

Glycogen Repletion Following Different Diets

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Summary

The effect of different diets on muscle glycogen repletion following exercise was studied in 6 Thoroughbred horses. On each occasion, each horse performed a standard exercise to deplete the glycogen content of the middle gluteal by approximately 40%, an amount similar to that seen under race conditions. They then received one of three possible diets for 3 days; a low carbohydrate diet (LC) consisting of hay, a normal carbohydrate diet (NC) consisting of cubes (pelleted concentrate) plus hay, and a high carbohydrate diet (HC) which was the NC diet supplemented with intravenous infusions of 0.45 kg glucose on days 1 and 2. Glycogen repletion was approximately the same with the HC as with the NC diet, and in either case faster than the LC diet. After 28 hours recovery, glycogen contents with the HC and NC diets were 90% of the pre-exercise content, compared with 70% for the LC diet. In a separate study of 4 Thoroughbreds, little or no diurnal variation in the resting glycogen content of the middle gluteal was observed.

Index terms: Diet; carbohydrate; middle gluteal; muscle glycogen; diurnal variation.

Introduction

Endurance capacity in man at work intensities of 60 to 85% of VO_{2max} is directly related to the content of glycogen in the working muscles (Bergström *et al.*, 1967; Hermansen *et al.*, 1967). Prolonged exercise may result in the almost total depletion of glycogen in the muscle fiber bed (Snow *et al.*, 1982). The importance of muscle glycogen in supra-maximal anaerobic exercise, however, is more controversial. It would appear in man, though, that below a content of 40 mmol glucosyl units/kg wet muscle (about 160 mmol glucosyl units/kg dry muscle (d.m.)) the muscles' capacity to produce lactate is compromised and exercise performance reduced (Jacobs, 1981). At these low contents it is likely that glycogen is limiting to phosphorylase, though the apparent intracellular concentration (40 mmol/kg wet muscle corresponding to a concentration of 13 mmol/l) is still several times above the reported Michaelis constant (K_m) of 2 mmol glucosyl units/l (Brown and Cori, 1961).

Because of the importance of glycogen as an energy source, extensive studies have been carried out in man and rat on the time course of repletion following exercise including the influence of diet (Bergström and Hultman, 1966; Bergström and Hultman,