend not only on the demands of training and match play, but also on activities outside the game. For those who train infrequently, or where training sessions are short or easy, the energy demands will not be high. Similarly, energy needs are lower during periods of inactivity such as the off-season or while a player is injured, and players should adapt their food intake accordingly.



How much food a player needs will depend largely on the total energy needs.

Body fat

An individual's body fat stores represent a lifetime history of the balance between energy intake and energy expenditure. Fat is the major energy store in the body, and is an efficient way to store excess energy for use in times of need.

A player will perform best when the amount of body fat is within his or her individual optimum range. This will vary between individuals, and will also vary across a player's career, so there is no single value that is ideal and less is not always better. If the body fat stores fall too low, health will suffer. If body fat stores are too high, the player will be slowed down by having to carry unnecessary additional weight. Excess body fat is also a health risk. It is important, therefore that players manage their food intake and energy output to achieve an optimum body size and body composition.

Strategies for managing energy intake and energy balance:

Players should individually manage their energy stores of body fat, carbohydrate (muscle fuel) and protein (muscle mass) by managing intake and expenditure of these nutrients separately. These issues will be discussed in separate parts of this booklet.

Players should follow an eating plan that helps them to achieve their specific goals rather than relying on appetite to guide energy intake. Advice from a sports nutrition expert is often required to develop this plan.

Players should use a number of separate bio-markers to monitor their progress in achieving each of their energy-related goals. Monitoring body weight can be misleading, and the information can be misinterpreted. Body weight is not a reliable or accurate indicator of energy balance, since day to day changes mostly reflect

differences in hydration levels and longer term changes can't distinguish changes in body fat and muscle mass

- Monitoring of skinfold fat thicknesses at intervals through the season, especially when undertaken by a trained kinanthropometrist, can provide useful information about changes in body fat stores
- Urinary ketones might provide a marker of inadequate carbohydrate intake
- Measurements of changes in muscle strength and endurance provide a useful biomarker of muscle development
- Premature fatigue and loss of form may be signs of nutrition-related problems



Special concerns about restricting energy intake

Many players reduce their energy intake at times to assist with the loss of body weight and body fat, but it is harmful to restrict energy intake so much that it interferes with normal body function. The diet must provide enough energy (calories) to meet the demands of training and match play, as well as cost of growth, development, and staying healthy. Eating less than this on a long-term basis will lead to a loss of performance and a risk to health.

Players requiring advice for weight loss or fat loss should seek guidance from a qualified sports nutrition expert such as a sports dietitian.

If a reduction in body fat content is necessary, this should be achieved gradually. Players can avoid potential problems by taking care to avoid excess weight gain in the off-season. Careful management of both diet and

activity levels in the off-season and in the pre-season can help players to reach their ideal weight and body fat level with minimal impact on health or performance.

To avoid irreversible skeletal damage, any female player with disruption of normal menstrual function should be referred without delay to a medical expert for investigation.

Weight loss supplements

Some players turn to weight loss supplements and "fat burners" to help them achieve their target weight. This is to be strongly discouraged. Most of these supplements do not work and those that do carry serious health risks. Some herbal weight loss products have been shown to contain illegal drugs that are not declared on the label.

Carbohydrates

in the diet

Carbohydrate is an important fuel for exercise but the body can store enough to last for only one day of hard training. The player's everyday eating and drinking plan therefore needs to provide enough carbohydrate to fuel their training program and to optimise the recovery of muscle glycogen stores between workouts. General targets can be provided for carbohydrate needs, based on the player's size and the demands of their training program (see Table below). Actual needs are specific to the individual, however, and must be fine-tuned to take account of the total energy needs and specific training goals. It is important to get feedback from performance in training and match play to assess whether there is a problem with fuel availability. An inadequate carbohydrate intake will lead to early fatigue.

Targets for carbohydrate intake

- Immediate recovery after exercise (0-4 hours): about 1 g per kg of the player's body weight per hour, consumed at frequent intervals
- Daily recovery from a moderate duration/low intensity training session: 5-7 g per kg BW per day
- Recovery from moderate-heavy endurance training (such as pre-season) or fuelling up for a match: 7-10 g per kg BW per day

Strategies for choosing carbohydrate foods and drinks and optimising recovery of glycogen stores

When the period between training sessions is less than about 8 hours (as in pre-season for elite players), carbohydrate intake, in the form of solids or liquids, should start as soon as practicable after the first session to maximise the effective recovery time. There may be some advantages in meeting carbohydrate targets through a series of snacks during the early recovery phase.

During longer recovery periods (24 hours), the pattern and timing of carbohydrate-rich meals and snacks do not appear to be critical, and can be organised according to what is practical and comfortable for each player. There is no difference in glycogen synthesis when carbohydrate is consumed in liquid form or as solid foods. Given the amount of carbohydrate to be consumed, high carbohydrate foods will need to be spread out over the full 24 hours.

It is valuable to choose nutrient-rich carbohydrates and to add other foods to recovery meals and snacks to provide protein and other nutrients. These nutrients may assist in other recovery processes, and in the case of protein, may promote additional glycogen recovery when carbohydrate intake is below targets or when frequent snacking is not possible.

Carbohydrate-rich foods and drinks with a moderate to high glycaemic index (GI) provide a readily available source of carbohydrate for glycogen synthesis. These foods should form the major part of recovery meals.

Adequate energy intake is also important for optimal glycogen recovery; the restrained eating practices of some players, particularly females, make it difficult to meet carbohydrate intake targets and to optimise glycogen storage from this intake.

Similar strategies apply to recovery after games. This can be especially challenging after matches that finish late in the evening, with further complications if there is a homeward journey beginning immediately after the match. Neglecting an adequate carbohydrate intake after the game will delay recovery and it is important that some carbohydrate is consumed before setting off on the journey home and before going to bed.



Breakfast cereals are good.

Special comments

Guidelines for carbohydrate should not be provided in terms of percentage contributions to total dietary energy intake (for example, stating that carbohydrate should provide 55% of energy intake). Such recommendations are hard for most people to follow since they require both carbohydrate and energy intake to be tracked. They can also be misleading when energy intakes are particularly high or particularly low.

Examples of carbohydrate foods with moderate-high Glycaemic Index:

- Most breakfast cereals
- Most forms of rice
- White and brown breads
- Sports drinks and soft drinks
- Sugar, jam and honey
- Potatoes
- Tropical fruits and juices

Examples of nutrient-rich carbohydrate foods and meal combinations

- Breakfast cereal with milk
- Flavoured yoghurt
- Fruit smoothie or liquid meal supplement
- Sandwich with meat and salad filling
- Stir-fry with rice or noodles

Carbohydrate is an important fuel for exercise but the body can store enough to last for only one day of hard training.

Protein needs

for training and bulking up

Protein has been considered a key nutrient for sporting success by athletes of all eras and in all sports. Ancient Olympians were reported to eat unusually large amounts of meat, but today's players have access to a vast array of protein and amino acid supplements to help them increase their protein intakes.

Protein plays a key role in the adaptations that take place in response to training. Amino acids from proteins form building blocks for the manufacture of new tissue, including muscle, and the repair of old or damaged tissue. They are also the building blocks for hormones and enzymes that regulate metabolism and other body functions. Protein provides a small source of fuel for the exercising muscle.

Some scientists have suggested that endurance and resistance-training exercise will increase daily protein needs up to a maximum of 1.2-1.6 g per kg body weight (BW). This is 50-100% more than the recommended intake of 0.8 g/kg BW for a sedentary person. The evidence for this increase in protein needs, however, is not clear and universal. Part of the confusion is caused by problems involved in scientific techniques used to measure protein requirements.

The debate over the precise protein needs of players is largely unnecessary. Dietary surveys show that most players who eat enough to meet their energy needs already consume diets that provide protein intakes above 1.2-1.6 g/kg/d, even without the use of protein supplements. Therefore, most players do not need to be encouraged or educated to increase their protein intakes. Rather, anyone who consumes adequate energy intake from a variety of nutrient-rich foods should be confident of meeting their protein needs, including any increases that could arise from high-level training

Players most at risk of failing to meet their protein needs are those who severely restrict their energy intake for long periods or who lack dietary variety. An adequate energy intake is also important in promoting protein balance or increasing protein retention.

Some resistance-trained athletes and body builders consume very large amounts of protein, but there is no evidence that such dietary patterns enhance the response to training or increase the gains in muscle mass and strength. While such diets are not necessarily harmful, they are expensive and can fail to meet other nutritional goals, such as providing the fuel needed to optimise training and performance.

Protein has been considered a key nutrient for sporting success by athletes of all eras and in all sports.

Exciting new research shows that the most important factor in the protein story is the timing of intake rather than the total amount that is consumed. Recent studies have focused on the acute response to workouts of both endurance and resistance training. Enhanced protein balance is a desirable goal of the recovery phase – to overturn the increased rates of protein breakdown that normally occur during exercise and to promote muscle growth, repair, and adaptation following the exercise stimulus. These studies have found that the intake of small amounts (about 20-25 g) of high quality protein enhances protein synthesis during the recovery period.

Further work is required to fine tune guidelines for the optimum amount, type, and timing of intake of these nutrients and to confirm that these eating strategies lead to an enhancement of the goals of training.

In the light of this information, it appears sensible to focus on the total balance of the diet and the timing of protein-carbohydrate meals and snacks in relation to training, rather than on high protein intakes per se. Such a combination can look after refuelling and protein recovery needs.



Protein rich foods – 10 g protein is provided by:**Animal protein (high quality)**

2 small eggs
 300 ml cow's milk
 20 g skim milk powder
 30 g cheese
 200 g yoghurt
 35-50 g meat, fish or chicken
 150 ml fruit smoothie or liquid meal supplement

Vegetable protein

4 slices bread
 90 g breakfast cereal
 2 cups cooked pasta or 3 cups rice
 400 ml soy milk
 60 g nuts or seeds
 120 g tofu or soy meat
 150 g legumes or lentils

Special sports foods such as sports bars and liquid meal supplements can provide a compact and convenient way to consume carbohydrate and protein when everyday foods are unavailable or are too bulky and impractical to consume. The additional cost of these products and the fact that they contain only a limited range of nutrients must be taken into account. There is little justification for using very expensive protein-only powders or amino acid supplements. Everyday foods are likely to be just as effective, and perhaps even better.



Animal Protein



Vegetable Protein

Vitamins, minerals and anti-oxidants for training and staying healthy

Hard training and match play place a heavy stress on the body, but good food choices can reduce the risk of harm. Adequate intakes of energy, protein, iron, copper, manganese, magnesium, selenium, sodium, zinc, and vitamins A, C, E, B6, and B12 are particularly important to health and performance. These nutrients, as well as others, are best obtained from a varied diet based largely on nutrient-rich foods such as vegetables, fruits, beans, legumes, grains, lean meats, fish, dairy products, and unsaturated oils. Dietary surveys show that most players are able to meet the recommended intakes for vitamins and minerals by eating everyday foods. Those at risk of sub-optimal intakes of these micronutrients include:

- players who restrict their energy intake, especially over long periods, to meet weight loss goals
- players whose diets lack variety and who eat a lot of foods with a poor nutrient-density

The best way to correct this situation is to seek advice from a qualified sports nutrition expert such as a sports dietitian. When food intake cannot be adequately

improved – for example, when the player is travelling in a country with a limited food supply - or if an individual is found to be suffering from a lack of a particular vitamin or mineral, then supplementation may be warranted. This should be undertaken with the advice of a qualified sports nutrition expert. In general, a broad-range multivitamin/mineral supplement is the best choice to support a restricted food intake, although targeted nutrient supplements may be necessary to correct an established nutrient deficiency (e.g. iron deficiency).

Anti-oxidant nutrients

Anti-oxidant nutrients are important in helping protect the body's tissues against the stresses of hard exercise. Hard training increases the need for antioxidants, but the body naturally develops an effective defence with a balanced diet. Supplementation with antioxidants cannot be recommended because there is little evidence of benefit while it is known that over-supplementation can diminish the body's natural defence system.

Hard training and match play place a heavy stress on the body, but good food choices can reduce the risk of harm.



Ideas for promoting dietary variety and nutrient-rich eating

- Be open to trying new foods and new recipes
- Make the most of foods in season
- Explore all the varieties of different foods
- Mix and match foods at meals
- Think carefully before banishing a food or group of foods from your eating plans

include fruits and vegetables at every meal. The strong colours of many fruits and vegetables are a sign of a high content of various vitamins and other food anti-oxidants. Aim to fill your plate with highly coloured foods to ensure a good intake of the range of these health-promoting dietary compounds. It is good to ensure that you “eat a rainbow” each day by choosing fruits and vegetables from each of the following schemes:

White – e.g. cauliflowers, bananas, onions, potatoes

Green – e.g. broccoli, lettuce, green apples and grapes

Blue/purple – e.g. blueberries, plums, purple grapes, raisins

Orange/Yellow – e.g. carrots, apricots, peaches, oranges, cantaloupe, mangoes

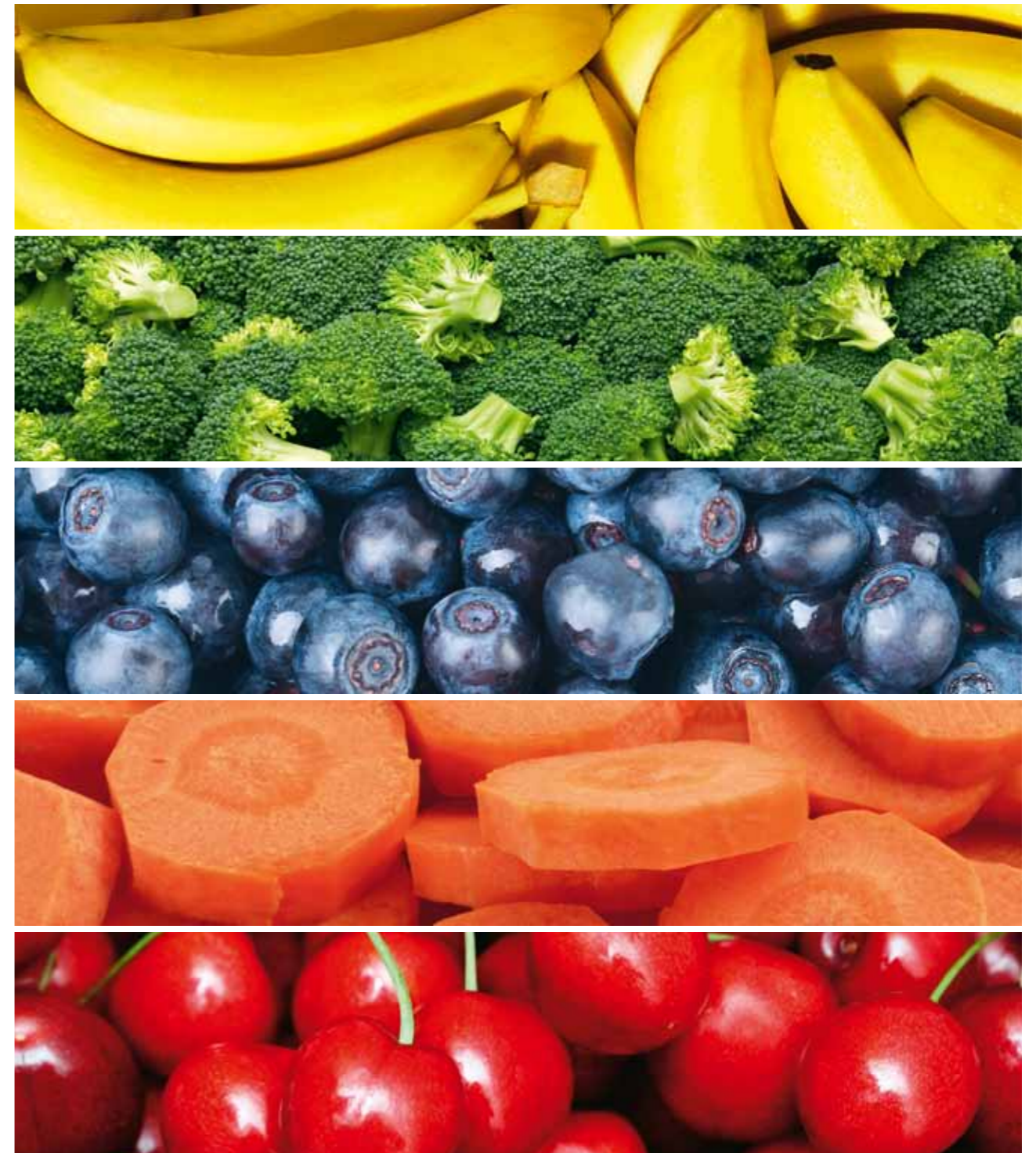
Red – tomatoes, watermelon, cherries, berries, red apples, red peppers

Special concerns

Iron deficiency is the most common nutrient deficiency in the world. It may occur in athletes, including football players, and can impair training and match performance. Unexplained fatigue, especially in vegetarian eaters, should be explored with a sports physician and sports nutrition expert. Routine use of iron supplements is not wise: too much is just as harmful as too little. Self-medication with iron supplements may not address the real problem that is causing fatigue or solve the cause of poor iron status.

Calcium is important for healthy bones. The best sources are dairy foods, including low fat varieties. Fortified soy foods may provide a useful substitute where players cannot consume dairy foods. Three servings a day are required by adults, with an increased requirement during growth spurts in childhood and adolescence, and for pregnancy and lactation.

Examples of fruits and vegetables representing the colours of the rainbow



Preparation

for competition

Most players appreciate the need to rest and eat well during the days prior to an important match, but questions arise regarding how much to eat, what type of food and when is the best time for the pre-game meal.

Carbohydrate is the key energy-providing nutrient that must be optimised during the days leading up to and including the day of competition. Players who start a game with low glycogen stores are likely to end up being substituted before the end of the game. Attention should also be given to optimising water and salt levels in the body. However, during the 2-4 days prior to a competition, a player's need for protein and fat, as well as most other nutrients, typically does not increase above the levels that are recommended for normal moderate level training. Nutrition on match day is all about performance and this is often where tailor-made sports foods can help to meet special match needs more practically than everyday foods.



‘Carbo-loading’

Players who train and compete intensely may benefit from ‘carbohydrate-loading’ for a few days before a big game. Eating a large amount of carbohydrate (about 8-10 g per kg of body weight per day; see below) at the same time that training intensity and duration are reduced will lead to very high levels of muscle glycogen stores within 2-3 days.

Example of one day of a carbohydrate loading diet providing 630 g of carbohydrate* (i.e. to provide 9 g/kg carbohydrate for a player weighing 70 kg).

Early AM – 150 g = 2 cups cereal with milk + 250 ml fruit juice + 1 banana + 2 thick slices toast + thick spread of jam

Late AM – 50 g = 500 ml soft drink or 750 ml sports drink

Mid-day – 150 g = 1 large bread roll + 1 medium muffin + fruit smoothie

Snack – 50 g = 200 g flavoured yoghurt + 250 ml fruit juice

Dinner – 200 g = 3 cups cooked pasta + 2 cups fruit salad + 2 scoops ice cream + 500 ml sports drink

Snack – 30 g = 50 g chocolate

(*foods added to balance a meal, such as sauce on the pasta, can meet needs for energy and other nutrients)

Carbohydrate is the key energy providing nutrient that must be optimised during the days leading up to and including the day of competition.

Carbohydrate in the 6-h period before playing

Players sometimes find a favourite pre-competition meal that not only provides extra energy during the match, but also feels ‘right’ in terms of curbing hunger, quieting their stomach, and being convenient and practical. Players are encouraged to find out what works for them and to stick with this – provided that what they are doing is not actually harmful to performance. In low key competition, or for some players who do little running in a game, the pre-match meal need not be predominantly carbohydrate. However, in intense competitions players are generally advised to focus on carbohydrate-rich foods to provide a total of 1-4 g/kg body weight of carbohydrate during the 6-h period before exercise.

The main ‘mistake’ players might make is to eat too little carbohydrate (less than 1 g per kg body weight) during the 1-6 h period before exercise and then fail to consume any carbohydrate during the game. This small carbohydrate meal ‘primes’ the body to rely more heavily on blood glucose, but it does not provide enough carbohydrate to sustain the player throughout the subsequent exercise.

Five different examples of foods that each provide 140 g CHO in a pre-competition meal* (2 g/kg for a 70 kg player) are:

2.5 cups breakfast cereal + milk + large banana

Large bread roll or 3 thick slices bread + thick spread honey

2 cups boiled rice + 2 slices bread

4 stack pancakes + ½ cup syrup

60 g sports bar + 500 ml liquid meal supplement or fruit smoothie

(*note that other foods may be eaten at the meal)

Fluid intake prior to competition

Players should drink sufficient fluid with meals on the day before competition to ensure they are well-hydrated on the morning of the match. There is no reason to refrain from drinking water or carbohydrate-containing fluids during the hours leading up to play. The aim, however, is not just to drink as much as possible in the pre-match period. We now recognise there are some dangers associated with excessive drinking, and that it is difficult to provide exact guidelines for fluid intake that suit all players. All recommendations should be treated as a starting point and adjusted for body size and the factors that influence fluid needs such as environmental conditions.

In hot weather, players should try to avoid too much exposure to outdoor temperatures in the hours before the game. A fluid intake of approximately 500 ml should be drunk during the 60-90 minute period before the start of the game. This will allow sufficient time for urination of excess fluid before the game begins. In training or competitions that cause heavy sweating without sufficient opportunity for fluid intake, players often benefit by drinking 300-600 ml of fluid during the 15 minute period immediately before the start of the event. These volumes should be scaled down for female and youth players with a smaller body size.

Hydration strategies

When players work hard, they lose sweat – in a game on a hot day, sweat losses may reach 3 litres. On a cold day, though, some players will lose very little sweat. Every player's hydration needs are different and will vary with the weather over the season. Just as general training and competition strategies should be tailored for individual athletes in accordance with their unique needs and preferences, so should their drinking and eating choices during exercise. Players, coaches, and trainers should 'fine tune' these recommendations to identify their own winning formula.

How much and when to drink?

Players should limit dehydration during training and matches by drinking water or a sports drink. Obvious opportunities to drink during a match include warm-up and at half time. During training, the coach or manager should organise drink breaks according to the weather and intensity of the session.

Training allows opportunities for players to get a feel for sweat rates and fluid needs so that drink practices can be adjusted accordingly (see box). It is not necessary

to drink enough to match sweat loss, but the amount of dehydration should normally be limited to a loss of less than about 2% of body weight (ie, 1.0 kg for 50 kg person, 1.5 kg for a 75 kg person, and 2 kg for a 100 kg person).

The negative effects of dehydration on high-intensity performance are greater in warm environments, so drinking practices in these conditions should be upgraded to reduce the overall fluid deficit. This may include drinking at the side-line when match play is interrupted, or having extra drink breaks during training sessions.

There should never be a need to drink more than the sweat loss so that weight is gained during exercise. This will not help performance and is likely to cause gut discomfort.

When do you need more than water?

Depletion of fuel stores can be an issue for football matches, especially for players in mobile positions or with a running game style. High carbohydrate strategies – fuelling up for the game and consuming extra carbohydrate during the match – have been shown to enhance performance in such players.



Players should limit dehydration during training and matches by drinking water or a sports drink.



Better intake of fluid and fuel during a game may not only keep players running further and faster in the second half of a match, but it can also help to maintain skills and judgement when players would otherwise become fatigued. Games are often won and lost in the last minutes of the match, and fatigued players are at increased risk of injury.

The use of commercial sports drinks with a carbohydrate content of about 4-8% (4-8 g/100 ml) allows carbohydrate and fluid needs to be met simultaneously in most events. The intake of carbohydrate that is generally associated with performance benefits is ~ 20-60 g per hour.

Sodium should be included in fluids consumed during exercise lasting longer than 1-2 hours or by individuals during any event that stimulates high salt losses. You can recognise "salty sweaters" by the salt rings on their clothes at the end of a hard session on a hot day. Players who lose a lot of salt may be more prone to muscle cramps. Adding a little extra salt to food and drinks and using the higher sodium version of sports drinks may reduce the risk of cramping for these players, but probably does not benefit other players.

Caffeine is present in many commonly available drinks (tea, coffee, cola, etc) and sports foods (e.g. gels, some sports drinks) and can enhance endurance during

How to estimate sweating rate:

- 1) Measure body weight (kg) both before and after at least one hour of exercise under conditions similar to competition or a hard practice.
- 2) Measure body weight wearing minimal clothing and while bare footed. Towel dry after exercise and obtain body weight as soon as is practical after exercise (e.g. less than 10 min).
- 3) Note volume of fluid consumed during exercise (Litres)
- 4) $\text{Sweat loss (Litres)} = \text{Body weight before exercise (kg)} - \text{Body weight after exercise (kg)} + \text{fluid consumed during exercise (Litre)}$
- 5) To convert to a sweat rate per hour, divide by the exercise time in minutes and multiply by 60

Note: 2.2 pounds equals 1.0 kg and converts to a volume of 1.0 litre or 1,000 ml or 34 ounces of water.

prolonged exercise. This benefit can be obtained with the relatively small doses of caffeine that are commonly consumed by people of various cultures (e.g. about 2-3 mg/kg bodyweight as found in a 1-2 cups of brewed coffee or 750-1500 ml of a cola beverage)

Rehydration after exercise

Recovery after exercise is part of the preparation for the next exercise session, and replacement of sweat losses is an essential part of this process. Both water and salts lost in sweat must be replaced. Aim to drink about 1.2-1.5 litres of fluid for each kg of weight lost in training or matches. Drinks should contain sodium (the main salt lost in sweat) if no food is eaten at this time, but most meals will contain adequate amounts of salt. Sports drinks that contain electrolytes can be helpful, but many foods can also supply the salt that is needed. A little extra salt may be added to meals when sweat losses are high, but salt tablets should be used with caution.



Just like new boots, don't try out new plans for fluid and fuel intake during important competition.

Do it in practice and find out what fits you best.

Supplements and sports foods

The use of dietary supplements is widespread in football, but players should not expect benefits from most of these supplements.

Players look to nutritional supplements for many benefits, including:

- promoting adaptations to training
- losing fat and building muscle
- increasing energy supply
- allowing more consistent and intensive training by promoting recovery between training sessions
- maintaining good health and reducing interruptions to training due to chronic fatigue, illness or injury
- enhancing competitive performance.

Few of the products used by athletes are supported by a sound research base and some may even be harmful to the player. All players should look carefully at the risks and rewards of individual supplements before trying them.



Where there is a demonstrated deficiency of an essential vitamin or mineral, this can usually be corrected by changes to the diet. Where an increased intake from food is not possible, a supplement may be helpful, but the use of supplements does not compensate for poor food choices and an inadequate diet. Many players ignore the need for caution in supplement use and take supplements in doses that are not necessary, and may even be harmful.

Protein powders and supplements

Protein supplements, high protein bars and amino acid preparations are among the biggest selling sports nutrition products. Although an adequate intake of protein is essential for muscle growth and repair, this can easily be achieved from everyday foods and extra protein is seldom required.

Protein-carbohydrate supplements may have a role as part of a post-exercise recovery plan, but the whole proteins that are found in foods generally have advantages over individual amino acids.

Fat reduction and muscle building

A huge array of supplements is on sale with claims that they can reduce body fat levels and build bigger and stronger muscles – claims that appeal to athletes and non-athletes alike. The reality is that many of the products that are effective in doing this are either on the banned list or are associated with serious health risks (or both). Some herbal weight loss products have been shown to contain prescription drugs that are not listed on the label.

Compounds in the muscle building category include chromium, boron, hydroxymethylbutyrate, colostrum and others. Based on current research, none of these has anything worthwhile to offer the player.

Increasing energy supply

Supplements in this category include carnitine, pyruvate and ribose as well as some more exotic herbal preparations. None of these is likely to improve performance and, in spite of advertising claims, none is supported by good independent evidence.

Nutrition and the immune system

There is some evidence that players who are training hard may be at increased risk of minor illnesses and infections. These are generally trivial, but they can interrupt training or cause a player to miss important competitions. Hard training may compromise the body's immune system and high levels of stress hormones reduce its ability to fight these infections.

Many nutrition supplements, including glutamine, zinc, Echinacea, colostrum and others, are on sale with claims that they can boost the immune system, but there is no strong evidence that any of these is effective. The best evidence supports practices which maintain good carbohydrate stores during exercise - thus lowering stress hormone levels - and appropriate rest periods.

Supplements for bone and joint health

Hard training puts extra wear and tear on the bones, joints and associated structures, and numerous supplements are claimed to look after these tissues. Healthy bones need a good supply of calcium from the diet and Vitamin D from exposure to sunlight. Players who suffer from problems related to sub-optimal bone density should seek professional advice and supervised treatment from a sports physician.

Glucosamine, chondroitin, methylsulphonylmethane (MSM) and other products are promoted for joint health. Long-term (2-6 months) glucosamine treatment may provide subjective relief in elderly individuals suffering from osteoarthritis, but there is little or no evidence of benefit for otherwise healthy players.

Supplements that might work

Some supplements do offer the prospect of improved performance: these include creatine, caffeine, bicarbonate, and perhaps a very few others.

Creatine. Creatine supplements can increase the amount of high energy creatine phosphate stored in the muscles, and may improve performance in single or multiple sprints. It may also lead to a gain in muscle mass, which is helpful for some players but harmful for others. As with all supplements, exceeding the maximum effective

dose is not helpful. Creatine is normally found in meat and fish, but the doses used in supplementation protocols (10-20 g per day for 4-5 days to load, and 2-3 g per day for maintenance) are more than is found in normal foods. There is some evidence that creatine supplements can also help increase glycogen storage in muscle. Creatine supplementation appears not to be harmful to health.

Caffeine. A small amount of caffeine (2-3 mg/kg) can help performance in prolonged exercise and may also be helpful in exercise of shorter duration. Such moderate doses can be found in everyday amounts of coffee, cola drinks and some sports products (e.g. gels, some sports drinks). For example, 100 mg of caffeine is supplied by a small cup of brewed coffee or 750 ml of a cola drink. Larger doses of caffeine do not seem to be more effective, and may have negative outcomes such as over-arousal and poor sleep patterns after an event.

Bicarbonate. In very hard exercise, the muscles produce lactic acid. This is both good (giving energy to allow hard efforts) and bad (causing pain and interfering with muscle function). In the same way that excess stomach acidity can be buffered by taking bicarbonate, so sodium bicarbonate (in a dose of about 0.3 g per kg body weight) before an event can counter the negative effects of lactic acid. Bicarbonate supplements are widely used by athletes in events that cause fatigue within a few minutes and there is now evidence of possible benefits from studies designed to simulate the activity patterns of football players. There is a real risk of gastrointestinal problems and players should experiment in training. Another buffering supplement that is gaining attention is beta-alanine. More work is needed on beta-alanine to know if it can be of benefit to football play. However,

players should be warned that a common side-effect of most beta-alanine supplements is an uncomfortable prickling sensation that lasts for about an hour.

A number of sports foods have been developed to supply a specific formulation of energy and nutrients in a form that is easy to consume. These can be valuable in allowing players to meet their special nutrition needs when everyday foods are unavailable or impractical to eat. This is most often the case just prior to, during, or after an exercise session. Examples of useful sports foods include:

- sports drinks (providing fluid and carbohydrate during exercise),
- sports gels (additional carbohydrate intake, especially during exercise)
- liquid meals (carbohydrate, protein, vitamins and minerals for a pre-event meal, post-exercise recovery or a high-energy diet)
- sports bars (carbohydrate, protein, vitamins and minerals – often a solid form of the liquid meal).

Of course, the relatively high cost of these sports foods must be taken into account when deciding whether to use them.

All players should look carefully at the risks and rewards of individual supplements before trying them.



Supplements and doping issues

Players who are liable for drug testing under national or international programs should be especially cautious about using any supplements.

Some supplements are prepared in unhygienic conditions and contain toxins that may cause gastrointestinal problems. Others do not contain ingredients - especially the expensive ones - that are listed on the label. Contamination of dietary supplements with substances that may cause a player to fail a doping test is widespread - some surveys have suggested that as many as one in four supplements may result in a positive test. Prohibited compounds including prohormones and stimulants may be present but not declared on the label, so there is no way for the player - or for the medical staff - to know that they are present.

At present, there is no guarantee of the purity of any commercial supplement. The only way to be sure is to avoid supplements altogether, but many players are unwilling to accept this advice. The sensible player will want to see very good reasons for using a supplement and a very low risk of an adverse test before deciding to use it.

There is no evidence that prohormones such as androstenedione and norandrostenedione are effective in enhancing muscle mass or strength. These prohormones are promoted for use by players and are readily available in shops and via the internet, but they will result in negative health consequences as well as positive drug tests.

Many herbal supplements are claimed to increase testosterone levels and hence have an anabolic action: such supplements include Tribulus Terrestris, Chrysin, Indole-3-Carbinol, Saw Palmetto, Gamma-oryzanol, Smilax and Mummio. These claims are based on experiments carried out in test tubes, and none has been shown to work in humans. All players are cautioned against the use of these supplements.

Players must be aware of the strict liability principle that makes them responsible for everything they eat and drink. Ignorance is not an acceptable excuse for a positive doping result.



Check all supplements with a medical officer. If there is any doubt at all, don't take it.



Alcohol

The use of alcohol is often intimately associated with sport, and the association is particularly strong in football. As well as providing a source of energy, alcohol (ethanol) has metabolic, cardiovascular, thermoregulatory and neuromuscular actions that may affect exercise performance.

Sensible drinking guidelines for the community

Alcohol intake may be measured in grams or ml of ethanol, or in units of alcohol: each unit of alcohol in the UK contains approximately 8 grams (10 ml) of ethanol. The UK Department of Health recommends that adult men should not consume more than 3-4 units of alcohol per day and women should not consume more than 2-3 units daily. In the US, however, a standard drink delivers about 12-14 grams of alcohol, and the US Department of Agriculture recommends that men should not drink more than 1-2 drinks per day and that women should not exceed 1 drink per day.

These recommendations provide a guide to the everyday use of alcohol, but the problems associated with alcohol in football generally arise from “binge” drinking on specific occasions – especially in the post-match period. This type of drinking has implications for the players’ post-match recovery, their well-being, and their reputation.

The use of alcohol is often intimately associated with sport, and the association is particularly strong in football.

Alcohol metabolism

Alcohol is metabolised primarily in the liver, and the rate of metabolism varies greatly between individuals. Alcohol can be oxidised at a rate of about 100 mg/kg body mass per hour – equivalent to about one unit of alcohol per hour for most people. Despite popular belief, the clearance of alcohol from the system cannot be enhanced by having showers, drinking coffee, or other practices believed to help an intoxicated person “sober up”.

The actions of alcohol on the central nervous system result in decrements in skill and in behavioural changes that may have adverse effects on performance. There is also evidence of dose-dependent decrements in aerobic capacity. Although the mechanisms are not well



understood, the aftermath of alcohol use (hangover) may also adversely affect performance for many hours after intoxication.

The most important problem associated with the excessive consumption of alcohol after exercise is that it may disinhibit the player and distract them from making good choices. Alcohol intoxication may make the player forget about following sound recovery practices such as appropriate treatment for injuries, adequate sleep, or optimal eating and drinking. Alcohol may displace carbohydrate from the diet at a time when restoration of glycogen stores should be a priority. The need for other important nutrients may be neglected while the player is consuming large amounts of alcohol, or sleeping off the hangover next day. An intoxicated athlete often succumbs to high-risk activities leading to accidents, violence, or other anti-social behaviour. Negative outcomes range from the tarnishing of a reputation to serious (and sometimes fatal) injury.

Examples of one unit (~ 10 g) alcohol

250 ml standard beer (4% alcohol)

500 ml standard low alcohol beer (2% alcohol)

250 ml wine coolers or alcoholic soft drinks

100 ml wine or champagne

60 ml fortified wines, port

25 ml (one nip – a shot in the US)

Alcohol is a high energy (and nutrient-poor) food and should be restricted when the player is attempting to reduce body fat.

The player should certainly avoid a heavy intake of alcohol on the night before a match. It appears unlikely that the intake of 1-2 standard drinks will have negative effects in most habitual drinkers.

Alcohol is not an essential component of a diet. It is a personal choice whether an adult player consumes alcohol at all. However, there is no evidence of impairments to health and performance when alcohol is used sensibly.

Before consuming any alcohol after a match, the player should consume a meal or snack to replace carbohydrate, and protein. This snack or meal will start the recovery process. Food intake will also help to reduce the rate of alcohol absorption and thus reduce the rate of intoxication.

Once post-exercise recovery priorities have been addressed, the player who chooses to drink is encouraged to do so “in moderation”. Drink-driving education messages in various countries may provide a guide to sensible and well-paced drinking.

The player who drinks heavily after a match, or at other times, should avoid driving and other hazardous activities.

Special needs of the elite player

There are no easy games for the elite player whose season includes pre-season tours, domestic league and Cup games plus international competitions. Each game is played at high pace with corresponding physical demands. The elite player's club will usually provide support and advice, but most meals will be taken away from the club, so players must take some responsibility for meeting their nutrition needs.

Training issues

- A demanding endurance training program usually involves daily or twice daily workouts. Inadequate refuelling leads to fatigue, ineffective training, and a risk of injury. Traditionally, many team players have focussed on fuelling up only on the day before a match or in the pre-event meal. However, the daily demands of training are best met by a permanent, daily approach to adequate fuel intake.
- Once the season is under way, the focus shifts from gaining fitness to staying healthy and being in peak condition for every game.

Competition issues

The elite, professional player has competitive demands beyond scheduled domestic league matches, including Cup competitions and national team duty in friendly matches or qualifying matches for a variety of international competitions. Competition is no longer confined to weekly games on a Saturday afternoon, and players may be asked to play at any time of day, with midweek evening games now common. Congested fixture lists may mean that only 2-3 days of rest are available between games, with some of that time required for travel to and from away fixtures. Where recovery opportunities between games are limited, it is vital that the training load is reduced to allow recovery of the carbohydrate stores. Fatigue is largely related to declining glycogen levels as the game progresses. Carbohydrate intake – usually, but not always, in liquid form - during a match can be effective at delaying fatigue, and although the nature of the game makes it difficult to ingest carbohydrate during a match, it is not impossible. The most difficult players to reach are the central midfielders as they are the most distant from the sides/ends of the field.

Special issues and eating strategies

Many teams have a large contingent of young players who are “fresh from home”. It is a good team strategy to organise cooking and shopping classes for young players to help them develop the domestic skills and nutrition knowledge that will allow them to reach their full potential as players. Players looking after themselves for the first time can find it hard to juggle the team commitments, as well as work/school. Many recipe books developed for athletes offer quick and nutritious meal ideas suited to the special needs of sport.

The pre-match meal is a good opportunity for a shared meal, ensuring final nutritional preparation as well as an opportunity to boost morale and share final tactics. Ideas for the pre-event meal are found in the box below, and are best provided as a buffet, to allow each team member to meet their individual needs and preferences.

An individual approach to fluid and fuel needs during matches is also useful. Undertaking fluid balance monitoring sessions during training or practice matches may help players to identify their individual needs and adjust their drinking practices accordingly. The current rules of football place some limitations on the intake of fluid or sports foods during matches. Players may need to use creative ideas to meet their refuelling and rehydration goals.

Post-match or post-training recovery is another good opportunity for team nutrition. Many professional football clubs have invested in an organised dining room or cafeteria to offer meals or snacks to players after training. This not only provides players with immediate access to the nutrients to promote recovery, but provides an educational message of the importance of nutrition in recovery. The provision of post-match snacks and light meals providing nutritious forms of carbohydrate and protein, as well as fluid options, will help players to recover effectively while celebrating or commiserating the results of the match. Alcohol, often a large part of post-game activities< should be discouraged, unless in moderation and even then only after recovery eating goals are achieved.



Ideas for high carbohydrate pre-event meals*

Breakfast menus

- Breakfast cereal and milk, fresh or canned fruit
- Toast and jam/honey
- Pancakes and syrup
- Fruit-flavoured yoghurt
- Baked beans or tinned spaghetti on toast
- Liquid meal supplement or fruit smoothie
- Fruit juice or sports drink

Lunch and dinner menus

- Rice dishes – risotto, fried rice, paella
- Pasta and light sauce
- Bread, including rolls and sandwiches
- Fruit and fruit based desserts
- Rice pudding

* A low-fat or low-fibre menu may help to reduce the risk of gastrointestinal problems in susceptible athletes



Snacks for recovery after training or matches

- 250-350 ml fruit smoothie or liquid meal
- 60 g (1-2 cups) breakfast cereal + milk + 1 fruit
- 200 g carton of yoghurt + cereal/breakfast bar
- 1 round of meat/cheese and salad sandwiches or roll + 250 ml fruit juice
- 150 g thick crust pizza – lean meat and vegetable toppings and easy on the cheese
- 60 g sports bar + 250 ml sports drink

Each choice provides ~ 50 g carbohydrate and a valuable source of protein and other nutrients



Special needs of the semi-professional player

The ambition of most young semi-professional players is to become a full-time player. Most teams at this level will include a mixture of older players who have played at a higher level with younger players wanting to move up. This combination of experience and youthful ambition gives these teams a unique set of opportunities and challenges.

Within the team, there may be very different approaches to training, depending on the demands of other employment and on individual perceptions of the need for training to maintain fitness. Experienced players with proven skills may not be able - or may not feel it necessary - to train as hard as the younger players. Any nutrition strategy developed for the team must take account of these individual differences as well as the usual concerns about individual food preferences of the different players.

Training issues

The semi-professional player typically must balance two competing demands - that of their work/career and that of the football team. Schedules need to be flexible so that the player can competently handle both responsibilities. Each will have their own daily demands, travel schedules, and time requirements that may, at times, conflict with each other.

The demands of training (intensity, duration, frequency) are likely to be less than that of full-time professionals, but some players will do extra sessions on their own as they pursue a career at a higher level. Training is usually scheduled after the work day, meaning the player has had a full day of some other activity prior to training. The time demands of having two jobs may mean limited opportunity for adequate nutrition.

Players looking after themselves for the first time can find it hard to juggle the team commitments, as well as work/school.

Competition issues

Semi-professional teams vary greatly in the level of support available to their players. Some clubs might offer a high level of support while others offer little. Each player needs to take responsibility for their own food choices to ensure they are as well-prepared as possible for competition.





A semi-professional club usually has a fixed schedule of matches, most commonly one match per week. The number of Cup matches is likely to be fewer than for professionals. It is not unusual for these players to have a match on some midweek evenings after their regular daily activities. The match is generally played at a lower absolute speed and the amount of work is less due to lower levels of fitness, reduced training demands and other reasons. Nonetheless most players are still very committed to their play and will do everything possible to ensure they can play at the levels they desire.

Special issues and eating strategies

Semi-professional players do not have the dietary support that is available to professional players. Some will have to make all their own purchasing, preparation, selection, and timing decision, while others will rely on partners or parents for most of their meal preparation. Those who provide meals may have little awareness of the nutrition

requirements of a serious player. This is further complicated by the need to balance dietary demands with the challenges of work, training, and matches. These players frequently must seek out the information necessary to educate themselves about the details of sports nutrition.

The pre-match meal for a midweek game may need to be eaten during their work day and the timing may not always coincide with the normal mid-day meal. A weekend match could follow the timing and selection guidelines for the professional, assuming that job demands are not a factor. Players should follow the hydration guidelines for the professional regarding timing, type, and volume of replenishment. Players should generally strive to restrict fluid losses to not more than 2% of body weight.

The scheduling of matches and training at this level is probably not as dense as the professional meaning the player has more time to refill the muscles of depleted

glycogen. Muscle is most receptive for glycogen refuelling immediately after exercise and the player should still strive to eat some carbohydrates after a match following choices outlined for professionals. Alcohol after the match should be limited as it may affect rehydration and food selections.



Strategies to help with planning meals for the week

- Plan the weekly menu around matches and training sessions. Note the days that the meal plan must be altered to suit this schedule
- Use days with light or no football commitments to get on top of the nutrition plan. Do the shopping and cook meals ahead of need. Refrigerate or freeze one-portion servings of meals for a pre-game meal at work, or a quick meal after training or matches.
- If you live in a shared household, work as a team to share these tasks
- If you are struggling, consider seeking advice from an expert in nutrition or time management

Special needs of the amateur player

The vast majority of football players world wide are amateurs who play for the enjoyment of the game. Their commitment may be purely recreational or they may play in an attempt to improve their game to move up in their level of play. Whatever their long-term ambitions, they will want to win every game. The age range extends from the very young up to older adults who continue to play for the love of the game.

These players often play in organised teams, but have no organised support other than setting up a team and alerting team mates of the schedule. More serious teams may have a coach and some measure of external support.



Training issues

There is a wide range of training schedules for amateur teams. Some teams gather only for matches while others may train one or more days each week. These sessions are commonly in the afternoon (youth) or evening (adults). Most practices focus on tactics and technique rather than on fitness.

The intensity and volume of training will be well below that of players at higher, more competitive levels. Attendance at training can be quite variable.

Competition issues

The number of matches per week, month, or year is likely to be variable. The amateur adult will likely compete once per week, but could play multiple, usually abbreviated, games in a weekend at a tournament. Youth teams usually have one match per week, but long travel might mean two or more games on any one trip to save travel time and money. Youth players may play on multiple teams and accumulate a substantial number of matches in a year. There are reports of young players playing 100 or more matches a year.

While matches will be played at a slower pace leading to reduced volume of running, these games may still be important to the players and teams, meaning that these players can still benefit from practising sound principles of sports nutrition.

Special issues and eating strategies

The vast majority of research into football focuses on professionals, but most experimental work is done on recreational-level players. The mixture of carbohydrates, fats and proteins is the same regardless of the level of play. What is different is the amount of food eaten. The amateur who tries to eat the same volume of food as a professional would probably gain weight. Amateur players can choose foods from the suggestions for



During the off season, the amateur needs to reduce food intake because there is little or no training.



professional players, but they may not need to eat the same volume of food unless they have a physically demanding occupation in addition to their football commitments.

Amateur leagues sometimes modify the Laws of football for their own circumstances. Primary changes usually involve unlimited substitutions and shorter match duration. This means some players will not play the entire match and will probably not experience the level of glycogen depletion seen after highly competitive matches. There is probably no need to eat the amount of carbohydrate required by the glycogen-depleted player, but this does not mean the player can ignore sound dietary principles.

At amateur matches, each player is probably responsible for their own hydration because they lack the support a more organized program might have. All players need to prepare for training and matches by bringing their own drinks and bottles. Sound hygiene suggests that each player should have their own bottle and not share with team mates.

The amount of football training and supplemental training is well below that of professional teams. The amateur needs to carefully monitor weight and food intake to minimise changes in weight. The older amateur who has played at a very high level might remember their diet as a professional and eat far more than needed, leading to increased body fat and weight gain.

An amateur's competitive season is usually not as lengthy as that of a professional, though some play year round with only short holiday breaks. During the off season, the amateur needs to reduce food intake during this period of reduced energy expenditure because there is little or no training.

Some amateur players are motivated to play football by the social element of team sport, and this can be expressed in the form of heavy drinking after matches or training sessions. Whatever the level of play, abuse often impairs performance, health, and can cause social problems. The information about alcohol given above provides a guide to sensible use of alcohol in sport.

Special needs of the female player



Training and competition issues

The women's game is now more popular than ever, and it is estimated that more women than men will be playing the game by the year 2010. Estimates of work rate and energy demand suggest that women generally cover less distance in training and match play than men, but the relative exercise intensity over the course of a game is about the same, at 70% of maximum oxygen uptake. Typical energy expenditure during a match is about 1,100 kcal for a 60 kg player.

There have been few studies of the eating habits of female players, but the information we do have suggests that their dietary habits and major nutrition concerns are not so different from those of other female athletes or of male players.

Some players restrict food intake to achieve their desired weight at the expense of both health and performance.

General health issues

Players should eat sufficient food to achieve an energy intake that:

- provides sufficient energy for training and competition needs
- meets the energy demands of other daily activities
- allows the player to achieve a body size and composition that meets their health and fitness goals

Some players restrict food intake to achieve their desired weight at the expense of both health and performance. Restricting food intake can lead to fatigue, leading to reduced training and in turn to reduced energy expenditure and therefore weight gain. Weight control needs careful management.

Losing body fat

There is enormous pressure on many women to achieve an unrealistic body weight and body fat level. This can compromise both short term playing performance and long term health with the real possibility of harm to reproductive health and to bone health. A player with

any menstrual irregularity should consider this as a possible warning sign and seek professional advice.

If there is a need to reduce body fat, this should be done sensibly. Reducing body fat requires a negative energy balance – energy expenditure should be greater than energy intake – and a negative body fat balance. It is a mistake to reduce energy intake – especially protein and carbohydrate intake – too far. This increases fatigue in training and daily life, reducing energy levels and thus limiting weight loss.

Strategies for reducing body fat

- Set realistic targets: this is a medium-term goal rather than something to be achieved by next week
- Limit portion sizes at meals rather than skipping meals altogether
- Use well-chosen snacks between meals to maintain fuel levels for training sessions. Save part of a meal for a later snack, rather than eating extra food
- Maintain carbohydrate intake to maintain fuel levels for exercise
- Use low-fat strategies in choosing foods and while cooking or preparing meals
- Limit alcohol intake or cut it out altogether – it is not an essential part of the diet
- Make meals and snacks more “filling” by including plenty of salads and vegetables, by taking the higher-fibre option, and by including low glycaemic forms of carbohydrate-rich foods.

Calcium

Calcium is important for healthy bones. In some countries, many everyday foods are fortified with calcium (e.g. fruit juice). The best sources of calcium, however,

are dairy foods with low fat varieties providing a great way to meet calcium needs within a smaller energy budget.

Each player should aim to include at least 3 servings of dairy foods in their daily eating plans – e.g. 200 ml of low fat milk, 30 g cheese or a 200 ml carton of low fat yoghurt.

Calcium-fortified soy versions of dairy foods are also suitable – e.g. soy milk, soy yoghurt.

An additional one-two daily servings are required during growth spurts in childhood and adolescence, and for pregnancy and when breast feeding.

Fish eaten with bones (e.g. tinned salmon, sardines) and leafy green vegetables (e.g. broccoli, spinach) provide a useful source of additional dietary calcium.

Iron

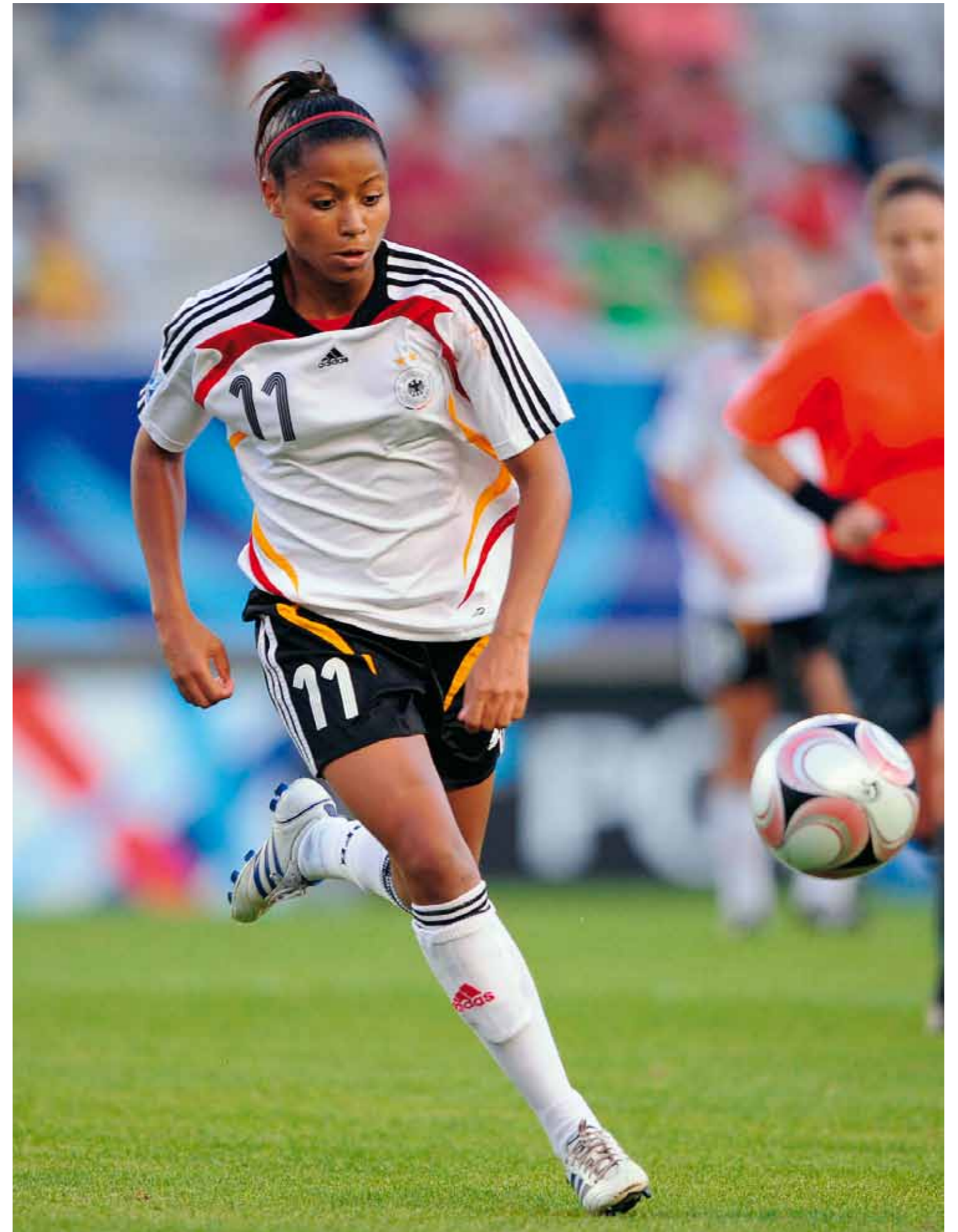
Iron deficiency is a cause of fatigue and reduced performance. Females are particularly at risk because of increased iron requirements due to menstrual blood losses matched against a smaller intake of food. Iron rich eating will help to reduce this risk.

Iron-rich eating

Consume moderate servings of red meats (well-absorbed iron) in 3-5 meals per week.

Choose iron-fortified cereal products such as breakfast cereals.

Combine plant and non-meat sources of iron (e.g. legumes, cereals, eggs, green leafy vegetables) with food factors that enhance iron absorption. These include vitamin C and a factor found in meat/fish/chicken. Examples of clever matching include fruit juice or fruit with breakfast cereal, or chilli con carne (meat and beans).



Special needs of the young player

Football enjoys one of the highest participation rates for children and adolescents around the world, offering the benefits of aerobic fitness, skill development, and a team environment without the risks of a contact sport. Girls and boys can start playing at an early age, often with modifications to rules, playing time, and pitch sizes. Football continues as a popular sport from junior school through to college or university levels. Those with particular talent may be chosen for scholarships to youth development programs for football. Others continue to play football for recreation, fitness or social contact.

Training issues

Depending on the age and calibre of the young player, "training" may range from the weekly match to structured squad sessions. The goals of training may range from simply having fun through to a progressive program aimed at developing the skills and specific fitness and physique required to play football at higher levels. Talented young players may be invited to train with a senior squad, often in addition to their involvement with their primary team. Whatever the long term ambition, the focus should be very firmly on fun and on the development of motor skills. Aerobic fitness will develop naturally over time.



Competition issues

At junior levels, players may follow modified rules, which alter the duration of their play and the activity patterns of the game. Young players typically play in a weekly competition, over a short competition season. Players who are being developed towards a potential career in elite or professional teams, however, may play in a number of teams or competitions. This can lead to heavy physical demands on these young players and parents, teachers, and coaches should be aware of the risks of playing too many games.

Special issues and eating strategies:

Parents are often roped in to become the coaches and trainers of under-age teams. They may accept these positions without an appreciation of either the physical demands or the nutritional needs of football or young people, and without any resources to implement a team program. It is important that education resources are made available to these coaches so that they can guide young players into good habits.

Players should be encouraged to develop good nutritional habits at an early age. Adolescence is a time marked by an increased independence in food choice and food preparation. The promise of sporting success may provide strong motivation to develop good dietary practices. Information and the example of good role models may help a young person to develop sound eating practices in their everyday (training) diets as well as the specific preparation for matches.

The physiology of children and adolescents differs from that of adults in several ways. The mechanisms of thermoregulation are less efficient in children and special attention must be paid to the environment, activity



patterns, clothing, and hydration to avoid problems of hyperthermia and hypothermia.

The growth spurts during childhood and adolescence require nutritional support in terms of adequate intake of energy, protein and minerals. Active young people may find it difficult to meet their needs for energy and nutrients when the costs of training and growth are added. Young people may not have developed the nutritional knowledge and time management skills to fit in all the eating occasions required to achieve high energy, nutrient-rich eating.

The rate of obesity in children is still rising, but active youngsters do need to eat lots of food. Many young players are eager to increase the rate of their growth and muscular development in pursuit of the physique of an adult player. While growth and maturation are genetically determined, high-energy eating plans can assist the athlete to maximise the outcomes of growth and specialised training programs. Young players eating a wide range of foods should not need to use dietary supplements, and parents and players alike should be aware that these do not provide a short cut to success.

Strategies for high energy eating

It is usually more efficient to increase the number of times that food is eaten each day – for example, a series of 5-9 meals and snacks – than trying simply to increase the size of meals.

Drinks such as fruit smoothies, liquid meal supplements, fortified milkshakes, and juices can provide a substantial source of energy and nutrients that are quick and compact to consume and less likely to cause gastrointestinal discomfort than bulky foods.

Sugary foods and specialised sports products (drinks, bars) can provide a compact form of carbohydrate and other nutrients, which is particularly useful when energy needs are high.

A food record can identify the times in a busy day that aren't being well used for fuelling up. The player should use creative ideas and good planning to arrange a supply of portable snacks and drinks that can travel with them over their day.

Adaptation to a resistance training program may be enhanced by consuming "recovery" snacks providing protein and carbohydrate before and after each workout.

Food combinations supplying carbohydrate and protein

Breakfast cereal and milk

Sandwiches with meats, cheese or egg fillings

Meat/fish/chicken stir-fries served with rice or noodles

Fruit smoothies or liquid meal supplements

Fruit and yoghurt

Dried fruit and nut mixes

Special needs of the referees

The referee is frequently the forgotten participant in the match. Much is written about training and nutrition for the player, but the referee must also keep up with the game and needs similar guidance to minimise fatigue. The players may have someone watching out for them during training and competition, but referees are often left to themselves to prepare for the demands of a match.

There have been several studies of the volume and intensity of running by the referee during a match. Recent data show that the referee runs about as far as the players, but in a different pattern of movement. For example, the referee covers more distance going backwards than do players. Without an appropriate training program and good nutritional preparation, the referee may become fatigued and may not be able to exert proper control over a match. In particular, referees

should tailor their food and fluid intake prior to and during a match to the demands of the game. The demands on the referee's assistants are less, but each assistant needs to be prepared to carry the whistle. It is interesting to note that there is little information in the referee's training and education regarding adequate fitness preparation or nutrition for performance. Therefore, the referee is often older than the players in the match, and this poses additional stress.

Training issues

A team generally trains as a group under the guidance of a coach or trainer. The referee usually trains alone. The level of play that the referee is responsible for dictates the volume and intensity of training needed. International referees and referees of high level professional matches have fitness standards that must



be met in order to maintain their status and good nutrition will help them to achieve this.

There are published programs that a referee can follow that will adequately prepare for match competition. Referees of lower level matches will not likely need to train so intensively and many rely on refereeing multiple matches each week as a sufficient training stimulus for their level of competition. The off-season poses special challenges for those not used to training alone.

Competition issues

Because referees run a similar distance to that of the players they are watching they should follow similar guidelines for daily nutrition, food choices for training, pre-match nutrition, and hydration. Essentially, the referee should follow the nutritional guidelines for the level of play they are arbitrating.



Special issues and eating strategies

A particular issue surrounds fluids during competition. The players may have support on the sidelines helping them to hydrate when possible during a match. The referee has no such support. The referee is also usually in the middle of the field, far from the sidelines and access to drinks. At the higher levels of play, the fourth official might be able to assist the referee during normal play stoppages. The referee's assistants are already on the sidelines and can place fluids along their running path. In lower levels of play, referees must take care of their own fluid needs. As normal stoppages of play frequently involve the referee, those opportunities may be few. One suggestion for the referee would be to wear a 'camelback' device worn by cyclists and carry only enough fluids for a half, refilling between halves or before overtime.

Fluid and nutrition suggestions for the referee

Follow the pre-match meal suggestions for the players.

Plan ahead for easy and quick access to fluids during matches. Water, sports drinks and carbohydrate replacement solutions are viable drink options.

At half-time, drink a sports drink to provide water to minimise dehydration and some carbohydrate to delay fatigue. You can eat solid food if you find that you can tolerate this.

After the match, follow the player suggestions for early replenishment of glycogen, especially when games are close together.

During periods of frequent travel, consider suggestions for eating on the road.

Special needs when playing on the road

Professional football players are well-seasoned travellers, spending much time travelling and living far away from home. These trips are often short, but may involve longer spells of travel for tournaments or pre-season tours. Competition is usually organised in a national or regional league that requires weekly or bi-weekly travel to matches. Frequent travel over long distances can pose a number of challenges:

- Disruptions to the normal training routine and lifestyle while the player is en route
- Changes in climate and environment that create different nutritional needs
- Jet lag
- Changes to food availability including absence of important and familiar foods
- Reliance on hotels, restaurants, and takeaways instead of familiar home cooking
- Exposure to new foods and eating cultures
- Temptations of an "all you can eat" buffet-style dining hall or restaurant
- Risk of gastrointestinal illnesses due to exposure to food and water with poor hygiene standards
- Excitement and distraction of a new environment.

Some key points for eating well while travelling include:

1. Planning ahead

Investigate food patterns and availability at your destination before leaving home. This may help in planning useful food supplies to take on trips that can replace missing and important items.

Contact the catering organisers at the destination to let them know of special needs for meal timing and menus. Make an eating plan for travel that incorporates the best of the available food supplies (e.g. airline catering, restaurants en route) as well as self-supplied snacks.

2. Eat and drink well while on the move

Recognise that enforced rest while travelling will reduce energy needs, but create more opportunities for high energy intake if the player succumbs to "boredom eating". Be aware of eating only when there is a real need.

When moving to a new time zone, adopt eating patterns that suit your destination as soon as the trip starts. This will help to adapt your body clock.

Be aware of unseen fluid losses in air conditioned vehicles and pressurised plane cabins. Have a drink plan that helps maintain hydration.

3. Be wary of food and water hygiene

Find out whether it is safe to drink the local water supply. If risky, stick to sealed bottles of water and other drinks or hot drinks. Be wary of ice added to drinks – it is often made from tap water. In high risk areas use bottled water when brushing teeth and avoid swallowing water when washing the face or showering.

In high-risk environments, stick to food produced in good hotels or well-known restaurants. Avoid eating food from local stalls and markets, however tempting it is to have an "authentic cultural experience".

Stick to food that has been well-cooked, and avoid salads or unpeeled fruit that has been in contact with local water or soil.

4. Choose well from local cuisine and supplement with non-perishable food supplies brought from home.

Ideas for portable supplies for the travelling player include

Breakfast cereal and powdered milk

Cereal and breakfast bars

Rice cakes

Spreads – honey, jam, peanut butter

Powdered sports drinks and liquid meal supplements

Sports bars

Dried fruit and nuts

5. Use clever tactics in restaurants, all you can eat dining halls, and when choosing takeaways

Stick to an eating plan based on what is normally eaten at home or what meets new nutritional needs rather than being mesmerised by all the food available.

Be assertive in asking for foods to be prepared to individual needs – for example, with low fat cooking methods, or with an added carbohydrate serving.

Avoid hanging around in restaurants or dining halls for entertainment – it can often lead to unplanned and unnecessary eating.

Remember that normal eating patterns probably involve well-timed and well-chosen snacks. If new catering arrangements provide only for main meals, ensure that the menu at meals includes some items that can be taken away for snack needs.



During the off season, the amateur needs to reduce food intake because there is little or no training.

Special environmental challenges

Football is a global sport played in every country in the world. Those who play may face difficult challenges when the environment is unfavourable. Football developed as a winter sport in northern Europe where the weather is seldom extreme and where most major cities are at, or close to, sea level. At high altitudes or at extremes of heat and humidity, the nature of the game changes and players face different challenges.

Altitude

Games played at very high altitude (4000 m or even higher as happens in some parts of South America) are seriously affected by the altitude, and most sea level natives will encounter health problems even at rest at this height. Acute exposure to high altitude normally results in nausea, headache, and general malaise: not what you want before a big game. Many games, however, are played at more moderate altitudes which are nevertheless sufficient to affect performance in most players. Effects on endurance become apparent at about 1800-2000 m, though some sensitive individuals will be affected before this.

High altitude results in a loss of appetite, but there are unlikely to be major implications for most players at the moderate altitude where most games are played. Hydration is important and players should be sure to drink plenty of fluids throughout the day. Because a move to a higher altitude may increase oxidative damage during exercise, athletes should ensure that their diet is rich in fruits and vegetables to provide essential antioxidants. For longer stays, such as tournaments, there will be an increased rate of red blood cell production, so the diet should contain plenty of iron-rich foods. It is worth checking iron status by way of a blood test before going to altitude.



Heat and humidity

When working hard, the body produces heat at high rates, causing its temperature to increase. A small rise in body temperature may be beneficial, but if it increases by more than about 2-3°C, performance is likely to suffer and there is a real risk of developing heat illness. Evaporation of sweat from the skin surface is the body's most effective way of losing heat, but we can also lose heat to the environment by physical transfer provided the skin is hotter than the environment.

When the temperature is high, we need to sweat more as we gain heat from the environment. High sweat rates over prolonged periods lead to large water losses and to some loss of salts. When the humidity is also high, the sweat cannot evaporate from the skin; it drips from the skin so no heat is lost, but we continue to sweat and so water and salts are lost at high rates.



Those who normally live in cold climates will benefit from a period of heat acclimation before travelling to games in a hot climate, but this is seldom possible because of other match plans. Heat acclimation is achieved best by 60-100 minutes of modest exercise in warm environment: about 10-12 sessions at intervals of not more than 2-3 days will achieve this, but any preparation is better than none.

Players who are not used to hot weather must be aware of the need to make some changes to their routine:

- The warm-up should be shortened and carried out in the shade, with less clothing worn to prevent overheating and excess sweat loss before play begins.
- Extra fluids may be necessary, and cool fluids may be especially welcome, so insulated drinks bottles can help.

The effects of dehydration on performance seem to be greater in the heat than in cooler conditions, so it is especially important to be well hydrated before the start of training or match play. This means learning to look for signs of dehydration: a gradual loss of weight, less frequent trips to the bathroom, dark coloured urine. All of these are warning signs of a need to drink more. Players should use meal times as opportunities to take more drinks. Those who know that they lose a lot of salt in their sweat might usefully add a little more salt to meals. Soups are usually a good source of both water and salt. Tomato juice has a very high salt content.

Playing in cold weather

Players usually cope with cold weather simply by wearing more clothing in training and match play. Wearing gloves can greatly decrease heat loss from the hands. In cold weather, players tend to forget about their fluid needs thinking that their sweat needs are minimal, but sweat losses can be substantial during hard training. Players wearing heavy kit may sweat as much in the cold as they do in the heat when they train wearing only shorts.

The effects of dehydration are less serious in the cold that they are in the heat, so a higher level of dehydration is tolerable. This means that drinks may be focused more on providing extra carbohydrate. Hot drinks may be welcome at half time and after the game. Players may choose more concentrated carbohydrate drinks – sometimes up to 25% concentration – or even add carbohydrate gels and solid foods at half-time. Experimentation in training will help the player to develop a successful match day routine.

Cultural and regional issues

Football is a truly international sport, and great players have emerged from every country in the world. Teams from different parts of the world will face different nutritional challenges, but none of these presents an insurmountable problem. A little attention paid to nutrition will pay big dividends in terms of better performance and better health.

Most teams will contain players from different ethnic, cultural and socio-economic backgrounds. On the field, they all play together and share the same aims and ambitions, but at home they are likely to have very different eating habits. Even though they all have broadly similar nutrition goals, an infinite variety of different food combinations can be chosen to meet their nutritional goals. All the essential nutrients can be obtained from normal foods, and variety is a key to meeting nutrient needs, but many different foods can be interchanged. Good sources of carbohydrate may be bread, rice, pasta, potato, couscous, or maize porridge. Protein will be provided by many different foods; the obvious foods are meat, fish, eggs and dairy products, but bread, cereals, pasta, lentils, and beans are only a few of the other excellent sources of protein. The fruits and vegetables that are commonly available will differ from region to region, although many staples or favourites are exported around the globe. Our eating habits are much more international than they once were, and players can enjoy foods from different countries of the world.

The vegetarian player need not be at any disadvantage. These players, though, must be more aware of the food choices that they make. If there are no animal foods in the diet, then a Vitamin B12 supplement may be necessary. Players who avoid red meat must pay special attention to ensuring that the diet contains enough iron from plant sources, and this should be combined with other foods that aid iron absorption: for example, iron-fortified breakfast cereals, consumed at a meal containing Vitamin C (a glass of orange juice). Dairy products should be included in the diet to ensure an adequate calcium intake, but calcium-fortified foods are also available for players with lactose intolerance.

There may be special circumstances that cause athletes to change their normal training and dietary habits. Muslim players avoid food and fluid intake during daylight hours throughout the holy month of Ramadan. This can mean that changes to training times are necessary to ensure that adequate hydration is maintained, especially in very hot weather and at high latitudes. Where matches take place during Ramadan, players should be aware that prior preparation is necessary to ensure good liver and muscle glycogen stores and good hydration. Performance will not necessarily suffer if the player is well prepared.



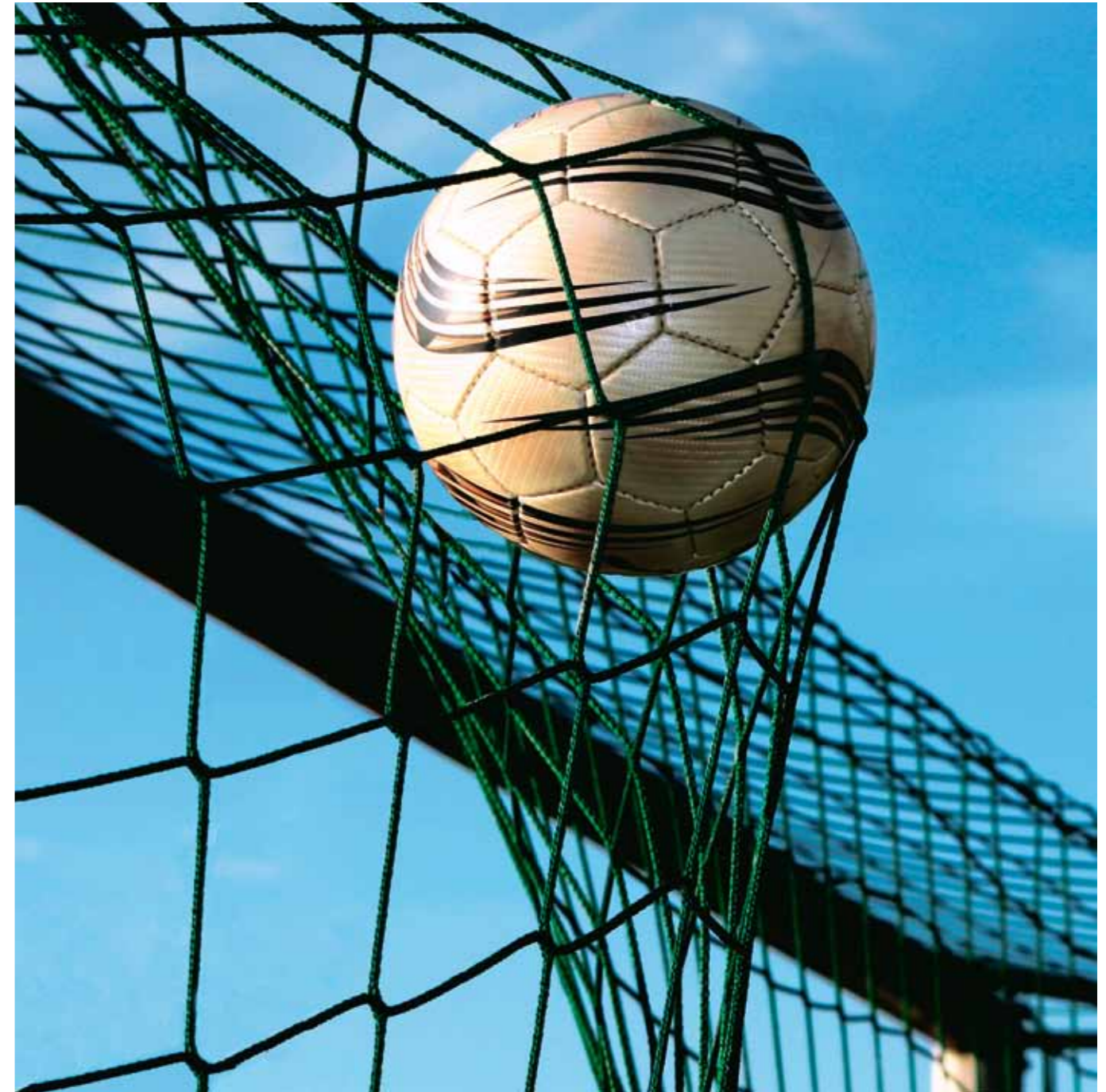
Teams from different parts of the world will face different nutritional challenges

References

for further reading

NUTRITION FOR FOOTBALL is based on information discussed at the FIFA/Marc Consensus Conference on Nutrition for Football, held at Home of FIFA in Zurich in September 2005. The papers listed below were presented at that meeting and were published as a Special Issue of the Journal of Sports Sciences (Volume 24, No 7, 2006). The information in this booklet was updated in January 2010 to take account of the many papers published since then.

1. Physical and metabolic demands of training and match play in the elite player
Bangsbo J, M Mohr, P Krstrup
2. Macronutrients and energy for training and recovery
Burke LM, A Loucks, N Broad
3. Nutrition on match day
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4. Water and electrolyte needs for soccer training and match play
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6. Nutrition strategies for soccer: counteracting heat, cold, high altitude and jet lag
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7. Alcohol and football
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10. The brain and fatigue: new opportunities for nutrition interventions
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11. Nutrition needs of female and youth soccer player
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12. Nutrition needs of the soccer referee
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Nutrition for Football:

the FIFA/F-MARC Consensus Statement

Football players can stay healthy, avoid injury and achieve their performance goals by adopting good dietary habits. Players should choose foods that support consistent, intensive training and optimise match performance. What a player eats and drinks in the days and hours before a game, as well as during the game itself, can influence the result by reducing the effects of fatigue and allowing players to make the most of their physical and tactical skills. Food and fluid taken soon after a game and training can optimise recovery. All players should have a nutrition plan that takes account of individual needs.

The energetic and metabolic demands of football training and match play vary across the season, with the level of competition and with individual characteristics. Typical energy costs of training or match play in elite players are about 6 MJ (1500 kcal) per day for men and about 4 MJ (1000 kcal) for women. The football player should eat a wide variety of foods that provide sufficient carbohydrate to fuel the training and competition program, meet all nutrient requirements, and allow manipulation of energy or nutrient balance to achieve changes in lean body mass, body fat or growth. Low energy availability causes disturbances to hormonal, metabolic, immune function, and to bone health. An adequate carbohydrate intake is the primary strategy to maintain optimum function. Players may need 5-7 grams of carbohydrate per kg body mass during periods of

moderate training and up to about 10 g/kg during intense training or match play.

Nutritional interventions that modify the acute responses to endurance, sprint, and resistance training have the potential to influence chronic training adaptations. The everyday diet should promote strategic intake of carbohydrate and protein before and after key training sessions to optimise adaptation and enhance recovery. Solid or liquid carbohydrate consumption should begin during the first hour after training or match play to speed recovery of glycogen. Taking food or drinks that contain protein at this time may promote recovery processes.

Match day nutrition needs are influenced by the time since the last training session or game. Players should try to ensure good hydration status prior to kick off and use opportunities to consume carbohydrate and fluids before and during the game according to their nutrition plan. Fatigue impairs both physical and mental performance, but intake of carbohydrate and other nutrients can reduce the negative effects of fatigue.

Training for and playing football lead to sweat loss even in cool environments. Failure to replace water and electrolyte losses can lead to fatigue and impaired performance of skilled tasks. Breaks in play currently provide limited opportunities for carbohydrate and fluid intake, and may not be adequate in some conditions. Football is a team sport, but the variability in players'

sweating responses dictates that monitoring to determine individual requirements should be an essential part of a player's hydration and nutrition strategy.

There is no evidence to support the current widespread use of dietary supplements in football, so the indiscriminate use of dietary supplements is strongly discouraged. Therefore, supplements should be used only on the advice of a qualified sports nutrition professional.

Female players should ensure that they eat foods rich in calcium and iron within their energy budget. Young players have specific energy and nutrient requirements to promote growth and development, as well as fuelling the energy needs of their sport. Many female and youth players need to increase carbohydrate intake and develop dietary habits that will sustain the demands of training and competition.

Players may be at increased risk of illness during periods of heavy training and stress. For several hours after heavy exertion, components of both the innate and adaptive immune system exhibit suppressed function. Carbohydrate supplementation during heavy exercise has emerged as a partial countermeasure.

Heat, cold, high altitude, and travel across time zones act as stressors that alter normal physiological function, homeostasis, metabolism, and whole-body nutrient balance. Rather than accepting performance decrements as inevitable, well-informed coaches and athletes should plan strategies for training and competition that offset environmental challenges.

Alcohol is not an essential part of the human diet. Recovery and all aspects of performance may be impaired for some time after alcohol use. Binge drinking should be avoided at all times.

The needs of the referee are often overlooked, but high standards of fitness and decision-making are expected of all referees. At every level of competition, training regimens and nutritional strategies, including fluid intake during the game, should be similar to those followed by players.

Talent and dedication to training are no longer enough to achieve success in football. Good nutrition has much to offer players and match officials, including improved performance, better health, and enjoyment of a wide range of foods.

Zurich, September 2, 2005



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