

## 7 Ways to Improve Your Performance on the Bike through Better Nutrition.

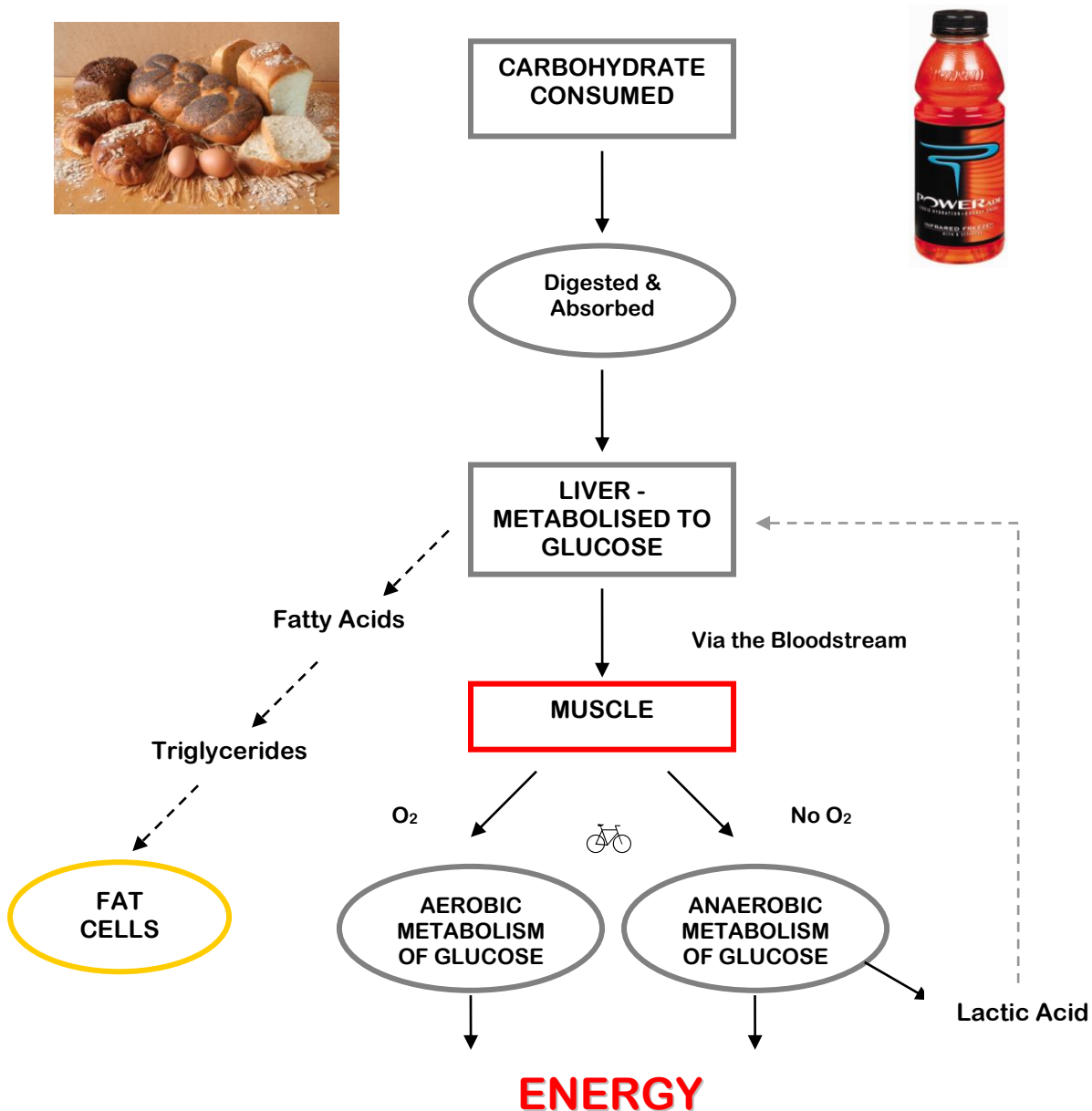
1. **Carbohydrates** – get it right.
2. **Choose quality protein** – not all amino acids are equal.
3. **Eat more vegetables** – the role of antioxidants.
4. **Stay hydrated** – how much, how often, what type?
5. **Electrolytes** – when you need them, when you don't.
6. **Omega 3** – what's all the fuss about?
7. **Healthy bowels** – the good, the bad and the ugly.



# 1. Carbohydrates – get it right.

Carbohydrate is a macronutrient made up of small units of sugars called monosaccharides, the main one being *glucose*. When carbohydrate foods are ingested, they are broken down into glucose, which then enters the bloodstream, providing important fuel for working muscles and the central nervous system (brain).

Carbohydrate (glucose) is the predominant fuel source for exercise of moderate to high intensity, because it can be metabolised anaerobically (when oxygen availability is limited), whereas fat cannot. Any excess glucose not metabolised during activity is combined with water and stored in our muscles and liver as the molecule *glycogen* – a storage form of energy. Only occasionally is excess glucose converted to fat.



During exercise, glucose is made available by: (1) being released from liver and muscle glycogen, or (2) consumption of carbohydrate-containing foods. Consumption of carbohydrate-containing foods is particularly important for sessions lasting over an hour, because at this point, liver and muscle glycogen stores start to deplete. If you don't consume sufficient carbohydrate you'll "bonk" or "hit the wall".

Sports nutrition guidelines therefore promote consumption of carbohydrate-containing foods and drinks **before, during** and **after** sport.

## Sources of Carbohydrate

Carbohydrate is found in foods such as breads, cereals, pasta, rice, potato, sweet potato, fruit, dairy products (yoghurt and milk), crackers, muesli bars, baked goods, sports drinks, bars and gels, lollies, soft-drink, cordial, honey and sugar.

## How much Carbohydrate do I need?

### Daily...

Situation	Carbohydrate Intake (Per Day)
Daily refuelling needs for training programs less than 60-90 min/day or of low intensity	5-7 g per kg bodyweight
Daily refuelling for training programs greater than 90-120 min per day (standard training)	7-10 g per kg bodyweight
Daily refuelling for athletes undertaking extreme programs - 6-8 hours per day (tour or charity ride)	10-12+ g per kg bodyweight
Carbohydrate loading for ultra endurance events	7-10 g per kg bodyweight

Source: Australian Institute of Sport . Fact Sheet: *Carbohydrate – How Much?* URL: [www.ausport.gov.au](http://www.ausport.gov.au)

### During Exercise...

The body metabolises glucose at a rate of about 1g per minute during moderate to high intensity exercise<sup>1</sup>. Therefore, you utilise approximately 60g of carbohydrate per hour during cycling, and even more at high intensities. Carbohydrate should be consumed during exercise lasting longer than 1-1.5 hours.



Recommendations are to consume **30-60g carbohydrate per hour** during exercise.

Commence consumption of carbohydrate early in a race so that you are well-fuelled. This can be achieved through consumption of whole foods, gels, bars or sports drink. Recent research<sup>2</sup> suggests that when multiple carbohydrates (e.g glucose + fructose, or maltodextrins + glucose) are ingested together, carbohydrate availability and oxidation increase, which could theoretically lead to improved performance.

### For Optimum Recovery...

It can take up to 24 hours to replenish muscle glycogen stores when they are completely depleted<sup>3</sup>. If you are planning to race or train again within 24 hours, rapid replenishment of muscle glycogen via adequate carbohydrate consumption becomes particularly important for optimising performance the next day.

Recommendations are to consume **1-1.5g per kg bodyweight** in the first **30-60 minutes following exercise**.

## What type of Carbohydrate is best?

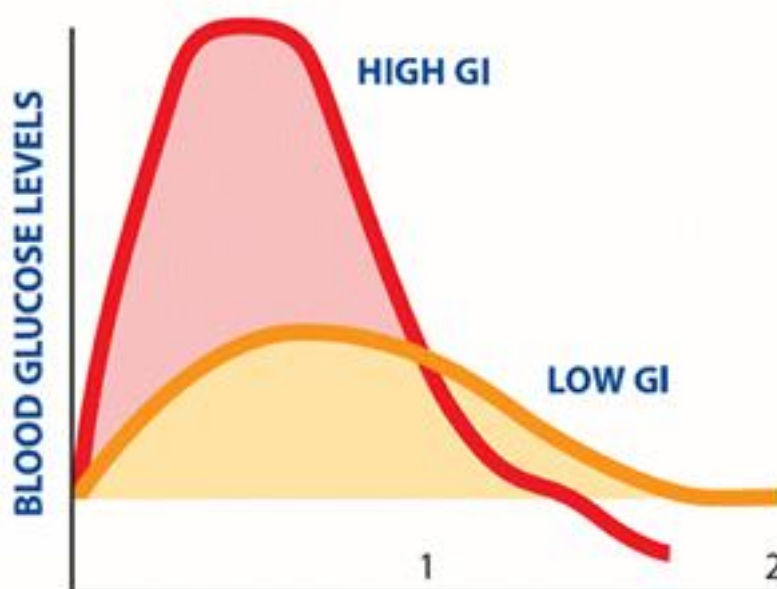
While the **total daily intake** of carbohydrate has the greatest impact on recovery and subsequent performance on the bike, the **type** and **timing** of carbohydrates is also extremely important. You need to get it right.

### The Glycemic Index

The **Glycemic Index (G.I)** is a ranking of carbohydrate foods based on how quickly they raise blood glucose levels compared to a reference food. The reference food is usually glucose which has a G.I of 100. G.I has no units – it is simply a number.

**High G.I foods** are rapidly digested and absorbed, causing a steep rise in blood glucose and a short-lived burst of energy. This triggers a rapid insulin response – insulin's role is to remove glucose from the blood and store it in the tissues. As a result, blood glucose levels drop significantly, leading to hunger and low energy.

**Low G.I foods** are more slowly digested and absorbed. Glucose is released steadily into the bloodstream. The insulin response is slower, resulting in a slower decline in blood glucose, and longer-lasting energy. Low G.I = < 55.



#### LOW G.I

Wholegrain breads & cereals  
Pasta and noodles  
Bananas, oranges (fructose)  
Milk and yoghurt  
Sweet potato

#### HIGH G.I

White & wholemeal breads  
Coke, sports drink, cordial  
Lollies (glucose)  
Corn Flakes, Rice Bubbles  
Dates, watermelon

Source: The Glycemic Index. *About Glycemic Index*. URL: [www.glycemicindex.com](http://www.glycemicindex.com)

The **majority of the carbohydrate in your training diet** should come from **Low G.I foods** such as wholegrain breads and cereals. These foods are high in fibre, help regulate blood sugar levels, and provide sustained energy throughout the day.

**High G.I foods should be consumed during the 'recovery window'** i.e. 30-60 minutes post-exercise because they are rapidly absorbed, facilitating the replenishment of muscle glycogen; hence, enhancing recovery.

## 2. Choose quality protein – not all amino acids are equal.

Protein is essential for growth and repair of tissues (including muscle). It also plays an important role in maintaining a strong immune system, forms part of important enzymes and hormones, and provides a source of energy in extreme conditions.

Proteins are made up of small chains of building blocks called **amino acids**. Some amino acids can be produced by the body (non-essential), some cannot (essential), so must be obtained from our diet. A diet combining **plant and animal proteins** will usually cover all bases. e.g legumes, grains, soy, red meat, eggs, chicken, fish, dairy.

The **branched chain amino acids** are essential amino acids which are particularly important for recovery, muscle growth and repair. The amino acid **leucine** has gained particular attention recently in terms of its role in muscle synthesis (growth); it can be easily obtained from foods such as eggs, soy protein, tuna and skim milk powder.

### How much protein do I need?

#### Daily...

Group	Protein Intake (Per Day)
Sedentary men and women	0.8-1.0 g per kg bodyweight
Elite male endurance athletes	1.6 g per kg bodyweight
Moderate-intensity cycling (racing)	1.2 g per kg bodyweight
Recreational cycling (not-racing)	0.8-1.0 g per kg bodyweight
Hill or interval training	1.4-1.7 g per kg bodyweight
Resistance athletes (early in training)	1.5-1.7 g per kg bodyweight
Resistance athletes (steady state)	1.0-1.2 g per kg bodyweight
Female cyclists	~15% lower than males

**Source:** Australian Institute of Sport. Fact Sheet: *Protein – How Much?* URL: [www.ausport.gov.au](http://www.ausport.gov.au)

#### For Optimum Recovery...

Recommendations are to consume **10-20g of high quality protein post-exercise**.

See Protein Counter handout for the protein content of specific foods.

### 3. Eat more vegetables – the role of antioxidants in sport.

**Antioxidants** are natural substances that help to fight free-radical damage that occurs to cells as a result of oxidative metabolism, exposure to pollutants and UV radiation. Exposure to free-radicals over time can contribute to inflammation, heart disease, and an increased risk of developing certain types of cancer<sup>4</sup>.

Since cyclists produce free radicals as a result of oxidative metabolism, and are also exposed to pollutants such as exhaust fumes, smoke and the sun, it is worth considering boosting your antioxidant intake. Antioxidants will also help maintain a healthy immune system, particularly at the start of a period of heavy training.

Nutrient antioxidants include Vitamins A, C, E and beta carotene, zinc, and selenium. There are also many other naturally-occurring antioxidant compounds in food. Fruits and vegetables are very rich in a number of antioxidants.

#### Foods sources of particular types of antioxidants:

- **Allium sulphur compounds** - leeks, onions, garlic
- **Anthocyanins** - eggplant, grapes, berries
- **Beta-carotene** - pumpkin, mangoes, apricots, carrots, spinach, parsley
- **Catechins** - red wine, green tea, dark chocolate
- **Flavonoids** - tea, citrus fruits, red wine, onion, apples
- **Isoflavonoids** - soybeans, tofu, lentils, peas, soy milk
- **Lignans** - sesame seeds, bran, whole grains, vegetables
- **Lycopene** - tomatoes, pink grapefruit, watermelon
- **Polyphenols** – thyme, oregano, dark chocolate
- **Selenium** - seafood, offal, lean meat, whole grains
- **Vitamin C** - oranges, kiwi fruit, broccoli, spinach, capsicum, strawberries
- **Vitamin E** - vegetable oils (e.g wheat germ oil), avocados, nuts, seeds, grains
- **Zinc** - seafood, lean meat, milk, nuts.

**Source:** Better Health Channel. URL: <http://www.betterhealth.vic.gov.au/BHCV2/bhcArticles.nsf/pages/Antioxidants>

If this seems all a bit too much to handle, a **good multivitamin and mineral or antioxidant supplement** is another option.



## 4. Stay hydrated – how much, how often, what type?

### How much? How often?

Our body is over 60% water, so adequate hydration is important at any time. Aim to consume **at least 2 Litres** of water on any given day.

### During Exercise...

During exercise lasting > 30 minutes or where sweat rates are high, fluid replacement is essential to prevent the effects of heat illness, which can result in death. Individual fluid requirements depend on factors such as: exercise intensity, individual metabolic rate, environmental conditions, fitness level, body size and acclimatisation<sup>3</sup>. Most athletes fall short of their fluid requirements.



Recommendations for fluid intake during exercise are individual. **500-1000 mL fluid per hour (~ 1 bidon per hour)** is a good guide.

### For Optimum Recovery...

**For recovery**, aim to replace **150% of the fluid deficit** (sweat - intake).  
e.g 1 kg ↓ in weight = loss of ~ 1 L = need to replace 1.5 L fluid.

### What type?

**Water** is the first point of call. **Sports drinks** provide a convenient combination of carbohydrate (5-8%) plus fluid, and also electrolytes. **Cordial, juice**, and **soft drink** are ok occasionally, but can cause gastric upset and osmotic diarrhoea due to their higher carbohydrate content (8-12%). Ensure that you trial them before race-time.

## 5. Electrolytes – when you need them, when you don't.

**Electrolytes** such as **sodium, potassium, calcium** and **magnesium** play an important role in bodily processes including muscle contraction, heart function and fluid balance. For moderate exercise lasting > 1.5 hours, high intensity exercise, and exercise in the heat, electrolyte replacement is essential; particularly replacement of **sodium** to prevent hyponatraemia (low blood sodium), which can be very dangerous.

Sports drinks (10-25 mmol/L sodium; 3-5 mmol/l potassium) may not adequately replace electrolyte losses during and after exercise<sup>5</sup>, meaning more concentrated and broad-spectrum electrolyte supplements such as *Endura*, *Gastrolyte*, *Enervit G Sport*, or *Musashi e* may need to be consumed. The need varies between individuals.

Post-exercise, replacement of the electrolytes lost in sweat, particularly sodium, must occur before fluid balance is fully restored<sup>5</sup>. This is because **sodium assists with water uptake and absorption**. Drinking water alone in a state of electrolyte imbalance and dehydration will only lower blood sodium levels, decrease thirst (desire to drink) and increase in urine output, further complicating the issue.

**Sodium** can also be replaced by eating high-sodium foods (e.g. bread, cheese, savoury foods, or table salt added to meals). **Magnesium** and **potassium** may also assist in the management of cramps. **But make sure you experiment before the race!**

## 6. Omega 3 – what’s all the fuss about?

**Fat** has important roles in the body, so you need some fat in your diet. Fat protects your organs, helps keep you warm, and forms the external structural component of each of our cells. It also has a role in hormone production, and provides energy. Although fat in the diet is essential, some fats are better than others.

Dietary fats are classified by their structure. Different types of fats react differently in the body. **Saturated** fats (found mostly in animal products like meat fat, butter, and dairy) increase LDL (bad) cholesterol, increasing your risk of heart disease.

**Monounsaturated** and **polyunsaturated** fats (found mostly in nuts, seeds, avocado, fish, and oils) lower blood cholesterol, and are therefore considered protective.

**Omega 3 fats** are an essential, polyunsaturated fat with **anti-inflammatory** properties. They have the potential to not only improve your health, but also your performance.

### Benefits of Omega-3 fats:

Research indicates that the benefits of omega-3 fats include:

- Reduced triglyceride levels; reduced risk of heart disease and stroke
- Improved blood vessel elasticity
- Improvements in blood pressure
- Maintenance of normal heart rhythm
- Blood thinning = less likely to clot and form arterial plaques
- Reduced inflammation of the joints
- Supporting the immune system
- Preventing and treating depression and behavioural problems.

Consumption of **3 serves of high omega-3 foods per day** will provide both cardiovascular and anti-inflammatory benefits that may contribute to enhanced recovery and performance, and improvements in general health and disease risk. The recommendation is a minimum of **160 mg/day for men** and **90 mg/day for women**<sup>6</sup>.

### Foods rich in Omega-3:

Nuts – walnuts, brazil nuts.

Oily fish – mackerel, trout, blue fin tuna, salmon, bream, mullet, sardines.

Cod liver oil.

Linseed – linseeds, flaxseed oil, soy and linseed bread/crackers.

Omega 3 fortified foods – yoghurt, eggs, bread.

Beef, liver.



## 7. Healthy bowels – the good, the bad and the ugly.

### a) Fibre

Dietary fibre keeps the digestive system healthy. It also assists with blood glucose control and can reduce cholesterol. In countries where a high fibre diet is consumed, diseases such as bowel cancer, diabetes and heart disease are less common.

Most Australians don't consume enough fibre. Recommendations for optimum health and prevention of chronic disease are **38 g/day for men** and **28g/day for women**<sup>6</sup>.

Disorders that can arise from a low fibre diet include:

- Constipation and haemorrhoids
- Irritable bowel syndrome
- Diverticulitis
- Heart disease
- Bowel cancer.

### Two types of fibre:

There two main types of fibre and we need both in our daily diets:

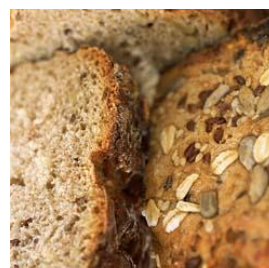
**Soluble fibre** - includes pectin, gums and mucilage, which are found mainly in plant cells. One of its major roles is to lower blood cholesterol levels. Good sources of soluble fibre include fruits, vegetables, oats, oat bran, barley, flaxseed, psyllium, beans, lentils, peas, soy. Soluble fibre can also prevent constipation.

**Insoluble fibre** - includes cellulose, hemicelluloses and lignin, which make up the structural parts of plant cell walls. Insoluble fibre adds bulk to faeces to prevent constipation and associated problems such as haemorrhoids. Good sources include wheat bran, corn bran, rice bran, the skins of fruits and vegetables, nuts, seeds, dried beans and wholegrain foods.

Both types of fibre are beneficial.

### Simple ways to increase your fibre intake:

- Eat more plant-based foods
- Eat breakfast cereals that contain whole grains such as wheat or oats
- Switch to wholemeal or multigrain breads, and brown rice
- Increase your legume and vegetable intake
- Snack on fruit, dried fruit, nuts or wholemeal crackers
- Consider adding bran or psyllium husks to breakfast, or smoothies.



## b) Probiotics

Probiotics are live microbial food supplements that benefit our health by maintaining **intestinal bacterial balance**. The two main commercially-produced species are *lactobacillus acidophilus* and *bifidobacterium bifidum*.

### Benefits of probiotics:

There is evidence that probiotics can:

- Improve intestinal tract health
- **Enhance the immune system**
- **Enhance the bioavailability of nutrients = better absorption**
- Prevent and assist with management of food allergy and intolerance
- Reduce the risk of certain types of cancers, particularly bowel.

The mechanism of action of probiotics is still largely unknown, but is thought to include: modifying gut pH (acidity), producing beneficial antimicrobial compounds, and stimulating immunomodulatory cells<sup>7</sup>. New research is emerging that **athletes may be at greater risk of bacterial overgrowth and food intolerances** due to bacterial translocation up the intestine that occurs as a result of strenuous exercise.

Probiotics can be obtained from foods, primarily dairy products (e.g. yoghurt), fermented milk drinks and commercial supplements.

Most studies in athletes report effectiveness with **doses of 1-10 billion bacteria/day**. 22 tubs of yoghurt or 1 capsule of *Inner Health Plus* each provide 25 billion bacteria<sup>8</sup>. **Daily consumption is recommended** as probiotics pass quickly through the intestine.

### Useful Links:

Sports Nutrition: [www.ausport.gov.au/ais/nutrition](http://www.ausport.gov.au/ais/nutrition) and [www.powerbar.com.au](http://www.powerbar.com.au)

Sports Dietitians: [www.sportsdietitians.com.au](http://www.sportsdietitians.com.au) and [www.daa.asn.au](http://www.daa.asn.au)

Hydration: [www.gatorade.com.au](http://www.gatorade.com.au) and [www.powerade.com.au](http://www.powerade.com.au)

General Nutrition: [www.betterhealth.vic.gov.au](http://www.betterhealth.vic.gov.au)

Supplement Plan: [www.deanwoods.com.au/store/dl/ESF%20Road%20Cycling-All.pdf](http://www.deanwoods.com.au/store/dl/ESF%20Road%20Cycling-All.pdf)

Probiotics: [www.innerhealth.com.au](http://www.innerhealth.com.au)

Recommended Dietary Intakes: [www.nhmrc.gov.au/publications/synopses/files/n35.pdf](http://www.nhmrc.gov.au/publications/synopses/files/n35.pdf)

Fruits and Vegetables: [www.gofor2and5.com.au](http://www.gofor2and5.com.au)

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