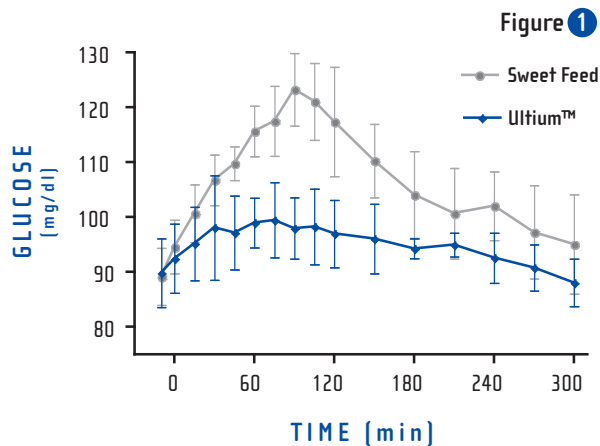


# RESEARCH ABSTRACT – ULTIUM™

A series of studies were performed to evaluate the metabolic effects of Ultium, a higher fat (min 12.4%) and fermentable fiber feed with low starch and sugar content (~15%), in comparison to a more traditional sweet feed (SWF) with lower fat and fiber and higher starch and sugar (~45%). The objective of the first experiment was to assess the glycemic and insulinemic responses after consumption of Ultium or SWF. In a balanced cross-over experiment, 6 mature horses were adapted to a diet of forage plus either Ultium or SWF. At the end of the 4-week adaptation period, horses were fed a meal of concentrate (2.5 lb) and blood samples for measurement of plasma glucose and insulin concentrations were collected before and at regular intervals for 6 hours after the meal. After a 3-week washout period, the dietary treatments were switched and the experimental protocol repeated. As expected, the glycemic and insulinemic responses were substantially lower in Ultium than in SWF. Specifically, mean peak plasma glucose and insulin concentrations were, respectively, 81% and 73% lower in Ultium than in SWF. Similar, mean areas under the plasma glucose and insulin vs. time curves were approximately 75% lower in Ultium than in SWF.

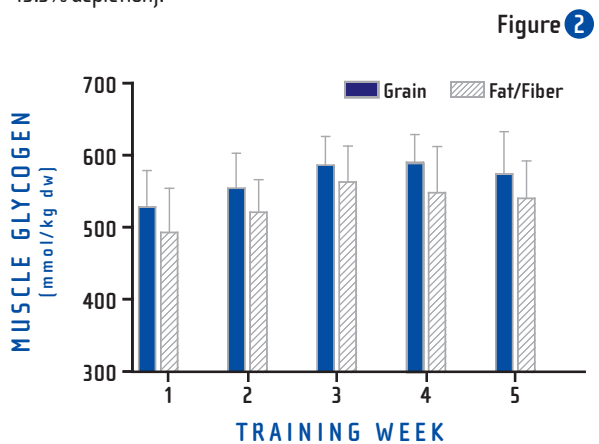


**Results:** Figure 1 shows the glycemic response in a group of 6 horses being fed Ultium vs typical sweet feed at a rate of 2.5lbs. There is a rise in blood glucose over a 300 minute period. Blood glucose peaked at about 2 hours post feeding for the sweet feed diet at about 125mg/dl. Whereas in the Ultium feeding the glucose response was greatly mitigated.

In a second experiment, the effects of diet on body condition and muscle glycogen metabolism were examined over a 3-month period. Fourteen mature (3-5 years) horses were randomly assigned to either the Ultium or SWF dietary treatments. In both treatments, forage was fed at 1.0% of bodyweight (bwt). The initial rate of concentrate feeding was 0.7% bwt, but was adjusted to maintain stable bodyweight and condition score which were evaluated weekly. For the final two-month period of the study horses undertook regular (4x/week) physical conditioning on a treadmill. Muscle biopsies were obtained before and after training for measurement of glycogen content. In SWF, an increase in concentrate feeding to approximately

1.0% bwt required during the training phase for maintenance of bodyweight. In contrast, horses fed Ultium maintained stable bodyweight and condition without a change in feeding rate. Despite the marked difference in the starch and sugar contents of the respective diets, muscle glycogen concentration was similar in the two dietary treatments during training (mean  $\pm$  SD; Ultium: 581  $\pm$  45 mmol glucose/kg dry muscle, SWF: 615  $\pm$  40 mmol/kg dm).

In the further study, the same diets were compared during more intensive training and exercise. Horses performed a combination of moderate (20 min of trot/canter) and high-intensity (4 x 1-min sprints) on 5 days/week over a 6-week period. Muscle biopsy samples were collected weekly for measurement of muscle glycogen concentrations. In the 6th week, horses completed an intensive treadmill exercise protocol (15 min canter followed by repeated sprints) to evaluate the net rate of muscle glycogen utilization. Muscle glycogen concentration tended to increase in both treatment groups during training, but did not differ between diets at any time point. The net rate of glycogen utilization during the exercise test was significantly higher in SWF (318 mmol glucosyl units/kg dry muscle; 56.9% depletion) when compared to Ultium (228 mmol/kg dry muscle; 43.3% depletion).



**Results:** Figure 2 shows muscle glycogen concentration at the end of each week during the training phase. In both diet treatments, muscle glycogen tended to be higher in weeks 3-5 when compared to week 1. Although mean glycogen concentration was slightly higher in Grain than in Fat/Fiber (Ultium) in each week, this difference was not statistically significant.

From these studies it can be concluded that, in comparison to a traditional concentrate rich in starch and sugar, the feeding of a concentrate with higher fat and fermentable fiber and lower soluble carbohydrate: 1) markedly reduces post-meal increases in blood glucose and insulin concentrations; 2) maintains bodyweight and condition at a lower feeding rate during athletic training; 3) supports muscle glycogen content despite a substantial decrease in starch and sugar intake; and 4) decreases the net rate of muscle glycogen utilization during strenuous exercise. These alterations in metabolic responses may be beneficial in the management of athletic horses.