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Role of carbohydrates in long distance running

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Abstract

Good nutrition must be a key part of training program is one has to succeed. The six major nutrients present in the food are mainly carbohydrates, protein, fats, vitamins, minerals and water. Just as each team member carried out different task during a game each nutrients performs specific functions in our body. Nutrition plays an important role in sports performance because it helps an athlete to maintain ideal body weight, body composition specific to sports and faster recovery. Training and nutrition should go hand in hand to attain high level of achievement in sports. Adequate nutrition enhances aerobic capacity, reduces fatigue, faster recovery and provides injury prevention and preservation of immunity. Carbohydrates are the main source of energy that is ingested by the human body. Carbohydrates provide quick energy to body and they are not stored in our body for longer duration. The importance of increased carbohydrates intake is less vital in short high intensity workouts, such as interval runs, yet still plays a role in the overall diet of an endurance athlete.

Keywords: carbohydrate, loading, distance running, athletes, performance

Introduction

The quest for excellence in sport predisposes on athlete to undertake excessive training loads for higher levels of achievement. This load consistently improves performance but also generates sports related stress, immune suppression predisposing an athlete to various threats, one such important area being the nutritional status of athlete for which continuous nutrition support is continuously planned and implemented for athletic excellence and the athletes long term good health. Nutrition plays an important role in sports performance because it helps an athlete to maintain ideal body weight, body composition specific to sports and faster recovery. Training and nutrition should go hand in hand to attain high level of achievement in sports. Adequate nutrition enhances aerobic capacity or VO_2 max reduces fatigue, fastens recovery and provides injury prevention and preservation of immunity, Adequate food and fluid intake is vital to insure athletic performance as its peak Macro nutrition's & micro nutrition's plays an important role in energy production, lean mass & hemoglobin synthesis, maintenance of bone health, adequate immune functioning and protection against oxidative damage. Good nutrition must be a key part of training program if one has to succeed. The nutrients are the distinct chemical components in the food. The six major nutrients present in the food are mainly carbohydrates protein fats or lipids, vitamins, minerals and water. They are like team mates that work together to provide good nutrition. Just as each team member carries out different task during a game each nutrient performs specific functions in our body. A lack of even one nutrient is a disadvantage to your body. Nutritional deficiencies can result in decreased performance. Under normal circumstances energy for rest daily activities and exercise mainly comes from carbohydrates and fats with very little contribution from proteins. Although vitamins and minerals provide no calories they are important to maintain normal function and metabolism of body. However vitamins and minerals supplementation above the daily consumption from a balanced diet does not increase exercise performance (Fox *et al.* 1993) [9]. Water is important for health and exercise. Dehydration not just decrease performance, but can also be hazardous to health. Adequate water supply must be ensured particularly when taking part in endurance events (e.g.) long distance running in hot weather condition. There is much debate regarding the increase in the amounts of nutrients needed for endurance runners, particularly macronutrients.

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A carbohydrate is defined as an organic compound containing hydrogen and oxygen, and typically broken down to release energy in the body. Carbohydrates supply muscles with fuel (Burke *et al.* 2004) [5], and the availability of carbohydrates in the body has the ability to alter performance, particularly during runs lasting longer than 90 minutes (Burke *et al.* 2004) [5]. The ingestion of carbohydrates should be a practice integrated into an endurance runner's every day diet, but particularly during training seasons. The importance of increased carbohydrate intake is less vital in short high-intensity workouts, such as interval runs, yet still plays a role in the overall diet of an endurance athlete (Burke, *et al.* 2004) [5]. Carbohydrates are the main source of energy that is ingested by the human body (Caffall *et al.*; 2009) carbohydrates provide quick energy to body and they are not stored in our body for longer duration. Carbohydrates are the compounds of carbon, hydrogen and oxygen with chemical formula CHO. The International Association of Athletic Federations (IAAF) Consensus Statement on Nutrition for athletics published in 2007 states: "Well chosen foods will help athletes train hard, reduce risk of illness and injury, and achieve performance goals, regardless of the diversity of events, environments, nationality and level of competitors.". Specific nutritional recommendations for optimal performance, particularly for endurance athletes, include a daily carbohydrate (CHO) intake ranging from 6 to 10 g/kg body mass (BM) considered essential for replacing liver and muscle glycogen stores.

Why is Carbohydrates Important for Athletes?

Carbohydrates are one of the most important nutrients needed in an athlete's diet. Carbohydrates are vital to help reach peak performance during physical activity because they provide:-

Energy:- Carbohydrates are the main source of energy for our brains and bodies to function properly. When carbs are eaten they are eventually digested and broken down into smaller sugar molecules called glucose. These glucose molecules are stored in the liver and muscles to be used for fuel, especially during physical activity. Carbohydrates improve athletic performance by delaying fatigue and allowing an athlete to compete at higher levels for longer.

Muscle Gain:- Without an adequate amount of stored glucose in the body, other nutrients, such as fat or muscle protein, are utilized to make energy. With the correct amount of carbohydrates available to muscles, protein can be free to do its main job of repairing and rebuilding muscle tissue, which maximizes muscle gain.

Carbohydrate Rich Foods in the performance Diet:-

Athletes should choose carbohydrates that are high in "nutrient density." These provide the most nutrients per calorie.

- Whole grain versions of cereals, pastas, and brown rice and bread products are ideal carbohydrates sources. Grain based foods are rich in B vitamins, which help with energy production. Winning choices include oatmeal, whole wheat bagels, brown rice or whole grain pasta.
- Fruits and Vegetables are excellent carbohydrates sources. They are excellent source of antioxidant nutrients, carotenoids and phytochemical that can help the body recover from performance efforts. Some top nutrition performers include potatoes, oranges, banana, berries and tomatoes-low fat dairy products also provide carbohydrates as well as bone building calcium.

- As part of a performance diet athletes should include at least two carbohydrates rich foods at every meal and at least one at every snack. Sports nutrient experts recommend athletes consume at least five serving of fruits and vegetables eight or more servings of low fat dairy on a daily basis.

Role of Carbohydrates

Carbohydrates are the most important source of energy. It is the most preferred fuel for sports performance. Glucose is the simplest form of carbohydrate and starch is example of complex carbohydrates. Different forms of carbohydrates which we consume in the diet are converted into glucose in our body which is then metabolized to produce energy. 1 gram carbohydrate gives 4 kilo calories of energy. Excess glucose is converted to glycogen in the liver and muscles. Glycogen gives sustained energy. Normal blood glucose levels are 90 to 120 mg /100 ml. Above this level leads to hyperglycemia (high blood sugar) and less than 80 mg leads to hypoglycemia (low blood sugar). Athletes need plenty of complex carbohydrates (starchy foods) along with proper training as these foods helps muscle and liver cells to store glycogen. Glycogen is a vital energy source for most sports. When muscle cells run out of glycogen muscle fatigue and tiredness set in and performance suffers. Right kind of diet with right emphasis on starchy food will result in enough stored glycogen to carry you through 90 minutes of vigorous activity. Foods rich in carbohydrates are cereals like rice wheat and wheat products (broken wheat rava, pasta etc.) and millets like maize, bajra, jawar, oats, ragi and roots & tubers like potatoes, sweet potatoes, carrots etc. Carbohydrates contribute 50 to 60% of total energy requirement in a day.

The Role of Carbohydrates in Athletics success:-

- Carbohydrates are the major fuel source for the brain & nervous system. If blood glucose and glycogen levels are low, athletes may feel irritable tired and lack concentration that could interfere with even simple performance related tasks.
- As the most efficient fuel for the exercising muscles, carbohydrates are the primary source of energy during both high and low intensity activities. Extensive research confirms the major role carbohydrates plays in endurance (aerobic) exercise and mounting evidence supports its importance for both strength and power event.
- Unlike protein and fat, the body has limited carbohydrates reserves. Dietary carbohydrates are stored in the body as glycogen primarily in the muscle and liver.
- During activity, the body relies on the stored glycogen to be released and used for by the muscles and brain for energy. The body's limited glycogen stores can be depleted in a single bout of exercise of sufficient intensity and duration. Thus daily carbohydrates intake is necessary to maintain these glycogen stores. If muscle and liver glycogen stores become depleted during exercise, the muscle will be left without fuel and fatigue will set in a condition known as "hitting the wall"
- Carbohydrate also aid in fat metabolism. The body require the presence of carbohydrates in order to utilize fat for energy. There is an old saying that fat burns in a carbohydrates flame.

Carbohydrate Loading

The ability to sustain peak performance over an extended period of time (as in a marathon race) is influenced by the

availability of muscle glycogen which is stored form of carbohydrates. To build up glycogen stores two phases of preparation are recommended. First about a week before the competition the athlete exercise vigorously to deplete glycogen stores and consumes diet high in protein and fat and restricted to about 100 gm carbohydrate. Second after 2 to 3 days of the glycogen depleting phase, a diet low in fat moderate in protein and high in carbohydrate (200 - 500 gm) is consumed for 3-4 days complete carbohydrate like cereals millets that also furnish minerals and vitamins are preferred to simple sugar over time men seems to increase their muscle glycogen storage much higher than woman, whereas women increase their muscle glycogen 13% of when eating high CHO diet for six days or more (Chen, 2008) ^[6] Carbohydrate loading is not recommended for short term competition since it can lead to a feeling of heaviness that is disadvantage in high intensity competition. It is also not advised for athletes in early adolescence and should be used no more than two or three times in a year.

Carbohydrates Loading effects on long distance endurance exercise/event

When gearing up to run a marathon a runner's number one goal is to stay energized as long as possible along with prolonging fatigue as long as possible, carbohydrates loading before a race along with intermittent restoration of muscle glycogen during the endurance run along with intermittent intake of carbohydrates between training runs has been shown to promote help the runner to train harder and recover optimally after long run (Burke 2007) ^[4]. Of course with any exercise regimen the exercise intensity and duration that exercise with carbohydrates loading in order to get the most optimal amount of stored muscle glycogen the run should be moderate intensity to prolong muscle fatigue by about twenty percent (Hawley 2012) for similarity and balance with training to the race it is most beneficial to eat 7-10 grams of carbohydrates per kilogram body weight the night before the race and long distance training runs. As well as proper hydration and replenishment of electrolytes. It is also recommended to eat about 55% of the diet carbohydrates and the height before the race day it is recommended to eat about 20% of the diet carbohydrates.

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