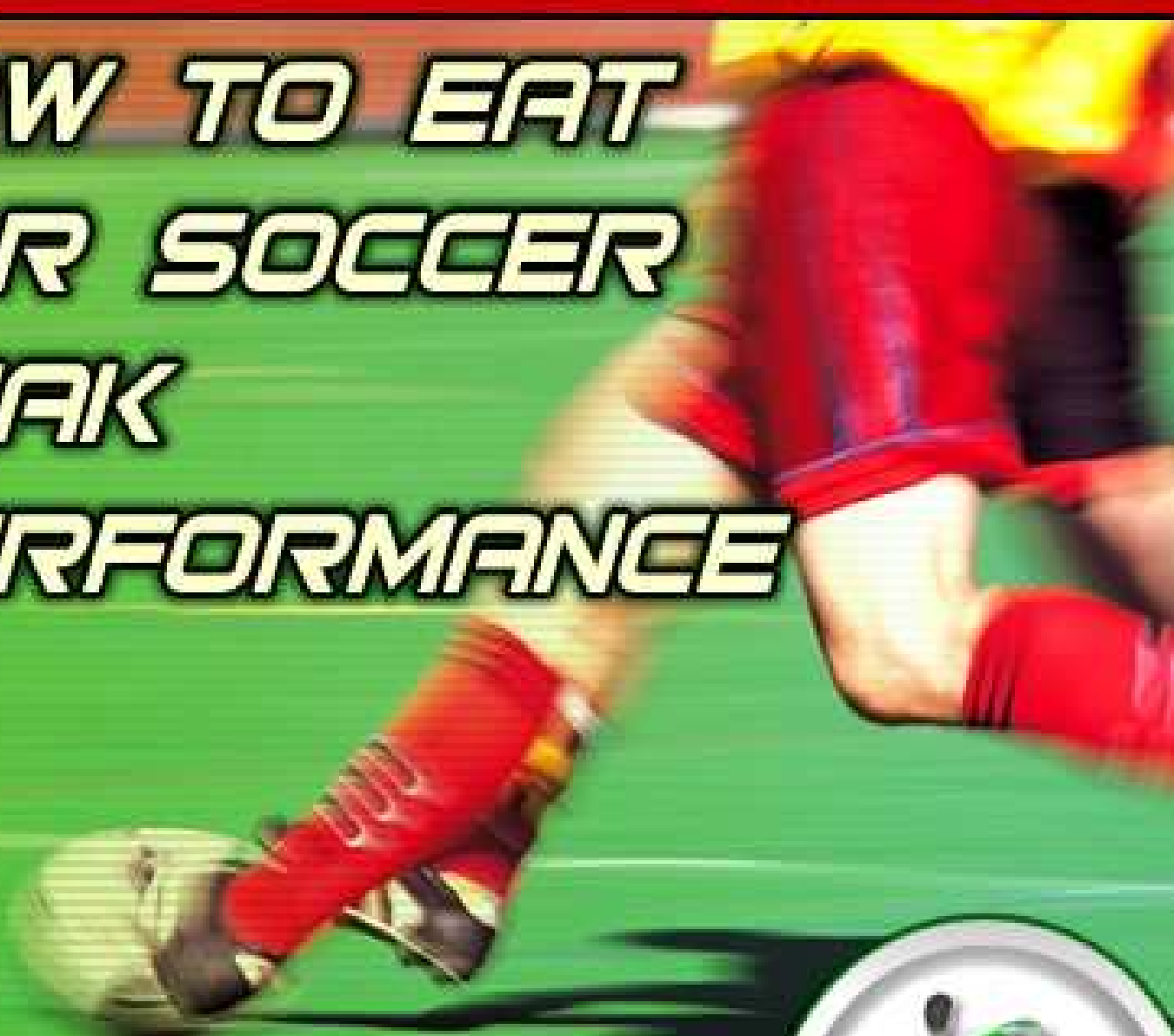


**HOW TO EAT—
FOR SOCCER
PEAK
PERFORMANCE**



TOTAL



**SOCCER
NUTRITION**

by Phil Davies

INTRODUCTION

There's nothing like the subject of nutrition to stir debate. It seems like the experts change their minds almost daily about what we should and shouldn't eat. In truth, scientific nutrition hasn't changed much at all in the last fifteen years. It's the constant and never-ending emergence of fad diets and weight loss programs that adds to the confusion. It appears everyone has differing opinions...

Fortunately, scientific sports nutrition is a little less contested. There are some very well-researched, well-practised dietary strategies that have been used by athletes for many years. Many are applicable to soccer. In fact, they are more than applicable – they are a pre-requisite to peak performance.

The aim of this book is to outline the basics of sports nutrition with an emphasis on practical application. Split into six sections, it covers macronutrients (fat, carbohydrate and protein), vitamins and minerals, pre and post match meals and fluid replacement. There is also a section reviewing some of the most popular sports supplements available to today's athletes. In an industry that boasts some of the best marketing strategies around, the claims often fall short of the facts.

The final section provides a bullet point summary of recommendations that soccer players can begin to use immediately.



The Energy Demands of Soccer

If you've read **Total Soccer Conditioning** already, you'll know that soccer is one of most physically demanding of all sports. During a ninety-minute game a player can burn as many as 1500 to 2000 calories. A study from Holland found that elite male soccer players expended about 3400 calories a day on average.

Vigorous training and competitive games increases the energy needs of professional and amateur soccer players. Failure to meet those increased energy needs, especially with the right **quality** of nutrition, significantly increases the risk of impaired training status - i.e. you don't get the results you deserve!

~ SECTION 1 ~



**MACRONUTRIENTS:
CARBOHYDRATE, FAT &
PROTEIN**

All energy, whether it's to play soccer or carry out any other activity, comes from three classes of food called **macronutrients**. These nutrients are better known as carbohydrates, fats and proteins. Each is important – not only to fuel athletic performance but also for overall health and well-being.

1.1 Carbohydrate

Weight for weight carbohydrates contain the least amount of energy out of the three macronutrients. Yet they are the most important type of fuel to a soccer player.

During short, intense bouts of exercise (like sprinting), carbohydrate is the **only** fuel capable of supplying the body with energy quickly enough. In the first few minutes of any activity, it is carbohydrate that almost exclusively meets energy demands. In addition, the ability to repeat a sprint at the end of a game to the same high level as at the start of the game relies, in part, on the body's carbohydrate stores.

Although the body does use fat for lower intensity activity, carbohydrate acts as a "primer" or catalyst for fat to be broken down. Finally, carbohydrates play a key role in central nervous system function. The brain for example, uses glucose almost exclusively as its fuel.



Can diet significantly affect the body's carbohydrate stores?

The average person has about 2000 calories of stored carbohydrate. An overnight fast (8 to 12hrs) and a low-carbohydrate diet can dramatically lower these stores. More importantly, a carbohydrate-rich diet can more than double them. The body's upper limit for carbohydrate storage equates to about 15 grams per kilogram (2.2lbs) of bodyweight. So an 80kg (175lb) person can potentially store up to 1200 grams of carbohydrate or 4800 calories worth of energy - all with just a few dietary modifications.

There are different types of carbohydrates. Understanding what they are and how they affect the body differently is important to soccer players and what they eat before and after a game.

Monosaccharides

This is the most basic unit of carbohydrate. Examples of monosaccharides include fructose (sugar found in fruit) and glucose (also called blood sugar).

Cells can use the glucose found in food directly for energy, while fructose is converted to glucose in the liver.

Disaccharides

Combine two monosaccharides and the result is a disaccharide. Sucrose or table sugar is a disaccharide and it's the result of combining glucose and fructose. The sugar in milk, lactose, is another disaccharide. The collective name for both monosaccharides and disaccharides is **simple sugars**. Simple sugars are quickly absorbed by the body and provide a rapid source of energy.

Simple sugars such as fruit and energy drinks are a good food choice to refuel **after** a game when the body's energy stores are low.

Polysaccharides

Starch and fibre are both polysaccharides. Starch is the combination of hundreds of monosaccharides joining together. Nutritionists often refer to polysaccharide as **complex carbohydrates**. Examples include bread, potato, rice and pasta. It takes longer for the body to break these complex structures down so they release their energy over a longer period than simple sugars.

Fibre differs from starch in that it cannot be digested and used for energy. It's still an important dietary component though and there is a growing link between lack of fibre and certain degenerative illnesses.

Starchy complex carbohydrates are the best choice **before** a game as a pre-match meal.

1.2 Fat

Fat contains more than twice the amount of energy as carbohydrate. A single gram contains nine calories making it a valuable source of fuel for longer duration activities. While fat cannot supply energy quickly enough for very intense activity, it can be used by the body to power lower intensity exercise such as jogging and walking.



Fat also provides insulation and protection to vital organs such as the heart, lungs and liver and transports vitamins throughout the body.

Not all dietary fat is the same. Like carbohydrate, fat can be broken down into several different groups:

Saturated Fats

Saturated fats are found in foods such as red meat, egg yolks, cheese, butter, milk and commercially prepared cakes, pies and cookies. The typical western diet consists of almost 40% total fat. Of this, 15% is made up of saturated fats, which is considered a major cause of coronary heart disease, diabetes and other major diseases. No more than 10% of the diet should come from saturated fats.

Unsaturated Fats

Unsaturated fats come in the form of **monounsaturated** fats and **polyunsaturated** fats. Monounsaturated fats can actually lower the risk of coronary heart disease and are found in foods like olive oil, canola oil, avocados, almonds and pecans. Polyunsaturated fats, found in sunflower oil, safflower oil and corn oil are not thought to contribute to heart disease but don't offer the same protection as monounsaturated fats.



Essential Fatty Acids

Essential fatty acids are a class of polyunsaturated fats that have received a lot of attention in the media recently. They are thought to be cardio-protective and may help prevent a range of other illnesses. There are three types of essential fatty acids – Omega 3, Omega 6 and Omega 9. Omega 3 and Omega 6 must be consumed while the body can produce some Omega 9 on its own. Essential fatty acids are required for healthy cardiovascular, reproductive, immune, and nervous systems. Found in foods like walnuts, pumpkin seeds, Brazil nuts, sesame seeds, avocados, some dark leafy green vegetables and oily fish, the typical Western diet is often deficient of essential fatty acids.

Cholesterol

Despite its bad press, cholesterol is actually essential for many important bodily functions. There are essentially two types of cholesterol – **low-density lipoprotein (LDL)** and **high-density lipoprotein (HDL)**. LDL is known as the “bad” cholesterol because it carries and then deposits cholesterol at the artery walls. HDL on the other hand, is known as “good” cholesterol because it acts

as a scavenger removing cholesterol from artery walls and transporting it to the liver to be excreted.

Although some foods like cream, butter, ice cream, egg yolks, shellfish and red meats contain cholesterol, it's a high intake of saturated fat that causes the body to synthesize too much cholesterol. The maximum amount of dietary cholesterol recommended each day is 300mg.

1.3 Protein

Correct and adequate protein intake is crucial for anyone involved in vigorous training. Protein is essential for the growth and repair of skin, hair, nails, bones, tendons, ligaments and muscles. It also serves a crucial role in enzyme production and maintaining a strict acid-base balance.

The Recommended Dietary Allowance (RDA) for the average male and female adult is just 0.83 grams per kilogram (2.2lbs) of bodyweight. In a 70kg (154lb) individual this equates to just 58 grams of protein per day or about two chicken breasts worth.



Some research shows that competitive athletes, particularly those involved in heavy weight training, may require more protein. The recommendation for strength and endurance athletes ranges from 1.2 to a maximum of 2.0 grams per kilogram. Research has shown that consuming more protein than this serves no benefit and may be harmful in the long term.

Good sources of protein include low fat milk, poultry, fish, lean red meat, eggs, nuts, beans and lentils and soy products. Fatty meats like pork and fast food

hamburgers as well as most cheeses contain a lot of saturated fats so are not as suitable sources of protein.

Recently, the emergence of high protein, low carbohydrate diets have become popular in the weight loss industry. While they may or may not help to shed the pounds, high protein, low carbohydrate diets are unsuitable for soccer players.

Many athletes are afraid that their heavy training schedule will force their bodies to breakdown lean muscle mass and then use it as energy. The body does use protein sparingly as a source of fuel after 45 minutes of exercise; however consuming more protein is not a good strategy.

By consuming plenty of carbohydrates before, during and after exercise it acts as a protein "sparer". Only in the absence of adequate carbohydrate stores will the body begin to metabolise significant amounts of protein for use as energy.

1.4 The Soccer Player's Diet

A typical western diet contains too much fat and not enough healthy, whole grain carbohydrates. Soccer players should aim to make 60-65% of their diet carbohydrate, with an emphasis on fresh fruit and whole grains such as brown rice and pasta, wholemeal bread, potatoes and high fibre cereals. About 20-25% of total calories should be in the form of fat. The majority of this should be in the form of good fats (monounsaturated, polyunsaturated, omega fatty acids) found in oily fish like mackerel and salmon, olive oil, avocado and raw nuts (not roasted or salted). Protein should make up the remaining 10-15% of a soccer player's diet derived from fish, poultry, low fat milk and lean red meat for example.

Ideal Diet Composition for a Soccer Player			
	Carbohydrate	Fat	Protein
Average Western Diet	46%	38%	16%
Ideal Soccer Player's Diet	60%	25%	15%

Here's a sample day's eating plan:

Sample Day's Diet for a Soccer Player in Training

Breakfast	Piece of fruit Bowl of oatmeal or porridge (sweeten with dried fruit or honey) 3-4 slices wholemeal bread toasted with small amount of butter/olive oil spread, jelly/jam Glass of fresh fruit juice (not concentrated)
Snack	Piece of fresh fruit Plain yoghurt 2-3 fig biscuits/cookies
Lunch	Tuna or grilled chicken Bagel, baguette etc. (preferably wholemeal) Mixed salad with olive oil and lemon juice dressing Glass fresh fruit juice or low fat milk Low fat or bran muffin 1-2 bananas
Snack	Bag of nuts and raisins (such as almonds, pecans, Hazelnuts etc)
Dinner	Large serving rice or pasta Tomato sauce Grilled fish, chicken or lean beef mince Large mixed vegetable salad with dressing Small serving of ice cream and strawberries

This is one sample day only and a wide range of foods should be eaten. Try also to drink 2 litres (68 oz) water each day (fluids as part of a sports drink count).

~ SECTION 2 ~



**MICRONUTRIENTS:
VITAMINS & MINERALS**

Vitamins and minerals have an important role in the body. They facilitate energy release and are vital for optimum growth, development and repair.

2.1 Vitamins

Thirteen different vitamins have been identified and studied to date. They are classed as either fat-soluble (vitamins A, D, E, K) or water-soluble (vitamin B complex, vitamin C). Together they are responsible for blood clotting, neuromuscular function, healthy skin, teeth and bones.

A well-balanced diet provides an adequate supply of all the vitamins regardless of age and level of physical activity. During periods of intense training, a natural increase in food intake supplies any extra vitamin demand the body may have.

Free Radicals, Antioxidants & Exercise

Free radicals are highly reactive molecules that can cause damage to the cells and are thought to accelerate the aging process and contribute to cancer, heart disease and diabetes. They are found in cigarette smoke, environmental pollution and some medications. Exercise may also increase the production of free radicals.

The body has an elaborate defence system against free radicals in the form of antioxidant enzymes. Vitamins A, C and E are known as antioxidant vitamins and can protect the cells against free radical damage. Although foods like citrus fruits, green vegetables and nuts contain antioxidant vitamins; some athletes feel the need to take a supplement due to the high level of training they undergo.

Although exercise is thought to increase free radical production, it also appears to increase the body's antioxidant defence system at the same time. However, there is some research to suggest that a vitamin E supplement can reduce harmful free radical production associated with exercise. Whether this offers any overall health benefits is unclear.

Water Soluble & Fat Soluble Vitamins

Vitamin	RDA (mg)	Dietary Sources	Functions	Deficiency	Excess
Fat Soluble					
Vitamin A (Retinol)	0.8-1.0	Dairy, green veg	Healthy eyes, bones, reproduction immune system	Blindness	Headache, vomiting, skin peeling
Vitamin D	0.01	Eggs, dairy, cod-liver oil	Healthy bones, helps calcium absorption	Rickets, osteomalcia	Vomiting, diarrhea, weight loss, kidney damage
Vitamin E (Tocopherol)	8.0-10.0	Seeds, nuts, green veg	Antioxidant, protects cells	Possibly anemia	Non toxic
Vitamin K (Phylloquinone)	0.06-0.08	Green veg, cereal, fruit	Helps blood clot	May cause hemorrhages	May cause jaundice
Water Soluble					
Vitamin B ₁ (Thiamin)	1.1-1.5	Meat, whole grains legumes	Helps remove CO ₂ , energy metabolism	Edema, heart failure, nerve damage	None reported
Vitamin B ₂ (Riboflavin)	1.3-1.7	Almonds, organ meats, whole grains, milk	Involved in energy metabolism	Red, cracked lips, eye lesions	None reported
Niacin	15-19	Liver, grains, legumes	Involved in energy metabolism	Pellagra (skin & gastrointestinal lesions)	Tingling, burning in face & hands
Vitamin B ₆ (Pyridoxine)	1.6-2.0	Meats, veg, whole grains cereals	Involved in energy metabolism, immune system	Irritability, convulsions, twitching, dermatitis, kidney stones	None reported
Pantothenic Acid	4-7	Eggs, fish, milk, whole grains	Involved in energy metabolism, hormone synthesis	Fatigue, sleep disorder, impaired coordination	None reported
Folic Acid	0.2	Legumes, green veg, Whole wheat products	Involved in protein metabolism	Anemia, diarrhea, gastrointestinal upset	None reported
Vitamin B ₁₂ (Cobalamin)	0.002	Meat, eggs, dairy	Healthy nerve cells blood cells	Pernicious anemia, neurological disorders	None reported
Biotin	0.03-0.10	Legumes, veg, meats	Fat synthesis, protein metabolism	Fatigue, depression, nausea, dermatitis	None reported
Vitamin C (Ascorbic Acid)	60	Citrus fruits, tomatoes, peppers, salad greens	Important for healthy cartilage, bone and collagen	Scurvy	Possibly kidney stones

Over 40 years of research has failed to show that vitamin supplementation can offer any sort of performance enhancement well a nutritionally balanced diet is present. Some vitamins (such as vitamin C) taken in excess can actually be harmful. The recommendation is to eat a well balanced diet rich in fresh fruit and vegetables.

2.2 Minerals

Minerals account for roughly 4% of a person's body mass. They provide the structure for forming bone and teeth. They also help muscles to contract, maintain normal heart rhythm and control the acid-base balance as well as other important bodily functions.

Minerals are classed as either **major** or **trace** depending on how much is required per day. Major minerals include calcium, phosphorus, sodium, potassium and magnesium. Trace minerals include iron, zinc, copper, selenium and chromium.

Calcium

The typical Western diet contains too little calcium. The RDA for calcium is 800-1000 mg for adults and 1200 mg for adolescents. The average adult consumes just 500-700 mg per day and for many it's as little as 300 mg per day. Calcium deficiency can lead to a condition called osteoporosis – a weakening of the bones. Exercise actually helps to maintain healthy bone density.

Sodium

Most adults consume too much sodium (found in abundance in processed foods), which can lead to high blood pressure. The RDA of 1100-3300 mg is equivalent to 0.5-1.5 teaspoons of table salt. Most people consume more than 2 teaspoons even when table salt isn't used as seasoning.

Iron

Iron helps the blood to carry oxygen so an iron deficiency (called anaemia) can lead to fatigue even with mild exercise. Some research has suggested that heavy exercise training creates an increased demand for iron. However, even in elite athlete supplements are unnecessary if the diet contains iron-rich foods.

Major & Trace Minerals

Mineral	RDA (mg)	Dietary Sources	Functions	Deficiency	Excess
Major					
Calcium	1200	Dairy, green veg	Healthy bones, teeth, blood clotting	Stunted growth, osteoporosis	Not reported
Phosphorus	1200	Dairy, yoghurt meat, fish, poultry	Healthy bones, teeth, ph balance	Weakness, loss bone density	Erosion of jaw
Potassium	2000	Veg, potatoes, bananas, milk, meat	Fluid balance nerve transmission	Cramps, confusion irregular heart beat	None if kidney function normal
Sulfur	Unknown	Protein	Ph balance, liver Liver function	Unlikely to occur	Unknown
Sodium	1100-3300	Table salt, found in many foods	Ph balance, water balance, nerve function	Cramps, apathy, loss of appetite	High blood pressure
Chlorine	700	Some fruit & veg, in salted foods	Important part of extracellular fluid	Unlikely to occur	High blood pressure
Magnesium	280-350	Whole grains, green veg	Activates enzymes for protein synthesis	Stunted growth, weakness, spasms	Diarrhea
Trace					
Iron	10-15	Eggs, meat, green veg, grains, nuts	Part of blood, helps energy metabolism	Anemia, fatigue, risk of infection	Cirrhosis of liver
Fluorine	1.5-4.0	Drinking water, Seafood	Helps maintain bone structure	Tooth decay	Teeth mottling neurological problems
Zinc	12-15	Meat, poultry, nuts beans, some seafood	Stimulates enzymes	Growth failure, abnormal sex glands	Fever, nausea vomiting, diarrhea
Copper	1.5-3.0	Meat, drinking Water	Helps iron metabolism	Anemia	Wilson's disease rare metabolic disorder
Selenium	0.055-0.070	Seafood, meat, Grains	Works closely with vitamin E	Anemia (rare)	Stomach disorders
Iodine	150	Fish, dairy, veg	Part of thyroid hormones	Enlarged thyroid	Depressed thyroid activity
Chromium	0.05-0.25	Legumes, cereals meats, grains, fats	Helps energy metabolism	Not reported	Occupational exposure: skin kidney damage

As with vitamins there is no convincing research to suggest taking mineral supplements can improve sporting performance. Exceeding the recommended daily allowance can also be potentially harmful. The only exception is adding a small amount of sodium to sports drinks during hot weather (¼ -½ teaspoon per litre of water).

~ SECTION 3 ~



**PRE & POST MATCH
EATING**

Long gone are the days when players thought that eating a big steak before a game would give them lots of energy. Today's elite soccer players follow a strict diet, particularly in on the day of a competitive match. While diet won't turn poor players into great players it can make the difference between playing poorly and playing to your full potential.

3.1 The Glycemic Index

Not all carbohydrate is digested and absorbed at the same rate. The Glycemic Index (GI) is a scale of how much a particular type of food raises blood sugar over a two-hour period compared to pure glucose.

For example, a piece of food with a GI score of 45 means that it raises blood sugar 45% as much as pure glucose in that two-hour period.

Common sense says that simple sugars like fructose in fruit should have a higher GI than complex carbohydrates, but that's not always the case. White bread, white rice and potato have a very high GI. That means they raise blood sugar almost as much or even more than pure glucose. Fructose has medium GI because the fibre found in fruit slows digestion and absorption.

Choosing foods with a high GI will help to quickly replenish carbohydrate stores after a game. Before a game low GI foods are more appropriate as they release energy more slowly and for a longer period.

3.2 Pre Match Eating

The goal prior to a game is to maximise carbohydrate stores in the muscles and liver and to top up blood glucose stores. Studies have shown that consuming foods with a high GI within an hour of exercise can actually lower blood glucose. The body produces an "overshoot" of insulin (which helps muscles to take up blood sugar). This in turn causes low blood sugar.



Soccer players should eat foods with a low to medium GI before a match. This allows for a relatively slow release of glucose into the blood and avoids the insulin surge. Consuming carbohydrate at least an hour before kick off allows any hormonal imbalance to return to normal.

Example low GI foods include pasta, whole grain breads and rice, oatmeal, milk and milk products and fruit (except bananas and dried fruit).

The same is true for the pre-match meal. It might consist of pasta in a low-fat tomato sauce, baked beans or scrambled eggs on toast and fresh fruit such as apples, pears or orange juice. Some grilled fish or chicken and vegetables could accompany the carbohydrates. Ideally this meal should be eaten at least three hours prior to the start – especially if nerves are a factor, which can impair digestion.

Food in the stomach is given a high priority to be digested before it has chance to spoil. As a result greater blood flow is directed to the digestive tract - not good news when players' muscles will soon be demanding an increase in blood flow too. The result of playing with a full stomach is nausea – the body's attempt to cease exercise so that it can redirect blood flow back to the stomach.

There is one exception to consuming carbohydrate immediately prior to the start of a game and it's in the form of a sports drink 5 or 10 minutes before kick off. This is discussed in more detail in section 5.

3.3 Post Match Eating

Outfield soccer players can use up 200 to 250 grams of carbohydrates during a game. It's important that they replenish those stores as quickly as possible. It becomes even more important if players have more than one match in the week or are involved in heavy training.

Ideally a large, high-carbohydrate meal should be eaten within two hours and it can and should consist of high GI foods. Bananas and dried fruits are good immediately following a match, as are sandwiches and high-carbohydrate drinks like Gatorade Exceed and Lucozade. A main meal several hours later might consist of bread, pasta, potatoes and rice as well as other simple sugars like cakes and sweets.



Even under the best circumstances it can take over twenty hours to fully restore carbohydrate stores. This has implications for players who are training five or six days a week. In this case carbohydrate replenishment at regular intervals during training sessions becomes important. This is where high-carbohydrate drinks can offer a real advantage (see section 4).

3.4 Carbohydrate Loading

Classic carbohydrate loading is often used by long distance athletes to “pack “ muscles with energy. The actual process involves depleting the muscles of carbohydrate a week or so before the event with exhaustive exercise and a low-carbohydrate diet. Two to three days before the even the athlete switches to a very high-carbohydrate diet. In their depleted state muscles take up more carbohydrate than they normally would giving the athlete a large store of energy.

For soccer, carbohydrate loading is unnecessary. In fact a disruption in a player’s normal eating pattern can actually cause stomach upset and lead to impaired performance. A more sensible approach to increase carbohydrate intake in the days leading up to a game.

~ SECTION 4 ~



HYDRATION & FLUID REPLACEMENT

Drinking before during and after a match serves two important aims – firstly it helps to prevent dehydration and secondly it can top up carbohydrate stores.

4.1 Preventing Dehydration

Soccer players can lose between 2-3 litres of sweat (oz) during a game, particularly in hot and humid conditions. They can also lose as much as 2-3 kg (4½-6½ lbs) in bodyweight during a game. This amount of fluid loss will certainly have a negative affect on performance.

Ideally to counteract dehydration players should consume 200-400 ml (7-14 oz) of cold water or a suitable carbohydrate solution (see 4.2 below) 5 to 10 minutes before kick off. During the half time interval players should try to drink another 300-500 ml (10-17oz) of a sports drink. During hot weather or strenuous training sessions coaches should try to provide players with 150-250 ml (5-8oz) of drink about every 20 minutes.

Following a match or hard training session, it's essential that lost fluids be replaced. Water on its own is fine but to replace fluid and replenish energy stores, a high carbohydrate drink may be more suitable.

4.2 Drinking Before & During a Match

The right carbohydrate drink taken before and during a game can postpone fatigue and stabilize blood sugar preventing light-headedness, headaches, nausea and "jelly-like" muscles.

However, not all carbohydrate drinks are created equal. Too much carbohydrate or sugar can actually hinder performance so it's important.

A solution that contains 40% carbohydrate empties the stomach much slower than plain water (which is 0% carbohydrate). It means that high sugar drinks such as Coca Cola, regular Lucozade, Exceed High Carbohydrate Source and Gator Lode (up to 40% carbohydrate) are NOT the best fluids to consume before or during exercise.

The ideal sports drink should contain 6-8% carbohydrate. It should also contain a small amount of salt. Sodium concentration in the blood can reduce due to sweating and drinking lots of diluted fluids. If it gets too low it can lead to nausea, headaches and blurred vision. Adding just a pinch of salt can offset this potential danger.

Sodium is also an **electrolyte**. Electrolytes help control the passage of water between body compartments and they also help to maintain the acid-base balance of the body. Electrolytes (or lack of them) have been associated with muscle cramps in the latter stages of soccer games.

Here are some effective sports drinks currently on the market suitable before and during a match or training session:

Suitable Sports Drinks for Soccer	
Brand	Amount of Carbohydrate
Gatorade	6%
Lucozade Sport	6.4%
Exceed	7.2%
Quick Kick	4.7%
Isotar	
High Five	6%
Powerade	6%

Drink 200-400 ml (7-14oz) of a suitable sports drink 5 to 10 minutes before kick off but no earlier. During the half time interval drink another 300-500 ml (10-17oz). In hot climates try to drink 150-250 (5-8oz) ml every 20 minutes or so.

4.3 Drinking After a Match

Within two hours after a game you should aim to consume 100-200 grams of carbohydrate. Muscles are depleted of carbohydrate stores, which need to be replenished as quickly as possible. Sometimes it can be impractical or unpalatable to eat a large meal immediately afterwards. Carbohydrate drinks offer a convenient alternative.

The sports drinks mentioned above are good but this is one of the few occasions when taking a high carbohydrate drink is beneficial. Fizzy drinks are okay but fruit juice is a more healthy option.

4.4 How to Make Your Own Sports Drink

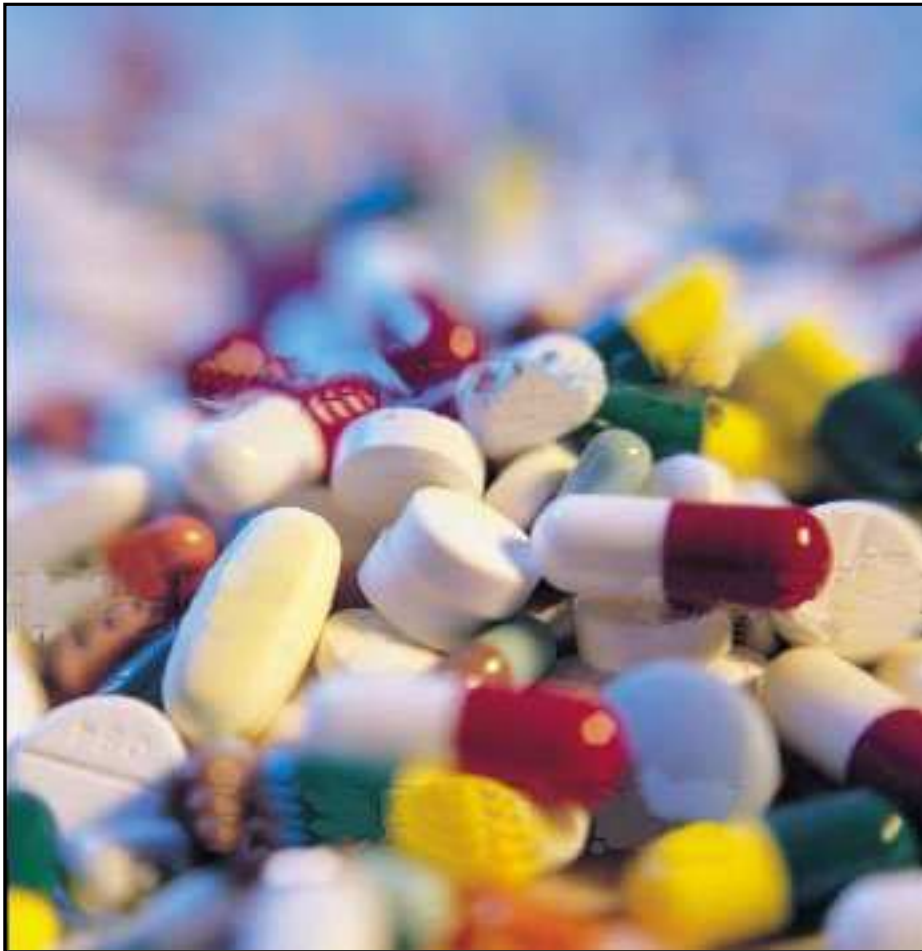
You may have heard of “isotonic” sports drinks that have been “scientifically developed in conjunction with top athletes”. It’s easy to make your own, low cost and equally as effective carbohydrate drink.

Isotonic means a fluid containing electrolytes and 6-8% carbohydrate (such as the sports drinks in the table above). To make your own add 200 ml (7oz) of concentrated orange juice (orange squash) to 1 litre (34oz) of water and add a pinch ($\frac{1}{4}$ - $\frac{1}{2}$ teaspoon) of table salt.

Hypotonic is a fluid that contains electrolytes and a very small amount of carbohydrate. This is used in very hot conditions where fluid replacement is the most important factor. To make your own add 100 ml (3.5oz) of concentrated orange juice to 1 litre (34oz) of water and add a pinch ($\frac{1}{4}$ - $\frac{1}{2}$ teaspoon) of table salt.

Hypertonic refers to a fluid that contains a large amount of carbohydrate and is ideal for refuelling after a game. To make your own add 400 ml (13.5oz) of concentrated orange juice to 1 litre (34oz) of water and add a pinch ($\frac{1}{4}$ - $\frac{1}{2}$ teaspoon) of table salt.

~ SECTION 5 ~



SPORTS SUPPLEMENTS

Erogenic aids consist of supplements, drugs or procedures believed to improve athletic performance. Some of these substances are completely legal while others remain banned and unethical. Many are completely untested yet still receive endorsements from professional sports stars. Those supplements that do have some limited research to back up the claims seem to receive even greater media hype. This section examines some of the more popular substances that many enthusiastic soccer players consider a necessary training and performance aid...

5.1 Amphetamines

Often referred to as “pep pills”, amphetamines exert a powerful stimulating effect on the central nervous system. The two most commonly used substances are Benzedrine and Dexedrine. They increase blood pressure, heart rate, breathing rate, cardiac output and blood glucose. They are said to increase alertness and a feeling of energy, decrease the sensation of fatigue and enhance self-confidence. Amphetamines create similar stimulatory sensations to that of cocaine but the effects last considerably longer. Some of the short-term side effects include headaches, insomnia, hallucinations, convulsions and even heart attack. Longer term use can lead to uncontrollable movements of the face, paranoid delusions and nerve damage.

Amphetamines are a banned substance and if soccer players are made aware of the well-documented side effects it’s unlikely they would consider using them. However, the sport is not immune to amphetamine abuse. The National Center For Drug Free Sport (NCDIFS) completed a survey in 2001 amongst college soccer players in the USA. Approximately 2.9% of those surveyed admitted taking amphetamines on a regular basis. The percentage of women’s soccer players admitting to amphetamine use in 2001 was higher than in any other sport at 4.6%.

Ironically, the majority of the research shows that taking amphetamines prior to a soccer game has no advantage. While it may “psyche up” players, excessiveness stimulation and palpitations can severely hinder play.

Another banned stimulant commonly used by athletes in many sports is ephedrine. Ephedrine is found in many cold remedies and can be bought in health food stores as a weight loss supplement. Although there are a few studies that show limited beneficial effects to athletic performance (thought to be due a reduced perception of exertion) the overall evidence is by no means convincing. Ephedrine use has also been linked with serious health concerns such as heart attack and stroke.

5.2 Anabolic Steroids

Many coaches believe that because of the physical nature of soccer drug and steroid abuse is not a problem in the sport. However, in 2001, Dutch national players Edgar Davids, Jaap Stam, and Frank de Boer tested positive for the banned anabolic steroid nandrolone. Other high profile players in European leagues, such as, Christophe Dugarry, and Josep Guardiola have also been found guilty of using performance-enhancing drugs. A 2003 study conducted by Ivan Waddington, professor at the University of Leicester, on behalf of the BBC found that 5.6% of English professional soccer players knew of a colleague who used performance-enhancing drugs.

An estimated one to three million athletes (90% of male and 80% of female bodybuilders) in the USA use steroids or androgenic substitutes. But the drug is not just reserved for power athletes. As soccer becomes faster and athletes become stronger and more powerful, more and more players are inclined to experiment with steroids.

Anabolic steroids function in a similar manner to the male sex hormone testosterone. Testosterone contributes to gender differences such as greater muscle mass and strength. The hormone's effects are lessened when synthetically prepared in the form of anabolic steroids but they still augment an increase in lean muscle mass and strength gain when combined with resistance training. Athletes often take a combination of steroids (called "stacking") in an increasing dose (called "pyramiding"). Dosages for medical use are usually in the 5-20mg range, however, athletes take between 50-200mg to achieve an ergogenic effect.

Despite the positive gains in strength and power, there are many, well documented negative side effects to taking steroids (which is banned by all soccer governing bodies). They include: damage to the cardiovascular system, increased risk of coronary heart disease, alterations to normal hormonal balance, infertility, abnormal liver function and interference with the immune system.

A substance called Androstenedione (known as "Andro") claims to offer similar androgenic effects to anabolic steroids and can be bought over-the-counter without prescription. It's often marketed as "one step away" from testosterone without the negative side effects of steroids. Some sporting governing bodies such as the IOC and the Men's Tennis Association ban its use because it may endanger health. Andro is classed as a food and so bypasses the Food & Drug Administrations rules. It can even be bought in the form of chewing gum.

There is little scientific evidence to support the use of Andro in sport. Studies comparing a supplemented group who undergo a weight training program versus a placebo group show that gains in strength and lean mass are the

same. Unfortunately, HDL (good cholesterol) is often reduced in those taking Andro potentially increasing their risk of coronary heart disease. Serum estrogen (female sex hormone) has also shown to increase with Andro supplementation, which can lead to gynecomastia (breast development). One of the appeals to athletes is that there is no specific test for Andro. However, because commercially produced Andro is not always pure and may contain testosterone, there is a real risk athletes may test positive for steroid use anyway.

Other common substances often used by athletes as prohormones include Clenbuterol and DHEA. Clenbuterol, a drug often prescribed in Europe for obstructive pulmonary disease, is not approved for human use in the USA. Studies show that, like anabolic steroids, it can increase lean muscle mass but also has potentially serious side effects. DHEA has been labelled in the media as “the mother of all hormones” and receives much hype in the anti-aging community. Athletes believe that it can also provide androgenic effects similar to testosterone but there is little research to back up this theory. Although DHEA is available without prescription, it is banned by many Sporting Committees because of the long term health concerns that have yet to be researched.

5.3 Caffeine

In athletes, caffeine is a controlled/restricted drug. Found naturally in coffee beans, tea leaves, cocoa beans and carbonated drinks it stimulates the central nervous system within 30 to 120 minutes of consumption. While not all studies support the beneficial affects of caffeine, ingesting an amount of caffeine equivalent to 2.5 cups of regular, percolated coffee (330 mg) an hour before exercising has been shown to increase endurance performance on a number of occasions.

As with other stimulants (such as amphetamines) the effect is thought to come from a greater tolerance o fatigue rather than an increase in cardiopulmonary variables. It may also help the body to use fat as a source of fuel thus sparing carbohydrate reserves.

Individuals who do not normally drink coffee or try to avoid dietary intake of caffeine may experience undesirable side effects if they take it in supplemental form. It can produce restlessness, headaches, insomnia, irritability and muscle twitching. Caffeine also acts as a potent diuretic, which may cause pre-exercise fluid loss, negatively affecting performance in a hot climate.

Supplemental caffeine is taken in tablet form rather than drinking coffee. Lower doses (3-6mg per kg body mass) have shown the same beneficial effects as higher doses with a decreased risk of dehydration. Although caffeine is one of the few legal substances with scientific evidence to back it

up, there is no reason for soccer players to feel they should take it prior to a game or training, especially if they maintain a low-caffeine diet.

5.4 Chromium

The trace mineral chromium has become a popular supplement amongst health seekers and athletes alike. Allegedly it helps to burn fat and build lean muscle and is often marketed to strength athletes as a safe substitute for anabolic steroids. It is usually taken in the form of chromium picolinate – an acid combination that supposedly improves absorption.

The hype surrounding chromium began back in 1989 when a researcher named Gary Evans at Bemidji State University published a paper which indicated that football players who ingested 200 micrograms of chromium per day were able to build more muscle and lose more fat, compared to chromium-free athletes. In fact, the study stated that the chromium-rich athletes reduced body fat by 22 per cent and added an six pounds of lean muscle in a brief, six-week time span.

Support for chromium supplementation has also emerged from studies carried out with animals, in particular pigs. Young pigs supplemented with chromium grow to be less fat and with increased lean muscle. However, the animals are usually given very high doses of chromium – significantly higher than what is considered safe for human consumption.

Several studies on athletes have shown that taking up to 600 µg of chromium picolinate daily has no effect on strength or body composition variables. In terms of negative side effects, chromium picolinate may affect iron transport and distribution throughout the body. There are also no studies in to the long term effects of taking high doses of chromium.

It's worth remembering that vitamin and mineral intake seems to only exert an ergogenic effect when the individual is deficient in that mineral in the first place. Many adults may fail to meet the recommended dietary intake of 50-200 µg because chromium rich foods such as broccoli, nuts, liver, apples (with skins) and wheat germ are not part of the daily Western diet. In addition strenuous training and associated high carbohydrate intake promote urinary chromium loss increasing the potential for deficiency. The most sensible approach in athletes with chromium-deficient diets is to first adjust dietary intake rather than visiting the health food store.

5.5 Creatine

Creatine is an organic compound found in foods such as meat, poultry and fish. The body can only create a limited amount of creatine on its own so dietary intake becomes important. Nearly all creatine taken in from food becomes incorporated into the body's muscles. A large amount combines with phosphate to form a substance called **phosphocreatine** and it's this substance that powers muscles during very intense, short-term activity.

The body has only a limited store of phosphocreatine, enough to power just 5 to 8 seconds of all-out sprinting. Once this has been used, the body must rely on other metabolic systems to produce energy and during intense activity this quickly leads to a build up of debilitating lactic acid.

Taking creatine in supplemental form significantly increases intramuscular stores of creatine. The rationale behind taking it as a performance aid is that it will allow athletes to perform a higher level of explosive activity for longer. It should also delay the onset of lactic acid accumulation.

Creatine is probably the most well-researched supplement on the market. Numerous studies do confirm that it improves performance in high intensity exercise, particularly in repeated bouts of effort. It has been used successfully by sprinters, football players, weight lifters and is now becoming more commonplace in other sports. Creatine is most often taken in a **loading** format. Athletes take 20 to 30 grams of creatine a day (usually in the form of powder added to liquid) for 5 to 7 days. A maintenance phase then follows during which athletes take as little as 2 to 5 grams daily.

Maintaining high levels of creatine through supplementation has led to reports of some negative side effects including abdominal cramping, muscle cramping and diarrhoea. While more research is required as to why this might occur, many athletes and sports teams now choose to avoid creatine because of negative past experiences. Concerns regarding potential long-term side effects also exist. Only limited research exists regarding long-term use and kidney function (creatine degrades to creatinine before excretion in urine).

There is little research into the effects of creatine supplementation on soccer performance during an actual match. However, the effect of creatine on soccer related fitness tests has received a limited amount of research. Unfortunately many of these studies have been poorly designed and fail to mirror the demands of the game. Even ignoring any limitations in the studies, results do not support the use of creatine in soccer. As so much of the running in soccer is at less than maximal sprinting speed, creatine supplementation likely provides no benefit to match performance.

5.6 Glutamine

Glutamine is a non-essential amino acid that serves many regulatory functions in the body. Its use by athletes falls under two categories – to prevent muscle breakdown and to protect the immune system. Some studies have shown that supplemental glutamine can help to prevent protein breakdown (beneficial for anyone following a strength training program) but the research is by no means conclusive.

In the body, glutamine is an important fuel for some cells of the immune system. In situations of stress, such as clinical trauma, starvation, or prolonged, strenuous exercise, the concentration of glutamine in blood is decreased, often substantially. In endurance athletes (such as marathon runners) this decrease occurs alongside temporary immunodepression. Heavy training schedules have also been linked to increase the occurrence of minor infections, particularly in the upper respiratory tract. Several clinical studies have found that oral glutamine can decrease the incidence of illness and infection in endurance athletes or athletes undergoing heavy training.

Glutamine is classed as a nutritional supplement and is considered completely legal ethical by all sporting bodies (as are all amino acid supplements). It can be found in most health food stores in the form of gels or tablets and is often an ingredient in many commercial protein powders. Due to the lack of research there are no guidelines for doses. Bodybuilders take up to 15mg per day but a more sensible recommendation for athletes trying glutamine is to start at 2-6mg per day and gauge reaction.

While some early research appears promising (particularly in relation to immune function) there is not enough evidence to suggest healthy individuals, even those involved in intense training, should take glutamine as a matter of course.

5.7 Growth Hormones

Physicians and pharmacologists are predicting that human growth hormone will overtake anabolic steroids as the most widely used training and performance aid. Human growth hormone (hGH) stimulates bone and cartilage growth, enhances fat metabolism and inhibits amino acid (and therefore muscle) breakdown. With age there is a natural reduction in lean muscle mass and an increase in fat mass. Genetically engineered hGH can reverse these negative effects and is often used to treat children who suffer from kidney failure and the inability to thrive.

The innumerable advertisements off and online are for a supplemental form of hGH (as opposed to the injected, genetically engineered form). To date there is no proven replacement for injectable hGH and very few well-controlled studies have examined how hGH supplements (such as an oral spray) affect exercise performance. Genetically engineered hGH is only available to healthy people on the black market and is often in an adulterated form. Child athletes who take hGH in the belief it will give them a competitive edge have an increased risk of gigantism, while adults can develop acromegalic syndrome and insulin resistance leading to type 2 diabetes.

For obvious reason, genetically engineered hGH is banned in sport and as yet there is no evidence to suggest supplemental hGH is effective and safe long term.

5.8 Pangamic Acid

Pangamic acid, or vitamin B₁₅, is alleged to improve aerobic endurance capacity. Proponents of the supplement refer to studies conducted in Russia that showed pangamic acid increased the body's ability to utilize oxygen and reduce the build up of lactic acid. Unfortunately, these early studies are criticized for their poor research design, so the results cannot be validated. More recent studies in the United States has found pangamic acid to have no beneficial effects on athletic performance. From a nutritional point of view, pangamic acid has no vitamin properties and seems to serve no purpose in the body. There is also concern that synthetic mixtures of vitamin B₁₅ may be harmful. The Food and Drug Administration prohibit the sale of this substance as either a dietary supplement or a drug.

5.9 Sodium Bicarbonate

During all-out exercise lasting between 30 and 60 seconds (such as several sprints up and down the soccer field), dramatic alterations take place in the chemical balance of the body's fluids. This occurs because the body must use anaerobic energy pathways to supply muscles with energy – and a by-product of this process is a sharp increase in lactic acid. To defend against an increase in acidity, the body has a buffering system, part of which is bicarbonate (highly alkaline). In theory, if high levels of bicarbonate can be maintained during exercise it will help to offset the increase in acidity and reduce the limiting affects of lactic acid accumulation.

Compared to many popular, commercial supplements, sodium bicarbonate is fairly well researched. While studies have produced conflicting results, many trials have found that taking a bicarbonate solution prior to exercise can indeed increase anaerobic exercise performance. One study into 800-m race

performance showed that taking a sodium bicarbonate solution before decreased race time by a significant 2.9 seconds compared to a placebo. Other studies, while less dramatic, support the benefits of sodium bicarbonate and many studies show no effects at all. There seems to be a wide variation between individuals, which may be related to their level of fitness.

The type of exercise also seems to play a major role. Continuous, all-out activities like sprint swimming or cycling are easier to measure than intermittent sports such as soccer. However, recent studies (one as recent as May 2005) have shown that sodium bicarbonate can improve the performance in a multi-sprint test and intermittent sports like soccer.

Currently, taking sodium bicarbonate (considered a food not a drug) is not banned by any sporting governing bodies. A typical dose, 1 to 2 hours prior to exercise is 300 mg per kg of bodyweight. There are some reported side effects, which include stomach cramps, nausea and diarrhoea. These negative effects would minimize and positive benefits gained from taking sodium bicarbonate so it's important athletes do not try the supplement for the first time on the day of an important competitive event.

There are many more supplements and performance enhancing aids on the market and this list is by no means exhaustive. Before you add to the industry's multi million dollar turnover, and before you potentially put your health at risk, be sure to spend time researching any supplement you are unfamiliar with.

~ SECTION 6 ~



QUICK TIPS FOR OPTIMAL SOCCER NUTRITION

- Following a demanding training program increases the body's need for energy. Extra meals or nutritious snacks and drinks should be eaten to provide enough fuel during strenuous conditioning periods.
- A soccer player's diet should consist of about 60-65% carbohydrate, 20-25% fat and 10-15% protein.
- Carbohydrates should be predominantly in the form of fresh fruits and whole grains such as whole meal bread, pasta, potatoes and brown rice. Protein should come from lean meats, poultry, fish, pulses, beans and nuts.
- Saturated fat intake should be reduced in most cases i.e. full fat milk, cheeses, pastries, cookies, pies, fast food. Fat should not be omitted from the diet. Good fats are found in olive oil, avocados, nuts and seeds and oily fish such as mackerel.
- Adequate vitamins and mineral intake comes from a well-balanced diet. Supplementation is not needed in healthy individuals who eat a wide range of foods that includes plenty of fresh fruit and vegetables.
- The pre-match meal should be eaten at least 3 hours before kick off and should contain complex carbohydrates such as wholemeal bread or pasta, potato or rice. Fruit is good choice also.
- In the hour before a game no carbohydrates should be consumed, including carbohydrate drinks. However, 5-10 minutes before kick off, 200-400 ml (7-14oz) of a suitable sports drink can be taken.
- A suitable sports drink contains 6-8% carbohydrate. Fizzy drinks such as Coca Cola and Lucozade are not suitable. Gatorade and Lucozade Sport are good choices.
- During the half time interval another 300-500 ml (10-17oz) of a sports drink can be taken. In hot climates try to drink 150-250 (5-8oz) ml every 20 minutes or so.
- After a match try to consume as much carbohydrate in the first 2 hours as possible. High glycemic index foods like bananas, sandwiches and cakes will help to refuel muscles quickly. High carbohydrate drinks like concentrated fruit juice and even fizzy drinks offer a practical way to replenish carbohydrate stores
- Very few legal supplements can be backed up with credible scientific research. Those that can be supported include creatine monohydrate, caffeine, sodium bicarbonate and glutamine. While in some cases these supplements can improve performance, none are a magic potion and none can match the benefits derived from proper training and nutrition.

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