Fuelling with Carbohydrate – Acutely Before Exercise and Competition

Background: *Brief overview of the research to establish context*

- Carbohydrate (sugar) metabolism underpins optimal race day performance → as exercise intensity increases, sugar-based foods are preferred by the body to meet the exercise demand (Hawley & Leckey, 2015). **See the Figure 1 below!**
- Important to remember → never *all or nothing!* The reality is that carbohydrate and fat contribute to overall energy production but the contribution is dependent on exercise intensity and duration (higher intensity exercise → greater reliance on carbohydrate (Fritzen et al., 2019)
- Glycogen is the stored form of carbohydrate in the body → liver and muscle
- Highly trained athletes can store more glycogen in the skeletal muscle compared to non-trained populations → up to 700 grams compared to 300 grams respectively (Burke et al., 2017)
- Glycogen stores are a limiting factor during endurance exercise (Gonzalez et al., 2016)

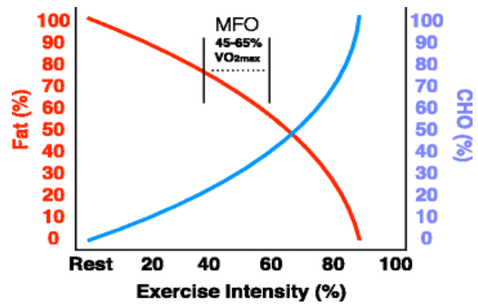


Figure 1: Graphic depicting percentage contribution of fuel sources *fat* and *carbohydrate*

Main takeaway: as exercise intensity increases, so does the reliance on carbohydrate to fuel exercising muscles

MFO: Maximal Fat Oxidation (this range shows the exercise intensity for the maximum rate when fat is being used as a fuel for exercising muscles

(Purdom et al., 2018)

Goals of Pre-Exercise Nutrition: *Why you should fuel with carbohydrate*

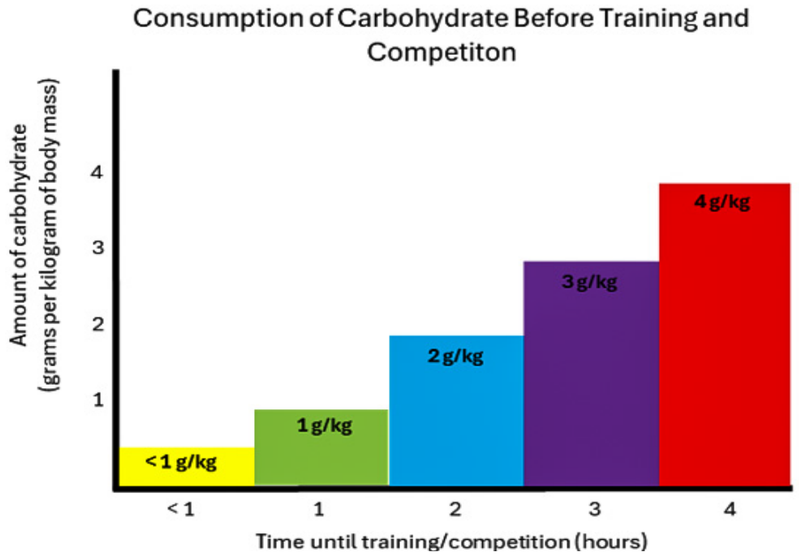
- Address hunger levels
- Meet the demands of exercise
- Keep glycogen levels topped up
- Improve performance in training or competition
- Nutrition practices should suit individual preferences or requirements

(Burke et al., 2011)

Guidelines and Considerations: *Here are the main practical takeaways*

- Carbohydrates are the primary focus in the pre-exercise meal
- Consuming carbohydrate meal or snack 1 to 4 hours before exercise
- Time before exercise: more time → more food
- 1 to 4 grams of carbohydrate per kilogram of body mass → see **Figure 2** below for timing
- Meeting individual preferences → solid vs liquids or consuming regular snacks especially if prone to gastrointestinal difficulties

Figure 2: Graph comparing the time before exercise with the amount of carbohydrate recommended to consume before exercise. Carbohydrate quantity is expressed in grams per kilogram of body mass. Generally, as there is more time before exercise, carbohydrate quantity is greater.



(Burke et al., 2011) (Podlogar & Wallis, 2022)

Potential Performance Aid Before Exercise and Competition: *Caffeine*

- Just as carbohydrate confers a performance benefit, so does caffeine
- Caffeine is categorised as a *Group A* supplement by the Australian Institute of Sport (AIS) → research shows there is strong evidence for a performance benefit (Australian Sports Commission, 2021)
- Click the following link for an athlete infographic from the AIS: https://www.ais.gov.au/__data/assets/pdf_file/0003/1001379/Caffeine-Infographic-final.pdf

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Fuelling with Carbohydrate – Acutely Before Exercise and Competition

Food Characteristics: *Follow this guide when choosing your pre-exercise foods*

- Primary focus is on carbohydrates
- Low in fibre and fat → aids in digestibility and decreases bulk in gut
- Carbohydrate foods can be categorised by their glycaemic index (GI) → GI describes the blood glucose response a carbohydrate-based food triggers → typically two (2) broad categories Low and High GI
- High GI carbohydrates for faster absorption when closer to start time e.g., white bread, honey, bananas, watermelon
- Low GI carbohydrates may provide more sustained energy and increased satiety (staying fuller for longer) → more suitable when exercise start time > 3 hours e.g., brown rice, oatmeal
- Protein → this nutrient is more important for after exercise → see our **Recovery Brochure** for more information!

(Burke et al., 2011) (Burke & Deakin, 2015)

Example Meal: *Race Day*

- Factors to consider:
- Size and timing of last meal, race intensity and duration, time before race, athlete body mass

Food	Food Serving	Carbohydrate (g)	Protein (g)	Fat (g)
Oats (raw)	80g	39.9 g	9.8 g	7.6 g
Milk (regular fat)	250 mL	13.8 g	8.5 g	8.8 g
Honey (for oats)	15 mL (3/4 table spoon)	15.5 g	0.1 g	0 g
White bread	2 slices ~65g Lightly toasted	30.0 g	0.1 g	0 g
Butter (plain, unsalted)	~5g (teaspoon)	0 g	0.1 g	4.1 g
Banana (medium)	~130 g	30.0 g	0 g	0 g
Honey	5 mL (~teaspoon)	5.2 g	0 g	0 g
Sports Drink	600mL	35.0 g	0 g	0 g
Totals		170.0 g	18.6 g	20 g

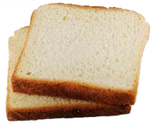
Example Foods: *Presented as Serving Size and Carbohydrate (CHO) Content per Serve*

Medium Banana
(~130g) 30g CHO

White Rice (Jasmine)
(~125g serve) 40g CHO can have 2 serves with meal >3 hours

Sultanas 40g/31.6g CHO

Honey Table spoon
20mL/20.7g CHO



White bread (1 slice
~33g) 15g CHO slide

Gluten Free White bread (1 slice ~39g) 17g CHO slide

(Food Standards Australia New Zealand, 2023)

Pre-Exercise Carbohydrate Calculator: *Practical tool*

- Use the following links or scan the QR code to access a calculator to determine the amount of carbohydrate to consume before exercise!
- **Practical Application:** use the carbohydrate content of the example foods here, or check the Nutrition Information Panel of your preferred foods to correlate the carbohydrate content with your recommended amount → remember to assess your individual response during exercise
- **How to assess individual response?** Monitor your energy levels gastrointestinal comfort during exercise
- Consume **more** food pre-exercise for additional energy
- Consume **less** food or allow for additional digestion time before exercise if you experience gastrointestinal symptoms

Pre-Exercise Carbohydrate Calculator:

https://asluggett.github.io/Sport-Nutrition/pre-training-carbohydrate-calculator.html

Calculator Home Page:

https://asluggett.github.io/Sport-Nutrition/

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