003

ESSENTIAL FUELS FOR
TRAINING & RECOVERY

The most effective way to improve in sport is to be able to maintain a level of consistent and effective training, which requires you to be able to recover sufficiently between sessions. As the most required fuel, carbohydrate is essential to this process, and it is essential that it is restocked as the body's stores are limited.

In this chapter you will find out:

- The most important food for energy is carbohydrates
- Athletes should aim to make carbohydrates the main part of their diet during training and competition
- Recovery from training is the key to sustained, consistent training
- An athlete needs to ensure that their stores of carbohydrate are restocked in between sessions in order to recover
- Refuelling should be trained for almost as much as your event – refuelling and recovery should not be new ground come an important competition!

003
ESSENTIAL FUELS FOR TRAINING & RECOVERY

As discussed in the last chapter, carbohydrates, proteins and fat are the three main energy fuels for exercise. However, the preferred energy fuel for the muscles is glucose, particularly as exercise intensity increases.

Glucose is formed from the breakdown of carbohydrates and is stored as glycogen within the liver.

However, carbohydrate stores within the body are relatively small and so need to be topped up daily or even more frequently. By not restocking glycogen stores correctly, fuel will run out after only a few days of training and the athlete will find performance is compromised as fatigue sets in.

BASIC ADVICE AND SIMPLE GUIDELINES

- The amount of carbohydrate you need depends on your level of training
- The more intense your programme, the more carbohydrates are needed
- More glucose used, the more carbohydrates you need to ingest in order to restock
- In order to maintain training loads, you need to make sure you replace carbohydrates effectively and accurately – not replacing enough will be detrimental to performance on track, road or in the field
- The best way to work out levels of carbohydrates needed is to work on the grams required per kilogram of body weight – this is an accurate way of representing the fuel needs of the muscle
- Using this information you can plan your diet to meet those targets accurately and remove the "guess factor" that some athletes rely on

See table 2 for guidance on the grams per day you should be ingesting which is calculated from your bodyweight.

Bodyweight is an essential part of calculating carbohydrate needs of different athletes, as is careful monitoring of the intensity and length of the training or competition. Knowing how hard you are training and being realistic with this is essential in getting this strategy right and accurate refuelling. Table 3 below demonstrates how these different factors make a large difference in the amounts of carbohydrate needed.

However, in the same way that athletics is an individual sport, each individual's needs will be slightly varied, and whilst the table below demonstrates recommendations, each athlete needs to assess how well they perform and train under certain carbohydrate levels and use this to determine whether they are taking in enough.

Table 2 - Carbohydrate recommendations for training

Training level	Carbohydrate (g/kg/d)
Regular levels of activity (3-5 hrs/week)	4-5
Moderate duration/low intensity training (1-2 hrs/day)	5-7
Moderate to heavy endurance training (2-4+ hrs/day)	7-12
Extreme exercise programme (4-6+ hrs/day)	10-12

Table 3 - Range of carbohydrate needs

Athlete's body weight in kg	Training level moderate duration and low intensity	Moderate to heavy endurance	Extreme exercise programme
40	200-280	280-480	400-480
50	250-350	350-600	500-600
60	300-420	420-720	600-720
70	350-490	490-840	700-840
80	400-560	560-960	800-960
90	450-630	630-1080	900-1080
100	500-700	700-1200	1000-1200
110	550-770	770-1320	1100-1320
120	600-840	840-1440	1200-1440
130	650-910	910-1560	1300-1560

003
ESSENTIAL FUELS FOR TRAINING & RECOVERY

CARBS GLORIOUS CARBS

Carbohydrates are the sugars and starches ingested in the diet. But man does not live on bread alone – and it is essential to make sure other foods are added to meals and snacks to ensure protein and other nutrients are provided.

The majority of your carbohydrate intake will come from cereals, potatoes, rice, pasta and bread, plus peas, beans and lentils. Most carbohydrates are broken down into glucose so one will not be better than the other, therefore practicality may play a part in the type of carbohydrates you ingest. E.g. rice, potatoes and bread are bulky and may not be easy to ingest as a pre-event snack or in large quantities post competition. Training also may have been so intense that the amount needed to refuel is simply not palatable to an athlete.

In these situations, sometimes is it useful to be able to source carbohydrates from other foods such as sugary foods and snacks, fruits and juices, which provide a concentrated hit of carbohydrate.

Monitoring carb levels:

Food labels will often tell you how much carbohydrate, per 100g and per portion that it contains, but as a quick example some everyday foods and the carbohydrate content for a medium portion are in table 4 below.

The key thing to remember though as an athlete is that needs will vary widely according to event, gender, bodyweight and intensity of work. Factsheet 1 demonstrates the varying needs of three athletes and the types of foods they would need to take in to meet their carbohydrate requirements. It is important to note that these menus are not representative of a fully balanced diet as the only foods listed are carbohydrate sources.

Table 4 - Carbohydrate content of everyday foods

Medium portion of food	Carbohydrate (g)
Baked potato, pasta or rice	60
Bagel, flapjack or slice of fruit cake	40
1 large banana or 50g raisins	35
2 slices of bread, 2 crumpets or 1 bread roll	30
Muesli, cornflakes, 2 Weetabix or cereal bar	30
50g chocolate, 10 jelly beans or 3 jaffa cakes	30
500ml sports drink or squash	30
Baked beans (135g) or sweetcorn (100g)	20
200ml orange or apple juice	20
Apple, pear, orange or 2 kiwi fruit	15
2 tsp honey or jam or 150g low fat yoghurt	15

THE GI QUESTION

One of the ways that carbohydrates can be categorised is by the speed at which is it converted into glucose – this measurement is the Glycaemic Index or GI.

A food's GI is a measure of how the food affects the body's blood glucose after consumption – the larger the rise in blood glucose the higher a GI score it has.

Although GI should not be thought of as the complete or only way of ranking a carbohydrate food's merit, carbohydrates with a moderate to high GI provide an excellent source of carbohydrate for glycogen storage and therefore it is recommended they are the fuel of choice in recovery snack and meals, the best way to refuel after a session or competition.

Foods are divided into 3 GI categories – low, moderate and high GI. However, there is no obvious way of identifying a food's GI by its appearance. Some sugars have a high GI (glucose), others have a low GI (fructose). Some starches have a high GI e.g. baked potato and some have a low GI e.g. pasta. Low GI foods are not bad, however they often contain higher levels of dietary fibre than high GI foods, can be more bulky and therefore proportionally more food is consumed in order to refuel muscles than high GI foods.

Factsheet 2 outlines different types of foods and their GI levels.

003
ESSENTIAL FUELS FOR TRAINING & RECOVERY

WHEN TO CARB... BEFORE, DURING AND AFTER

So far, the factors you need to consider in relation to carbohydrates are:

- the amount you need
- when you need it
- what sort of carbohydrate to choose
- whether to add other nutrients

All of these factors can enhance glycogen recovery and improve the practicalities of carbohydrate intake targets. But ultimately, as an athlete you have to make sure you work out the most effective fuelling strategy and ensure any variations in routine are tested in training and not during a competitive cycle. This is most important in relation to ingesting carbohydrates before and in the case of certain athletics events during activity and the considerations will in many cases be event specific. Factsheet 3 contains a number of carbohydrate snacks providing approx 50g of carbohydrate, for consumption before or after a session or competition.

CONSIDERATIONS FOR BEFORE TRAINING AND COMPETITION

Although chapter seven deals in more detail about preparing for events and planning nutrition, generally speaking, a snack high in carbohydrates approximately 30-60 minutes before training, can be beneficial to some, providing enough carbohydrate is eaten – particularly for athletes who require fuel mid exercise but may not be able to take on board fuel during the session.

However, it is also the case that some athletic events are not conducive to eating soon before. It is also wise to ensure that any food close to competition is just snack sized (containing around 50-100g of carbohydrate), as a meal can take in excess of 2-4 hours to be digested.

High GI food is probably the best option, although if – as is the case with marathon runners – an athlete has the capacity to refuel mid event then the GI of the pre race snack is not as important. Other factors may then need to be considered such as the amount of bulk (fibre-content) in the selected snack and whether it will cause stomach problems. Therefore, high fibre options would be best avoided.

DURING TRAINING AND COMPETITION

For refuelling during an event, a key factor that will determine levels will be the duration of the exercise:

Up to an hour – the athlete's own choice as to whether they

- have nothing
- have water
- have water and some carbohydrate with or without salt. It is thought that 30-60g per hour will maintain glucose levels

Intense exercise lasting longer than an hour, i.e. brings about fatigue

- highly recommended to have 30-60g of rapidly absorbed carbohydrate (high GI) per hour
- best to ingest gradually, taking regular smaller feeds which maintain a steady flow of glucose fuel
- carbohydrate in the form of glucose, sucrose, maltodextrins and high GI starches recommended over fructose which may cause stomach discomfort
- 600-1200ml of a sports drink containing between 4-8% carbohydrate will meet a level of 30-60g per hour and can be sipped easily during exercise

Obviously, the type and timing depends greatly on the event. A marathon runner will have a consistent level of effort throughout a couple of hours and the carbohydrate needs to be in the form of liquid or gel for ease of digestion. A jumper or thrower may be out in the field for a couple of hours, but as their efforts are explosive and not sustained in the same way as an endurance runner, they have more options for refuelling during competition.

AFTER TRAINING AND COMPETITION

Perhaps the most important part of an athlete's nutritional strategy is their refuelling and recovery phase. Without effective refuelling, an athlete will struggle to train regularly, in some cases two or three times a day.

Carbohydrate is key to this recovery. However, so is timing as the highest rates of muscle glycogen storage occur in the first hours after exercise. When an athlete only has a matter of hours between training, carbohydrate intake should begin as soon as is possible. Some endurance athletes may have up to three training sessions a day including a morning run, a strength and conditioning session early afternoon, followed by an additional running session late afternoon/early evening. Therefore, the need to refuel is essential, yet it is doubtful they would be able to consume the carbohydrates needed comfortably all from large meals. Therefore, a combination of small high-carbohydrate snacks, both drinks and solids, may be the best option.

In the immediate aftermath of a session, eating carbohydrates will start the muscle recovery process. This is also a key period in that the muscles are far more efficient in their storage of glycogen at this time. In essence, the immediate 2 hours post-session is the best window of opportunity for refuelling – both aiding recovery and preparing the body for the next session to come.

The table below demonstrates an athlete's immediate carbohydrate requirement in the initial hours after exercise:

Although the initial hours following a session are important, it is most important to ensure carbohydrate is being consumed. Glycogen storage will only happen when carbohydrate is eaten!

For athletes with regimes containing longer recovery phases between sessions, e.g. daily sessions; then the timing is less critical as long as the overall balance is correct with the correct amount of carbohydrate being met during the course of the day. It also means as an athlete, you have slightly more options over how to consume carbohydrates, e.g. as part of larger meals or in snack and liquid form.

Table 5 - Immediate carbohydrate needs after exercise

Body weight (kg)	Carbohydrate needs (g/hr)
40	40-48
50	50-60
60	60-72
70	70-84
80	80-96
90	90-108
100	100-120
110	110-132
120	120-144
130	130-156

RECOVERY – OTHER NUTRIENTS TO CONSIDER

Fluids and salt

In chapter five, the replacement of liquids is discussed in more detail. However water and salts lost through sweating need replacing: fluid at the rate of 1.2-1.5 litres per kg of bodyweight lost and salt through sport drinks and food.

Protein

As you will find in the next chapter, protein is also essential to the recovery process, but generally when protein is added to carbohydrate immediately after training, glycogen storage is enhanced. In practical terms, this can help when food availability and energy intake levels make eating enough carbohydrate difficult. Protein in a post training snack can certainly enhance overall glycogen recovery and also influence the repairing and building of muscle tissue.

Fat

The body's fat stores are relatively large, even in very lean athletes. Therefore, it is not necessary to purposely have a strategy for replacing fat post exercise. Although fat cells are metabolised in exercise, it is advisable to concentrate on carbohydrate intake in the initial hours of recovery – relying on regular meals to provide dietary fat.

Warning: excessive intake of protein, fat and alcohol is discouraged during the recovery phase as it could interfere with the practicality and process of effective glycogen storage.

The dreaded wall

Hitting the wall; bonking out; running on empty... all expressions of the extreme symptoms of fatigue experienced by elite athletes who suffer a severe drop in energy – which primarily happens towards the end of an event.

As an athlete, you may have experienced those horrible few minutes when your become sluggish, unable to react quickly, your coordination and balance are compromised and you appear very dizzy.

The main cause is due to running out of glycogen in the muscles – although dehydration can also cause fatigue.

Therefore, to avoid hitting the wall, and to enable yourself to train longer and harder means ensuring your pre and during competition fuelling strategy provides you with a full tank of fuel (glucose) and making sure your recovery from a session or competition is not neglected.


adidas