

Nutrition for Ultra Marathon Training and Racing

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Basics

- The length of ultra endurance events means that the bodies ideal carbohydrate (CHO) needs will exceed its capacity to store it.
- CHO loading will maximize glycogen storage but providing CHO during exercise through food and fluid is vital to maximize the amount of CHO available for oxidation and to preserve glycogen stores.
- During a marathon you will burn ~ 4000kcal → this rises to 6-7000kcal for a 50mile run.

The body can burn up to 600kcal per hour during endurance events but can only absorb 250-300kcal

- Therefore consuming above 300kcal per hour has no additional energy benefit and may lead to gastrointestinal distress.

Limiting Factors

→ Gastric emptying (the speed at which food and drink leave the stomach) and absorption

Studies have shown that an intravenous infusion of glucose could increase the amount oxidized therefore it is the rate of gastric emptying which limits the amount which can be used by the body.

Factors affecting the rate of gastric emptying

1. Ingested volume (higher volumes result in faster gastric emptying)
2. Energy concentration (higher concentrations result in slower gastric emptying)
3. Osmolality (higher osmolar solutions result in slower gastric emptying)
4. pH (deviations from neutral pH slow gastric emptying)
5. Exercise intensity (higher intensities result in slower gastric emptying)

Glycemic Index – the ranking of CHO according to its effect on blood glucose

Low GI = small fluctuations in blood glucose and insulin levels (banana, dried apricots, milk, tomato soup, wholemeal bread)

High GI = creates blood sugar 'spikes', travel into the blood very quickly (mashed potato, white bread, jelly babies, bagels)

- You must practice and adapt your nutrition plan during training to train the gut to accept food and fluid whilst running.
- **'Gold Standard' ingestion rate of CHO is 1g per minute or 60g per hr**
 - This equates to 4kcal per gram or 240kcal/ hr (this figure may alter slightly depending on gender and weight).

NOTE:

CHO oxidation during exercise can be much higher but ingesting 60g/hr can spare glycogen by providing an alternative fuel source

However – over an extended period of exercise, glycogen storage diminishes

Resulting in a decrease in CHO as a proportion of fuel oxidized and a decline in performance

- After 4-6 hours you should start to consume protein at a rate of 1g protein to 3-4g CHO. There is no need to change the overall kcal – just the proportion coming from CHO.

Fat Utilisation

- The body has a limited capacity to store CHO however fat stores are high and represent a major source of fuel for exercise
- However fatty acid oxidation is limited especially during intense exercise

There is current research interest into ways to promote fat oxidation, slow the rate of muscle glycogen depletion and increase exercise capacity.

Current techniques to improve fat oxidation are:

1. Endurance training
2. Caffeine ingestion

During ultra endurance exercise – fat oxidation can reach 1g/min

Thoughts on fasting and fat oxidation:

- Study has shown that short term fasting in rats increases fat oxidation and raises the level of circulating free fatty acid thus increasing endurance performance, however there have been inconclusive results in human subjects.
- BUT fasting can decrease muscle glycogen levels and subsequently decrease endurance performance
- One study shows that a 24hr fast decreases pre-exercise glycogen and impairs exercise time by 20-25%.
- Another trial included subjects eating a 400kcal breakfast 3 hrs before exercise OR just consuming dinner the night before.
 - Those eating the breakfast cycled for 136mins to exhaustion compared with 109mins without breakfast.

Types of food

Simple sugars need to be ingested in the correct concentration to be absorbed and used as fuel by the body. This concentration is 6-8% dilution and a solution of this concentration can provide a maximum of 100kcal. Therefore some concentrated energy gels required a large amount of water to be absorbed efficiently.

Sample foods and energy content:

Sweet foods

	Portion size	Calories	CHO (g)	Protein (g)
Dried Apricots	75g	125	27	2.9
Dates	75g	201	48	1.8
Malt loaf	Slice	101	20	2.5
Rice pudding	½ can	210	35	6.8
Custard	1/3 can	143	22	4.1
Jelly babies	1	20	4.8	0.2
Grapes	80g	48	12.3	0.3
Banana	1 medium	90	22	1.2
Peanut butter	40g	260	6	10
Milk Jelly	¼ pack jelly with ¼ pint of milk	193		
Jam	Spread on bread	38	9.4	trace
Pancakes	1	79	13.3	1.8
Honey	Spread on bread	51	12.7	Trace
Flapjack	1 small 'bite'	81	9.8	1.1
Cereal bar	1 x fruit + nut	125	15.1	1.8

Savoury foods

	Portion size	Calories	CHO (g)	Protein (g)
Mashed potato	200g	142	24.2	2.8
Sweet potato	100g	86	19.7	1.2
Bread	1 medium slice (white)	95	17.8	3.6
Baked beans	½ can	164	26.7	9.7
Soup	½ can (cream of tomato)	113	13.3	1.8
Cheese	40g	166	trace	10.1
Mini sausages	1	30	1.2	1.1

Drinks

	Portion size	Calories
Coke	250mls	85
Complan	Sachet + 200ml whole milk	382 (15.7g protein + 43.2g CHO)
Hot chocolate	150mls whole milk 1 heaped tablespoon skimmed milk powder 3 teaspoons hot chocolate powder 2 tablespoons of cream	450
Milk shake	200mls whole milk 2 heaped tablespoons skimmed milk powder Milkshake syrup or powder to taste	300
Smoothie	300mls whole milk 1 heaped tablespoon skimmed milk powder 1 pot (150g) thick and creamy yoghurt 3 pineapple rings or 1 ripe banana Liquidise all the ingredients and serve chilled	300 per serving (makes 2 servings)

Notes:

- Start eating as early as possible to prevent early depletion of glycogen stores
- Alternate sweet and savory foods to avoid taste fatigue
- Remember to take salt capsules or equivalent to prevent hyponatraemia
- If dairy causes GI problems – experiment with dairy free alternatives such as soya milk and oat based milks

Ideas to increase the energy density of foods

Food	Portion	Ideas how to increase calories	Calories Before	Calories After
Custard	1 ladle (125ml)	Add 1 heaped tablespoon of skimmed milk powder and 2 tablespoons of double cream to custard made with full cream milk	140	270
Soup	1 ladle (125ml)	Add 1 heaped tablespoon of skimmed milk powder and 2 tablespoons of double cream. You could also add cheese	80	350
Porridge	1 ladle (125ml)	Add 1 heaped tablespoon of skimmed milk powder and 2 tablespoons of double cream to porridge made with full cream milk	170	440
Mashed Potato	1 scoop	Add an extra tablespoon of margarine or butter and 1 tablespoon of double cream to mashed potato	70	250
Sponge pudding/ Cake	2 tablespoons	Place an extra 2 teaspoons of jam or syrup on the sponge when serving. Serve with fortified custard or ice-cream	425	525
Milk Puddings	1 ladle (125ml)	Add 1 heaped tablespoon of skimmed milk powder and 2 tablespoons of double cream to the milk pudding made with full cream milk	195	465

For further information or for references of cited studies please contact:

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