



RESEARCH ■ REVIEW >

RESEARCH <

Weight Gain and Insulin Sensitivity in Horses: Does Calorie Source Matter?

A SUMMARY OF NUTRITION RESEARCH CONDUCTED AT THE PURINA ANIMAL NUTRITION CENTER, EXAMINING THE EFFECTS OF INTENTIONAL WEIGHT GAIN FROM PURINA® OMOLENE #200® AND ULTIUM® COMPETITION HORSE FEEDS.¹

< INTRODUCTION >

It has been suggested that feeding a higher sugar and starch diet to horses decreases insulin sensitivity during weight gain. But is a calorie just a calorie when it comes to weight gain or does the source of calories and physiological specifics about the horse matter? This experiment was designed to test the hypothesis that horses gaining weight from different caloric sources would differ in insulin sensitivity and other physiological parameters after weight gain. The effects of breed and previous exercise were also considered for their influence on the time required to gain weight and average daily weight gain.

< MATERIALS AND METHODS >

14 QH and TB geldings and mares (age 7 ± 2 yrs, initial BW 538 ± 36 kg; mean \pm SD) were randomly assigned to 1 of 2 dietary treatments for weight gain. Treatments groups were balanced for breed and previous exercise. Groups received either Purina® Omolene #200® or Ultium® Competition horse feeds (Table 1), along with 1% of their body weight in grass hay. Horses were provided 21.5 Mcal/day (21,500 calories) providing ~5000-6000 more calories than required by the National Research Council guidelines to maintain their body weight at rest. Prior to this study, the horses participated in a weight loss experiment and insulin sensitivity measurement periods in the present study were set at the end of weight loss (InsTest 1), after gaining to original BW (InsTest 2) and after horses gained 45 kg past their original BW (InsTest 3). All weight gains were within 2% of goal weight and testing occurred within 3 days of reaching the goal weight. Horses were weighed weekly with an electronic scale and time to gain weight (days) and ADG (kg/day) were also calculated. Insulin sensitivity was measured using a Frequently Sampled Intravenous Glucose Test, with data analyzed using MinMod Millenium software. Results including insulin sensitivity (SI), acute insulin response to glucose (AIRg), glucose effectiveness (Sg) and disposition index (DI) were analyzed with repeated measures ANOVA with horse as a random effect and period as the repeated effect. Differences in time to gain weight, ADG, and breed and exercise influences between treatment groups were determined using student's t-test. Significance was set at $P < 0.05$.

¹Gordon, M.E., M.L. Jerina, R.H. Raub, A. Finzel, M. Engel, and J. Lindemann. 2009. Weight gain and insulin sensitivity in horses fed different calorie sources. *Journal of Equine Veterinary Science* 29(5); 381-383.

< RESULTS >

There was no difference ($P > 0.05$) in the number of days required to reach original BW or gain an additional 45kg between dietary treatments, but there was a trend ($P = 0.09$) for horses on Ultium® to take longer to gain weight versus Omolene #200® (126.2 vs 111.6 mean days to reach original BW). Diet also did not influence ($P > 0.05$) ADG between the measurement periods (Table 2). Within the Ultium® group, if horses had not previously exercised, the amount of time required to gain weight was longer (254.3 ± 11.4 days) than horses who were exercised (216 ± 9.2 days \pm SE, $P = 0.0403$). When diets were grouped, there was no difference ($P = 0.3607$) between previous exercise and non-exercising horses. Breed influenced time to gain weight when diets were grouped, with Thoroughbred horses taking longer to gain weight over the total testing period (Figure 1). For insulin sensitivity testing, there were no changes in SI, DI, and Sg to note that were of physiologic significance (Figure 2). Weight gain itself within each treatment was related to increases in AIRg ($P < 0.05$), demonstrating that horses secrete more insulin in response to a glucose bolus, as they gain weight (Figure 3).

TABLE 1

CONCENTRATE FEEDS USED FOR WEIGHT GAIN

	OMOLENE #200®	ULTIUM®
CRUDE PROTEIN %	14	11.7
FAT %	6	12.4
CRUDE FIBER (MAX) %	6.5	18.5
STARCH %	37	13

TABLE 2

WEIGHT GAIN CHARACTERISTICS FOR HORSES EATING DIFFERENT FEEDS

	OMOLENE #200®	ULTIUM®	P VALUE
DAYS TO REACH ORIGINAL BW	111.6 \pm 8.5	126.2 \pm 1.3	0.092
DAYS TO REACH +45 KG	114.0 \pm 5.0	114.0 \pm 10.8	0.992
DAYS TO GAIN TOTAL WEIGHT	220.5 \pm 11.5	235.1 \pm 9.92	0.355
ADG (KG/D)	0.36 \pm 0.01	0.35 \pm 0.03	0.776

FIGURE 1

Thoroughbreds took longer to gain weight than Quarter Horses

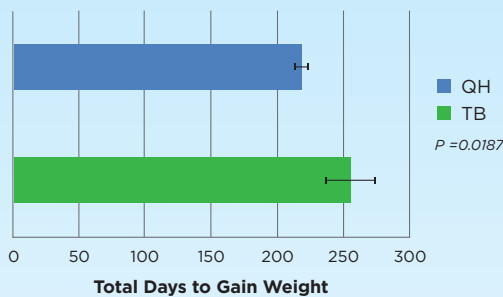


FIGURE 2

Insulin sensitivity (SI) in horses gaining weight on different feeds

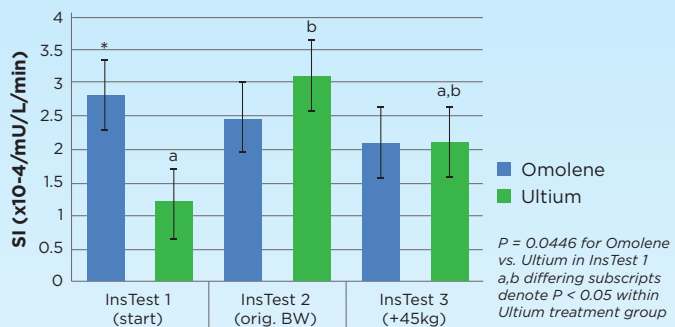
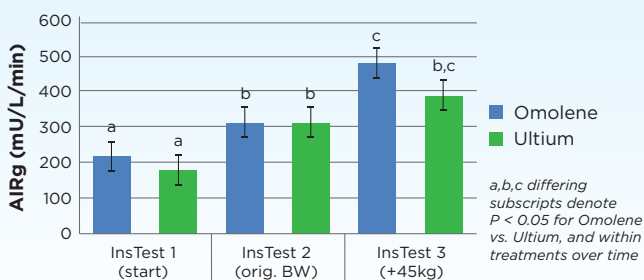


FIGURE 3

Acute Insulin Response to Glucose (AIRg) as horses gain weight on different feeds



< FOR MORE INFORMATION >

Please contact your local Purina representative if you would like more information about this study.

< IMPLICATIONS >

As horses gained weight, AIRg increased but was not different between Purina® Omolene #200® and Ultium® Competition horse feeds. Further, the horses' insulin sensitivity was unchanged, respective of diet. This suggests that horses were compensating for the insulin secretion since the insulin response was increasing, but this did not reflect in a decrease in insulin sensitivity. Perhaps there is a threshold level to cause alterations in insulin sensitivity due to diet, which was not reached in this study. Also, these horses were potentially not at a high weight for long enough to create a difference or the Omolene #200® diet was not high enough in starch and sugar to induce changes. In addition, previous weight loss and exercise may be protective in developing insulin resistance due to high calorie diets. Not surprisingly, Thoroughbred horses took longer to gain weight than Quarter Horses, but individual diet did not influence time to gain weight or ADG. In conclusion, although weight gain was related to an increase in AIRg, source of dietary calories used to gain weight did not influence insulin sensitivity in this study.