

## FACT SHEET

### EATING & DRINKING DURING SPORT

You have endured weeks of dedicated training and it's time to deliver the performance you have worked hard for. During most sports, your body's main fuel mix comes from carbohydrate (from muscle glycogen and blood glucose) and fat. Generally, if your training involves less than an hour of activity, you will perform well without refuelling during the event and, with good food choices, you should be able to fuel adequately before your event. On the other hand, sweat losses accrue from the start and, in many sports or conditions, may cause a fluid deficit that interferes with performance. This calls for an individualised fluid plan during exercise to manage the fluid deficit. (See Fluids in Sport).

If your event or training takes longer than an hour, you may benefit from consuming carbohydrate during the session in addition to fluid. The decision will depend on:

exercise intensity (higher intensity burns glycogen more quickly)

duration (the longer the event, the more carbohydrate burned)

ambient temperature (the hotter it is, the quicker glycogen will be burned; also more likely that overheating and dehydration will limit performance – Febbraio et al 2010)

how well you have eaten before sport (eating carbohydrate before exercise increases carbohydrate stores, but also increases the rate at which carbohydrate is burned during exercise – [Goodpaster et al 1996].

The benefits of consuming carbohydrate during exercise include:

1. Maintaining blood glucose levels during prolonged moderate- to high-intensity events. Blood glucose can provide an alternative fuel source for the muscle when glycogen levels dwindle;
2. Providing a fuel source for the brain to maintain skill accuracy, decision making and reduce the perception of fatigue;
3. Sparing or replenishing muscle glycogen. In some situations, such as low intensity work, carbohydrate consumed during exercise can be burned to spare glycogen stores or can build new glycogen stores for later use.

### FLUIDS

Fluid intake during exercise should aim to match fluid losses so that the overall fluid deficit remains low. Water will replace fluid losses, so is a good choice for sports lasting less than an hour, and perhaps for situations where you don't need to perform at your best. However, sports drinks have a number of advantages, including taste that encourages greater fluid intake and the

provision of carbohydrate. They also contain some electrolytes to help retain the fluid you drink and to replace electrolytes lost in sweat. Sweat rates during sport vary widely between and within individuals depending on the exercise intensity, environmental conditions, genetics, fitness, and so on. Studies indicate sweat rate may be as low as 300mL/hour or as high as 2.6L/hour, but losses are often not compensated for by athletes' voluntary intake (Sawaka et al 2007: ACSM Position Stand). Since both electrolyte and fluid loss can vary so widely, an individual fluid replacement plan should be formulated for different training and competition scenarios.

When exercising in warm conditions for prolonged periods, ensuring that your beverage is cold may improve performance. Some studies have shown that consumption of cold beverages (fridge temperature; <5°C, as opposed to warmer beverages) during prolonged exercise in the heat may improve body temperature measures, voluntary fluid consumption and/or performance (Burden et al 2010).

### HIGH INTENSITY SPORT LASTING AROUND ONE HOUR

Typically, sports that last less than an hour do not threaten body fuel stores. Good preparation should see you well fuelled for at least an hour of sustained or intermittent high-intensity activity (for example, a 2km swim or gym circuit session). In these situations, additional carbohydrate is not usually required and fluid replacement is considered the main nutritional need.

However, some recent studies of sustained high-intensity exercise lasting about one hour – e.g. a 40 km cycling time trial – have produced interesting results. They found that performance was enhanced by consuming carbohydrate immediately before and during the event, even when it couldn't have had a big impact on muscle fuel use. The benefits were attributed to an affect on the brain and nervous system, making subjects feel better and choose a faster pace. Other studies have found that simply swirling a sports drink in the mouth (signalling receptors that recognise carbohydrate) can also enhance performance of this type, so the retention of sports drink in the mouth for a few seconds may aid performance. It seems that even promising the brain that carbohydrate is on the way may be enough to make you feel better and exercise harder (Rollo & Williams 2011).

Water alone should be sufficient for high intensity sport lasting 60 minutes. However if overall energy levels are low or you'd like to experiment with carbohydrate and performance effect, trial a carbohydrate source like a sports drink in training, just before and during the exercise session.

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### SPORTS LASTING 60 TO 90 MINUTES

Most team sports and individual events are completed within 90 minutes, e.g. netball, squash, football, soccer, hockey or a 10 km jog. Your fluid plan should make use of the opportunities to drink (e.g. bench time and breaks) to replace a reasonable proportion of your sweat loss. It is likely that some level of fatigue will occur during these sports to slow you down or impair your skills. Fatigue can often be due to inadequate fuel supplies. Risk factors include not having an opportunity to fuel up in the day prior to your event, going without breakfast before a morning event, or participating in a higher intensity sport where fuel is burned faster. If such fuel depletion occurs, it can be addressed by replacing carbohydrate during the event.

Again, individual experimentation is important and targets up to the amounts suggested for endurance sports (30-60g/hr) are a reasonable guide (see next section). It is usually most practical to refuel as part of your fluid plan by choosing carbohydrate-containing fluids such as sports drinks. However, some athletes like to use gels, confectionery, fruit and other easy-to-eat fuel sources, particularly at half time for team sports.

### SPORTS LONGER THAN 90 MINUTES

Generally, we think of sports lasting longer than 90 minutes as endurance events e.g. marathons, Olympic distance triathlons, and a mid-fielder's role in a game of Australian Rules football. Fluid and sodium losses can be extensive in these events, and the role of the individualized fluid replacement plan is vital. Fuel fatigue is also more likely, although muscle glycogen stores will again depend on the rate of fuel-burning during the sport and the success of pre-event fuelling. A recent systematic review on carbohydrate intake in endurance exercise from the University of Sydney found that ingestion of carbohydrate between 30 and 80g/hour enhances performance for exercise longer than 1 hour [Temesi et al 2011].

Choosing a mix of carbohydrate types (i.e. 2:1 glucose: fructose ratio) to maximise fuel uptake may become more important in longer duration sports of 2.5 hours or more where intake of up to 90g/hour may be beneficial [Burke et al 2011]. A competition fuel plan should be developed in training sessions, to fine tune timing, type and amount of carbohydrate to suit the athlete and the logistics of their sport.

Some general guidelines:

- It seems best to start refuelling early in the event rather than waiting for fuel stores to become depleted;
- A carbohydrate intake in the range of 30-60grams per hour works for most individuals;

- Fuel-containing drinks are often able to cover all needs of the event. For example, fuel targets can usually be met by 500-1000ml of sports drink per hour or alternatively, roughly 1g of carbohydrate per kg per hour; and
- As the length of the event increases (and the intensity is reduced), there may be more opportunity or need to consume solid carbohydrate choices. These can range from special sports foods to confectionery items and everyday foods like jam, honey or vegemite sandwiches.

### ULTRA-ENDURANCE EVENTS (> 4 HOURS)

Ultra-distance events have an increased requirement for additional fuel intake during the event. Luckily, because they are undertaken at lower exercise intensities, they usually offer more opportunity to consume a greater variety of carbohydrate sources. Solid foods become more valuable in lengthy events when hunger is possible, and it is also good to have extra choices to reduce the risk of "flavour fatigue". It is easy to become bored with sweet flavours or foods with similar textures when they are consumed for hours on end. Savoury choices, foods of different temperatures suited to the climate, and foods with alternative textures can all become valuable. When the duration and total energy requirements of a sport become large – for example, multi-day cycling or running events – the hours spent exercising may need to be a time for aggressive intake. Ironman triathletes and tour cyclists are often found to consume carbohydrate during their events at higher rates than we have previously recommended – up to 90grams per hour. It may also become important to replace salt losses and to consume protein. For individuals with higher exercise loads, these competitors (or their handlers) need to be creative in choosing energy and nutrient sources that fit the logistics and requirements of their events, as well as their individual preferences. An experienced sports dietitian should be able to provide specialised and individualised suggestions.

### RUNNER'S GUT

Some athletes experience gut symptoms such as stomach pain, bloating and diarrhoea, that impact on dietary intake during exercise. This is particularly so for those engaged in prolonged, high intensity and/or vertical impact sports like running and triathlon. Dehydration and dietary factors like timing of pre-event meal, type of food eaten pre-event (e.g. high fibre, high fat, high protein meals), and caffeine intake may influence these symptoms. For more information, on our website see [Runner's Gut](#) and [Low FODMAPs for Athletes](#). If you suspect a food allergy or intolerance, it is wise to seek diagnosis and guidance from a physician and an Accredited Sports Dietitian



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#### EXAMPLES OF CARBOHYDRATE CHOICES DURING EXERCISE

Each serve provides ~60 g of carbohydrate :

- 1 litre sports drink
- 600 ml cola drink
- 1.5 sports bars
- 1.5 packets sports gel blasts
- 3 cereal bars
- 2 sports gels
- 3 small or 2 large bananas
- 2 small boxes of sultanas
- 95 g jelly babies or jelly beans
- 1 round jam sandwiches (thick sliced bread) & 2 tablespoon jam
- 2 rounds vegemite sandwiches
- 1.5 slices of café style (thick) raisin bread
- Liquid meal supplement (~ 5 scoops in water) ever, some athletes like to use gels, confectionery, fruit and other easy-to-eat fuel sources, particularly at half time for team sports.

#### SUMMARY POINTS

- During sporting activities, it is important to have an individualised fluid plan that replaces most of your sweat loss.
- In events of 60 minutes or longer, replacing carbohydrate during the event may enhance performance.
- Experiment in training to find a plan that works for you and your sport and seek the advice of an Accredited Sports Dietitian to assist.
- A target of 30 - 60grams of carbohydrate per hour of activity is a good starting point.
- In shorter events, even a small amount of carbohydrate exposed to the receptors in the mouth can be useful, while in endurance events, higher intakes may be needed.
- Early findings suggest that in longer events in the heat, cold beverages may assist hydration efforts and enhance performance.
- For tips on maintaining dental health whilst meeting carbohydrate goals, click here to view the Dental Health Factsheet.