

Food and hydration for athletes

Geoff Read and James Riley for Todmorden Harriers skills share, February 2014

There is a scientific consensus that the foundation of health and athletic ability is eating a varied diet containing sufficient carbohydrate, fat, protein, vitamins, minerals and fiber, which is high in fresh, whole (single origin) foods and water and low in processed foods, sugar, added salt and alcohol. This is much more important than race food choice (and see piece from JR, p5 below). Other aspects of diet and special nutrition for athletes are more complex and unhelpfully you will find opposing views on nearly everything. What works will vary greatly depending on our physiology, weight and fitness; the event and the weather. We need to be wary of information from those trying to sell us something, always looking for good evidence across a variety of sources. If in doubt, choose the healthy option and test out food and drinks in training, not during target events. Things to consider include:

Ratio of carbohydrate, fat and protein for athletes

Cue an argument, but for example, 70%, 18%, 12% has been suggested ('Nutrition and prolonged exercise' 1988). See JR's piece below for suggested types of each.

Glycogen: the most available energy store for athletes

Most available glycogen is mainly stored in the muscles and the liver (1,200-2,000 calories) and is used up in 1 ½ to 2 hours of exercise. Without eating, the body begins to convert to burning fat, which is much less efficient - you will know because you will feel rough. Body fat stores are much greater even in lean people (15% body fat = 90,000 calories, potentially enough for 6 ultras) but much slower to come through and you will run (or walk!) much slower than when using glycogen. The body can usually only digest around 60g of carbohydrate per hour (or 1g per kilo of body weight), but we often feel like eating more than that when tired.

<http://en.wikipedia.org/wiki/Glycogen>

Carbo-loading: designed to increase the amount of stored glycogen for endurance athletes, originally people did a depletion run a week before the key event, ate minimal carbohydrate for three days (usually feeling dreadful!) then ate a lot of carbohydrate in the last three days. Now it is thought that depletion doesn't help much, and increasing the proportion of carbohydrate for the last 3-4 days - not necessarily overall food quantity - makes more glycogen available for long distance events than an ordinary diet. It doesn't help for short and medium events.

Glycemic Index (GI)

The idea of learning about the Glycemic Index (GI) of foods is so that athletes can select slow-release and fast release carbohydrates at the right time in relation to racing and training. You need to net-search a list as some are counter-intuitive: chocolate is low GI, meaning slow release; white rice is high GI or quick release. Some sources suggest that high GI foods are good for a quick boost but can result in a low afterwards and should be avoided just before races, especially short races, and that low GI foods are best before endurance events.

http://www.uni.edu/dolgener/UG_Sport_Nutrition/Articles/GI_and_Performance.pdf

However research is not conclusive on the benefits, for example this quote from a review of studies is from 2010:

"Despite the fact that the relationship between GI and sporting performance has been a topic of research for more than 15 yr, there is no consensus on whether consuming CHO [carbohydrate] of differing GI improves endurance performance. Until further well-designed research is carried out, athletes are encouraged to follow standard recommendations for CHO consumption and let practical issues and individual experience dictate the use of HGI or LGI meals and supplements before, during, and after exercise." <http://www.ncbi.nlm.nih.gov/pubmed/20479489>

Hydration

Dehydration reduces aerobic capacity, severe dehydration risks heat exhaustion. We can absorb 800-1200ml of liquid per hour (but you can lose up to 2 litres an hour in severe conditions!) Typically runners might drink 150-250 ml (4-8oz) or 2-3 mouthfuls every 10-15 minutes, which is 500-800ml per hour as this is easier to absorb than drinking larger amounts less regularly and helps avoid bloating and risk of hyponatremia (low blood sodium through over dilution and

sweating). Carbohydrate/sodium drinks may reduce this risk. Perceptions of thirst have been found by some studies to be quite accurate, suggesting that your body will tell you when you need to start drinking, but occasionally we can make mistakes and get dehydrated, so make sure you are well hydrated before long events, and be especially careful and self-aware in hot and humid conditions. On the one hand you need to be well hydrated, on the other hand don't go over the top and risk hyponatremia.

Is it OK to drink from streams?

Many fell runners traditionally drink from UK mountain streams, but not in warmer climes, though increasingly people are carrying their own liquid in bottles or hydration packs (be very careful with hygiene with the latter). Possible risks if you are unlucky include bacteria like E.coli, parasites like liver flukes and viruses. Most solutions for purifying water are either impractical or unpalatable for a racing situation. The usual advice given if you are going to drink untreated water from mountain streams is to choose a spring coming straight out of the ground, or at least a fast-flowing, steep section of a stream, having followed it downhill for 100 metres to check there isn't a carcass in it. It is hard to find anything but anecdotal information on this subject, but here is a positive view:

<http://v-g.me.uk/WildCamp/WildCampWater.htm>

In areas like the Lake District, Snowdonia and Galloway which were contaminated with radiation by the Chernobyl plume in 1986 (and until recently were not able to market livestock without testing), and areas downwind of nuclear plants, internal exposure to radionuclide particles ('hot particles') may be of concern, as the science on possible risk is un-developed and contradictory. Some scientists think that ingesting one small radioactive particle can be damaging, others that the risk is negligible as it is overall dose that counts. See:

http://en.wikipedia.org/wiki/Hot_particle

[Note from Geoff: I drank from streams throughout my running career and always enjoyed it, including on the Duddon race in 1986 while unbeknownst to us, heavy rain from the Chernobyl plume was falling there. Was the chronic fatigue that ended my career related to this, or to a virus I picked up in the water? I will never know. Having been in Fukushima at the time of the disaster and researched as best I can since, I would now only drink from streams in the Lakes/Snowdonia/Southern Scotland in an emergency, and would recommend that children and young women don't, just in case, as they are more susceptible to radiation.]

Special sports drinks and nutrition

Although many people, including some professionals, use special sports products and supplements for race drinking and eating, there is little reliable peer-reviewed independent evidence of sufficient scale suggesting any special effect over water and ordinary foods, which have the benefit of being healthier. See research cited in: http://en.wikipedia.org/wiki/Sports_drink

Pros: the electrolytes (minerals & salts) and carbohydrates they contain may be needed, depending on the person and the event, for races over 90 minutes; you know how much carbohydrate or sodium you are taking, you can repeat this if it works, and they are designed to go down easily; you can try them and know you will get exactly the same thing next time.

Cons: it is also possible they can cause problems including upset stomach and salt-induced cramps for some people, and they are usually processed rather than a natural whole food and contain preservatives. They should certainly not be drunk or eaten regularly outside competition for the same reason that all sugary drinks and snacks should be minimized, as they are associated with increased weight gain and bad teeth. They are more expensive.

Nitrates

There is a current fashion for increasing nitrate intake before endurance events to increase energy efficiency by 2-3% and race times by up to 4% (but only if you avoid mouthwash, which interestingly kills the mouth bacteria needed for absorption!), usually in the form of beetroot juice 2-3 hours before the event, although you can actually get more from rhubarb, as you will see from this list of nitrate-rich vegetables:

Arugula (rocket): 4,677 mg/kg

Rhubarb: 2,943 mg/kg

Swiss chard: 1,690 mg/kg

Beet (root): 1,379 mg/kg

Celery: 1,103 mg/kg

No doubt the 'evidence,' which seems to come from one source (take a bow Andy Jones of Exeter University), will change with time. In the meantime, if you want to try it, stick to vegetables, in juice form if you prefer, but don't overdo it, keep it to before selected events and try it in training first. Avoid any manufactured supplements that come out.

<http://www.runnersworld.com/nutrition-for-runners/beet-juice-how-much-and-when>

The fitter you are, the less benefit you may notice:

<http://www.runnersworld.com/nutrition-for-runners/beet-juice-for-milers>

Artificial supplements

Supplements can cause as many problems as they solve. As a general rule, they are best avoided. Even extra vitamins, for example, are controversial in that it is possible to cause damage if not properly supervised and can harm athletic performance:

<http://www.runnersworld.com/nutrition-for-runners/the-seductive-lure-of-supplements>

Always check with a doctor and research yourself before using any supplement and consider whether it is healthy - or ethical for competition. Want to improve your performance? Eat more healthily, loose weight, plan and increase your training, periodize, and race less.

Caffeine

There is some evidence that taking caffeine 2-3 hours before an event increases endurance performance by increasing fat burning, thereby sparing muscle glycogen, though it isn't understood how. There is no benefit for short events. Deliberately taking large amounts of caffeine for competition can be considered doping. Caffeine can cause nausea, stomach cramps or speeded up heart rate in some athletes.

<http://www.acsm.org/docs/current-comments/caffeineandexercise.pdf>

<http://www.rice.edu/~jenky/sports/caffeine.html>

http://www.vanderbilt.edu/AnS/psychology/health_psychology/caffeine_sports.htm

Anti-inflammatory drugs eg Aspirin

Before or during competition some people take Aspirin-based anti-inflammatory tablets, or Paracetamol-based pain killers to help them ignore pain. Neither of these can be recommended, both for health and ethical reasons. Anti inflammatory drugs (NSAIDs) used in endurance events can have serious side-effects including reducing the protective lining of the stomach, impairing kidney function and affecting electrolyte balance, and thinning the blood therefore impairing muscle repair. In the worst case effects can be life-threatening. Running through pain and injury is a pretty bad idea, but if you want to do it, toughen the hell up, don't take a pill. For more detail see this literature review (by a sports company, and even they warn against it!)

<http://firstendurance.com/2011/09/06/prerace-caffeine-aspirin-and-more-a-literature-review/>

Alcohol and athletes

A lot of the socializing in running, especially fell running, as in much of English life has traditionally centred around the pub, and there has been a close association with beer in the lore of fell running. Sadly, the evidence is that it has a bad impact on athletic achievement and on recovery. Alcohol:

- Reduces the energy available to muscle cells, reducing efficiency and endurance
- Reduces Human Growth Hormone (by up to 70%) and testosterone, both needed for muscle repair
- Each unit contains 100-150 empty calories which are not used as glycogen but get stored as fat
- Can dehydrate unless very well diluted
- Can prevent the liver's glycogen stores being used while it metabolizes the alcohol
- Inhibits the absorption of vitamins and nutrients essential to athletic performance
- Reduces the ability to keep warm

Clearly for general health it is best to keep alcohol consumption low and avoid bingeing, and for athletes especially to avoid alcohol immediately before and after events.

<https://www.princeton.edu/uhs/pdfs/NCAA%20Alcohol%20and%20Athletic%20Performance.pdf>

Review of studies:

<http://www.athletestore.co.uk/wordpress/wp-content/uploads/2013/01/>

[The_Effect_of_Alcohol_on_Athletic_Performance.7.pdf](#)

If your alcohol consumption is affecting your health, work, or relationships, seek help:

<http://www.nhs.uk/Livewell/alcohol/Pages/Alcoholsupport.aspx>

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NUTRITION SEMINAR FOR TOD HARRIERS 26 FEB 2014

By James Riley

Introduction

Much of what follows may be considered to be 'general health' but perhaps unsurprisingly not a lot of it is well known. This is, in no small part, because the public health message in the Western World over the past three or so decades has moved increasingly towards the consumption of a diet that is low in fat and relatively high in (processed and chemical) carbohydrates. This has been (and still is) positively reinforced by government in partnership with Big Food, through initiatives such as the Eat Well Plate (which groups good and bad foods together), and such as Fast Food being the primary sponsors of the 2012 London Olympics, all helping to muddy the waters and affect our ability to make informed food choices for the benefit of both our long-term health and optimal running performance.

Add into that mix Big Food using pseudoscience to sell us snake oil in the form of 'healthy' processed foods – a wise man once told me to never to buy anything that needed an advert to sell it – and pyramid selling schemes such as Weight Watchers, Juice Plus and Herbalife, we find ourselves in 2014 with an obesity epidemic that is seemingly out of control, and a general population in the UK that is overfed but under nourished.

So, the ranting being over for the moment, what steps can we take to improve our nutrition that might better support our training requirements and our racing goals?

It's worth saying at this point that if you are absolutely happy with where you are at the moment both physically and also training wise, are never injured and/or never ill, then you will learn little by continuing. Otherwise, read on.....

In contrast to the aforementioned processed food revolution, a great deal of evidence instead points towards choosing well-sourced, whole, single-ingredient foods as close to their natural state as possible, and this applies across the board irrespective of individual ethical, moral or indeed religious beliefs that determine that choice. A simple rule of thumb could be to go shopping for your fridge, not your cupboard.

This is important because these foods contain their own enzymes to break down in the gut – think foods that go off as opposed to those that have a sell by date of 10 years next Thursday. Otherwise, we rely on the body's own digestive enzymes to break down the food and over time this has an adverse effect on gut health. A lot of current research appears to strongly suggest that gut health is the key to absolutely everything else, for example 90% of the body's immunity is in the gut. If the digestive system is broken there would appear to be little point worrying about emptying and absorption rates.

Water

Water is vital to the body functioning efficiently on a daily basis; it's made up of 80% water with muscles being 75% water and the brain being 70%.

It has been well documented that an athlete needs to be dehydrated by only a small amount to see performance suffer. Conversely, research undertaken on highly-trained professional athletes in endurance sports has demonstrated that these individuals can suffer an amount of what has been termed 'voluntary dehydration' with no detrimental effect on results. Nevertheless, for us mere mortals, the consensus suggests we try to drink on a daily basis as much good quality, clean water as we need, and – especially for individuals with non-sedentary jobs and/or us runners who train frequently – to supplement it with minerals as otherwise the muscles will really struggle to absorb the water.

Factors to consider when determining your individual requirements for training and racing will

include temperature, intensity and duration and will therefore vary.

Leafy greens

Leafy greens, such as kale, spinach and broccoli, are full of micronutrients and are also alkaline in nature and therefore help to neutralise blood acidity. If you want to understand more about why this is important search on the internet for post-renal acid load, or “PRAL”. For example, meat tends to be generally mildly acidic and brown rice very acidic. Leafy greens are at the other end of the scale so help to bring blood pH levels back to normal and in an ideal world would be consumed at every meal.

It is best to eat them wilted as this breaks down their cell membranes and allow the body to digest the nutrients they contain. The easiest way to do this is simply to add them directly to the dish, to steam them or, my favourite when overall calories are not a particular concern, put them in a pan of hot water mixed with garlic and raw butter.

Protein

One of the three macronutrients, the main function of protein is the maintenance and development of the body's muscles. Therefore, like leafy greens, in an ideal world some would be consumed at every meal. Like your training, try and rotate different protein sources to prevent boredom.

Good options for vegetarians are pulses (legumes) especially soya beans (or tofu); seeds and nuts, wholefood peanut butter, almond butter, cheese, cottage cheese, eggs and Greek yoghurt. Quorn is readily available and provides variety, but is a man-made protein rather than a wholefood. Vegetarians usually eat 'combination,' or 'complementary' proteins, pairing different protein sources to increase the availability of the protein for absorption, for example legumes with grains, though variety is increasingly seen as being more important. *(added notes by Geoff)*

Common choices for carnivores might be:

- Skinless chicken breast bought from a supermarket – but often the welfare of the animals is poor, pumped full of artificial proteins and water. Better perhaps to get to know your butcher better and source free range, full term chickens, or grass fed beef. Other lean meat protein sources include venison and buffalo, these days readily available online from UK-based supplies;
- Tuna – but a lot of tuna is caught in mercury polluted water and also the fishing methods result in many other species being caught, only to be discarded; better options are perhaps wild salmon, mackerel and trout; or
- A recovery drink/powder, many being made with whey that has received a heat treatment and containing chemical nasties. More on cleaner choices later but other good choices are free range eggs, legumes and pulses.

Fats

Fat is also a macronutrient and vital for cell function, recovery and development amongst other things. Search “Ancel Keys” and you can read about his ultimately flawed study from the 1950s into possible connections between CHD and the consumption of saturated fats. In the United States in particular, in the late 1970s, the misinterpretation of his results led to the development of the low-fat culture, in particular paranoia towards consuming saturated fats. It's also worth noting that most heart/diabetic associations were set up by Big Food, not by expert un-biased cardiologists.

However, the consumption of dietary fat does not mean you will gain body fat, unless over consumed in vast quantities. Quite the opposite in fact, because any product that claims to be fat free/low fat is a sugary, chemical 5h1t storm!

Optimal fat choices to consider including in your diet:

- Saturated fat: butter (preferably raw if you can handle it, like Kerry Gold), coconut oil (choose extra virgin varieties. It's very heat stable so superb for cooking, and contains high levels of

Lauric acid which assists the body's immune system), meat;

- Monounsaturated fat: nuts, avocados, olive oil (again, choose extra virgin varieties. It's superb in dressing so salads, poor for cooking though so avoid), meat; and
- Polyunsaturated: fish (see protein section above), nuts, seeds, leafy greens

Personally, I steer clear of margarine. Its origins are in fattening turkeys, but that was stopped when the turkeys started dying. Search You Tube for examples of how margarine is made; this should put you off – it is grey without the artificial colourings.

Carbohydrates

When we train, our primary fuel source is the glycogen stored in our muscles as glucose and in our liver as fructose. To replenish these stores we eat (quality) carbohydrates, which is broken down into glycogen and moved around the body by the hormone insulin. The body is most receptive to this around the training window, and the process is made even more efficient when consumed with a quality protein source. When these glycogen stores have been topped up to the brim, the body stores the excess as fat.

Some individuals can tolerate carbs extremely well and can happily consume porridge oats for breakfast, a butty for dinner and pasta for tea, irrespective of when they train that day or indeed whether it is a recovery/rest day.

Others, like me, are not able to tolerate carbs particularly well and if you carry excess timber around with you or feel sluggish and/or bloated, that could be a possible cause (amongst other factors). By using carbs to bracket training and reducing – but not eliminating – intake with other meals you may find your carb tolerance increases and fat loss occurs. This protocol is most commonly used by physique athletes when shredding for competition, but still works for me and many others in difference sports.

Search “Carb Cycling” and you will find endless material to get you started; when I first came across it about fifteen or more years ago it was a real light bulb moment.

In practice this means that whilst all meals are important to support training and recovery, my most important meal is the one I consume immediately after my previous session; remember, the body deals with carbs most effectively around the training window. By doing this I know I will be in a great place to attack the next session or race. Again, a net search for “carb *backloading*” will provide plenty of options for further consideration. At other times I simply consume a maintenance amount of carbs depending on need.

Optimal carb choices are vegetables, fruit, sweet potato, basmati rice for general use, jasmine rice post training as it is high GI, buckwheat and quinoa (which in addition also contains all 9 essential branch chain amino acids or “BCAAs”, the building blocks of protein).

A quick note for those of you who love breakfast biscuits – Belvita, for example, contains lots of grains and sugars, plus the GMO-derived canola oil. Marvellous.

Top fruit to include pre-training are apples and raisins, post training bananas (a just-ripe banana contains almost the perfect balance of glucose and fructose for the body and dependent on training duration and intensity you may find you need more than one) and cherries, and evening “sweet tooth” snacks could be raspberries, blueberries or kiwi fruits (fresh berries are dear, frozen more cost-effective).

So, how to put all this together?

This may sound odd, but treat food as you would training – draw up in advance weekly meal plans that fit around, fit with and support your budget, family, training, work and social life. Factors you will need to consider are appetite, satiety, (dis)likes, allergies/intolerances, habits and your schedule. Then keep a food diary so that over time you can see what works well for *you* for a particular training block and what perhaps worked less well, allowing you to monitor and adjust as required..

Similar to when starting a new training programme, if you alter what you eat it will need time to have an effect, and you should apply it consistently; you wouldn't (I hope) only do one 4 mile run a week during March, April and May and expect to put in a good performance at Ennerdale at the beginning of June.

If there is interest I can prepare follow ups dealing with sleep, supplementation (both daily and training-specific BUT it is very important to ensure your diet is on point first allowing you to extract the maximum benefit from supplements) and looking at how you start to calculate the amount and proportions of protein, fats and carbs you need to consume within overall calories.

Further reading

The best advice I can give here is to pretty much ignore nutritional information provided by running and fitness magazines, the health section of the Daily Mail website and books. I could write a book that says the moon is made of cheese or the world is flat and have it published – it means nothing. The best source is evidence-based research that has been independently-funded and peer-reviewed.

That said there are a lot of people putting out some really good material and a few just for starters are:

- Graham Close and James Morton from the Sports Science team at Liverpool JMU (Morton is also head of performance nutrition at Liverpool FC)
- Barry Murray is currently head of sports nutrition at BMC and also runs ON4S (Optimal Nutrition for Sport). In his spare time he trains with Terry Conway and Paul Tierney and is a superb ultra runner in his own right, placing high in the L100. He was the first person to teach me the concept of fat adaptation
- Ben Coomber owns Body Type Nutrition and he and his team put out lots of really useful, general stuff. Also, look for "Ben Coomber TV" on You Tube, specifically his less-than-five minute clips on a variety of subjects

JR

Collated by Geoff Read for Todmorden Harriers skills share, February 2014