THE INFLUENCE OF TIME OF FEEDING ON EXERCISE RESPONSE IN THOROUGHBREDS FED A FAT SUPPLEMENTED OR HIGH CARBOHYDRATE DIET

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Recent research (Pagan *et al.*, 1994) demonstrated that feeding supplemental fat to Thoroughbred horses altered blood glucose and insulin levels compared to a grain based diet and these changes influenced substrate selection during a standardized exercise test. All of the exercise tests in this experiment were conducted 4 hours after feeding. It is not known if this is the best time to feed horses before exercise or if the high fat diets would yield a different response if the feeding interval were altered. Therefore, the following experiment was conducted to evaluate the influence of time of feeding on exercise response in horses receiving either a traditional sweet feed or a fat supplemented diet.

Six Thoroughbreds were used in a two period switch-back design study. During period one, 3 horses were fed a fat supplemented diet (FAT) (sweet feed + 340 g soybean oil/day) while 3 horses received a control ration of sweet feed (CON). These horses had been eating these diets for 8 months. Weekly during period one, the horses performed a standardized exercise test (SET) on a high speed treadmill inclined to 3°. This exercise test was performed at 3 different times after eating: 1) after an overnight fast 2) 3 hours after eating 3) 8 hours after feeding. The time of feeding was assigned within each dietary treatment in a 3X3 Latin square design so that each horse was tested weekly at a different time of feeding. At the end of period one, the horses' diets were switched and they continued in training for a 1 month adjustment period. At the end of the adjustment period, the horses repeated the three week SET schedule as in period 1.

The SET consisted of a 2 minute walk at 1.4 m/s, 800 meter trot at 4.3 m/s, 800 meter gallop at 7.7 m/s, 1600 meter gallop at 11.0 m/s, 800 meter trot at 4.2 m/s and 2 minute walk at 1.4 m/s. Blood samples were taken before feeding, hourly until the beginning of the SET and then after the trot, at the end of the 800 meter gallop at 7.7 m/s, after 800 meters and at the end of the 11.0 m/s gallop, after the warm-down trot and walk and 15 and 30 minutes post exercise. During the SET, heart rate was measured and blood was analyzed for glucose, lactate and insulin.

Heart rate was significantly higher when the horses were fed 3 hours before exercise at 7.7 m/s ($p<0.10$) and during the warm-down trot ($p<0.05$). During the warm-up walk, fat supplemented horses had lower heart rates (75 b/min vs 81 b/min, $p<0.10$). Insulin (figure 1) was significantly higher in the 3 hour fed horses at the beginning and

throughout exercise ($p<0.01$). Insulin was lower in the fat supplemented horses following the warm-up ($p<0.05$) and during exercise ($p<0.10$). Blood glucose (figure 2) was higher after the 3 hour feeding at rest and following the warm-up ($p<0.01$). During exercise, blood glucose dropped in the 3 hour fed horses and was significantly lower during and after the 11 m/s gallop. Lactate (figure 3) was unaffected by time of feeding or diet during exercise. Fifteen minutes post exercise, however, the 3 hour fed horses had significantly lower ($p<0.05$) plasma lactate levels.

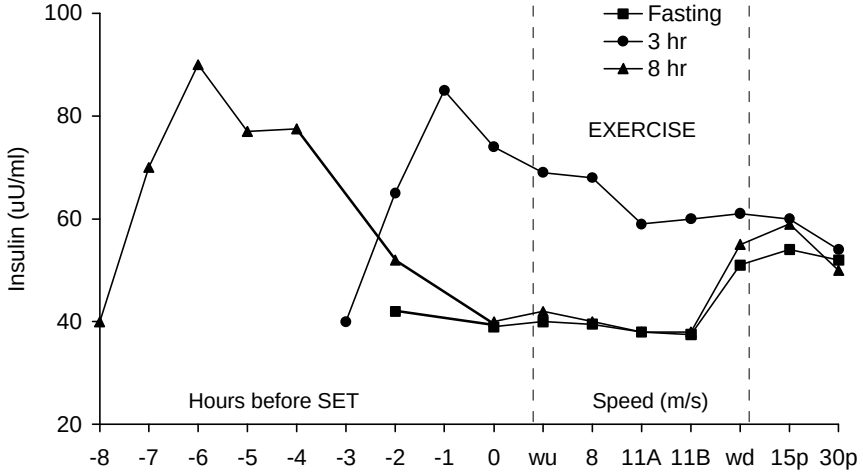

Figure 1. Effect of time of feeding on plasma (control and fat treatments combined)

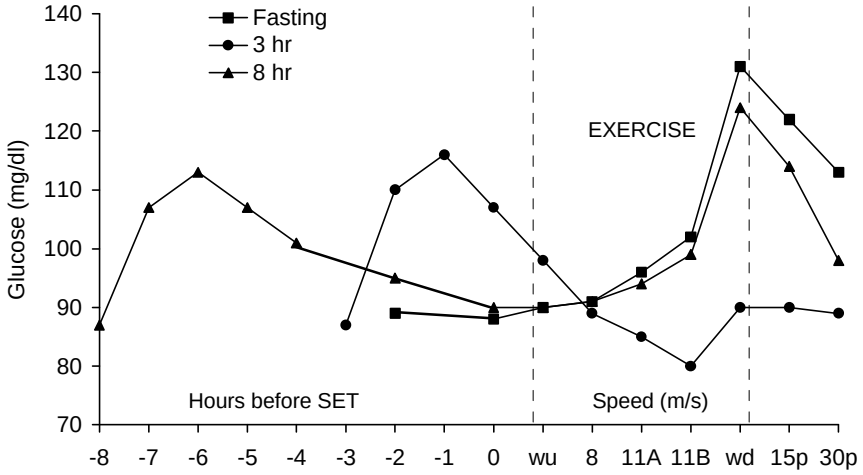

Figure 2. Effect of time of feeding on plasma glucose (control and fat treatments combined)

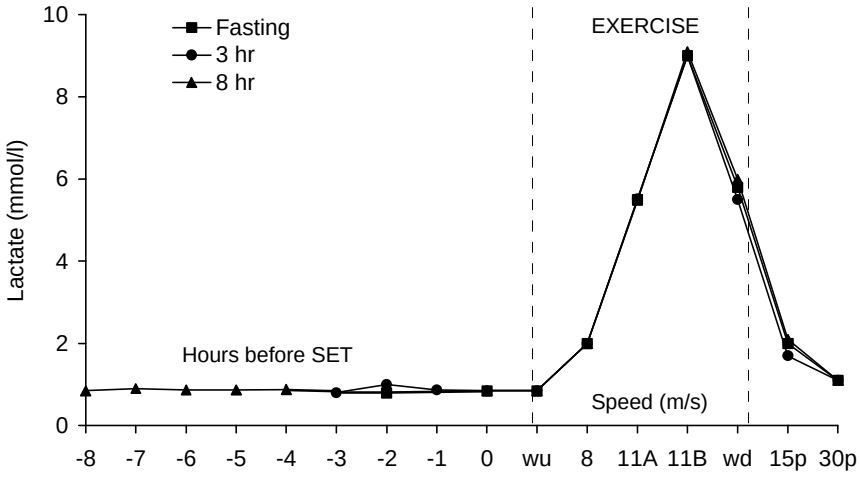

Figure 3. Effect of time of feeding on plasma lactate (control and fat treatments combined)

Time of feeding affected plasma glucose and insulin before, during and after exercise. Horses fed 3 hours before exercise experienced large drops in blood glucose during exercise. These drops were probably due to elevated insulin levels at the beginning of the SET. Fat supplementation did not affect blood glucose during exercise. However, glucose was higher in the FAT groups ($p<0.05$) 15 and 30 minutes post exercise.