

EQUINEWS[®]

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The Business of Nurse Mares

Biotin Basics

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Kentucky Equine Research Congratulates Team Member Champions

Top event rider John Williams has been named 2002 Overall Horseman of the Year and Eventing Horseman of the Year, and David O'Connor's mount Giltedge was chosen as 2002 Overall Horse of the Year and Eventing Horse of the Year. These honours were bestowed by The Chronicle of the Horse, the official publication of ten equine organizations including the United States Equestrian Team and the United States Dressage Federation. Both Williams and O'Connor count on KER Team Member Pennfield Feeds to keep their equine partners in peak condition.

Williams rode his Thoroughbred-cross gelding Carrick to a second-place finish at the Rolex Kentucky Three-Day Event (CCI****) last spring. Williams and Carrick also captured fourth place individually and helped the American team earn a gold medal at the World Equestrian Games in September. On a second horse, Sloopy, Williams completed the MBNA Foxhall Three-Day Event in sixth position, and he and still another gelding, Hazmat, claimed a ninth place ribbon at the Fair Hill Three-Day Event. Pennfield Feeds supplies KER-formulated feed and supplements to the Virginia-based Williams stable. Perennial eventing champion David O'Connor also uses products from Pennfield Feeds to provide superior nutrition to Giltedge and the other horses in his care. Giltedge, a gelding owned by Jacqueline Mars, has consistently turned in superior performances over many years of competition. At the World Equestrian Games last fall, Giltedge and O'Connor finished tenth individually and helped the U.S. team earn the gold medal.

Thoroughbred racing is becoming popular in India and KER has worked with a number of Indian breeders to devise suitable feeding programs that allow for optimum growth under harsh climatic conditions. Nanoli Stud at Pune uses a number of KER supplements and a KER-designed feeding program, and it has had outstanding success in recent months by breeding and racing the winners of several major races. Aldeburgh won the Indian 2000 Guineas, Noble Eagle won the Indian Derby and Zurbaran won the most prestigious event, the Indian Turf Invitation Cup, after finishing second in the Derby. More recently, Zurbaran, Spaniards Inn and Noble Eagle finished first, third and sixth, respectively, in The McDowell Indian St. Leger. In addition to these Grade 1 wins, the farm has also won a number of Grade 2 and 3 races with its youngsters. In total, the farm has bred eight stakes winners this season.

David Hayes has created history in Hong Kong by winning the HK\$14 million Hong Kong Derby (Grade

1) with the mare Elegant Fashion, only the second filly to win the race. The Hayes stable relies on Stablemaster Furlong produced by Team Member Ridley AgriProducts and several Equivit supplements. In 2002, under the care of Tony McEvoy at Lindsay Park, Elegant Fashion won the Group 2 Fillies Treble in Melbourne before running second in the Oaks in Sydney.

Elegant Fashion was bred by long-term KER client Emirates Park Stud at Murrurundi in the Upper Hunter Valley. That farm has had outstanding success in the last few years and the farm's two-year-olds are flying this year. Secret Land, Winestock and Dress Code are three Emirates Park-bred horses that have won rich two-year-old races this season. Emirates Park relies on KER nutritional advice and a host of feeds, supplements, and pellets produced by Team Member Ridley AgriProducts. The results speak for themselves!

Clarendon Standardbreds is an up-and-coming stud in South Australia whose associates believe that much of its success in the past couple of years can be attributed to proper nutrition. Not only has this stud made a huge impact at recent yearling sales for the relatively small number of horses which it presents each year, but a high percentage of these yearlings have gone on to prove themselves as quality racehorses. Of the six yearlings Clarendon prepared for the 2002 Adelaide yearling sales, four successfully qualified for the final field of twelve for this year's Graduate Pace, South Australia's richest two-year-old harness race. Of these four Clarendon-bred horses, Miss Holland and Louise Dream finished first and second respectively. Of the four yearlings presented by Clarendon at the this year's sales, the group won numerous distinctions including grand champion filly, reserve champion filly, highly recommended filly and reserve champion colt. Eighty-one horses were presented for inspection on that day.

Clarendon Standardbreds has achieved much of this success by using KER Team Member feeds. The broodmares are given a ration consisting of Ridley AgriProduct's Breed'N'Grow and Harbison's Balancer Pellet, a pellet formulated by KER and manufactured by Ridley AgriProducts. The sales yearlings are given this same base formulation but are also supplemented with Bio-Bloom. Clarendon Standardbreds has proven that correct feeding can lead to sound and successful horses, from the sales ring to the racetrack!

For these outstanding accomplishments, Kentucky Equine Research offers sincere congratulations to its Team Members and the horsemen they serve. ○○

Fueling Champions Across the Globe

Kentucky Equine Research proudly congratulates Pennfield Feeds for being the feed supplier to John Williams and David O'Connor. Williams was named Horseman of the Year and O'Connor's mount Giltedge was named Horse of the Year by *The Chronicle of the Horse* for 2002.



Photo by Charles Bishop



Photo by Shawn Hamilton



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BIOTIN BASICS

Biotin has become commonplace in feed rooms across the world because of its reputation as an effective hoof supplement. And while this is true, some horsemen believe it to be a man-made and mystical creation. Nothing could be further from the truth. Like the more familiar niacin, riboflavin, and thiamin, biotin is a B-vitamin. Biotin is similar to other B-vitamins in that it is essential in the conversion of feedstuffs to energy so horses can grow, work, and reproduce. Biotin is found in virtually every cell in the body and is an essential coenzyme in carbohydrate, fat, and protein metabolism. This B-vitamin is also important for normal thyroid and adrenal gland function, reproductive tract health, nervous system stability, and most dramatically, growth and repair of skin and hooves.

Biotin occurs naturally in many feedstuffs commonly fed to horses such as oats, soybean meal, alfalfa, rice bran, and molasses. However, horses derive most of their biotin requirement from the fermentation of forages by the microbial population in the hindgut. Interestingly enough, speculation surrounds exactly how much of the biotin produced in the lower portion of the digestive tract can be absorbed, as the hindgut is typically an inefficient zone for nutrient uptake. In fact, only water seems to be absorbed well from the hindgut. Further, any factor that interferes with normal functioning of the microbial environment would affect biotin synthesis, resulting in less biotin availability. Biotin presented in the diet may have a better chance of being absorbed as it passes through the upper portion of the digestive tract, where the majority of vitamin and mineral absorption occurs. For this reason, commercially produced biotin and other B-vitamins are often added to high-quality horse feeds. The amount typically found in feeds and produced by microbial fermentation is enough to prevent any outright biotin deficiency.

Researchers found normal blood levels of biotin in horses with poor-quality hoof horn, so unhealthy hooves are not a result of deficiency. Despite normal blood levels, horses responded to megadoses of biotin given orally, which led scientists to believe that this is one of the few nutrients where more may actually be better. Biotin intake in fortified feeds is typically less than 2 mg per day when feeds are given at recommended amounts. Hoof supplements, on the other hand, offer 5 to 25 mg of biotin per day.

Research focusing on biotin as a means of improving hoof quality of the horse started in the mid-1980s. Over the intervening years, various studies have found a statistically significant improvement from biotin supplementation on overall hoof condition with more than 15mg per day. Normal blood values of biotin average around 350 ng/l, but within 24 hours of feeding large doses of biotin, blood levels were greatly increased to more than 1000 ng/l. Biotin only improves the growth of new hoof horn, not existing hoof. Because of this, the results of biotin supplementation took eight to 15 months to be evident, depending on the growth rate of the hoof. This is the length of time necessary for the hoof wall to completely grow out and replace itself.

Photo by Catherine Bishop



Photo: Brock Dobbin



Throughout some studies, differences were noted in hoof growth rates among numerous breeds as well as individuals, and several factors were thought to cause contrasts in growth. Colder environmental temperatures slowed growth, as did high body temperatures. Other conditions accelerated growth. For instance, the additional concussion experienced by the hooves of horses in regular work may increase the growth rate. In other studies, biotin supplementation did not change growth rate, but the quality of the hoof improved. Hoof quality was determined by measuring hardness, integrity, conformation, and tensile strength (the ability of the hoof to withstand pressure from spreading). One study found growth rates and hardness were greater when horses were dosed with 15 mg per day than with 7.5 mg per day. Intermittent feeding of biotin did not result in rings on the hooves, but if biotin supplementation ceased altogether the hooves regressed to their former state. If the dose was decreased below recommended levels, there was deterioration of hoof quality but not complete reversion to the state observed before biotin supplementation began.

Researchers are unsure how biotin helps the hoof, but the actual improvement seen from doses of 20 mg per day has been documented by electron microscope examination. The hoof horn is made up of keratinized cells arranged spirally to form long tubules that run from the coronary band to the end of the toe. As the cells thicken around the tubules, the hoof horn becomes more resilient to damage.

Many horsemen that regularly feed hoof supplements may have noticed a significant jump in price during the last year and occasionally some difficulty in obtaining a biotin product. Biotin manufacturers were scrambling to meet an increased demand for the product generated by recent research that indicated improved beef and dairy cattle yields with supplementation. At the same time, one of the largest biotin producers lost its production plant to fire. Prior to these events prices had been so low that many plants had decreased production. Increased demand thus came at a time of low production. Faced with all of these problems, the world market availability was minimal, which resulted in price increases. Biotin is an imported product and supplement producers were hit with incredible trouble in purchasing biotin, obviously victims to market fluctuations. With the addition of new companies in the marketplace and an increase in biotin output by older manufacturers, the price of biotin in the world market is easing. As a result, hoof supplement prices should soon stabilize.

Biotin has always been one of the most expensive as well as the most effective vitamin supplements.

In order to achieve maximal improvement in hoof health, a horse should consume 15 mg of biotin per day. If improvement has been seen within eight to 15 months,

Bio-Bloom

More Than Just Biotin

First and foremost, Bio-Bloom contains 15 mg of biotin per serving, the amount proven by researchers to significantly improve hoof growth and quality. What separates Bio-Bloom from other supplements designed to improve hoof quality, however, is the inclusion of other ingredients including methionine and zinc. These ingredients are thought to positively influence the formation and strength of keratin, the protein that composes most of the hoof wall.

Methionine is an essential amino acid. Horses are unable to synthesize methionine in their bodies, so it must be fed to them in appropriate quantities. Methionine is important to body chemistry in countless ways, including the production of hoof horn. Sulfur-bearing amino acids like methionine are largely responsible for the cross-linking of keratin, which accounts for hoof wall sturdiness and resilience.

Another nutrient included in Bio-Bloom is zinc. Zinc is a trace mineral integral in the health of hair, skin, and hooves and it may be deficient in the diets of some horses. While the nutrient is present in hays and grains, levels may be too low to satisfy daily requirements. Horses with poor quality hoof horn have been shown to have low zinc levels in the blood and hoof. If zinc deficiency is in fact having a negative impact on hoof quality, the use of Bio-Bloom will boost levels of the trace mineral in the diet and the quality of hoof horn.

The recommended daily serving of Bio-Bloom also has an astonishing effect on coat condition. This is partly due to the inclusion of full-fat soybean meal and lecithin, a rich source of fatty acids, elements linked to elastic skin and glossy hair coats.

Bio-Bloom offers more than most hoof supplements. With Biotin, methionine and chelated zinc, Bio-Bloom is the hoof supplement of choice for improving strength and integrity of hoof tissue.



the horse will need to remain on biotin the rest of its useful life to maintain that improvement. Cutting the dose is not advisable because it may affect the results.

Other nutrients such as zinc, methionine, and iodine also affect hoof quality. A formulated hoof supplement will contain all of these nutrients in addition to the 15 mg per serving of biotin. These combination products are more effective than straight biotin. ○○

OF

Realising Potential

KENTUCKY EQUINE RESEARCH
TEAM MEMBER
Formulated In Association With KES



Mark Llewellyn



Julie Wilson



Charles Bishop



Julie Wilson

Optimal nutrition is essential to build the sound conformation that will allow your Sporthorse to realise its full potential.

KER can provide nutrition advice and tailor feeding programs to supply balanced levels of energy, protein, vitamins and minerals for all stages of your Sporthorse's life - from breeding and growing right through to retirement.



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spend my professional life writing about horse nutrition or some aspect thereof. General interest articles, brochures, feed tags, feed bags: if it can benefit a feed manufacturer, I've probably written it. Oftentimes I do not have a personal interest in the matter. I've never fed rice bran, for instance, but I can tell you its benefits. I've never owned a horse with exertional rhabdomyolysis, but I am able to offer up some nutritional tips that may prevent a horse from tying-up. Every now and then I delve into a topic I know little about at the onset, but after hours of Internet and library research and the occasional interview, I manage to put together what I hope to be an informative piece. But simply spewing facts and instructions for horse owners is nothing like experiencing firsthand the awkward and sometimes terrifying moments of horse ownership. So, I offer this simple story about me, Mark Llewellyn, and my mare Skean.

Skean, a chestnut with an elongated star and two white socks, is my 20-year-old Thoroughbred. Though she was not a standout on the racetrack or the dam of a stakes winner, her sturdy, correct conformation and amiable disposition would lend itself well to my appendix Quarter Horse breeding program.

While Skean was a veteran broodmare by the time she entered my life, I had only bred her one other time. On that occasion, in 2001, I sent her to a reputable breeding farm to foal, and unfortunately that pregnancy ended in a profound dystocia and a dead foal. I decided not to breed her in 2001, allowing her time instead to recover from the trauma of the difficult birth. In 2002, I bred her to an athletic, structurally correct Quarter Horse stallion with the hope of producing a show hunter for myself.

By March 26, the old chestnut mare was overdue, three weeks overdue in fact. Because of my complete lack of knowledge in the mysterious and sometimes nebulous field of equine reproduction, I had dutifully shipped the mare to more capable hands a month prior to her projected foaling date, originally pegged to be March 7. And when I say capable hands, I mean extraordinarily qualified. Those hands belong to two friends, one who spent years as a technician in the intensive care unit at a well-known equine hospital and one who is a respected veterinarian whose practice essentially revolves around hundreds of Thoroughbred broodmares. Needless to say, experience was on my side, even if it wasn't my own.

The habits of parturient mares are as individual as the markings, whorls of hair, and chestnuts they possess. If ever there was a mare that could turn on and off the behaviors labeled by textbooks as "imminent signs of foaling," it was Skean.

Welcome Shout—

It's about time!



Photo by Mark Llewellyn

As Skean's foaling date approached, she was tucked away nightly in her spacious straw-bedded stall. Her udder began to distend, increasing ever-so-slightly, on a daily basis. The anticipated foaling date came and went without nary a sign of a little one. Almost two weeks after her due date, a watershed moment occurred on the morning of March 20; Skean had waxed the previous night. Prior to foaling, mares develop a wax-like substance on the end of each teat. The honey-colored droplets are historically a surefire sign of looming birth. Now, I thought to myself, we were getting somewhere.

Beginning that evening I began camping out in a loft that overlooked Skean's stall. Camping out is a bit of an exaggeration. The heated loft was actually full of amenities including a cushy bed, television, and most importantly, an observation window. A bathroom, complete with shower, was only a few footsteps away. And to be perfectly candid, it's not as though I spent every moment of every night from this moment on with eyes affixed on Skean. My friends own a Breeder Alert system. This monitoring device was designed based on the fact that most mares lie on their sides prior to and during foaling. When foaling is thought to be near, the mare is outfitted with a transmitter that is attached to the underside of her halter. If and when the mare lies flat out, as if to foal, the transmitter sends a signal to a repeater, which in turn sends another signal to a pocket-sized pager. Although false alarms occasionally occur, the system does allow for some shut-eye in the wee hours. Every foal watch attendant should have it so lucky!

By the next morning, however, Skean was no longer waxed up. The vigil continued through March 25 with little changing except for the size of her bag, which seemed to be extending a bit more each day. On this morning, the attend-

ing veterinarian decided to palpate Skean to ascertain the position of the foal. Fortunately, he found the foal in a relatively normal position. While the head rested between the forelegs as in a normal presentation, the body was a bit skewed to one side. This slight malposition could easily be corrected by the mare during labor, and I was told this was not a major concern.

To further soothe my anxiety, a second veterinarian arrived later in the day to perform transabdominal ultrasonography, a diagnostic technique frequently performed on mares experiencing unusually long gestation periods. Assessment of fetal well-being is determined through measurement of heart rate, thickness of the fetal membranes, and quality and quantity of allantoic and amniotic fluids. While the veterinarian found a healthy heart beat of 70 beats per minute and normal fluids, he did note some thickening and premature separation of the placenta. Because of the mare's age and the number of full-term pregnancies she has endured over the years (at least ten that I know of), he did not consider this finding too worrisome.

Skean remained busy throughout the morning of March 25. My friend kept a tally of the number of times she laid down and her best estimate was 19. From all outward appearances, the mare was obviously becoming more and more uncomfortable. As morning turned to midday, Skean returned to grazing casually with her pasturemate. The vigil on the evening of March 25 offered only one false alarm and the mare was up before I could make my way from the bed to the observation window.

By the morning of March 26, however, Skean was producing plenty of milk, so much so that it streamed from her teats all morning long and coated her hind legs. In typical fashion, however, the stream ebbed and Skean went about her day in her usual lackadaisical way, grazing nonchalantly as if nothing out of the ordinary was about to happen. Although I should have been encouraged by this latest development, I wasn't. It had been five days since Skean first waxed and she had spent the previous day in obvious discomfort. I was convinced that this release of milk was yet another trick Skean plucked from her arsenal to frustrate me. In fact, I was sure she would never, ever have this foal!

I arrived at my foal-watch station on the evening of March 26 at about 9:45 p.m. By this time, Skean had completely finished her evening meal and was circling the perimeter of her stall. There was nothing frantic in her movements, only a general sense of unease. I watched patiently for about 20 minutes. Because I was fairly sure the moment I had been waiting so impatiently for had finally arrived, I immediately called my friend to the scene. She sneaked into the barn quietly and watched Skean intently.

In what seemed like a moment of complete resignation, the mare found the center of the stall and dropped heavily onto the straw. My friend slipped into the stall, wrapped her



Measuring Shout

Shout had his first encounter with a portable equine scale six days after he was born. With his dam overseeing the goings-on, Shout finally consented to standing quietly on the scale. He weighed in at 66kg. According to data compiled by Kentucky Equine Research over the last twelve years, Shout weighs only slightly more than 64kg, the average weight of colts born in Kentucky during March at six days of age.

Kentucky Equine Research developed Gro-Trac in 2002 to monitor the height and weight of foals. By ensuring steady growth with Gro-Trac, foals often dodge orthopedic problems that are brought about by accelerated growth.

Check the next issue of Equineews to see how Shout's growth is stacking up against other foals!



tail quickly, and felt inside the mare to be sure the foal was in the correct position. She looked up at me with a distraught expression and instructed me to get her husband, the veterinarian, out of bed...NOW. I bolted to the house and awoke him. He made it to the barn within a minute or so and calmly, methodically assessed the situation. The foal, he said, was flipped on its back. After ten minutes of trying, unsuccessfully, to reposition the foal, he asked me to ready the truck and trailer for an emergency departure.

Within minutes, the mare was loaded and we were on our way to Hagyard-Davidson-McGee Veterinary Clinic, located just outside of Lexington. A quick glance at the clock in the truck revealed it was nearly 10:30 p.m. The on-call veterinarian, Dr. Paul Thorpe, had been notified and would be waiting for our arrival. During the ride to the veterinary clinic, all I could imagine was losing yet another foal. You see, my track record to this point was not encouraging. I've managed only one live foal from three pregnancies with three different broodmares.

Twenty minutes after leaving the farm, we unloaded the mare and led her quickly into the hospital stall. Dr. Thorpe wasted little time in sizing up the situation. After commenting that the foal was quite large, he looped chains around the foal's front fetlocks and, with the assistance of another veterinarian, began pulling. Progress was slow in the beginning, but then I heard Dr. Thorpe utter, in almost a whisper, the most promising words of the evening, "I think this one's alive."

As is always the case in times of uncertainty, minutes seemed like hours. I remember looking at the clock and thinking to myself, This is taking so long-too long," but, of course, what did I know about dystocias? The white-faced wall clock read 11:07 p.m. Just a few minutes after thinking this, however, I heard Skean heave, and with that effort, a chestnut colt made a sudden and slippery entrance into this world.

Skean, completely exhausted, lay motionless on the floor, breathing deeply. Milk once again flowed from her udder. Meanwhile, the veterinarians resuscitated the foal and gave him a thorough once-over, declaring him healthy except for a few fractured ribs. Skean gently rolled onto her chest, folded her legs underneath her, and offered the softest, most endearing nicker any mare could possibly bestow.

Approximately ten minutes later Skean rose, and the veterinarians suggested we take her and her colt, now christened Shout, to a warm stall where he would be better able to get his footing to stand, or at least try to!

In his stall, Shout made several attempts to stand before Dr. Thorpe arrived on the scene once again. He gave Shout a healthy dose of colostrum through a nasogastric tube, reassurance that he received sufficient antibodies. I am not sure if the colostrum energized Shout, but within minutes of receiving it, he was on his feet for the first time in his life. While finding his feet wasn't difficult for the colt, locating the udder proved to be most troublesome. Eventually, however, he found the faucet and all was well.

The weather in central Kentucky has, for the most part, been gorgeous and spring-like since Shout's birth, and the pastures have responded accordingly. Seemingly overnight, fields that were once brown and barren are now green and ripe with plentiful grasses. Skean and Shout, however, are not able to soak in the spring sunlight as the colt has been relegated to his stall for at least two weeks and perhaps longer while his broken ribs knit. Had his fractures been less severe, he would be able to be turned out, but his are comminuted and require stall rest to mend properly.

In just a few weeks, the little chestnut colt will have acres and acres at his disposal to bounce, play, and run. I've got big plans for him, so now's the time for him to grow and become strong. ☺

**Have Milk,
Will
Travel**





Photo by Mark Lewalyn

Dixie. Belle. Big Mama. Simple enough names for the mares in the small band. A quick glance reveals nothing out of the ordinary; the mares and their foals seem completely content devouring their hay this chilly spring morning. But there is something extraordinary about these matrons, something so special that they're revered by breeders everywhere. In fact, these mares are on call, biding their time until their unique services are required, in much the same way human physicians readily respond to beeping pagers and ringing mobile phones. And just like those physicians, these mares are in the business of saving lives, those of orphan foals.

Owners of nurse mares provide an indispensable service to the horse-breeding community. When foaling goes smoothly, the outcome is an energetic foal and an attentive mare. Unfortunately, however, foaling often results in a perfectly healthy foal and an imperfect mother. Sometimes the mare fails to produce milk or refuses to nurture her foal. Rejection by the mare may take several forms. Some mares will nuzzle and lick a foal but will not allow it to nurse. On the opposite end of the spectrum, other mares become vicious after foaling and will bite the foal's



Photo by Mark Lewalyn

neck, shake it, and attempt to throw it to the ground. In other instances, mares die from the trauma of foaling. When any of these predicaments arise, management of the motherless foal presents a sizable challenge.

The owner is typically left with two options, bottle-feeding the foal or acquiring a nurse mare. Many orphan foals have been successfully bottle-fed, but hand-rearing is a considerable undertaking. During the first week of life, for instance, foals must typically be fed every two hours. Equine behaviorists believe it best to have a mare raise an orphan foal. Not only will the foal be healthier and more robust because of the antibodies contained in mare's milk, but the foal will be better socialized to other horses. Hand-raised foals, particularly colts, often become difficult to manage because they are not respectful of people. Nurse mares are an incredible labor-saving resolution.

Mares of draft or draft-cross breeding are often used in the nurse mare trade because they have strong maternal instincts, provide plenty of milk, and rarely reject a foal. Mild-mannered mares of other breeds, such as Paints, Appaloosas, and Quarter Horses, have also proven to be exceptional foster mothers. One now-retired Appaloosa nurse mare in Washington showed phenomenal commitment to her trade. She reportedly raised 20 Thoroughbred foals, in addition to 17 foals of her own. In some years she mothered two foals simultaneously.

Milk on Demand?

Can mares produce milk without foaling? According to French scientists, it's possible. Building on previous studies, a research group led by Peter F. Daels, DVM, PhD unveiled a method for induction of lactation in mares without corresponding pregnancy at the annual convention of the American Association of Equine Practitioners late last year.

For a period of two weeks, Welsh pony mares were given a precisely calculated mixture of estrogen and progesterone, coupled with a dopamine D2 antagonist such as sulpiride or domperidone, the product often used to counteract fescue toxicity in late-term pregnant mares and to boost milk production in mares with little milk at foaling. All of the mares in the study had given birth and nursed at least one foal in preceding years. A milking machine designed for dairy goats allowed the collection of milk five times per day and was begun nine days after the commencement of the treatment.

In a second though closely related study, mares were given the same treatment as previously described, but milking was delayed until the end of the second week in an attempt to pool colostrum, the antibody-rich milk secreted by mares immediately following typical foaling.

No significant differences in milk yield occurred between the two studies. Measurement of antibodies in the milk during the first two days of collection revealed low levels, indicating mares are unable to produce colostrum when lactation is artificially activated.

An offshoot of the aforementioned studies determined the growth rates of foals adopted by mares with induced lactation. Sixteen newborn foals and three seven-day-old foals were successfully united with mares in the study. Fifteen foals remained with their natural mothers and served as controls in the study. All foals were weighed at birth, at 14, 30, 60, and 120 days of age, and at weaning. While differences were noted in initial growth rates, none were documented in adopted and control foals by weaning.

Raising an orphan foal is a formidable task. Often nurse mares are difficult or impossible to acquire during emergency situations, and bottle-feeding an orphan foal requires a significant commitment of time and resources. The advantages of inducing milk production in mares are numerous, though this technology is likely years away from day-to-day use by veterinarians and horsemen alike.

Safety First

Once the decision has been made to lease a nurse mare, several key steps should be followed. Although few risks surround the acquisition of a nurse mare, those that loom can be devastating. The primary concern, beyond that of her disposition and willingness to accept a foal that is not her own, is the nurse mare's health. While the urgency of the matter may seem to outweigh the importance of health documentation, foal owners should insist on a vaccination and deworming history of the mare.

Foal owners may require a nurse mare to have a comprehensive immunization battery, not simply bare-bones vaccinations. A vaccination for strangles, for instance, is not one typically given to broodmares, but imagine the widespread implications of a strangles outbreak at a Thoroughbred nursery. This is precisely what happened on one Japanese stud. A nurse mare was diagnosed with strangles after being introduced to the farm. As a result of her infection, three foals and four yearlings developed clinical signs of strangles within the next six weeks and required costly veterinary treatment.

Once the nurse mare arrives at the farm, she should be kept away from other mares for at least seven days and preferably 21 days. This precaution will protect resident horses from the spread of pathogens, including equine herpes virus-1, which could cause a storm of abortions.

A once-over by a veterinarian is also imperative, particularly if the mare was delivered with little history of preventive medicine. The veterinarian can formulate an appropriate vaccination and deworming protocol that dovetails with procedures already in place on the farm.

Of course, accurate record keeping is a reciprocal kindness. Horsemen who utilize nurse mares should be able to document all health care given while the mare was providing her services at the foal owner's farm. Cooperation between the owners of the foal and the nurse mare will also prevent duplication of vaccinations and deworming.

Bonding

Nurse mares are well aware that the babies introduced to them are not their own, but their willingness to adopt a foal is a compliment to their disposition and maternal instincts. Mares are typically placed in specially designed stocks or are otherwise restrained while the foal nurses the first few times. Particularly docile mares may only need to be restrained through a few nursing bouts before being turned loose with the foal. The mare and foal should be observed carefully for several hours to ensure the bond between them is established. Once acceptance is achieved, most nurse mares will then treat foals as their own.

The Question of Overnutrition

Draft mares usually produce abundant quantities of milk. As such, there has been a suggestion that draft mares may not be the most appropriate foster mares for foals of light horse breeding such as Thoroughbreds and Standardbreds. Milk production is thought to be directly correlated to body weight; mares provide approximately 3-4% of their body weight in milk to their offspring each day. Therefore, a typical 600 kg Thoroughbred broodmare may generate 18 kg of milk. If a Thoroughbred foal is weaned onto a draft mare that tips the scales at approximately 800 kg and is capable of producing 30 kg of milk daily, what effect will this have on the foal?

The growth rate of foals is dependent on energy and protein intake. Rapid growth rate resulting from overconsumption of these nutrients may predispose foals to skeletal problems including osteochondritis dissecans.


In a study conducted by Kentucky Equine Research, growth rates of foals raised on nurse mares were compared to growth rates of foals raised on their natural dams and growth rates of foals weaned at five days of age and fed milk replacer. The foals raised on nurse mares were larger than the other groups of foals at the end of at the six-month study, and they grew faster during the first three months of age.

The stage of lactation of the nurse mare is also a pertinent consideration. In addition to antibody levels, mares produce more protein and lipids in their milk immediately following foaling. These levels decrease over the ensuing weeks. For example, the protein content of mare's milk drops from 2.7% during the first month of lactation to 1.8% during the fourth month. If a newborn foal is placed on a nurse mare in her fifth month of lactation, the mare's milk may not contain adequate quantities of essential nutrients.

The Bottom Line

Mare owners often pay about \$2000-\$3000 for the services of a nurse mare, with some suppliers collecting more for a one-season lease. Of course, the mare owner is responsible for caring for the mare throughout lactation, so any farrier, veterinary, and feed expenses must be figured into the final calculation. But this is a pittance considering that many foals placed on nurse mares may be worth thousands and perhaps millions of dollars.

In addition to everyday expenses, mare owners are expected to return the mare in foal. The owners of nurse mares are usually not particular about what stallions are used for rebreeding. Teasers are generally used to breed back these mares.

Raising foals is a life-enriching experience for many horsemen. More likely than not, the services of a nurse mare will not be required. When nurse mares are needed, however, they truly offer compromised foals a link to life. 

Motherhood—It's Not Always Black and White

Whitey, a towering flea-bitten gray mare, differs considerably from the other horses that stroll Mitzi Dotson's farm. Dotson, a breeder of coal-black Friesian horses, has a perfect explanation for the disparity. Whitey brings new meaning to the expression "working mom." Wherever Whitey goes, so goes her adopted black colt. And although he is awash with vim and vigor now, he wasn't always so robust.

While the two-week premature arrival of the colt was a bit of a setback, this was soon overshadowed by a far more worrisome dilemma. Instead of the soothing nuzzling, nickering, and licking most mares bestow on their newborns, Dotson's colt was confronted with flailing hooves, pinned ears, snapping teeth, and squealing.

"I should have seen it coming. The mare knew something we didn't—she didn't want a baby. First, it took us two years to get her in foal using artificial insemination, and then she rejected the colt right after foaling," commented Dotson.

"For over a week, we tried to get her to accept the colt," said Dotson. In the middle of an ice storm that left much of central Kentucky without electricity, Dotson could be found milking the uncooperative mare in a flashlight-illuminated stall and, with the assistance of her veterinarian, tubing the foal colostrum.

"After a week of milking her, the mare would allow the colt to nurse but only if she was restrained with a twitch," remarked Dotson. It was at this time she decided to seek an alternative, and that alternative came in the form of Whitey, a draft-cross nurse mare with a knack for motherhood. "The big gray mare accepted the colt almost immediately. It amazes me that his dam was so mean to him but a completely strange mare would treat him as her own," said Dotson. But, after all, that is Whitey's job.

The Latest on Laminitis

The stance is unmistakable: forelimbs positioned oddly in front of the chest and hind limbs planted under the abdomen in a desperate attempt to support the heft of the horse. This classical “sawhorse” posture is undeniably indicative of the insidious syndrome known as laminitis. Succinctly put, laminitis is the local manifestation of a body-wide metabolic breakdown. Why this metabolic collapse materializes in the feet is not completely understood, but the damage that occurs is well documented.

The Anatomy of Laminitis

Of the two bones that are completely encapsulated in the hoof, the pedal bone (also known as the distal phalanx or P3) is the largest, and is shaped much like the hoof. The significantly smaller, shuttle-shaped navicular bone lies adjacent to the pedal bone and closer to the heel. Nestled between the pedal bone and the hoof wall are a series of interlocking tissues called laminae. Sensitive laminae are produced by the corium, or outer layer of the pedal bone,

and mesh steadfastly with insensitive laminae, which line the hoof wall, to create a delicate, accordion-like structure that supports the pedal bone. The folds of the laminae are expansive, with some researchers calculating the surface area of the laminae to be approximately that of a tennis court when unfurled.

One of the most critical functions of the laminae, both the sensitive and insensitive, is to anchor the pedal bone against the pull of the deep digital flexor tendon, one of the largest tendons in the forelimb. When this mainstay of support is jeopardized, no matter how slightly, laminitis may result.

How It Happens, In a Nutshell

Laminitis occurs when the cells of the laminae do not receive sufficient nutrients from the blood supply and are damaged by activated enzymes. These enzymes are triggered by changes in the bacterial population in the gut. This sets the stage for inflammation and eventual cell death. Due to a mechanism not well understood by researchers, bloodflow to the hoof increases, but is actually shunted away from the tissues of the foot, which accounts for the oft-found bounding pulse of laminitic horses. As the laminae become damaged, they weaken and are unable to keep the pedal bone in place, and, in severe cases, the tip of the pedal bone shifts toward the sole of the hoof. Complete destruction of laminae can occur within hours of the initiating insult. Once crumbling of foot architecture commences, the horse begins to experience pain that may in time be excruciating and eventually career-ending.

Laminitis most often affects both front feet simultaneously. When only one forefoot is affected, it is usually caused by exces-

By the time a horse adopts this posture, he is likely in severe pain, and damage to the inner structures of the hoof may be irreparable.



sive load-bearing due to injury of the opposite leg. Much less frequent is the occurrence of laminitis in the hind feet without involvement of the front feet.

Gorging on starch-rich grains. Retained foetal membranes in post-foaling mares. Grazing unlimited amounts of lush pasture. Severe gut disorders resulting in acute diarrhoea. These factors and several others are well-known causes of laminitis. Two relatively new causes of laminitis that have come to the forefront of recent research are ingestion of fructans and obesity.

The Fructan Factor

Well-tended pasture can fulfil the nutritional requirements of many horses, and is therefore often the foundation of sound feeding programs. Several species of sugar-rich grasses are planted in hopes of increasing production in cattle and sheep. Little thought is given to the effects these grasses may have on horses. These temperate grasses frequently contain large amounts of water-soluble carbohydrates such as sucrose, fructose, and glucose. In addition, these plants are rich in fructans, which are simple chains of fructose and glucose molecules.

Researchers believe that fructans, unlike other carbohydrates, cannot be digested in the stomach or small intestine of the horse. They can, however, be utilized by certain microbial species in the hindgut, but only at the expense of the entire intestinal ecosystem. Researchers theorize that when large quantities of fructan gain entrance into the hindgut, a rapid change occurs in the microorganism popu-

Researchers believe that fructans cannot be digested in the stomach or small intestine of the horse. They can, however, be utilized by certain microbial species in the hindgut but only at the expense of the entire intestinal ecosystem.

lation, including acidity, the death of vast numbers of bacteria and the proliferation of other types of bacteria. These changes produce trigger factors that alter the circulation in the hoof and stimulate enzymes to damage the attachment between the laminae. This is the same mechanism that triggers laminitis following the overconsumption of grain.

Researchers at the Institute of Grassland and Environmental Research in Aberystwyth, United Kingdom have completed extensive research involving the



Photo by Mark Llewellyn

Overconsumption of grasses rich in fructans is linked to the development of laminitis in horses and ponies.

fructan concentrations of temperate grasses popular in that country.

In their study, the researchers discovered that time of grazing was critical in determining fructan ingestion. Using single pasture, it was found that horses grazing from 9:00 a.m. to 3:00 p.m. could consume approximately 2 kg of fructan. Conversely, those grazing from 3:00 p.m. to 9:00 p.m. could potentially ingest only 500 g or one quarter of that consumed during midday grazing. From this data, researchers concluded that the fructan content of grasses changes dramatically, not only day to day, but also within a single day. Fructan concentration is affected by exposure to sunlight, temperature, water availability, grass species and a host of other lesser factors.

In another experiment by the same researchers, horses grazing certain pastures could devour approximately 5 kg of fructan in one day, which is similar to the amount of cereal starch known to induce laminitis in horses.

Christopher Pollitt, BVSc, PhD of the Australian Equine Laminitis Research Unit at the University of Queensland, has tested the fructan theory in an experimental setting. In preliminary trials, he and his co-workers brought about laminitis using commercially available fructan. The amount of starch in the dose was only about half of that formerly proven to induce laminitis. Signs of mild laminitis occurred in dosed horses in 48 hours.

Scientists continue to work fervently on the fructan theory, primarily because of the considerable number of

unanswered questions surrounding it. Pollitt hopes to answer some of these questions using data from an ongoing trial. The goals of the present study are formidable: to invent ways to reduce fructan in pastures, to pinpoint methods of limiting fructan consumption, and to stabilize hindgut bacteria when confronted with fructan to prevent the formation of laminitis triggers such as endotoxins. Until more conclusive management techniques are forwarded from researchers, there are ways to keep laminitis-prone horses out of harm's way. These horses should only be allowed to graze pastures with grass species known to produce small quantities of fructan. Regulating time of grazing is another management strategy. By avoiding pasture exposure during the midday hours, horses are unlikely to consume sufficient fructan to cause laminitis.

Obesity-Associated Laminitis

Obesity-associated laminitis is frequently observed in ponies and horses that do not receive consistent work. Those affected with this syndrome typically have distinctive body fat distribution, with large pockets of fat deposited on the crest of the neck and the rump. Male horses also tend to accumulate fat in their sheaths. Horses and ponies prone to obesity-associated laminitis are often difficult to manage nutritionally, as reducing calorie intake does little to lower the body condition of these horses.

This syndrome may be particularly frustrating on breeding farms. Affected broodmares may experience irregular oestrous cycles, which in turn lowers reproductive efficiency. Obesity-related laminitis is often incorrectly linked to hypothyroidism. This mistake is made most frequently because some affected horses have low serum thyroid hormone concentrations. Scientific studies, however, have proven conclusively that this specific combination of obesity and laminitis is unrelated to disordered thyroid metabolism. Thyroid stimulation tests have not elicited expected abnormal responses in these horses, as they would have if the horses were suffering from the primary differential diagnosis, Cushing's syndrome. In addition, experimental removal of the thyroid glands did not induce obesity or laminitis, but did produce other signs indicative of true hypothyroidism. Therefore, the potential role of hypothyroidism in obesity-associated laminitis is questionable.

Once Cushing's syndrome has been ruled out as a possible cause of the laminitis, veterinarians should look to the obesity-associated syndrome. Philip Johnson, BVSc (Hons), DVM, Dipl. ACVIM, MRCVS, associate professor in equine internal medicine at the University of Missouri, believes the abnormal activity of a single enzyme may be the root of obesity-associated laminitis. This enzyme, named 11-beta hydroxysteroid dehydrogenase (HSD), is responsible for cortisol regulation within cells.

The versatility of HSD is remarkable. Based on cellular

environment and requirement, the enzyme is capable of converting cortisol to cortisone, its inactive metabolite, and when necessary, the enzyme can change cortisone back to cortisol. This enzyme efficiently dictates cortisol concentration of the cell independent of circulating levels. Johnson developed a reliable test to ascertain HSD levels in peripheral tissues such as skin, fat, and laminae. Once he found that HSD concentrations could be measured in skin and laminae membranes, he compared levels of HSD in healthy adult horses to those found in laminitic horses. HSD was noticeably elevated in tissues obtained from horses with laminitis. Additionally, the form of HSD responsible for converting inactive cortisone to active cortisol was markedly elevated. Results of this study suggest that hyperproduction of cortisol by peripheral tissues could be a factor in the clinical appearance of obesity-associated laminitis.

Recent studies in human medicine have revealed increased cortisol levels in cells caused by disturbed HSD activity. The result of this enzyme disturbance was the appearance of symptoms similar to those of Cushing's disease. Elevated HSD activity in cells leads to increased cortisol in tissues. This accumulation of cortisol is an important cause of a syndrome in humans called central obesity or omental Cushing's syndrome.

Humans with central obesity and horses with obesity-associated laminitis have significant similarities including abnormal distribution of fat stores, difficulty losing weight, and reduced fertility. Horses and humans affected with the disease tend also to have hypertension, mild hyperlipemia, and insulin resistance. The relationship between the species-specific syndromes is obvious, and the human disorder continues to serve as a model for equine researchers.

While obesity-associated laminitis is not well understood among researchers and veterinarians, affected horses may go on to lead otherwise healthy lives if treatment is swift and diligent. Recommended treatments centre around corrective trimming and shoeing, use of nonsteroidal anti-inflammatory medications for pain, and strict diet. Forced exercise can be imposed once all laminitis-related pain has abated.

Prognosis

The prognosis for horses faced with complicated laminitis is not bright. The majority of horses with laminitis recover using various means of treatment—some even without treatment—and seem to suffer no ill consequences. Nearly 20-30% of affected horses will, however, have devastating outcomes resulting in catastrophic damage to the laminae. If these horses are able to survive, the likelihood that they will return to work is tenuous. Laminitis is unquestionably a devastating disease. As researchers delve deeper into the causes of this disease, the likelihood that horse owners will one day be able to prevent its occurrence is promising. ☺☺

Nutrition Conference in Australia Offers Something for Everyone

KER's thirteenth annual Equine Nutrition Conference will be held August 23 through 25 in Sydney. This year's theme is the skeletal system of the horse, with special focus on growth, development, and disorders. The conference is open to worldwide feed industry professionals, horse breeders, veterinarians, and members of the public.

Some of the world's foremost authorities have been invited to speak. Dr. Wayne McIlwraith, a New Zealand native, is currently a professor in the Equine Orthopedic Research Laboratory at Colorado State University. Considered a pioneer in equine arthroscopic surgery, McIlwraith has directed research in diagnostic, therapeutic, and preventative techniques involving joint disease and pathobiology. Another speaker, Dr. Andrew Dart, is director of the University Veterinary Centre at Camden, New South Wales. As an associate professor of equine surgery, his interests range from upper airway dysfunction of exercising horses to the biomechanical properties of the equine superficial flexor tendon. These experts, as well as a number of other well-qualified lecturers from Australia and New Zealand, will join KER's Dr. Joe Pagan, Dr. Peter Huntington, and Dr. Larry Lawrence in presenting the latest findings on the equine skeleton.

On the first day of the conference, participants may choose from concurrent programs. The clinical session will encompass an overview of bone disease followed by detailed presentations on the surgical, medical, and nutritional management of osteochondritis dissecans (OCD). This session will also address techniques for the treatment of hock lameness and will wrap up with a panel discussion of presale radiographs.

A parallel program will focus on normal bone development, nutrition of broodmares and young horses, and the importance of bone disease and OCD as they impact the horse owner and breeder. This program is a special feature of the Australian conference and is developed especially for sport horse breeders. All breeders will benefit from practical advice and insights into new research findings that affect the management of breeding stock.

Lectures on the second day will review conformation and bone disease research from the United States, Netherlands, and Australia. Horse breeders and trainers

may be especially interested in a talk on the positive and negative effects of various growth-promoting drugs (somatotropin, anabolic steroids) on young horses.

The final day's program will be built around the influence of pasture, feeding, exercise, and training on weanlings, yearlings, and two-year-olds. Broodmare nutrition and its impact on development of the foal will also be covered.

This not-to-be missed opportunity presents a rare mix of speakers, each well respected within his field. The fact that this most prestigious of gatherings is being held in Australia for the first time is even more fortuitous for the Australasian horse industry. Don't miss your opportunity to attend what promises to be an exciting presentation of some of the most cutting-edge thinking in the field of horse breeding today.

Further details about the conference can be found on the KER Web site at www.ker.com. Registration for the conference is also available on-line on the Web site.

Alternatively, email equivit@ker.com to register your interest and be placed on the mailing list.

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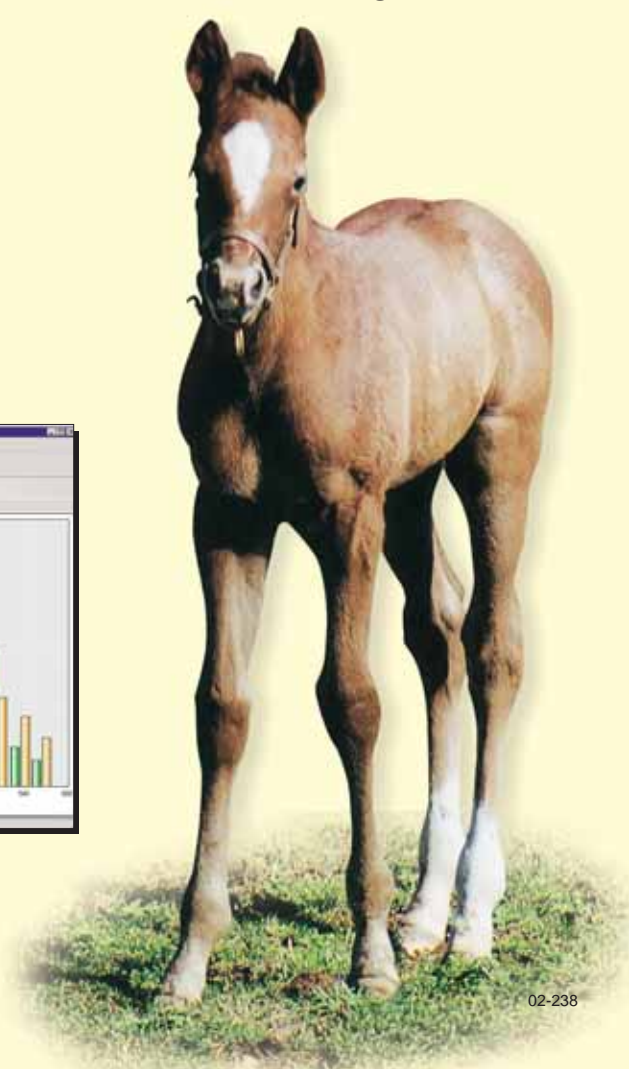
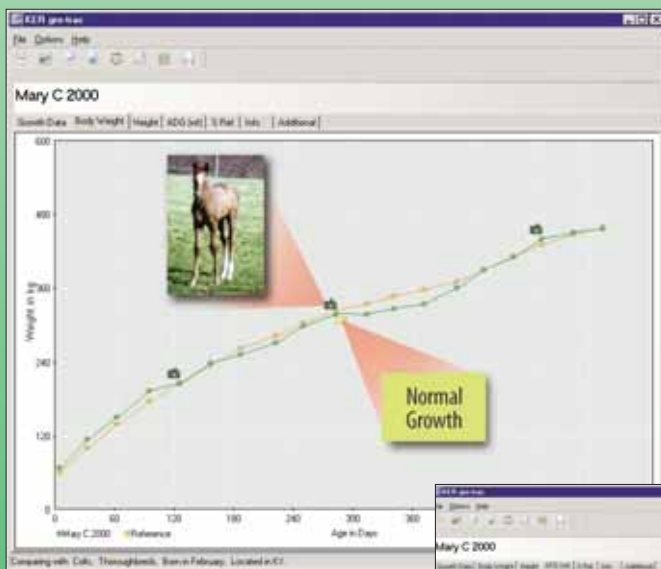
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Equine Q & A

Q What are lupins and what are the benefits of feeding them?

A Lupins have been cultivated for over 2000 years, originating in Egypt and the Mediterranean, and have even been featured in a famous Monty Python sketch!

Lupins are used extensively in the USSR, Poland, Germany, South Africa and the Mediterranean as forage and as an ingredient in livestock feeds. They have been widely used as a feed for farm animals in Australia for many years. Lupins are, however, a relatively new addition to the list of feeds deemed suitable for horses, and like chaff, are principally used for only horses in Australia. Lupins are considered legumes and have similar physical properties as peas and beans. They have a hard, tough outer coating requiring soaking, rolling, crushing or grinding to enable the horse to digest them efficiently. Pelleting or heat-treating the grains may also help to increase their palatability and digestibility; although little is known about the effects of processing on the digestibility of lupins.

Two major types of lupins exist, the bitter and the sweet varieties. Only sweet lupins are suitable for horse consumption. When crushed, sweet lupins have a yellow-coloured flesh and may be mistaken for corn in a mixed feed. They are easily discernible from corn by their speckled outer seed case.

Lupins are predominantly a source of protein (28-34% crude protein) but also contain some fat (around 5%) and digestible fibre. Because of their low starch content and high fibre content, lupins are digested microbially in the hindgut of the horse. It is thought that the fibre in lupins is highly digestible and through fermentation eventually break down to volatile fatty acids, thus contributing to the high energy content of the grain.

This makes lupins particularly suitable for horses that have a low tolerance for high-carbohydrate feeds such as oats or corn, which are digested predominantly in the small intestine. Horses with a predisposition to tying up or laminitis, or those horses that get too excitable on grain, may benefit from the addition of lupins to the diet. Because lupins contain very little starch, they are often considered an ideal “cool” feed, but their high protein content means that their inclusion in the diet should be limited. A 500-kg horse, for example, should receive no more than 2 kg of lupins daily.

In summary, lupins are suitable as both an energy and a protein supplement. As a protein supplement, lupins can be quite cost effective and are usually considered “good value” compared to other commercial or synthetic protein supplements.

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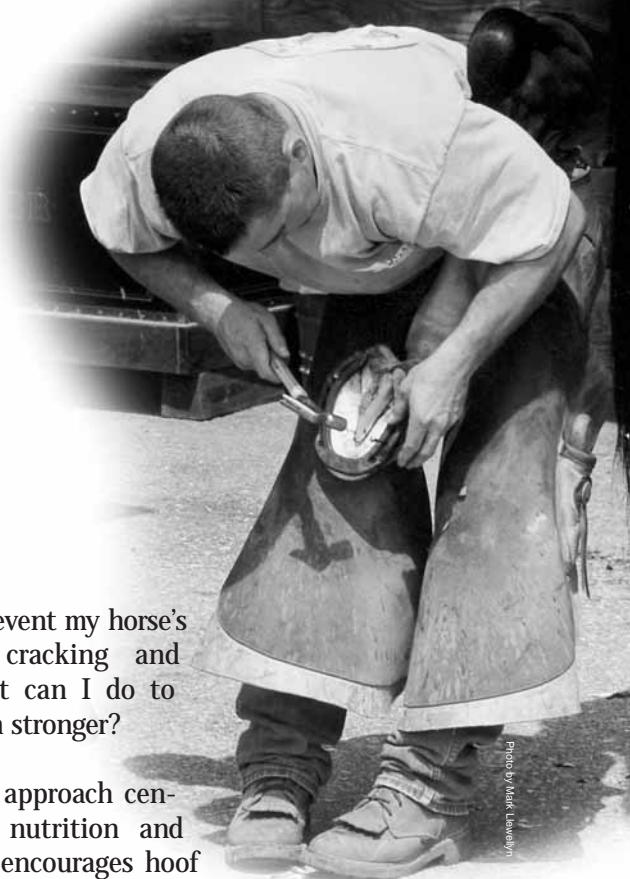


Photo by Mark Llewellyn

Q How can I prevent my horse's hooves from cracking and breaking? What can I do to help make them stronger?

A A two-prong approach centering around nutrition and timely farriery encourages hoof growth and strength, and will in time rid hooves of unsightly and unhealthy damage.

Nutrition plays a significant role in hoof integrity. A well-balanced diet fed consistently over an extended period of time will do much to encourage hoof health. Daily supplementation with approximately 15 mg of biotin, a B-vitamin, has resulted in significant improvement in overall hoof condition. Biotin only invigorates new hoof growth, though, and will not improve existing hoof wall. Because of this, the positive effects of biotin supplementation may take from eight months to over a year to surface, the length of time necessary for the hoof wall to completely replace itself. Whether or not the horse must remain on biotin supplementation throughout its life depends on the individual. If poor hoof quality is a result of neglect, a horse may be tapered off the supplement following complete restoration of the hoof wall. If, on the other hand, hoof weakness is genetically linked, a horse may require lifelong supplementation.

Locating a farrier that is successful with problem hooves and allowing enough time for him to ply his trade are two important factors in hoof maintenance. It is unreasonable to think that a farrier can repair damaged hooves in one or two visits. The farrier may request more frequent visits than normal, particularly in the spring and summer months when hooves tend to grow faster and an increased likelihood of chipping and cracking exists. By offering a balanced diet and following the farrier's instructions to the letter, owner should notice hooves becoming stronger and more resistant to breakage. ☺☺

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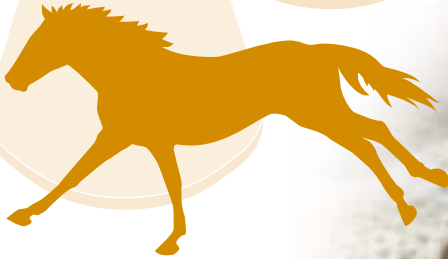


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A lustrous coat and strong hooves are hallmarks of a healthy horse. Bio-Bloom is a blend of natural ingredients designed to boost skin and coat condition and promote healthy hoof growth from the inside out. Bio-Bloom aids in the treatment of quarter cracks, collapsed heels, thin walls, and laminitis.

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