Skeletal Muscle Adaptation in Racehorses Following High Intensity Interval Training

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Summary

Five Thoroughbred racehorses were trained with an increasing number of short gallops (600 metres at 820–860 m/min) 5 days per week for 8 weeks, followed by 8 weeks detraining. Before, at 2-week intervals during training and after 8 weeks detraining, the horses were subjected to a standardized exercise test of 5, 600 m periods of exercise at increasing speeds of 240, 300, 400, 600 and 800 m/min, with a rest of 3 minutes between each exercise. Blood lactate was determined after each period of exercise and muscle biopsies were obtained from the gluteus medius before and after each test to determine muscle fiber types and glycogen content throughout the training program.

As a result of training, the speed producing a plasma lactate concentration of 4 mmol/l (V_{LA4}) increased significantly from a mean of 540 m/min to 668 m/min. Following detraining V_{LA4} declined to 598 m/min. There was a significant increase in the number of highly oxidative type II fibers during training. There was no significant change in glycogen content of the gluteus muscles following training.

Thoroughbred racehorses appear to adapt to intensive sprint training by increasing the oxidative capacity of their skeletal muscles, and this adaptation is maintained at least in part for 8 weeks of detraining.

Index terms: Lactate; muscle fiber types; glycogen.

Introduction

Thoroughbred racehorses are required to perform high intensity exercise for short periods of time, in the great majority of cases lasting between 1 and 2 minutes. Routine methods of training these horses involve a high proportion of low intensity, long duration exercise, which as the animal gradually becomes 'fitter' is supplemented with varying amounts of high intensity exercise, which in many cases is performed only twice weekly.

Studies on the effect of training on skeletal muscle metabolism in horses have assessed the effect of endurance training either alone, or in combination with short periods of high intensity exercise. Endurance training in humans results in increased cardiac output, lower heart rates at given levels of activity and an increase in the maximum oxygen uptake ($\dot{V}O_2max$) (Åstrand and Rodahl, 1977). Lactate production at given sub-