

FOOD INTAKE AND ENDURANCE EVENTS

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Increasing interest in long distance running and the publicity given to 'pasta parties' the evening before marathon events, has prompted a number of people to ask whether manipulation of food intake can improve their endurance when hill walking. Here then is an outline of the Carbohydrate Loading regime which you may consider trying for yourself.

Experimental laboratory work has shown that the capacity to perform prolonged heavy exercise can be influenced by preceding diet. This effect is related to the availability of carbohydrate in the form of glycogen stored within the working muscles. During exercise we use up this glycogen as a source of energy. When it is almost depleted, high intensity activity cannot be maintained and we reach what is known as the point of exhaustion. It follows, therefore, that the larger the store of glycogen, the longer we can continue at our peak level of activity.

The way to increase muscle glycogen is to exercise to the point of exhaustion, then for at least three days eat food with a high carbohydrate content and train only lightly. Normal glycogen levels will be regained within twenty-four hours and will continue to increase over the next three to four days. This is what is called carbohydrate or glycogen loading, or supercompensation. Some Swedish researchers found that even higher levels of muscle glycogen could be reached if the athlete had three days of restricted carbohydrate intake after exercising to exhaustion and before the high carbohydrate diet.

Thus, a typical pattern of this glycogen loading regime has emerged since it was first used in competitive athletics in 1969: e.g. if the event is to be on Saturday the previous week's programme is:—

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| Saturday | — Exercise to exhaustion to deplete glycogen stores |
| Saturday — after exercise, | — Low carbohydrate intake with |
| Sunday, Monday, Tuesday | moderate training |
| Wednesday, Thursday, Friday | — High carbohydrate intake with light training |

Some people find that one day on the low carbohydrate intake is enough, so they exercise to exhaustion on Monday. This can be done by tiring out the leg muscles required for running by either a very long run, or more quickly by a combination of jogging and sharp bursts of speed.

SUGGESTED FOODS FOR THE TWO PERIODS OF DIETARY MANIPULATION

1. LOW CARBOHYDRATE INTAKE (with a high content of protein and fats)

TAKE PLENTY OF:— Eggs, cheese, meats, fish, nuts, cream or top of the milk.

AVOID — All sugary foods and drinks

SUITABLE DRINKS — Tea and coffee (without sugar), water, Low Calorie or Diabetic lemonade and squashes. Unsugared fruit juices. Small amounts of spirits with water or a Low Calorie mixer or Diabetic beer.

THE DAYS' MENU COULD BE:—

- BREAKFAST — Scrambled eggs, bacon, sausages, kippers, cheese. Crispbread or thin slice bread or a buttery roll.
- MAIN MEAL — Pate/egg mayonnaise/shrimp cocktail. Large helping meat or fish with vegetables. Small helping potato cooked with fat, e.g. chips, roast, creamed.
Cheese and crispbread or crackers/plain yoghurt.
- LIGHT MEAL — Cold meat/potted herring/smoked mackerel/meat pie
Salad with oil and vinegar dressing
Fresh fruit and cheese
- BETWEEN MEALS — Crispbread or thin slices or bread spread thickly with butter, margarine, peanut butter, cream cheese, pate.
Nuts, buttery rolls.

2. HIGH CARBOHYDRATE INTAKE (with a low content of protein and fats)

TAKE PLENTY OF:— Breakfast cereals, bread, biscuits, potatoes, rice, pastas, sugary foods and drinks, sweets.

AVOID — Large helpings of meat, fish, cheese and eggs
Cream, fats, oils

Greasy foods such as buttery rolls, pastries

SUITABLE DRINKS — Tea and coffee with sugar
Malted milk drinks e.g. Ovaltine
Lemonades, squashes, fruit cordials and sweetened fruit juices
Moderate amounts of beer or cider.

THE DAY'S MENU COULD BE:—

- BREAKFAST — Breakfast cereal/porridge/waffles with sugar, treacle or syrup
Plenty of bread spread with marmalade, jam or honey

- MAIN MEAL** – Thick soup
 Small helping of meat or fish
 Large helping of potato – boiled or baked (no added fat) or rice
 Vegetables
 Milk pudding with stewed fruit
- LIGHT MEAL** – Grilled sausages, baked beans and chips or any pasta dish made with a minimum of fat and lots of pasta (macaroni, spaghetti) and a small amount of cheese or meat or Rissotto or Pot Noodles
 Gateau, instant desserts, tinned fruit
- BETWEEN MEALS** – Fresh fruit, fruit yoghourts, ice cream, sweets, cakes, biscuits, dried fruit e.g. sultanas, popcorn Sandwiches (without butter or margarine) of jam, honey, marmalade, syrup, chocolate spread.

SOME WORD OF EXPLANATION

1. These foods indicate a selection from which the athlete may choose. He should never force himself to eat foods which he dislikes.
2. Many athletes have been found to be eating too little during the low carbohydrate period and so have an insufficient energy intake. As a result they break down some of the muscle tissue which they had been training hard to develop.
3. Alcoholic spirit can be taken during the period on the low carbohydrate intake. It depresses the body's internal production of glucose (gluconeogenesis) which, when taken in moderation, may be beneficial.
4. During the high carbohydrate period, some athletes have consumed too much refined carbohydrate (sugary foods and drinks). The absorptive area of the small intestine can only cope with so much at a time and if overloaded, the excess sugar passes on into the bowel. This strong sugar solution draws more fluid into the bowel from the bloodstream, by osmosis and results in diarrhoea. Miscalculations of this kind are the reason for several unexpected last minute withdrawals by some long distance athletes from important events!
5. Athletes should try out these dietary manipulations themselves in the training weeks preceding the major 'event', as individual food preference and tolerance is very variable.

DAY OF THE EVENT

The stomach should be empty at the start of the event, which means that the last meal should be consumed at least three hours before starting time. It's best to avoid meats and fries as they tend to delay the emptying rate of the stomach. The content of the meal should be a continuation of the high carbohydrate intake.

Recent evidence suggests that athletes who have followed this glycogen loading regime will particularly benefit from it if they drink a cup of very strong coffee about an hour before the start of the race. This has the effect of raising the levels of free fatty acids in the blood, so using some body fat stores at first as a source of energy. Thus the glycogen stores are not used at the start, so will last longer.

Sugary foods and drinks should not be consumed during the hour before the race. The reason is that when sugar reaches the bloodstream, insulin is released from the pancreas which, among other effects, reduces the amount of glucose which is normally released by the liver (gluconeogenesis). This can result in the runner tiring more easily.

FLUID – balance is most important during the race.

Exercising muscles generate heat. The athlete can very quickly become dehydrated as regulation of body temperature takes priority over regulation of body water. One to four litres of water can be lost hourly due to sweating and increased ventilation of the lungs, or put another way, 1% of body weight can be lost after only 30 minutes of heavy exercise at an air temperature of 20°C.

EFFECTS OF DEHYDRATION

1%	loss of body weight due to fluid loss	—	heart rate and body temperature increase
3%	" " " "	" " " "	— impaired performance
5%	" " " "	" " " "	— heat exhaustion
7%	" " " "	" " " "	— hallucinations
10%	" " " "	" " " "	— heat stroke and collapse

Research indicates that the best way to combat dehydration is to follow these guidelines.—

Drinks should –

- (a) Contain less than 2.5g glucose per 100ml (This is much less than the currently available 'sports drinks')
- (b) Contain few if any electrolytes – at most 0.2g sodium chloride (salt) in 100ml
- (c) Have an osmolality of approximately 200mOsm/litre
- (d) Be taken frequently (every 10 -15 minutes) in volumes of 100 - 200ml
- (e) Be cold – 4°C or 40°F.

On hot days, at high altitude or in a very dry atmosphere, more water may be needed and on cold days, more glucose in the solution.

It is only possible to replace 800ml – 100ml fluid/hour (due to the stomach's rate of emptying) so runners must discipline themselves to consume this amount to minimise dehydration. Glycogen is stored in the body in association with water, (1g glycogen to 2 – 3g water), so the 'glycogen' loaded athlete does have this as a source of fluid too. During training athletes should drink as recommended above and can gauge their success in minimising dehydration by weighing themselves before, during and after training. The less weight loss they have, the more efficient will they be.

After all this explanation – a salutary reminder:–

Athletes who are at the peak of their training for endurance events DEVELOP AN INCREASED ABILITY TO STORE GLYCOGEN. They are also more able to use fatty acids as an energy source towards the end of a long distance event.

The dietary manipulation described should benefit only those whose training has been less thorough. There is, therefore, at present no substitute for training.

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