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**Alex M**
Research Scholar, Lekshmibai National College of Physical Education, Thiruvananthapuram, Kerala, India

**Corresponding Author:**
**Alex M**
Research Scholar, Lekshmibai National College of Physical Education, Thiruvananthapuram, Kerala, India

# Success in endurance through nutrition

## Alex M

**Abstract**
Endurance sports are increasing in popularity and athletes at all levels are looking for ways to optimize their performance by training and nutrition. For endurance exercise lasting 30 min or more, the most likely contributors to fatigue are dehydration and carbohydrate depletion, whereas gastrointestinal problems, hyperthermia, and hypernatremia can reduce endurance exercise performance and are potentially health threatening, especially in longer events. Although high muscle glycogen concentrations at the start may be beneficial for endurance exercise, this does not necessarily have to be achieved by the traditional super compensation protocol. An individualized nutritional strategy can be developed that aims to deliver carbohydrate to the working muscle at a rate that is dependent on the absolute exercise intensity as well as the duration of the event. Endurance athletes should attempt to minimize dehydration and limit body mass losses through sweating to 2-3% of body mass. Gastrointestinal problems occur frequently, especially in long distance races. Problems seems to be highly individual and perhaps genetically determined, but may also be related to the intake of highly concentrated carbohydrate solutions, hyperosmotic drinks, as well as the intake of fiber, fat and protein. Here I provide a comprehensive overview of recent research findings and suggest several new guidelines for the endurance athlete on the basis of this.

**Keywords:** Endurance, exercise, nutrition

### 1. Introduction
Sports nutrition is the area of the science of nutrition and dietetic that covers the needs of individuals who engage in physical activity. Unlike an infant, a lactating mother or an elderly person, the "physically active" individual is not characterized by either age, gender, or physiological status – almost everyone is included to a greater or lesser degree. Physical activity encompasses a number of human endeavors during work and leisure. In the field of sports, it include a variety of disciplines, techniques and arts. Exercised with passionate dedication or occasional enthusiasm, it covers a broad range of physiological demand, from light to heavy. Therefore, sports nutrition more particularly addresses those active individuals who identify themselves as sportsmen and sportswomen and recognize that they have special dietary needs in this regard.

### 2. Endurance Activity
#### 2.1. During low intensity Exercise
Majority of energy is derived from fatty acids mobilized from adipose tissue. As the intensity of the exercise is increased proportionally more of the energy is derived from carbohydrate (blood glucose and glycogen) and contribution of muscle triglycerides is also higher.

#### 2.2. During moderate intensity exercise (about 65% of VO2 Max)
Carbohydrate (blood glucose and glycogen) and fat (Plasma fatty acids and muscle triglycerides) contribute equally to the total energy expenditure.

#### 2.3. During high intensity exercise
Glycogen becomes the primary source of energy, and rate of fat oxidation is lower compared to that during moderate intensity exercise.

#### Food requirement
The amount of food necessary for each day depends on a person's energy needs. These energy

needs are directly related to Period of rapid growth, Age and Physical Activity.

The percent contributions towards the total caloric intake for each of the three foods stuffs are,

Protein - 10-15%
Fat - 30-35%
Carbohydrate - 60-70%

**Pregame meal**

Purpose of pregame meal

- To provide adequate
- To avoid sensation of hunger on a relative empty stomach
- To minimize gastro intestinal tract problem

**Nutrients in pregame meal**

The number of kilocalories in a pregame meal should be 500-1000. And the primary nutrient should be complex carbohydrate because they are easily digested and provide glucose to increase liver glycogen. The protein content of pregame meal should be small. The fat content of pregame meal should be kept to a minimum. These meals should be eaten about 3 hours prior to competition. Large carbohydrate meal 3-4 hours before competition. Simple carbohydrate snacks and fresh juice, 2 hours prior to competition. Sports drinks/fresh juice/water with glucose molecule 0ne hour before competition.

**3. Guidelines to follow in planning the pregame meal**

**3.1 Energetic of the diet**

Energy intake should be adequate toward off any feeling of hunger or weakness during the entire period of competition.

**3.2 Timing of diet**

The diet plan should ensure that the stomach and upper bowel are empty at the time of competition.

**3.3 Fluid content of the diet**

Food and fluid intake prior to and during prolonged competition should guarantee on optimal state of hydration.

**3.4 Baldness of the diet**

The pre competition diet should offer foods that will minimize upset in the gastrointestinal tract.

**3.5 Psychological aspect of the diet**

The diet should include food that the athlete is familiar with and is convinced will make him/her win.

**Replacement of sugar and water during activity**

It is generally agreed that ingestion of some liquid glucose during prolonged physical exercise will help spare muscle glycogen and delay or prevent hypoglycemia or blood sugar level. Both process will help reducing or delaying fatigue.

**Some guidelines for drinks during exercise**

- During exercise lasting less than one hour (80-130%) the athlete should drink 500-1000 ml of water.
- For exercise duration between one and three hours (60-90% VO2 max) the drink should contain 10-20 ml of sodium and chlorine and 6-10% of carbohydrate with 500-1000 ml/h meeting the carbohydrate need, 800-1600 ml/h meeting the fluid needs.
- For events of more than 3 hours duration the drink should contain 20-30 ml of sodium and chlorine and 6-8% of carbohydrate with 500-1000 ml/h meeting the carbohydrate and fluid needs of most athlete.

**Diet following activity**

Following endurance events, a serious effort should be made to replace fats, protein, carbohydrate, vitamins, minerals and water. One will be in better physiological condition if the athlete wait an hour or so after exercising before eating a large meal.

However a liquid nutrient may be consumed a few minutes following exertion to stabilize blood glucose. If competition is to be renewed the next day care must be taken to replenish the energy store-muscle and liver glycogen.

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