## RESPONSES OF BLOOD GLUCOSE, LACTATE AND INSULIN IN HORSES FED EQUAL AMOUNTS OF GRAIN WITH OR WITHOUT ADDED SOYBEAN OIL

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When fat is substituted for carbohydrate isocalorically in a horse's ration, blood glucose and insulin response to feeding is reduced (Stull *et al.*, 1987, Pagan *et al.*,1994). These studies, however, haven't shown if this response is simply due to reduced glucose in the diet or if fat affects glycemic response in some other manner. Therefore, this experiment was designed to evaluate whether adding fat to a grain meal would affect glucose and insulin response to feeding when the level of grain intake remained the same.

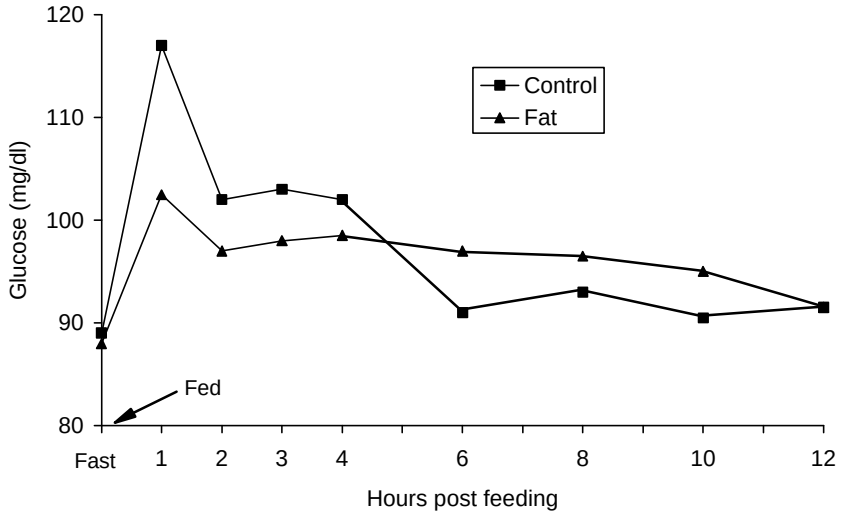


**Figure 1**. Blood glucose response to feeding a grain meal with and without added soyabean oil

Nine Thoroughbred horses were used in this two period switch-back design experiment. Five of the horses were in training and were physically fit and four were untrained. During period one, each horse was fed 2.27 kg of a grain mix (table 1) which consisted of 72% oats, 20% corn and 8% molasses at 7 AM. Five of the horses were also fed 200 ml (170 g) of soybean oil mixed into the grain. At 8 AM each horse was given 2.72 kg of mature bluegrass hay (table 1). Blood samples were

taken from each horse by jugular catheter before feeding and at 1, 2, 3, 4, 6, 8, 10, and 12 hours post feeding. Water was available to the horses at all times. The same procedure was followed two weeks later with the soybean oil added to the grain of the four horses that served as controls during period 1.

The blood samples were collected in sterile glass tubes containing EDTA and centrifuged immediately. The plasma was pipetted into glass tubes and frozen. The samples were analyzed for lactate, glucose and insulin at the conclusion of the study. Lactate was measured using an automated L-lactate analyzer (YSI, 1500 Sport). Glucose was measured using an automated glucose analyzer (YSI, 2300 STAT). Insulin was measured using a commercially available radioimmunoassay (RIA) kit which had been validated for specificity and accuracy in equine plasma (BET Labs, Lexington, Kentucky).

**Table 1.** NUTRIENT COMPOSITION OF EXPERIMENTAL FEEDS (DRY MATTER BASIS)

| *Nutrient* | *Grain Mix* | *Bluegrass Hay* | *Soybean Oil* |
|---|---|---|---|
| Dry matter (%) | 84.7 | 93.0 | 100.0 |
| Crude protein (%) | 11.1 | 6.5 | - |
| Acid detergent fiber (%) | 11.0 | 44.3 | - |
| Neutral detergent fiber (%) | 22.1 | 73.0 | - |
| Lignin (%) | 2.8 | 5.8 | - |
| Ether extract (%) | 5.8 | 1.8 | 100.0 |
| Soluble CHO (%)[1] | 57.7 | 12.7 | - |

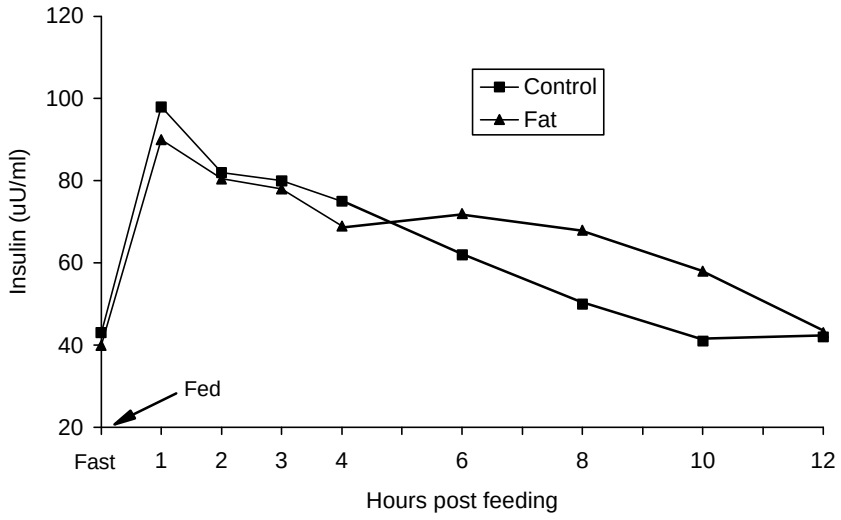


**Figure 2**. Insulin response to feeding a grain meal with and without added soyabean oil

Blood glucose was significantly lower ($p<0.05$) one hour after feeding (102.4 vs 117.2 mg/dl) when soybean oil was added to the diet (figure 1). Glucose remained lower ($p<0.10$) for 3 hours post feeding. After 6 and 10 hours, blood glucose was higher ($p<0.10$) in the fat supplemented group. Insulin was lower ($p<0.10$) in the fat supplemented group 1 hour after feeding (figure 2). After 8 and 10 hours, insulin was higher ($p<0.05$) in the fat supplemented group. Plasma L-lactate tended to be higher ($p=0.14$) in the control group 4 hours after feeding and higher in the fat supplemented group ($p=0.20$) 6 hours after feeding.

These data suggest that the addition of fat (soybean oil) to a grain meal will affect glucose and insulin response to feeding. These affects are independent of the amount of carbohydrate in the diet and may be due to differences in the rate of gastric emptying when fat is included in the diet.