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Increase of fat utilisation during endurance exercise

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Abstract
The capacity of the human body is limited to store carbohydrates, where as to store the fat depots are large, which are representing a vast source of fuel for exercise. However, fatty acid oxidation is limited, especially during intense exercise, and carbohydrate remains the major fuel for oxidative metabolism. For the improving strategies of athletic performance, recent interest has focused on several nutritional procedures which may theoretically promote fatty acid oxidation, easy the rate of muscle glycogen depletion and improves exercise capacity. In some individuals the ingestion of caffeine improves endurance capacity, but L-cantina supplementation has no effect on either rates of fatty acid oxidation, muscle glycogen utilisation or performance. Likewise, the ingestion of small amounts of medium-chain triglyceride has no major effect on either fat metabolism or exercise performance. On the other hand, in endurance-trained individuals, substrate utilisation during sub maximal exercise can be altered substantially by the ingestion of a high fat (60 to 70% of energy intake), low carbohydrate (15 to 20% of energy intake) diet for 7 to 10 days.
Adaptation to such a diet, however, does not appear to alter the rate of working muscle glycogen utilisation during prolonged, moderate intensity exercise, nor consistently improve performance. At present, there is insufficient scientific evidence to recommend that athletes either ingest fat, in the form of medium-chain triglyceride, during exercise, or "fat-adapt" in the weeks prior to a major endurance event to improve athletic performance.

Keywords: Fatty acid, carbohydrates, fat, oxidation

Introduction
The study is totally reference based, and the evidence provided through internet and others sources of matters. The concept of manipulating an individual's habitual diet before an exercise bout in an attempt to modify patterns of fuel substrate utilization and enhance subsequent exercise capacity is not new. Modern studies have focused on nutritional and training strategies aimed to optimize endogenous carbohydrate (CHO) stores while simultaneously maximizing the capacity for fat oxidation during continuous, sub-maximal (60-70% of maximal O (2) uptake. Such "nutritional periodisation" typically encompasses of a high-fat diet (60-70% E) followed by of high-CHO intake (70-80% E; CHO restoration). Despite the brevity of the adaptation period, ingestion of a high-fat diet by endurance-trained athlete's results in substantially higher rates of fat oxidation and concomitant muscle glycogen sparing during sub-maximal exercise compared with an iso-energetic high-CHO diet. Higher rates of fat oxidation during exercise persist even under conditions in which CHO availability is increased, either by having athletes consume a high-CHO meal before exercise and/or ingest glucose solutions during exercise. Yet, despite marked changes in the patterns of fuel utilization that favour fat oxidation, fat-adaptation/CHO restoration strategies do not provide clear benefits to the performance of prolonged endurance The capacity of the human body is limited to store carbohydrates, where as to store the endogenous fat depots are large, which are representing a vast source of fuel for exercise. However, fatty acid oxidation is limited, especially during intense exercise, and carbohydrate remains the major fuel for oxidative metabolism. For the improving strategies of athletic performance, recent interest has focused on several nutritional procedures which may theoretically promote fatty acid oxidation, easy the rate of muscle glycogen depletion and improves exercise capacity. In some individuals the ingestion of caffeine improves endurance capacity, but L-cantina supplementation has no effect on either rates of fatty acid oxidation, muscle glycogen utilisation or performance.

Likewise, the ingestion of small amounts of medium-chain triglyceride has no major effect on either fat metabolism or exercise performance. On the other hand, in endurance-trained individuals, substrate utilisation during sub maximal exercise can be altered substantially by the ingestion of a high fat (60 to 70% of energy intake), low carbohydrate (15 to 20% of energy intake) diet for 7 to 10 days.

Adaptation to such a diet, however, does not appear to alter the rate of working muscle glycogen utilisation during prolonged, moderate intensity exercise, nor consistently improve performance. At present, there is insufficient scientific evidence to recommend that athletes either ingest fat, in the form of medium-chain triglyceride, during exercise, or "fat-adapt" in the weeks prior to a major endurance event to improve athletic performance.

The performance of prolonged (>90 min), continuous, endurance exercise is limited by endogenous carbohydrate (CHO) stores. Accordingly, for many decades, sports nutritionists and exercise physiologists have proposed a number of diet-training strategies that have the potential to increase fatty acid availability and rates of lipid oxidation and thereby attenuate the rate of glycogen utilization during exercise. Because the acute ingestion of exogenous substrates (primarily CHO) during exercise has little effect on the rates of muscle glycogenolysis, recent studies have focused on short-term (<1-2 weeks) diet-training interventions that increase endogenous substrate stores (i.e., muscle glycogen and lipids) and alter patterns of substrate utilization during exercise. One such strategy is "fat adaptation", an intervention in which well-trained endurance athletes consume a high-fat, low-CHO diet for up to 2 weeks while undertaking their normal training and then immediately follow this by CHO restoration (consuming a high-CHO diet and tapering for 1-3 days before a major endurance event). Compared with an isoenergetic CHO diet for the same intervention period, this "dietary periodization" protocol increases the rate of whole-body and muscle fat oxidation while attenuating the rate of muscle glycogenolysis during submaximal exercise. Of note is that these metabolic perturbations favouring the oxidation of fat persist even in the face of restored endogenous CHO stores and increased exogenous CHO availability. Here we review the current knowledge of some of the potential mechanisms by which skeletal muscle sustains high rates of fat oxidation in the face of high exogenous and endogenous CHO availability.

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