

## Sports Gels

### Supplement Overview

- › Sports gels are a highly concentrated source of carbohydrate (65–70% or 65–75 g/100 ml) in a form (“honey consistency”) that is easily consumed and quickly digested.
- › Gels are substantially more concentrated in carbohydrate than sports drinks to provide a large fuel boost in a single serve.
- › Most gels are produced in easy to open pouches to enable consumption while undertaking exercise. May also be decanted into small plastic squeeze bottles to allow carriage of multiple gels and flexibility with frequency and volume of consumption during endurance and ultra-endurance exercise activities.
- › Various gel products are differentiated by flavour, consistency, the type and amounts of carbohydrate and the addition of other “active ingredients” including caffeine (see below).
- › The type and quantity of carbohydrates provided in gels varies according to the manufacturer. Some newer gels contain “multiple transportable carbohydrates” – a blend of carbohydrates such as glucose and fructose which are absorbed from the intestine via different transporter molecules. The purpose of such mixtures is to bypass the usual limitation on gut uptake of glucose-based sugars which occurs at rates of ~ 60 g/h. Studies have shown that when carbohydrates are consumed at high rates (> 60 g/h) during exercise to meet new guidelines for prolonged strenuous events, they are more effective than glucose-based products in maintaining gut comfort, promoting muscle carbohydrate oxidation and enhancing performance (see Jeukendrup, 2010).

### Products and protocols

- › A range of sports gel products is available. Differentiating characteristics include the volume and amount/concentration of carbohydrate, type/mixture of carbohydrates, the consistency or texture of gel, and the presence of other “active ingredients”.
- › Other ingredients commonly found in sports gels include electrolytes and caffeine.
- › Sports gels provide a compact and portable source of carbohydrate which can easily be consumed immediately before or during exercise to assist with meeting carbohydrate intake targets.
- › Gels should be consumed with water or other dilute fluids, which can separately address hydration needs for the activity. This fluid intake will also reduce the net carbohydrate concentration to reduce risk of gut upsets.
- › Despite recommendations in early sports nutrition guidelines *against* consuming concentrated forms of carbohydrate during exercise, recent studies have shown that sports gels consumed with water during moderate intensity exercise provide a similar pattern of carbohydrate delivery and oxidation by the muscle as sports drinks (Pfeiffer et al., 2010).
- › Research in laboratories and in the field has shown that the use of sports gels is well tolerated by most athletes (Pfeiffer et al., 2010; Pfeiffer et al., 2009).
- › Although each gel provides ~ 20–25 g of carbohydrate, decanting into custom made flasks allows the gel to be consumed in more variable volumes. In some sports, a gel can also be added to a drink bottle of water during the event to create a more dilute “sports drink”.
- › The consistency of sports gels is likely to increase the amount of time and mouth contact associated with the intake of carbohydrate compared with sports drinks. This may increase the ability of gels to provide a performance benefit via the stimulatory effect of carbohydrate-sensing mouth receptors on the brain and central nervous system

## Sports Gels

**Table 1: Nutritional composition of a range of sports gels available in Australia**

Gel/brand	Size	Flavours	Energy (kJ)	CHO (g)	Sodium (mg)	Comments
PowerBar (US and Australia)	41 g	Orange Dream, Pomegranate Blueberry Acai, Strawberry Banana, Vanilla, Tangerine, Double Latte, Chocolate, Green Apple, Berry Blast, Kona Punch	462-504	27-28	200	Green Apple, Berry Blast and Straw Berry Banana flavours contain 25 mg caffeine Double Latte and Tangerine contain 50 mg caffeine
PowerBar PowerGel Fruit (US and Europe)	41g	Apple mango strawberry, Banana blueberry, Pear apple peach, Pear Blackberry	454	27	300	
Endura	35 g	Citrus, Vanilla, Raspberry, Cool Mint	444	26	14	All gels contain 8.5 mg caffeine
Gu	32g	Peanut Butter, Peppermint Stick, Vanilla Bean, Chocolate Outrage, Tri-Berry, Strawberry Banana, Mandarin Orange, Espresso Love, Lemon Sublime, Jet Blackberry, Mint Chocolate, Just Plain	420	20-25	40-65	Some flavours contain caffeine – Vanilla Bean, Chocolate Outrage, Tri-Berry, Mandarin Orange, and Just Plain (20mg), Espresso Love, and Jet Blackberry (40mg)
Gu Roctane	32g	Island Nectar, Chocolate Raspberry, Blueberry Pomegranate, Vanilla Orange, Cherry Lime, Pineapple	420	20-25	90-125	All contain caffeine (35mg), BCAAs (1220mg) and Ornithine Alpha-ketoglutarate (480mg)
SIS Go Isotonic Gel	60ml	Apple, Lemon Lime, Blackcurrant, Orange, Tropical		25	9	
SIS Go + L-Carnitine	60ml	Lemon				Contains 1g carnitine
SIS Go + Caffeine	60ml	Berry-caffeine				
Carboshotz	45g	Berry Banana, Cola, Lemon Line, Mango Passion, Wild Berry, Cola Vanilla, Green Plum, Cappuccino	495	30	36	Some flavours contain caffeine – Cola Vanilla, Green Plum, Cappuccino (80mg)
Body Science Energy Gel	35g	Lemon Lime, Mixed Berry	418	24	110	Contains BSc Proprietary Amino Blend 130mg (Beta Alanine, L-Leucine, L-Isoleucine, L-Valine)
High 5 Energy Gel	30ml	Apple, Banana, Citrus, Orange, Summer Fruits	385	23	20	
High 5 Energy Gel Plus	30ml	Orange Plus, Raspberry Plus	385	23	20	Contain 30mg caffeine
Lucozade Sport Elite Gel	45g	Citrus Boost, Orange	509	30	Trace	Citrus Boost contains 80mg caffeine
Torq Gel	45g	Strawberry Yoghurt, Black Cherry, Forest Fruits w/Guarana, Rhubarb Custard, Raspberry Ripple	468-476	29	50	Forest Fruits contains 89mg caffeine
Clif Shot Gel	34g	Chocolate	462	22	60	Chocolate, Chocolate Cherry, Citrus, Double Espresso, Mocha, Razz, Strawberry, Vanilla

# Sports Gels

## Situations for Use in Sport

- > Provides easily consumed carbohydrates to allow the athlete to meet fuel targets for their sporting activities (see Table 2).
- > Compact fuel source for:
  - Endurance athletes during exercise lasting longer than 90 minutes, especially when high rates of carbohydrate intake or the need for a portable carbohydrate source is advantageous (i.e. cycling, triathlon, running)
  - Team sports during extended training or competition
  - To provide smaller amounts of carbohydrate during high intensity exercise lasting ~ 1 hour without the need for intake of large volumes of fluid. Note that the major benefit of carbohydrate intake in such situations might come from “mouth sensing” whereby the exposure of receptors in the mouth/oral cavity to carbohydrate creates a favourable response in the brain and central nervous system (CNS), decreasing the perception of effort and improving pacing strategies.
- > Low fibre and compact carbohydrate source for pre-event fuelling by athletes who are unable to tolerate regular foods and fluids.

**Table 2: Guidelines for carbohydrate intake during sporting activities (taken from Burke et al. 2010)**

Type of sport/ exercise	Duration	Carbohydrate target	Comments
Brief exercise	< 45 min	Not needed	
Sustained high-intensity exercise	45-75 min	Small amounts including mouth rinse (swilling in mouth)	<ul style="list-style-type: none"> <li>&gt; A range of drinks, gels and sports products can provide easily consumed carbohydrate</li> <li>&gt; The main benefit from carbohydrate use in these events comes from interaction with the brain and CNS. To achieve optimal benefit, the athlete may need to organise their event nutrition strategy to allow frequent “mouth sensing” with a significant duration of mouth contact (e.g. 10 s)</li> </ul>
Endurance exercise including “stop and start” sports	1-2.5 h	30-60 g/h	<ul style="list-style-type: none"> <li>&gt; Opportunities to consume foods and drinks vary according to the rules and nature of each sport.</li> <li>&gt; A range of everyday dietary choices and specialised sports products ranging in form from liquid to solid may be useful</li> <li>&gt; The athlete should practice to find a refuelling plan that suits their individual goals including hydration needs and gut comfort</li> <li>&gt; The benefits of carbohydrate intake strategies in these events are likely to be achieved both in the muscle (fuel) and CNS (perception of effort)</li> </ul>
Ultra-endurance events	>2.5-3 h	Up to 90 g/h	<ul style="list-style-type: none"> <li>&gt; As above</li> <li>&gt; Higher intakes of carbohydrate are associated with better performance.</li> <li>&gt; Products providing multiple transportable carbohydrates (glucose:fructose mixtures) will achieve high rates of oxidation of carbohydrate consumed during exercise</li> <li>&gt; The benefits of carbohydrate intake strategies in these events are likely to be achieved both in the muscle (fuel) and CNS (perception of effort)</li> </ul>

### Concerns Associated with Supplement Use

- The need for the use of sports gels, like sports drinks, at every training session or event should be carefully considered.
  - Excessive use within a session or at every session may lead to over consumption of energy intake and over-reliance on low-nutrient carbohydrate sources.
  - The optimal training program may include the periodisation of workouts in which there is “low carbohydrate availability” (i.e. the session is undertaken with low muscle glycogen stores and/or after an overnight fast). This strategy may increase some of the important adaptive responses to exercise. Therefore, on some occasions, an athlete may deliberately not choose to consume carbohydrate during the session or during the first part of a session
- Athletes should practice the use of gels and assess tolerance during training sessions if they are intended for use during competition. Research in laboratories and in the field has shown that the use of sports gels is well tolerated by most athletes. However, a small number of athletes suffer from significant gastrointestinal issues and may need an individualised protocol (Pfeiffer et al., 2010; Pfeiffer et al., 2009).
- Sports gels should always be consumed with adequate fluid to meet hydration needs and to improve gastrointestinal tolerance.
- Gels are an expensive alternative to regular food and fluid choices. This supplement should only be used for specific conditions for which it is suited, rather than as a general snack.
- Individuals with fructose malabsorption or FODMAP intolerance should be aware of the fructose content of sports gels containing multiple transportable carbohydrates.

### Further reading

Burke LM, Hawley JA, Wong SH, Jeukendrup AE. Carbohydrates for training and competition. *J Sports Sci.* 2011 Jun 8;1-11.

Jeukendrup AE. Carbohydrate and exercise performance: the role of multiple transportable carbohydrates. *Curr Opin Clin Nutr Metab Care* 2010; 13(4): 452-457.

Lane SC, Bird SR, Burke LM and Hawley JA. Effect of a carbohydrate mouth rinse on simulated cycling time-trial performance commenced in a fed or fasted state. *Appl Physiol Nutr Metab* 2013; 38:134-9.

Pfeiffer B, Cotterill A, Grathwohl D, Stellingwerff T, Jeukendrup AE. The effect of carbohydrate gels on gastrointestinal tolerance during a 16-km run. *Int J Sport Nutr Exerc Metab.* 2009; 19(5):485-503.

Pfeiffer B, Stellingwerff T, Zaltas E, Jeukendrup AE. CHO oxidation from a CHO gel compared with a drink during exercise. *Med Sci Sports Exerc.* 2010; 42(11):2038-45.

This Fact Sheet was prepared by AIS Sports Nutrition as part of the Sports Supplement Framework ([www.ausport.gov.au/ais/nutrition/supplements](http://www.ausport.gov.au/ais/nutrition/supplements)). Note that a Fact Sheet with additional information on this topic is available for Members of the Sports Supplement Framework via the Clearinghouse.

The Sports Supplement Framework has been designed to provide a framework for NSO athletes and specific Sports Supplement Programs may be available to NSO athletes through their NSO. All attempts are made to stay abreast of scientific knowledge and of WADA issues related to anti-doping. It is recommended that other athletes and groups should seek independent advice before using any supplement, and that all athletes consult the WADA List of Prohibited Substances and Methods before making decisions about the use of supplement products.

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