Osteochondritis Dissecans (OCD) in Thoroughbreds

Weanlings: A Field Study

by HEATHER SMITH THOMAS

Developmental Orthopedic Disease (DOD) includes physitis and Osteochondritis Dissecans (OCD), and is a common problem in young horses, resulting in injuries and unsoundnesses. Much research has been done in the past 20 years and studies are still ongoing. Some veterinarians in Kentucky, including Joe Pagan (Kentucky Equine Research, Versailles), participated in a field study to look at the relationship between glycemic response from feed and OCD in young horses, and Pagan gave a report on this study at the November 2001 AAEP Convention.

"Developmentally, orthopedic disease is a major problem in several breeds and, as a nutritionist, it is my number one concern when trying to design diets for young, growing horses. DOD is a term that encompasses several problems centered around diseases that affect the skeleton of growing horses. There is confusion about what actually causes DOD, since these are different types of problems. There are many factors that come into play. Genetics, nutrition and environment are important, and trauma may be a factor, also," says Pagan.

"The role of nutrition was first realized by horsemen in 1985 when a paper was published by researchers at Ohio State University, the result of a field study looking at the correlation of dietary mineral to incidence and severity of metabolic bone disease in Ohio and Kentucky (at that time, DOD was called metabolic bone disease). This survey showed there was a relationship between concentration of certain minerals in the growing horses' diets, and incidence of this problem," he says.

This got a lot of folks' attention, changing the way we looked at feeding young horses. It also made a difference in the way feeds were formulated. Almost all feed companies increased the mineral fortification in feeds for young horses—especially trace minerals copper and zinc. Pagan feels this decreased the incidence of certain types of DOD, such as physitis (inflammation of growing portions at the ends of long bones) and certain types of wobblers.

But the problem didn't go away, even though most horsemen followed the new dietary recommendations. "Typical types of OCD (splitting off of cartilage pieces into the joint) in stifle, hock and fetlock have not decreased in incidence. Mineral fortification is not the complete answer."

Pagan says that while the 1985 study was important, it was unfortunate that it focused everyone's attention so completely on mineral fortification while other areas of research were ignored. Another study looked at the effect of high carbohydrate intake on the incidence of OCD, and found that this caused some endocrine changes, particularly in insulin, thyroxin and growth hormone.

These changes, in genetically susceptible animals, seemed to cause OCD, perhaps due to upsets in endocrine balances, changing the way cartilage cells grow and mature. The problem could be exaggerated in genetically susceptible animals if there were also mineral deficiencies, the animals were obese, or received excessive exercise thus adding more stress to the cartilage.

"This work is continuing at the University of Cambridge, where studies have shown that fetal and foal chondrocytes (mature cartilage cells within the cartilage matrix) react to insulin. The researchers concluded that high levels of insulin in the blood could be a contributing factor to osteochondrosis," he says. "Recent work at Rutgers suggested that in Standardbreds, abnormally high glucose or insulin levels after eating may be a factor in the development of OCD. We wanted to see if this was also true in Thoroughbreds," said Pagan. They also wanted to see if foals predisposed to OCD could be identified by a simple glycemic response test.

"We studied six Thoroughbred farms in central Kentucky, with a total of 218 weanlings. These farms routinely weigh their horses, so we had monthly data on body weight, height and condition score. We performed a glycemic response test on these foals in December or January of the weanling year. Average age of the weanlings was 300 days of age and average body weight was 300 kilograms. We followed and recorded the incidence of OCD in these horses. We had a very strict definition of OCD for this study—we only looked at OCD that was treated surgically. So that was a very narrow definition, and we probably didn't record all of the incidence of OCD," says Pagan.

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HORSE CARE Continued

For the glycemic response test, they fed the foals in the morning, a single meal of their regular grain, at a level of intake equal to 1.4 grams of non-structural carbohydrate per kilo of body weight. The foals received their normal grain mix.

"We had initially hoped to feed every foal on all six farms the same grain mix, but we got inconsistent intake, so we decided to feed their normal grain—at the same level of non-structural carbohydrate intake. Meal sizes averaged about 963 grams—about a kilo of feed. We took a single blood sample two hours after the foals completely finished that meal," he said.

"We measured plasma glucose and insulin in this single blood sample, then we took the grains back to our research farm where we did a proper glycemic response test with four Thoroughbred geldings, taking blood samples every 15 minutes for four hours, after they had finished their meal." In comparing these with the foal's blood samples, they realized they missed the peak, and probably should have taken the samples at 90 minutes, rather than two hours.

"The farms used six different types of feeds. We assumed the glycemic response in all these feeds would be similar, but found later this was not true. There were four sweet feeds and two pelleted feeds. All had similar protein and vitamin profiles and met the requirements for young growing weanlings, and they all contained between 40 and 50 percent non-structural carbohydrate. They were typical foal feeds," says Pagan.

Incidence of surgical OCD in these groups was 11.5 percent or 25 of 218 foals. Four foals had lesions in the fetlocks, seven in the hocks, eight in the stifles, one in the shoulder, while five foals had multiple joints affected. Half of the lesions were diagnosed radiographically in January or February of the yearling year. None showed clinical signs of OCD. They were identified radigraphically and surgery was done at that point, to give them a chance to heal before sale time.

"That percent (11.5) is actually fairly close to the level we had recorded in an earlier study where we followed the incidence of DOD on a single Thoroughbred farm in Kentucky for a four year period. During that time there was a total of 271 foals on that farm, and they experienced about a 10 percent incidence," says Pagan.

The level of insulin in the OCD foals was significantly higher than the unaffected foals—130 versus 106. None of the foals that had the very low insulin response had OCD, and 23 percent of the foals that had above average insulin response had OCD. There was also a significantly higher glucose response—150 versus 134—in the OCD foals. Again, none of the foals that had the low glycemic response had OCD, and 26 percent of the foals that had the exaggerated glycemic response had OCD, Pagan observed.

"If we just looked at the weanlings within a farm and compared unaffected versus OCD foals, there was little difference in their glucose or insulin response, and that was disappointing. In other words, we couldn't tell which of the foals were going to develop OCD,

from their glycemic response. But what was interesting was the comparisions between farms. There were large differences in glucose response, insulin response and the incidence of OCD on these different farms," says Pagan.

"I think the reason we had such a wide difference in glucose response is explained by the studies we did on individual feeds, using our research horses. There was a lot of variation in the glycemic index on the different feeds. If we compared the glycemic index of the feeds measured at our farm, with the glucose response of the foals, there was a nice relationship."

A couple of farms were outside the averages. One farm had an unusually low incidence of OCD, while another had higher incidence. Part of this difference may have been related to the size of the weanlings on the two farms, says Pagan. Body weight and condition scores were quite different. There wasn't much difference in height of the foals, but there was great variation in body weight. The farm with no OCD had foals below the Kentucky average.

"We have a data base of about 700 foals that we compared them to. The foals that had OCD on one farm were 15 percent above the Kentucky average, in January. That equals 100 pounds of extra body weight, and they were the same height. The extra weight may have contributed to biomechanical wear and tear," says Pagan. Grain intake of heavier yearlings on that farm was actually quite similar to that of the yearlings on other farms—what was different was that the farm had a very aggressive pasture fertilization program and a low stocking rate. These horses had a lot of pasture and may have had a higher pasture feed intake.

Foals that had a really high glycemic response had high incidence of OCD while those that had a really low response had low incidence of OCD. "It seems that the glycemic index of the feed was a factor in the difference we saw between farms. Body weight and condition are also factors. Very large foals may be more susceptible to development of OCD. Based on the results of this study, it would be prudent to feed foals concentrates which produce lower glycemic responses," explains Pagan.

"At our research farm we've tried to develop diets with the same energy density but low glycemic responses. This year we're beginning a larger field trial, with the 2002 foal crop, using 16 farms. Half the farms will use traditional feeds, and half will use the low glycemic feeds," he says.

At this point it's hard to pinpoint feeds that might put young horses at risk. "The feed with the highest glycemic index in our study was a pelleted feed, not a sweet feed. We thought it would be sweet feeds. We know there are different glycemic indexes for different grains, and that processing affects glycemic index. For instance, steam flaking increases the glycemic index of a starch source. Oats has a higher index than corn. Grinding corn may increase its glycemic index slightly, by increasing its surface area. Flaking increases it even more, by cooking the starch and making it more available." Hopefully they will have more answers after this second study.