

Insulin Resistance: Not Just for Old Cushing's Horses

By University of Kentucky College of Agriculture, Food, and Environment

Pituitary pars intermedia dysfunction (PPID), also known as equine Cushing's disease, is caused by a tumor formation on the pars intermedia of the pituitary gland and typically occurs in horses older than 15. Clinical signs of PPID include hirsutism, or a long, shaggy hair coat; laminitis; increased secondary infections; and insulin resistance.

PPID is commonly associated with insulin resistance, but research supporting this association is unclear. So researchers at the University of Kentucky's Department of Animal and Food Sciences recently looked further into the correlation between these two conditions.

Current and previous research has compared horses with PPID to healthy younger adult horses. Since it is known that insulin sensitivity decreases with age, the results of these studies may be invalid.

The University of Kentucky's (UK) study might have interesting implications for feed companies as well as anyone feeding a geriatric equine. Currently, feed companies are marketing feeds formulated for insulin-resistant horses toward horses with PPID, laminitis, and/or metabolic disorders. However, the results of this study suggest that healthy, normal-aged horses are just as likely to need these types of feed as the aged horse with PPID.

Overall, the study results show that insulin resistance might be a concern for all aged horses, not just horses affected by PPID. The study highlights the importance of treating each horse as an individual when it comes to assessing the horses' insulin sensitivity.

Kristine Urschel, PhD, assistant professor within UK's College of Agriculture, Food and Environment, noticed this discrepancy and decided to investigate it further.

"PPID is a problem that may affect as many as 20% of our horses over 20 years of age," she said. "For that reason, I felt it was important to look further into this disease, and I specifically wanted to look at whether these horses had lower insulin sensitivity because of PPID or simply because they were old.

Urschel contacted Amanda Adams, PhD, assistant research professor at UK's Gluck Equine Research Center. Adams has an established herd of more than 40 aged horses,

several of which she suspected had PPID. The researchers identified six horses affected by PPID based on conventional laboratory test results.

Then they carefully selected six control horses (of the same age and sex as the PPID horses) that did not test positive for PPID and showed no clinical signs of PPID.

“It was very important to us that the horses were age-matched, since that was the downfall of the previous studies,” Urschel explained. “Both the control and PPID horses in this study had an average age of about 25 years old.”

To quantify insulin sensitivity in these horses, the team used a technique called the euglycemic hyperinsulinemic clamp (EHC). The technique works by infusing insulin at a constant rate, and then adjusting the rate of glucose infusion to maintain the horse’s baseline plasma glucose concentrations. A higher rate of glucose infusion indicates a more insulin-sensitive horse, while a lower rate of glucose infusion indicates a less insulin-sensitive horse. Additionally, the researchers employed baseline plasma glucose and insulin values to calculate two proxies used to estimate insulin sensitivity and insulin secretory response in order to determine any differences between the two groups of aged horses.

The researchers found that insulin sensitivity did not differ between the PPID horses and age-matched controls. The assessment of insulin sensitivity using the EHC procedure found no difference in glucose infusion rates between the two groups during the last 30 minutes of the EHC procedure. The two proxies used to measure insulin sensitivity and insulin response also showed no differences between PPID and aged controls. The only difference the researchers found between the two groups was a trend for the PPID horses to have higher glucose concentrations during the EHC procedure.

The study results suggest that a decrease in insulin sensitivity might occur as a normal part of aging, but is not directly associated with PPID status.

“What this means is that as a horse ages, a decrease in insulin sensitivity is likely to occur,” Urschel said. “When we compared the results of this study to another one of our studies that used the exact same procedure to measure insulin sensitivity, we found that our old horses had a 75% decrease in insulin sensitivity compared to the horses around 8 years old.

“It seems our average aged horses may be just as much at risk for insulin resistance as our horses with PPID,” she added. “PPID is a multi-faceted and complex condition that needs more research to fully understand.”

The study, “Pituitary pars intermedia dysfunction does not affect various measures of insulin sensitivity in old horses,” was recently presented at Equine Science Society Symposium 2013, in Mescalero, N.M., and was awarded 3rd place in the Production and Management category of the Graduate Student Competition.

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