Spring of 2001 was marked by an epidemic of equine abortions that cost the industry and the region an estimated 14,000 foals of all breeds and economic losses estimated at over $336 million. This disease was ultimately termed Mare Reproductive Loss Syndrome (MRLS) and linked to less frequent diseases of the heart and eye. The industry, the region and the University of Kentucky responded to this crisis by mounting a broad-based investigation into the potential causes of the disease. The schematic below illustrates the progress of this investigation.

The initial investigation was coordinated through the Gluck Equine Research Center and pursued two tracks simultaneously. First, scientists eliminated a list of ‘usual suspects’, the agents that were known to cause abortions in central Kentucky. MRLS losses of 2001 did not have symptoms similar to other abortigenic diseases. The diagnostic signs of MRLS were changes in placental fluid echogenicity and the presence of bacteria normally found in the equine gut, in fetal fluids and tissues. Given that these symptoms were not found in other abortigenic diseases it was no surprise that the ‘usual suspects’ were quickly eliminated as potential causes. The second line of work led by Dr. Roberta Dwyer and Dr. David Powell required close cooperation with area horse farms and used an epidemiological approach. The objective of this line of work was to identify one or more factors in the environment or management of those farms that suffered most heavily from MRLS that differed from farms without losses. The survey associated the presence of Eastern Tent Caterpillars (ETC) with MRLS and was in agreement with earlier on-farm observations made by Dr. Jimmy Henning, Dr. Mike Collins and some farm managers.

Tent caterpillars can be found on horse farms every spring but their abundance varies from year to year. In 2001, caterpillars were very abundant and weather patterns probably synchronized their development and potential for impact.
Mare Reproductive Loss Syndrome -Continued from page 1

The idea that tent caterpillars might cause horse abortions raised more questions than it answered. Frankly, it was considered ludicrous by many inside and outside the University. Dr. McDowell and I set out to test the idea by exposing pregnant mares to tent caterpillars under conditions similar to those on horse farms. There is not sufficient space here to describe the studies completely; but it is enough to know that exposure to ETC not only caused foal loss; but we were able to advance exposure and losses in the study and thereby provide an early warning to the industry.

The field experiments raised important questions about the route of exposure. To test whether ingestion of tent caterpillars could induce foal losses and whether frozen insects could be stored, Dr. McDowell and I fed frozen insects to pregnant mares. A collaborative study with Drs. Michelle Leblanc and Bill Bernard delivered tent caterpillars via nasogastric gavage (tubing) and induced abortions. This result was confirmed in several studies of late term mares by a research team headed by Dr. Manu Sebastian. Dr. Mike Donahue has consistently observed that losses from the ‘tubing’ experiments do not have normal bacterial associates of MRLS suggesting that this experimental model may imperfectly reproduce MRLS.

Having shown that insect materials could be stored, we set out in 2003 to collect ample quantities and then do experiments to take the insects apart to localize and isolate the abortigenic factor. To do this we dissected thousands of caterpillars into 3 parts (gut, internal tissues and exoskeleton or ‘pelt’) and also tried to take the insect apart chemically by homogenizing and extracting either whole insects or insect parts. The main conclusions of these experiments were that only the ‘pelt’ causes abortions and disrupting the structure of the pelt reduces abortigenic activity. Simultaneously, a research team led by Drs. McDowell, Williams and Lindeman evaluated pregnant sows as an animal model. Not only did sows fed ETC in their diet abort with signs of MRLS, tissues collected from these animals had thousands of microscopic lesions throughout their digestive tracts while sows on normal diet had no lesions. At the center of every one of the lesions he examined, Dr. Williams observed a caterpillar ‘hair’ (setae) that had penetrated the lining of the digestive tract. A comparative study of a mare fed ETC showed that she had similar lesions.

Taken together, these studies have shown that tent caterpillars cause MRLS and that only the caterpillar ‘pelt’ is required to cause the disease. The accumulated information also suggests that the disease may be induced when caterpillar hairs penetrate the lining of the gut and intestine. We think that this penetration opens the door and allows bacteria to enter the bloodstream, circulate to other tissues and ultimately infect fetal tissues and cause MRLS. But, we have not yet shown experimentally that the lesions are involved in the disease process.

As researchers in the midst of this crisis, we were challenged to find ways to respond effectively and this required us to work outside our areas of expertise. Our combined response was rapid and effective as the University of Kentucky put into place recommendations to minimize exposure to tent caterpillars which reduced the impact of the disease in 2002 and 2003. It is likely that epidemics of MRLS will not recur because exposure to tent caterpillars will be reduced. However, treatments or cures for the MRLS require better understanding of the disease and more research. Our research effort has reached a crossroad; as we do not have funds required to sustain this research effort. We have a research team with hard-won expertise in MRLS and a strong track record. We have ideas and experiments that we want to pursue, but lack the wherewithal to function. In these circumstances, we are seeking support from the industry and other sources because we recognize that our progress will be slowed or unfinished without additional funding. Please contact Dr. John Lew (859-873-3333) of McCauley Brothers or Dr. Bruce Webb of the University of Kentucky (859-257-7415) for further information if you have questions or wish to support this work.

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The MRLS investigation has benefited greatly from the dedicated participation of other scientists and industry representatives that are too numerous to recognize in this brief summary. The MRLS research of Dr. Webb and coworkers has been sponsored by the USDA:ARS, the Kentucky Thoroughbred Association and the College of Agriculture at the University of Kentucky.
The Big Chill
Feeding Horses in the Winter
Amy Parker M.S.

When snowflakes begin to fall, special attention needs to be given to a horse’s diet. While a wooly hair coat does provide some protection against winter chill, the horse has to work harder and burn more calories to stay warm.

Acclimation and the comfort zone
The horse’s thermal “comfort zone” has been estimated to be approximately 30°F to 75°F. This range may depend upon the individual horse and the climate to which the horse is accustomed. Nevertheless, it does provide a general basis for determining when the horse may need assistance to keep warm. When temperatures are within this comfort zone, the horse is able to make behavioral and physiological changes to adapt to the ambient temperature (e.g., reduce activity, changes in hair coat, etc.). Below the comfort zone, the horse needs extra dietary energy to help maintain weight and optimal health. The addition of precipitation (rain, sleet, snow) and/or wind raises the lowest temperature of the comfort zone, which further increases the need for supplemental energy. Compared to horses in good body condition that are adapted to winter weather, the lowest comfort temperature will also be elevated for young horses, horses in poor body condition and horses with a thin hair coat.

Fuel for warmth
To stay warm in cold temperatures, the horse has to burn energy, which can come from stored sources (e.g., glycogen, body fat, etc.) or from the diet. Horses in good body condition have some body fat stores to burn for energy; but thin horses have little to no body fat stores from which to draw. In cold weather, fat reserves can be rapidly depleted and need to be constantly replenished. Therefore, supplying energy in the diet is essential to avoid weight loss.

While most nutrient requirements will remain unchanged or increase only slightly in the winter, the digestible energy (DE) requirement will increase significantly. On average, a horse requires 1.4% (0.23 Mcal/lb) more DE for every 1°F drop in temperature. Therefore, if the lower end of the comfort zone is 30°F, then a 10°F drop in ambient temperature would mean an average size horse (1,100 pounds) at maintenance would require 14% more DE. Generally, this means the horse has to increase intake (either grain or forage) to satisfy the energy requirement; however, some horses are unable or unwilling to eat more (horse is at maximum intake). In such cases, increasing the caloric-dense feedstuffs in the diet (e.g., grain, oil) and feeding excellent quality hay is necessary. However, caution should be taken not to overfeed grain and/or reduce hay so as to put the horse at risk for digestive upset.

Example of Caloric Intake Calculations (dry matter basis)
On average, an 1,100 pound maintenance horse requires 16.4 Mcal of DE per day and will consume ~16 to 22 pounds per day of hay and grain (1.5 to 2% of body weight). If the total consumption is 22 lb/day, then:
- 22 lb of hay @ 0.77 Mcal of DE/lb = 16.9 Mcal of DE (average consumption within comfort zone)
- Assuming there is a 10°F drop in temperature, then 2.3 Mcal/day more DE is needed (0.23 Mcal * 10).

- If the horse can increase intake, then 1.3 lb of oats/day needs to be added to the diet to meet the energy requirement.
  
- (22 lb hay @ 0.77 Mcal/lb) + (1.3 lb oats @ 1.45 Mcal/lb) = 16.9 Mcal + 1.9 Mcal = 18.8 Mcal/day
- If the horse is unable or unwilling to increase intake, then 5 lb of oats/day is needed to replace 5 lb of hay to meet the energy requirement.
  
- (17 lb. hay @ 0.77 Mcal/lb.) + (3.9 lb. oats @ 1.45 Mcal/lb) = 13.1 Mcal + 6.5 Mcal = 18.8 Mcal/day

Feeding overweight horses
Winter provides an excellent opportunity for overweight horses to shed a few unnecessary pounds by burning body fat (stored energy). Overweight horses do not need feed (grain); but fiber, vitamins and minerals are still important. Feeding a comprehensive vitamin and mineral supplement with hay will ensure adequate nutrient intake. Relatively mature grass hay (e.g., bluegrass, timothy, orchardgrass) will provide the necessary fiber, but will have lower digestible energy content, so as not to promote weight gain for overweight horses.

Feeding aged and under-conditioned horses
Horses in poor body condition have limited body fat stores from which to draw. Many aged horses may fall into this category. Feeding grain mixes processed and formulated to be more digestible and providing excellent quality forage can help these horses to improve and maintain a desirable body condition. Unfortunately, many under-conditioned and aged horses are unable or unwilling to consume enough feed to maintain a healthy weight. Adding fat (vegetable oil) to the diet is an easy way to increase the caloric value while not increasing the bulk of the diet.

The forgotten nutrient
Finally, the most commonly ignored and yet most important nutrient for horses is water. Dehydration is commonly thought of when the ambient temperature is hot; however, dehydration is not uncommon in the winter. Providing water throughout the day (in pastures and stalls) and particularly at feeding time, is imperative. At every feeding, waterers and buckets should be checked for freezing. (continued →)
Contrary to popular belief, horses cannot meet their water requirement by eating snow. When possible, water should be kept above 45°F. Drinking water below this temperature requires extra energy to warm the horse’s body. Cold water and snow will cool the horse internally; and the horse has to use extra energy to stay warm. Inadequate water intake may result in dehydration and may increase the risk for impaction colic. While this is a concern for all horses, aged horses need special attention. As a horse ages, its teeth become more sensitive to cold. As a result, older horses may not drink an adequate amount if the water is too cold.

**Summary**

Regardless of the time of year, the ultimate goal is to achieve a healthy body condition while meeting all nutrient requirements, including water, for any horse. The following is a general checklist when feeding horses in the winter.

- Is the horse acclimated to the climate?
- How is the horse’s body condition: poor, good or heavy?
- Can the horse adequately consume hay, feed and water? Does it need a specialized diet?
- Is water available and at an appropriate or comfortable temperature?
- Does the diet need to be altered for the horse to maintain a healthy body weight and condition?

**To: McCauley Bros.**

**From: Nancy & Dan Bowling**

McCauley’s would like to share the Christmas card we received from our customers, Nancy & Dan Bowling:  

**Seasons Greetings**

Dear McCauley Brothers,

Merry Christmas to each and every one of you. Thank you for your excellent feeds and service.

Last year I lost my beloved Standardbred, MacArthur, after 33 years (26 years with me). His life was definitely prolonged by your Original cube feed. I had tried every other “senior feed” on the market with no success. So thanks for giving me a few extra years with him!

Nancy and Dan Bowling

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**Not Just Horses**

For 20 years, John Conway has been supplying asphalt coating for the black plank fences that surround some of the world’s most prestigious horse farms. His company, C & C Paint & Supply has been in business in central Kentucky since 1983. He attributes his long term success to his company motto, *Stubborn on Quality*.

John’s company motto is a reflection of his family heritage. The Conway family has been breeding mules for 3 generations. Most people think mules are stubborn and hard to train; but John’s experience is just the opposite. His opinion is that mules are actually smarter than horses. They just refuse to do anything that might get them hurt. However, some mules can be difficult. If you get a bad one, don’t try to change its attitude, sell it. John’s advice for buying a mule is to remember the saying, “Most owners won’t sell a good mule.”

John, his wife Debra, and their children ride and drive mules. One mule, Chocolate Bell is the family favorite. Chocolate Bell was born on June 1, 1997. She got her name because they put a bell on Chocolate’s halter so her mother, who was nearly blind, would know where she was.

Shortly after she was born, Chocolate Bell and her mother, Powder moved to the Kentucky Horse Park for the summer. There they participated in the parade of breeds. Everyone loved Chocolate Bell! However, a lot of time was spent explaining why the mule baby was in the stall with a mare, and that in order to have a mule you must have a male donkey and a female horse.

Chocolate Bell is 6 years old now and is in great condition eating one pound of McCauley’s M30 per day. She has been fed only McCauley’s M30, hay and pasture since she was weaned. Like Chocolate Bell most mules only need pasture and a supplement like M30 to cover there protein, vitamins and mineral requirements.

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**McCauley’s is Proud to Announce “Alam” was named in the Top Products Of The Year by The Horse Journal**

(see insert)

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