THE VO_2 PROJECT

YOUR NUTRITION GUIDE

www.thevo2project.co.uk

INTRODUCTION

The key to good nutrition is quite simply eating real foods, and limiting processed and refined foods. Although this may seem a little bland, it is the single most important factor to emphasise in good dietary habits. Meals should be a good balance of quality proteins, carbohydrates and good fats, with an abundance of vegetables a good addition to any plate. As a rule of thumb, refined and processed foods are stripped of their nutritional value, tend to lack fibre and be high in salt, a recipe for lifestyle related health problems.

Below is a guide to general recommendations derived from the scientific literature for dietary intakes of athletes. Remember, nutrition does not have to be 100% right 100% of the time. Good dietary practises are sustainable ones: an 80/20 rule is a good place to be!

CALORIES

By definition energy balance is achieved where calories in equal calories out. If weight maintenance is the goal, food intake must equate to the energy demands of resting metabolic rate, the thermic effect of food, and physical activity expenditure.

Resting metabolic rate (RMR), the energy needed to sustain vital cellular processes, can be estimated from the following equation:

{10 x body mass (kg)} + {6.25 x height (cm)} – {5 x age (y)} + 5

For you this is:

However, since on a daily basis we are not just sustaining life, we must make a correction for physical activity. For a sedentary person this is multiplying RMR by 1.4. This is your daily calorie requirement if no exercise is undertaken.

For you this is:

Adding on the number of calories burnt during training gives a good estimate for your total energy expenditure, and the amount you must consume to remain in energy balance. To lose weight, it is recommended that a calorie deficit of no more and ~500kcal should occur.

Training session	**Estimated Energy Expenditure (Kcal)**

CARBOHYDRATE

Carbohydrates (CHO) are your key fuel for all moderate to high intensity training sessions and racing. CHO is stored in the body in the liver and muscles as glycogen, and a small supply of glucose in the blood. These stores must be maintained during training and replenished post-training to aid recovery, and fuel subsequent sessions.

Quantity

Daily CHO intakes should reflect training load and be sufficient to meet the fuel requirements of their training sessions:

Training load	CHO intake (g/kg/day)
Recreational (3-5h/week)	3 – 5
Moderate Endurance (1-3h/day)	5 – 7
Heavy Endurance (3h/day)	7 – 10
Extreme Endurance (4 – 5h/day)	10 – 12

What you are currently eating (g)	Target (g)

Timing

Glycogen re-synthesis post training is key to recovery. Post-exercise there is a window of opportunity where the muscle is more primed to take on CHO. This lasts approximately 2 hours after the cessation of exercise although eating ASAP is recommended. Maximum storage is achieved when consuming 1 – 1.2g/kg for the following 2 – 4 hours.

Glycaemic Index (GI)

The GI of a food essentially translates into how fast the sugars found in that food enter the blood. However, a more appropriate term to use is glycaemic load, which estimates how much eating a certain amount of a food raises blood sugar. GI on the other hand is dictated by the relative proportion of the CHO in foods and give misleading information regarding its effect on blood sugars. Although research is equivocal, low GL diets seem to offer some protection to health related diseases, such as diabetes. For sport performance, high GL foods are beneficial during and after exercise where it is advantageous for sugars to appear quickly in the blood to maintain blood plasma glucose, and provide fuel to the working muscles. As a general guide, try to restrict high GL foods to around training sessions, and eat low GL meals at other times.

Examples of high and low GL carbohydrate rich foods:

High GL Foods	**Low GL Foods**
Cornflakes/shreddies/coco pops	Porridge/no added sugar muesli
White bread/toast and jam	Wholegrain/rye bread
White potato	Sweet potato
Pasta/Rice/Cous cous	Wholegrain pasta/brown rice/ pearl barley/ quinoa/ bulgar wheat
Biscuits/Rice cakes	Oat cakes
Milk/white chocolate bars	Dark chocolate (70% or more)
Sweets	Fruit
Jam/Nutella	Peanut/Almond butter
Fizzy drinks/Sports drinks	Sparkling water

Train low?

Training low is idea of training with low glycogen stores in the muscle, and can alter the response of muscle signalling molecules. Although some positive effects of the muscle micro-structure appear to be prevalent (including increased number of enzymes responsible for fat metabolism), evidence remains un-compelling for any subsequent practical performance benefit. Importantly, 'training low' has been shown to reduce self-selected pace, and increase the risk of illness. Although occasional use may be suitable, this should be limited to 1 or 2 'easy' rides per week and much research is being conducted in this area.

PROTEIN

The protein requirements of athletes are higher than that of the average person. Protein is required for all cellular functions, from repairing damaged tissues to mitochondrial growth. Since the adaptation of athletic training are observed with maximum protein synthesis rates, a higher protein intake is beneficial. It is recommended endurance athletes consume between 1.2 – 1.6g/kg/day.

What you are currently eating (g)	**Target (g)**

When combined with training high quality protein intakes of 20-25grams every 3 hours is the most effective strategy for net protein accretion. It is important that protein is always present in meals and also incorporated into snacks. Note that this does not have to be a protein shake!

Food sources of proteins:

Food	**Protein/100g**
Medium size eggs	13
Wild Salmon	24
Peanut/Almond butter	24
Milk	3
Quinoa	4
Chicken breast	16
Turkey	29
Beef	33
Tofu	7
Soy Beans	17
Nuts/seeds	33

Protein during training?

Protein contributes minimally as an energy fuel to exercise (~5%, although this can increase to ~15% when glycogen depleted), and so protein ingestion during training or racing is not necessary. It may be warranted only during very long rides/races (above 3 hours) as it may help to 'prime the pump' and aid in early recovery. It is recommended to consume protein as soon as possible after the race to initiate and accelerate the recovery process. This will also allow more useful opportunities to feed later in the day. Over-consumption of protein simply leads to the excess being metabolised and burnt off or stored as fat.

FAT

High-fat diets (LCHF/Paleo/Ketogenic) have become increasingly popular recently built on the idea of the body switching to a greater reliance on fat as oppose to CHO as a fuel. Although high-fat diets do increase fat usage, and have a glycogen sparing effect, there is absolutely no evidence of any subsequent practical benefit to sport performance and only no effect or negative effects have been reported, when compared to high CHO diets. Furthermore, endurance training alone is a sufficient stimulus for fat adaptation. High fat diets impair high intensity exercise performance, increase perception of effort, muscle recruitment and heart rate.

However, fats are an essential macro-nutrient and should not be neglected as a food choice. Foods high in mono-unsaturated and poly-unsaturated fats offer a degree of protection from cardiovascular health problems and should be consumed regularly. Of particular importance are the essential fatty acids abundant in Omega 3.

Foods high in mono-unsaturated and poly-unsaturated fats include:

Food
Salmon/Mackeral/Sardines
Almond/Cashew/Walnut/Brazil nuts
Sunflower/Sesasme/Flax/Pumpkin seeds
Extra virgin olive oil
Eggs
Avocado

HYDRATION

It is common knowledge that as little as 2% dehydration of body weight degrades exercise performance. Starting exercise dehydrated is commonly observed in athletes (around 50%), often caused by inadequate rehydration from previous training. Drinking coffee/tea/green tea is an easy way to consume adequate fluids. Although previously thought, drinking coffee does not cause dehydration. After training, especially in the heat or when you have been sweating a lot, drinking 150% of sweat losses gradually over the next few hours, and eating salty foods is the best method to re-hydrate.

As a rough guide, sweat losses can be calculated by measuring weight lost during the training session, accounting for fluid intake and urine production.

Never drink in excess of sweat rates! This can cause hyponatraemia (low plasma sodium), and other major health problems.

SUPPLEMENTS

There are very few supplements substantiated by compelling evidence in the scientific literature and you should be very cautious when reading performance or health claims from any manufacturer. Although the laws regarding supplements are tightening, there is still enormous scope for abuse of science within the industry. When taking any supplement you should always check that they have been batch tested.

Supplement	**Role**
Omega 3/ fish oils	Contains large quantities of essential fatty acids EPA and DHA, with strong links to many health benefits. Your best source is from eating regular portions of oily fish such as salmon and mackerel, in which case supplementing is probably unnecessary. Try to eat 2grams omega 3 per day.
Vitamin D	Some athletic groups have been shown to be deficient in vitamin D, and so may be necessary for athletes who have little exposure to the sun. Foods high in vitamin D include oily fish and eggs. Supplementation with vitamin D3 can help to correct deficits. Take 2000IU per day.
Caffeine	Improves exercise performance and capacity through metabolic and central stimulation. 3 – 5 mg/kg just before exercise is optimal with an extra 1-2mg/kg in the later stages.
Beta Alanine	Increases the buffering capacity of muscles to hydrogen ions, and improves short duration high intensity performance. Take 6 grams per day, in 3 X 2gram doses for a 4 week loading period, followed by 3 grams per day thereafter. At current, studies are lacking in long term supplementation, and so it is recommended to cycle supplementation throughout the year.
Creatine	Very effective for power sports and very high intensity sprints, as a means of increasing substrate availability of phosphocreatine in the muscle. It is not necessary for endurance cyclists, and leads to increased water retention, hence weight gain.
Dietary Nitrates/Beetroot juice	Improves efficiency of aerobic metabolism. Take 2 shots of 'beet-it' before racing, one 4 hours before and 1 2 hours before.
Sodium Bicarbonate	Acts as a buffer to improve short duration high intensity performance. Useful for hill climbs and very short time trials. Take 0.3g/kg 1 hour before the event. Try this is training first, as some people experience nausea and gastrointestinal problems.

RACE DAY

Nutrition in the days leading up to the sportive and morning of the sportive has significant impacts on subsequent performance. There is only sufficient carbohydrate stored in the body for approximately 1.5h of exercise. Maximising your muscles glycogen stores before races and keeping it topped up during the race is key. In the days preceding competition, you should aim to eat 7 - 12g/kg CHO to maximise glycogen stores in the muscles. It was previously thought a glycogen depletion phase was necessary first to maximise storage, but further research has shown this is not required.

For you this is:

Pre-race

Consume a low GL CHO breakfast, and standard protein serving around 3-4 hours before and drink 5-7ml/kg of fluid. 2 hours before the sportive, have a light salty snack, and a further 3-5ml/kg drink.

During

It is beneficial to consume CHO during exercise to provide fuel to the muscles and maintain blood plasma glucose. A 2:1 mixture of glucose and fructose in a 6% solution, consumed at a rate of 90g/h provides the highest rate that CHO can be used by the body. Eating above this level can cause gastrointestinal problems, and will have no additional benefits to fuel supply.

High5 2:1 is a good option for energy drinks providing these intakes.

For you this is: 1 litre of energy drink, or 0.5 litres energy drink and an energy bar/gel per hour.

Recovery

The recovery period after exercise is a key area where a good nutrition strategy can make a huge difference to subsequent training, especially during days of multiple training sessions. There is a clear metabolic window, which lasts approximately 2 hours after the cessation of exercise. Consumption of high GL CHO and protein should be a priority. It should be noted that protein intake does not have to be a shake. Protein shakes are convenient but not necessary: a meal containing high quality protein

is equally beneficial. You should aim to consume 1 – 1.2g/kg CHO, and 20 – 25grams protein.

For you this is: CHO

Recovery food ideas	
Protein	**CHO**
30 grams whey protein in milk	2 medium bananas
3 eggs	4 slices of toast (white)
Tin of tuna	Large baked potato

An example for race day or hard training maybe:

4 hours before	150grams porridge 3 eggs 350-500ml fluid (coffee)
2 hours before	Apple, handful of salty nuts 200-500ml fluid (coffee)
Race	0.5 litres sports drink + 1 bar/gel per hour
Recovery	30 grams whey protein in 500ml milk. 3 medium bananas
Lunch	150grams white pasta Tuna Salads/greens/veg Fruit
Snack	Peanut butter on toast
Dinner	150grams quinoa Salmon Salads/greens/veg
Pre-bed	2-4 Oatcakes Cottage cheese

DIET PLAN

Your nutrition should reflect your training needs. On hard training days, eating more, high GL CHO is crucial. Packing meals with salads and veg provides many micronutrients and vitamins, and improves satiety.

Long duration or high intensity training	
Time	**Type**
Breakfast	Low GL CHO PRO
Training	HIGH GL CHO
Recovery	HIGH GL CHO PRO
Lunch	High GL CHO PRO Salad/greens/veg
Snack	High GL CHO PRO
Dinner	Low GL CHO PRO Salad/Green veg
Pre-bed	Low GL CHO PRO

Short duration or low intensity training	
Time	**Type**
Breakfast	Low GL CHO PRO
Training	None required
Recovery	HIGH GL CHO PRO
Lunch	Low GL CHO PRO Salad/greens/veg
Snack	Low GL CHO PRO
Dinner	Low GL CHO PRO Salad/Green veg
Pre-bed	Low GL CHO PRO

Below are examples of appropriate serving sizes, and ideas for meal foods and snacks.

High GL CHO	
Food	Quantity to provide 100grams
Shreddies/coco pops etc	130g
White Bread	4 slices
Baked potato	500g
Pasta	150g
Rice	150g
Cous cous	150g
Bannanas medium	3
Haribo	120g
Glucose	100g
Sports drink (6%)	1.5L

Low GL CHO	
Food	Quantity to provide 100grams
Porridge	160g
Museli (no added sugar)	160g
Rye Bread	4 slices
Sweet Potato	500g
Quinoa	160g
Bulgar wheat	160g
Pearl barley	160g
Whole-wheat pasta	150g
Brown rice	150g

Protein Sources	
Food	Quantity to provide 25grams
Medium eggs	3
Wild Salmon	100grams
Peanut/Almond butter	100
Milk	750ml
Quinoa	625
Chicken breast	150
Turkey	85g
Beef	75g
Tofu	350g
Soy Beans	150g
Nuts/seeds	75g
Whey	30g

SUGGESTIONS

1) Protein for breakfast – 20-30grams of high quality (e.g. 3 x eggs). High protein breakfasts have been shown to improve satiety and results in fewer calorie consumption throughout the entire day

2) Low GI carbohydrates for breakfast. Keeping blood glucose and insulin levels steady will help to stop cravings, improve satiety, and improve insulin sensitivity. Foods high in fibre generally have a low GI (e.g. no added sugar museli, porridge, brown bread)

3) Low GI carbohydrates before training, high GI during and after. If you train in the morning, then eat low GI for breakfast, high GI for lunch and back to low GI for dinner. 20-25grams of protein post training also.

4) Ride in a fasted state. Consume a low carbohydrate meal the night before, and train without consuming any food (drink black coffee prior, and water during). This results in much higher rates of fat oxidation during the ride, and possibly beneficial training adaptation. Consume 1-1.2g/kg body weight high GI carbohydrate immediately after. Restrict this to low intensity training rides and up to around 2 hours only, as it can suppress immune system.

5) Switch biscuit/crisps snacks to oat cakes, nuts/seeds, dark chocolate above 70% cacao.

6) Calculate your standard sweat rate per hour by weighing yourself prior to and after a ride, include urine production (best guess!) and drinks consumed during the ride. Sweat rate = body mass pre – body mass post + urine produced + drink consumed. Adjust it to a per hour rate (ie. Divide by ride time in minutes and times by 60). During a ride aim to limit body mass losses to less than 2%, most people require 400-800ml per hour depending on intensity/temperature/natural sweat rate. Add table salt (sodium chloride) to bottles (up to 1 gram per bottle). Post training aim for drink 150% of sweat losses over the next few hours, again including salt or eating salty foods.

Contact us

If you have any queries regarding the information in this booklet, feel free to email us:

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