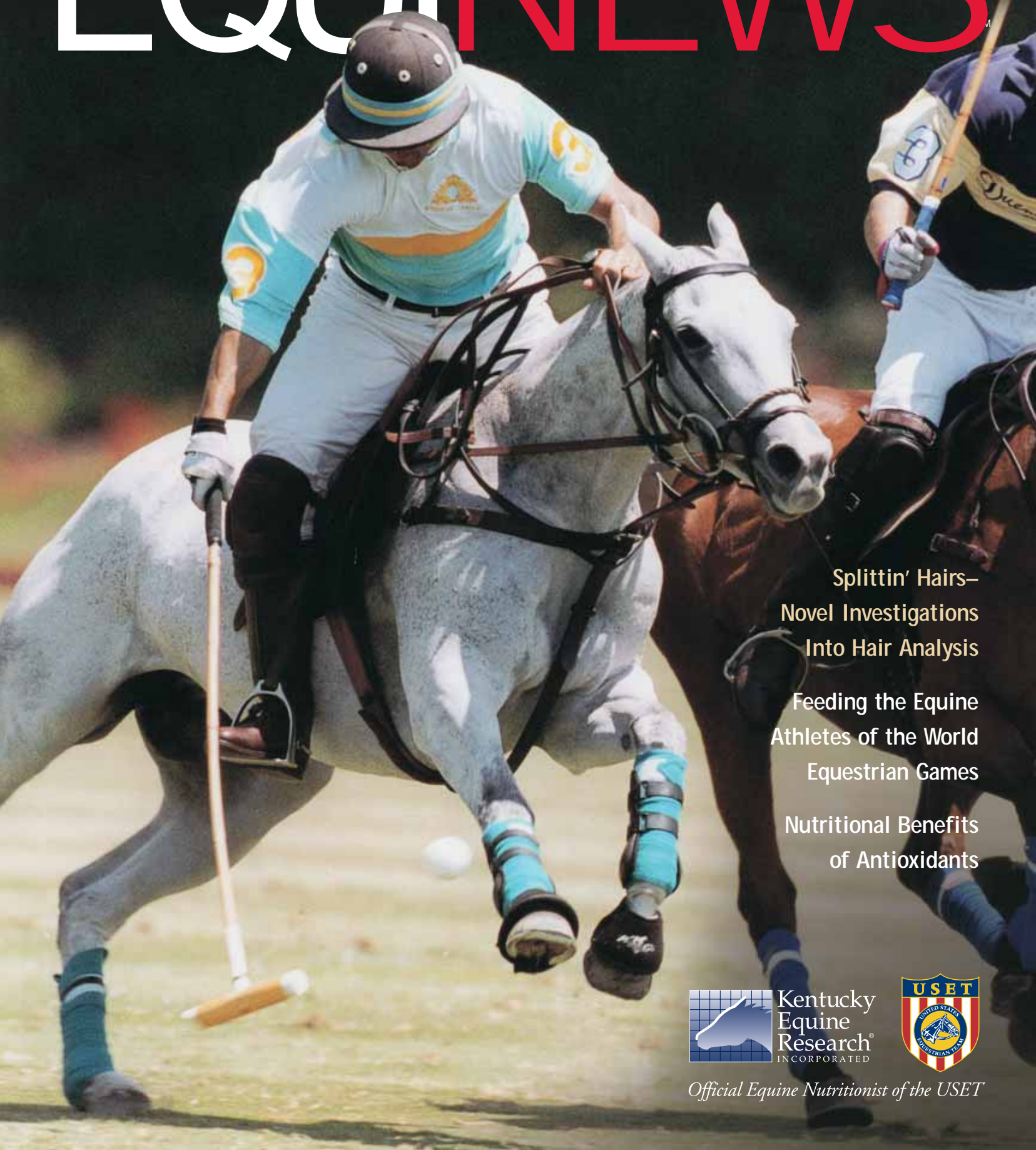


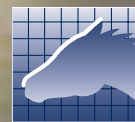
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EQUINEWS®

VOLUME 6 ISSUE 1

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Equineews is the official quarterly publication of Kentucky Equine Research. Its intent is to present informative and entertaining articles that advance the primary goal of Kentucky Equine Research and its worldwide affiliates—to ensure superior nutrition for all horses and ponies.

Equineews features on its front cover a photograph by David Lominska showing Adam Snow on Pumbaa. Turn to page 2 to learn more about Snow and Pumbaa. U.S. subscription price is \$12 per year.



EQUINEWS

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Kentucky Equine Research Congratulates Team Member Champions

Chris Anckersen is a Newnan, Georgia equine professional who names Flint River Mills (FRM) feed as a crucial element in the success of his horses. Anckersen manages the Arabian stallion *Dakar El Jamaal, a competitor at the recent 2002 U.S. Arabian and Half-Arabian National Championships in Louisville, Kentucky. The spectacular grey horse, owned by the Dakar Kartel and shown by Michael Byatt, was named 2002 U.S. National Champion Senior Stallion.

Anckersen made the decision to use products manufactured by FRM, a Team Member of Kentucky Equine Research (KER), in order to ensure superior nutrition without feeding an array of supplements and additives. He has been pleased with the way all his horses, from young stock to breeding animals, have thrived on feed provided by FRM. Their impressive records underscore the importance of careful feed management in producing and showing quality horses.

One of *Dakar El Jamaal's first offspring, the three-year-old Dakharo, was a 2002 U.S. National Top Ten Futurity Stallion. Dakharo is owned by the Dakharo Partners of Rome, Georgia. Star Intention, owned by Chapel Farms Arabians, claimed the titles of Junior Champion Colt and Supreme Show Champion at the 2002 Alabama Arabian Show. Chatrinaa, also owned by Chapel Farms Arabians, was Junior Champion Filly at five major Arabian shows in 2001 and 2002. Flint River Mills is proud of the accomplishments of these outstanding Arabians.

Adam Snow has just achieved what most people can only dream of: being at the top of the game. He is one of only a dozen polo players in the world to earn a ten-goal handicap, an all-star designation awarded to players with the highest levels of experience, dedication, and skill. But Snow doesn't want to talk about his own honours. He wants to talk about his polo ponies.

"I have 26 horses," he said, "and of those, only one is a gelding. I like mares for polo. My mare Pumbaa is a nine-year-old American Thoroughbred. She was the winner of the Best Playing Pony prize at the 2002 U.S. Open in Boca Raton, Florida." He is also proud of the talents of Hale-Bopp, Bag Lady,

and his other top horses, speaking with justified pride of their contributions to his success.

A key member of Snow's support team is his wife, veterinarian Shelley Onderdonk. Knowing that training, competition and travel make tremendous physical demands on the horses, Onderdonk researched the nutritional requirements of top polo horses and decided a custom mix was needed. "I wanted somewhat less protein and a little more fat than a regular feed," she explained. "These horses compete in warm climates, and fat digestion adds far less body heat than protein metabolism." She was also looking for a high-fibre ration that would complement timothy/alfalfa hay. She contacted polo enthusiast Charlie Herrick, owner of Banks Mill in Aiken, South Carolina, about manufacturing a custom mix. Onderdonk's ideas and Herrick's knowledge of feed ingredients and mill technology led to the formulation of a ration offering 10% protein, 10% fat, and 15% fibre.

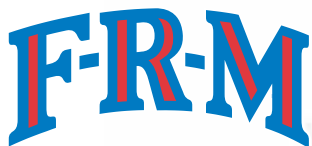
Banks Mill, a KER Team Member, feeds all of Snow's polo mounts, mostly Thoroughbreds ranging from 7 to 16 years old. Each horse spends only half the year in work and is turned out for the remaining months, a schedule that requires adjustments in feed management. Snow and his wife praised the assistance they have received from Banks Mill, and felt that Herrick's knowledge and attention to detail have been instrumental in eliminating problems such as tying-up and colic. Onderdonk said, "Charlie was the one who suggested adding probiotics to the feed, and I really like this modification." Knowing they can rely on the nutritional expertise of Banks Mill, the Snow stable is free to concentrate on the important thing: superior performance on the polo field.

In last fall's Breeders' Cup races, a longtime KER Team Member deserved part of the applause, as more than a quarter of the starting horses, and nearly half those finishing in the money, were fuelled by feed supplied by Farmers Feed Mill. In "win-place-show" style, Farmers Feed Mill counted the top three Breeders' Cup Series money earners among its clients. ○○

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Kentucky Equine Research proudly congratulates Flint River Mills for being the feed supplier of *Dakar El Jamaal, the 2002 U.S. Arabian National Champion Senior Stallion.

Antioxidants for Tip-Top Performance

The formation of ordinary rust is not a chemical enigma, and is perhaps the most familiar example of oxidation. A mixture of moisture and oxygen chemically attacks metal, and in time corrosion creates a reddish-brown, brittle coating that weakens and ultimately destroys the metal. Just as destructive, though invisible to the eye, is the oxidation that occurs at the cellular level in horses and other mammals. **The end result of unchecked oxidation in the bodies of equine athletes may be muscular fatigue severe enough to compromise performance.**

Oxidation is a normal metabolic process that

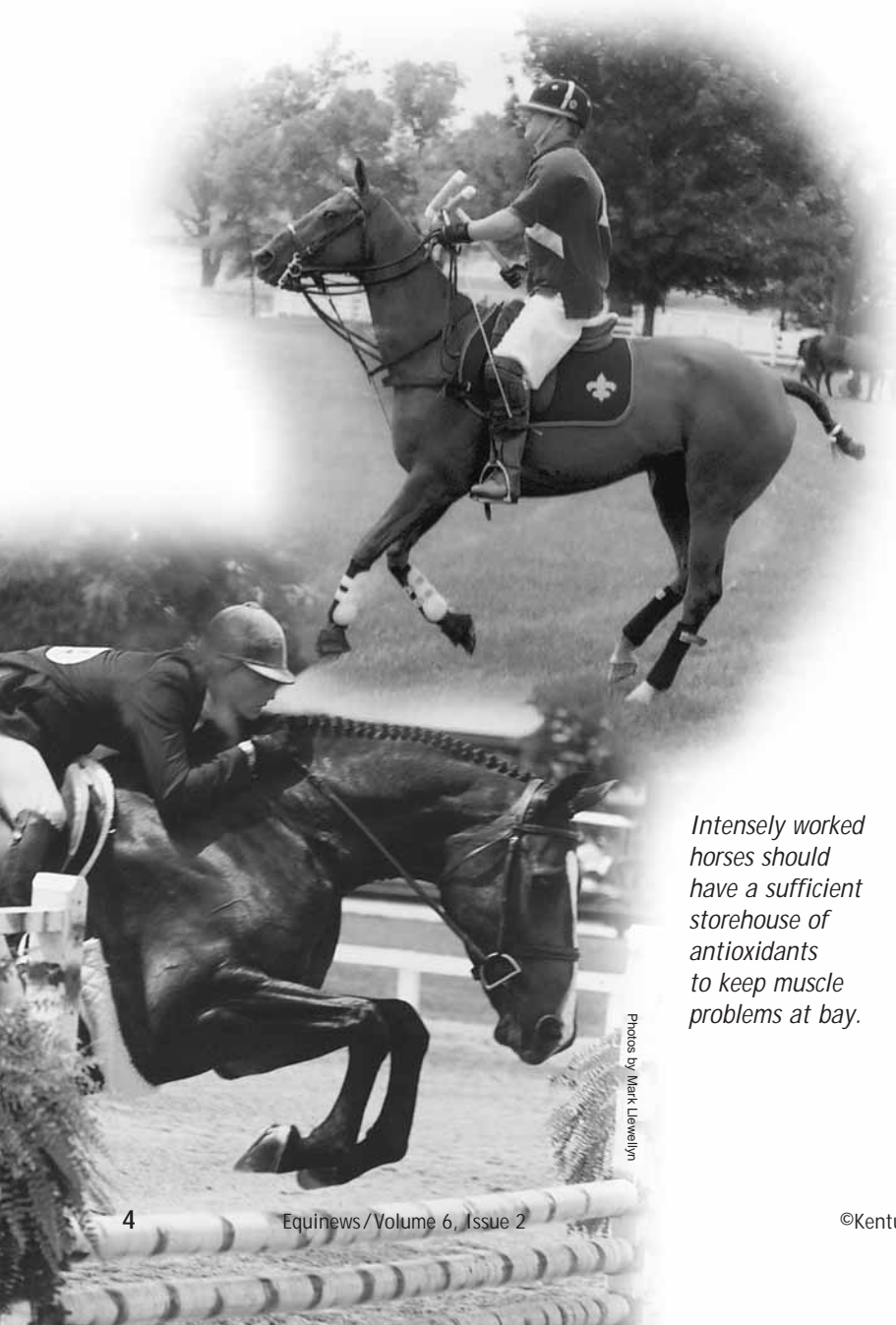
allows horses to transform the carbohydrates, fats and proteins they devour in meals to energy—energy to grow, perform and reproduce. One unfortunate, although completely unavoidable, spin-off of oxidation is the creation of free radicals, compounds that have the potential to irreparably damage cells. Free radicals are particularly harmful to cell membranes, structures responsible for keeping destructive entities away from delicate inner organelles.

Under normal circumstances, substances called antioxidants thwart much of the wreckage caused by free radicals. However, oxidation speeds up during athletic effort due to increased oxygen consumption and accelerated aerobic metabolism. In instances of strenuous exercise, natural stores of antioxidants have difficulty providing sufficient protection against the cascade of free radicals generated from aerobic metabolism. **Supplementation of antioxidants is therefore necessary to help ward off the ill effects of mass-produced free radicals associated with intense exercise.** Horses with an inadequate reserve of antioxidants may experience muscle soreness or stiffness during an exercise bout and prolonged recovery following hard work.

The All-Star Antioxidants

Vitamin E contributes most generously to the natural antioxidant defences of the horse. The term vitamin E is actually a collective one that encompasses eight distinctive compounds of plant origin. These eight are divided into four tocopherols and four tocotrienols. Of these, only two—alpha-tocopherol and gamma-tocopherol—have antioxidant properties, and alpha-tocopherol is the most biologically active. On the cellular level, alpha-tocopherol embeds in cell membranes and protects cells from the ravages of free radicals. Alpha-tocopherol has an affinity for fat, and is therefore attracted to cell membranes, which are composed of polyunsaturated fatty acids.

Feeds typically fed to horses have variable vitamin E concentrations. Cereal grains such as corn, oats and barley contain minimal vitamin E, and processing may further decrease vitamin



Intensely worked horses should have a sufficient storehouse of antioxidants to keep muscle problems at bay.

Photos by Mark Llewellyn

activity. Drying corn artificially, for example, reduces the alpha-tocopherol level by as much as 50%. And while vegetable and soybean oils possess substantially more vitamin E than grains, refining can diminish content. Even if they undergo only minimal refining, these oils have such low inclusion rates in diets that their contribution to total vitamin E intake is miniscule.

Horses may derive sufficient amounts of vitamin E from fresh forage or hay; however, the vitamin content abates as forages mature and are harvested. Up to 90% of vitamin activity may be lost between the pre-bloom or boot stages, and complete heading out in grasses. Losses also occur in legumes, although to a lesser extent. Storage negatively impacts vitamin composition as well. In one month, for instance, a 50% loss in vitamin E can occur in stored hay.

Because of the irregularity in vitamin E content of forages and other feedstuffs, the nutrient is often added to fortified feeds. Synthetic forms of vitamin E are absorbed well by horses; however, more natural tocopherol is thought to be preferentially used by horses during digestion.

Deficiencies of vitamin E are often thought to precipitate nervous disorders such as equine degenerative myeloencephalopathy, a disease characterized by deterioration of the brain stem and spinal cord. Ataxia is the foremost sign of equine degenerative myeloencephalopathy, usually beginning in the hind limbs and progressing to the forelimbs. Equine motor neuron disease, a debilitating neurological affection that may cause profound paralysis and death, is often partially attributed to vitamin E insufficiency. Treatment for both diseases centres on the provision of megadoses of vitamin E, often 10 to 20 times the normal daily requirement. In some cases of equine degenerative myeloencephalopathy, supplemental vitamin E has completely arrested signs, although few horses return completely to normal.

Vitamin E is often linked with selenium, a trace mineral that possesses potent antioxidant properties. Because it is an essential component of glutathione peroxidase, an intercellular enzyme that helps prevent the formation of free radicals, selenium is integral in the diets of performance horses. **In addition to inadequate antioxidant defences, a selenium deficiency may be detrimental to the muscular, reproductive, and immune systems.**

Vitamin C, often referred to as ascorbic acid, also plays a pivotal role in neutralizing harmful free radicals. Because of its water-soluble nature, vitamin C can work both inside and outside the cell to combat free radical damage. In the exercising horse, perhaps the foremost contribution of vitamin C is its synergistic relationship with vitamin E. Once a molecule of vitamin E inactivates a free radical, its ability to short-circuit others is forsaken. In the presence of vitamin C, however, vitamin E can be regenerated to

Preserve The Ultimate Antioxidant

Preserve is the ultimate one-stop antioxidant supplement. Three powerful antioxidants are combined in Preserve to create a unique supplement designed to ward off muscle problems encountered by equine athletes. Vitamin E is widely acclaimed for its antioxidant action. The vitamin E found in Preserve protects the stability of cellular membranes and provides a defence against oxidative stress. Preserve's formulation includes organic selenium yeast, a form of selenium that has been shown to be more available than conventional inorganic forms. Selenium and vitamin C work in concert with vitamin E to provide a substantial antioxidant safeguard.

Magnesium is also included in Preserve. During exercise, magnesium, as well as other electrolytes, is lost in sweat. Much of the body's magnesium is stored in the skeleton, and transfer from bone to bloodstream is not efficient enough for rapid replacement of magnesium losses through heavy sweating. Therefore, supplementing an equine athlete's ration with

magnesium may be necessary for optimal muscle function. When blood magnesium levels become too low, nervousness and muscle tremors may occur.

The balanced mix of antioxidants in Preserve provides comprehensive cellular protection, which leads to healthier muscles that recover more quickly from exhaustive exercise.

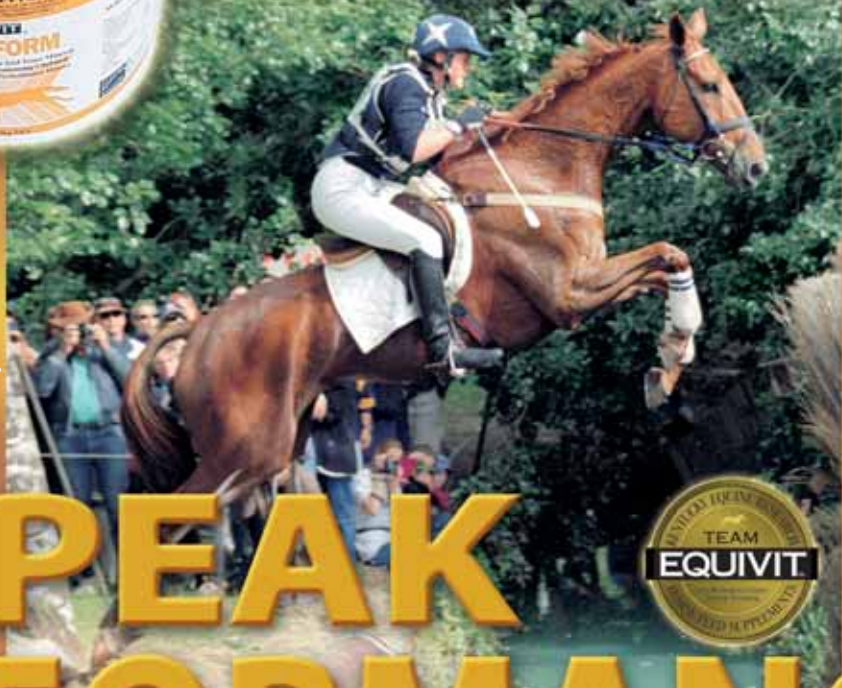


continue its raid on free radicals. The rejuvenating properties of vitamin C, therefore, make it an essential ingredient in an effective antioxidant supplement.

Vitamin C is not included in the diets of most horses because the liver synthesizes sufficient quantities under normal circumstances. In periods of stress, such as during sustained exercise, vitamin C levels may drop and reduce the efficiency of antioxidant mechanisms in the body. In one study completed by Virginia Polytechnic Institute and State University, 35 endurance horses competing in 80- and 160-km race incurred vitamin C depletion, suggesting supplementation may be necessary to maximize antioxidant defenses.

An antioxidant cocktail has been advocated by human physicians for several years, and the positive effects of such a concoction have proven effective in nourishing the equine athlete as well. A triad of antioxidants including

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Changing of the Guard



Photo by Catherine Bishop



Photo by Mark Ellmewlyn

A stroll through the barn at the Kentucky Equine Research (KER) facility this winter reveals some changes since last autumn. In the stalls that used to house the Thoroughbred geldings Willy and Fat Man, inquisitive baby faces peek over the gates to watch the stable cats sleeping in a sunny corner. Vinnie and Damien, former kings of the equine treadmill, graze in a side field while slender youngsters explore a black-fenced paddock adjacent to the barn. In the tack room, bright yearling halters hang next to a row of well-used equipment in larger sizes. The new year is bringing a revised focus to studies at KER.

Dr. Larry Lawrence, an equine nutritionist and KER's director of research, talked about the decision to phase out the experienced treadmill horses and purchase a group of Thoroughbred yearlings to use in upcoming studies. "To understand where we're going, you need to look at the history of KER," he explained. "Dr. Joe Pagan, KER's president, did a lot of the original research on energy needs of exercising horses, and his work was the basis for many of the National Research Council (NRC) recommendations for equine nutrient levels. In more recent years, our research has been directed toward mature horses performing strenuous exercise—racing, endurance riding, or three-day eventing, for example. The goal was to determine exactly how horses metabolize nutrients and energy during exercise. With that knowledge we could formulate feeds and provide feeding programs to optimize energy use in exercising horses."

Is it possible to encourage the development of a stronger skeleton and tougher connective tissue in young horses?

KER will continue to examine the interaction of exercise and nutrition, according to Lawrence, but future studies will take a slightly different direction. "If you look at the horse industry today," he said, "one big difficulty is keeping athletic horses sound. A lot of effort has gone into ways to prevent and heal sports-related injuries. Instead of fixing horses after they are injured, researchers are now wondering if we can grow better horses that are less likely to get hurt in the first place. Is it possible to encourage the development of a stronger skeleton and tougher connective tissue in young horses? Some field studies have been done on the overall effects of nutrition on broodmares and young horses from birth through the first few years of life. This work has yielded important information, but we feel there is also a need for controlled studies under laboratory conditions using young horses with metabolically active bones. With our group of young



Photo by Jeff Rogers

Thoroughbreds, we're interested in putting these horses in training programs that will simulate what's going on in the racing industry. We'll look at the effects of different exercise and nutrition programs on bone quality and quantity."

Lawrence explained that recent studies of super fibres, high-fat diets, and low-glycemic-response feeds have led to changes in the understanding of how to feed horses. This information is exciting, he said, because researchers are now looking at the influence of specific nutrients on the array of hormones that affect growth. If nutritional management can enhance balanced development of muscular and skeletal tissue, it might be possible to prevent some of the more common problems like bucked shins as young horses enter training. Eliminating the negative effects of stress during the early years might also carry over into maturity, and allow horses to remain healthy as they continue their athletic careers.

Lawrence feels the time is right to move KER's research program into this new field. He explained, "The technology is available to answer some questions that have been around for a long time. In the last few years a lot has also been learned about the effects of hormones on bone. Studies done at several places have shown us that it's possible to manipulate hormones and produce effects from the cellular level up. This work has been done on several species, but it turns out that the horse is actually a very good model for looking at bone development. Unlike the situation in cattle where the rumen modifies practically everything the animal eats, nutrients in the horse are digested more directly, and it is somewhat easier to trace their impact on growth. During the same time, the tools have been developed to let us look at bone noninvasively, and to monitor skeletal development over a period of several years."

Three tools will be of particular value in the upcoming research. Recent refinements in the use of metabolic bone markers give researchers a very sensitive indicator of the earliest phases of metabolism as bones reshape under the influence of stress. X-ray photodensitometry and ultrasound scanning yield slightly different data related to the type, amount, and density of mineral material in bone. Combining feedback from the various techniques should give researchers an excellent outline of the chemical and mechanical changes resulting from exercise and diet.

The new direction of study has great potential to help the horse industry, according to Lawrence, if only because the cost of a year lost to lameness or injury is so great. "The focus of Kentucky Equine Research is the same as it has always been," he explained. "The goal is to increase knowledge of exercise physiology and nutrition in order to produce sounder, more athletic horses. As we develop new ideas, technologies, or products based on our research, we

want to move the findings to the industry as rapidly as possible and then analyze the results of any changes that occur. We want to turn our discoveries into practical applications that will help individual horses and the industry as a whole."

To find young horses to carry the research torch in its new direction, Lawrence and KER farm manager Delia Nash scouted Thoroughbred yearling sales. The ideal set of animals had to be fairly uniform in age and size. Horses born in late spring would be suitable for the study of muscular and skeletal development from an early stage, but the yearlings needed to be mature enough to enter an exercise program without running a high risk of injury. Individuals showing obvious structural defects or signs of developmental orthopedic disease were not considered.

Temperament, an extremely important factor for a research horse, was not easy to assess, but Lawrence and Nash brought years of horse experience to the sales and were able to make preliminary evaluations that eliminated some prospects. "If a horse was continually dancing and never had all four feet on the ground, we were pretty sure that one wouldn't fit our needs," Nash commented with a grin. "I've worked with a lot of young horses, and I could get a pretty good idea which ones were nervous because of the strange environment of a sales barn and which were just probably bad-tempered."

After weighing all the variables, Nash and Lawrence selected nine yearling colts on the basis of their disposition, structural correctness, and athletic way of going. Their arrival at the research farm prompted a flurry of suggested names. Laughing at the memory, Nash



Larry Lawrence and Delia Nash evaluate young horses at a Thoroughbred sale in central Kentucky.

explained that youngsters Dr. Joe and Dr. Larry were given their titles in honor of the KER president and research director. Following the same line of thought, the names Nash and Izzie were bestowed on two more yearlings to recognize the farm manager and KER vice-president Karen Isberg Pagan. One colt, Russo, already had a moniker, so the naming spree ended as the remaining horses were christened Barney, Bob, Ollie, and Sam.

During their first few weeks at the KER research farm the yearlings were given time to settle into their new surroundings before being gelded. As with any young horses, training will proceed slowly, Nash said. “We’ll do a lot of ground work—leading, grooming, picking up their feet—just getting them used to being handled and setting the habits of trust and cooperation. We’ll lunge and ground-

drive them a little, not to get them fit, but just to help introduce the ideas of being responsive and going forward. Probably they will learn to wear a surcingle or saddle so that later, when we strap on a heart monitor, that won’t be an unfamiliar feeling. After a few months we’ll start them on the treadmill at a walk, and then work up to a little slow trotting.” Nash emphasized the importance of remembering that the new horses are babies, both physically and mentally, and therefore must be handled somewhat differently than the treadmill veterans. “We’ll plan very gradual advances in work, and each horse will be examined daily for signs of heat or strain in the feet and legs. We do this routinely with all the exercise horses, but it will be doubly important with these youngsters. We know the older horses so well that we can tell by their mannerisms if something is not quite right, and it will take some time to get that familiar with the new guys.”

Nash has seen no problems with the yearlings so far and doesn’t expect major surprises as they move into an exercise program. “The new horses mean a lot more work for me and the research interns right now, but we’re pretty excited about having them here,” she said. “Before I came to KER most of my experience was with young horses, and it will be fun to watch these youngsters grow and develop. It will take some time to find out where each one’s aptitude lies. The ones that get along well on the treadmill will probably spend some years in exercise research. We need only four or five new exercise horses, so if some of these yearlings show outstanding athletic ability, they may move on to careers in racing or eventing.”

And what of the older horses that have spent years in the KER barn? Several of the veterans will continue to participate in exercise studies for the next year or so. Others will retire from the treadmill but will be put into digestibility trials, eating carefully formulated and measured amounts of feed and hay and wearing harnesses for the complete collection and analysis of waste material.



These Thoroughbred yearling colts will become an integral part of growth and exercise physiology studies conducted at Kentucky Equine Research.

Horses in these trials eat in their stalls and have frequent muzzled turnout periods so they can socialize with pasturemates. The oldest campaigners will eventually live out their days in the pensioners’ paddock on the research farm but will stay on a regular schedule of feeding, grooming, vaccinations, deworming, dental care, and farrier visits.

There’s a different story for each horse, of course. Clyde and Vinnie were born at the research farm after pregnant mares were purchased for use in an early study on milk replacement formulation. Teenaged Vinnie is still in the prime of health and will continue to participate in exercise studies. Clyde will leave the treadmill and move into feeding trials along with Willy and Wally, also members of the foundation herd but a few years older than the others. Damien, Fat Man, and Mikey were added to the research herd seven years ago. Damien and Fat Man will participate in feeding trials, while Mikey has found a new career as a pleasure horse. “Most of our retired horses stay right here,” Nash said, “and a few others go to people the Pagans know personally. Although we know they will get good care at their new homes, we always set up an unlimited send-back guarantee. These horses have made their contributions to the KER research program, and everyone here is very

Photo: Shawn Hamilton

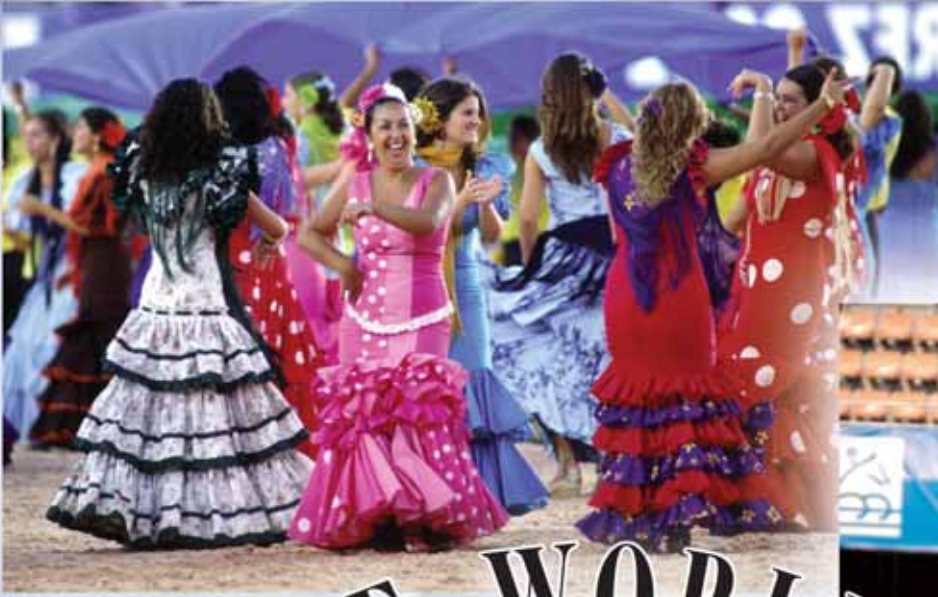


Photo : Julie Wilson

FEEDING THE WORLD



Photo: Shawn Hamilton



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Official Equine Nutritionist of the USET

Horses thrive on routine, yet world-class performance horses are subjected to a kaleidoscopic schedule of frequent travel, unfamiliar stabling, and a variety of training and competition venues. In this whirlwind of change, Kentucky Equine Research Inc. (KER) has developed a way to provide consistency in the feeding programs of these equine athletes. Building on its knowledge of nutrition and its experience as a feed consultant and supplier for two Olympic Games, KER's most recent venture was to supply hay, concentrates, and supplements for horses competing at the World Equestrian Games (WEG). The success of this effort was reflected in the number of medals amassed by KER clients at the WEG.

"As the official equine nutritionist for the United States Equestrian Team (USET), we were very pleased to see the USET athletes finish so well. The dressage and driving teams finished with silver medals, the highest either has ever accomplished. The three-day event team finished with a gold medal for the first time since 1974. The reining team won the inaugural reining competition. USET show jumpers, vaulters, and endurance horses all performed very respectably as well," said KER President Dr. Joe Pagan.

The company also formulates feeds for manufacturers around the globe known as KER Team Members. These companies supplied feed for Australian, Canadian, Indian, and Irish competitors. One such company, Brooks Feed Store in Ontario, supported many riders on Canada's equestrian team. Robert Van Camp, the company president, explained, "About two weeks before our team's horses were to ship to Spain, we were asked if we could help with the feeding program. Of course we were delighted to have the opportunity but were a little concerned about how we would manage to do this within the time frame. We called KER and found out what feeds it would be able to get to Spain for our horses, and then we helped all 20 of our equine athletes switch over to those feeds before they left the country. Managing that

transition in such a short period of time wasn't easy, but it worked very well. All of the horses maintained their weight, and our reining team achieved a silver medal."

The logistics of providing the feeds that fuel equine athletes has traditionally been the purview of each horse's immediate support staff—the owners, trainers, or grooms. According to Mandy Brown, barn manager for Tucker Johnson's champion four-in-hand driving horses, this could mean taking as much feed as possible with the

horses when they traveled to Europe for competition and then using that in decreasing amounts to blend with locally available feeds. Brown explained, "Changing feeds can often mean changing personalities. You know how your horses perform on their usual feed, but things can take a dramatic turn when you have to make substitutions. It is bad enough when you are dealing with one horse, but we have four horses in a team—four horses with distinct personalities—that have to mesh well together. Changing the feeds can dramatically alter the way our horses perform. We try to manage our time to adjust for this, but sometimes it just isn't possible."

KER recognized the need for consistency when it served as the official feed supplier for the 1996 Olympic Games in Atlanta. Pagan and his staff worked diligently with equestrian team leaders from around the world to organize feeds that would support every equine athlete. At the 2000 Olympic Games in Sydney, KER was again on hand as a consultant. The company built upon its experience

in Atlanta and set up a special Web site to communicate with all of the equestrian federations. The Web site displayed the range and quality of feeds that would be available and explained quarantine restrictions that could affect the importation of feeds and supplements. By the time the horses prepared to compete at the World Games in Jerez, Spain this fall, KER's experience had grown to enable it to arrange for individual competitors to have their own feeds, hays, and supplements ready and waiting for them in training barns throughout Europe and at the Games.

Members of the United States Equestrian Team were just a handful of the many horsemen who benefited from the services of Kentucky Equine Research during the 2002 World Equestrian Games in Jerez, Spain.



Kentucky Equine Research Manages Feed Challenges for International Athletes

“It was wonderful,” Brown explained. “We didn’t have to worry about a thing. When we arrived at our training barn in Spain two weeks before the Games, our feed and hay were already there. When we shipped into the stabling facility at the Games—same thing. When we ran out of hay, I called Jeremy Edwards at KER, and the hay we needed was there that day.”

Edwards joined KER early in 2002 to manage its global logistics. He had worked with the company during the 2000 Olympics in his position as procurement and logistics manager of the Sydney International Equestrian Center. Edwards’ experience with the Olympics made him a perfect fit for a company expanding its role in the international equestrian community.

Managing the movement of everything equine, from over 300 horses to the stalls they would use, jump standards, and feed, gave Edwards experience few people could claim. Of all the challenges he faced, he pointed to obtaining the feeds and organizing their delivery to the Olympic venue as one of the most intense. “Australia’s quarantine inspection service has very strict regulations on the importation of feedstuffs. Any type of feed or supplement that was brought into the country had to be approved first and then irradiated, ostensibly to kill any germs or insects. Many professional horse people were concerned about this and decided to try to find similar feeds produced within Australia to use while they were training and competing here. Dr. Pagan and the staff of KER were extremely helpful

Jumping Through Hoops

Freight Forwarder Makes Feed Transportation Possible

Having the right connections is often a main ingredient in any recipe for success. Kentucky Equine Research (KER) has certainly found this to be true. It has put together a staff of experienced equine professionals and assembled a consortium of international feed manufacturers that are a part of its Team Member program. Together the company and its associates are able to develop and manufacture some of the best equine feeds and supplements in the world. Moving them from country to country, however, requires yet another essential connection—that of a freight-forwarding firm.

KER international shipping expert Jeremy Edwards attributes a large part of KER’s success in Jerez to the company’s association with Eagle Global Logistics, one of the world’s largest freight forwarders. He said, “Having all the feeds at the right places at all the right times would have been impossible without the help of a firm that knows the many different regulations and how to dot all the i’s and cross all the t’s for each country. Eagle was able to do that for us.”

Eagle was founded in 1984 to provide ground, air, and sea transport for heavy freight. Today its 8000 professionals in almost 400 global offices arrange the movement of goods and solve the logistical problems that might arise when those goods are transported between countries.

John Klesch, the director of international business development for Eagle, explained, “Our company deals with customs and regulatory agencies all the time, so we were prepared to help KER move the feeds the athletes would need. However, it definitely helped that KER had people who were

quick to answer the questions that came up about ingredients in some of the feeds. Customs can be problematic anywhere. It was nice to be able to solve those problems quickly. Jeremy Edwards’ experience at the Olympics helped us tremendously. He was able to provide us with advance documentation in plenty of time, alert us to some of the issues we might have to face, and follow through with answers when we needed them.”

Speed is essential in moving many commodities, but in the case of the World Equestrian Games (WEG), timing was even more crucial as the commodity had a definite arrival date. Klesch said, “We knew when the horses would arrive, and the feeds had to be there before them. The WEG weren’t going to stop because a load of feed didn’t come through. The feed absolutely had to be at its destination on time. That meant there was very little room for problems.”

The language barrier was another problem Eagle was able to solve for KER. While Spain’s quarantine restrictions were less exacting than Australia’s, there were some supplements that were questioned and the queries came in Spanish. Edwards credited the Eagle representatives on hand in Spain for being able to translate the requests quickly and efficiently. “Eagle’s offices throughout the world all have employees who speak English as well as the language of the host country. In Spain they helped by translating immediate questions and also by making certain that all of our documentation was prepared correctly. That really helped to make our job easier.”

in providing information. Its Web site was an incredible asset for the teams' managers," Edwards stated.

KER Team Members used the Web site to coordinate feed formulations with Team Members in Australia, and the KER nutritionists in both Australia and the United States developed transition feeds for North American horses prior

support it has received from KER and (Team Member) Pennfield Feeds," said David O'Connor.

Australian three-day event rider Olivia Bunn feels much the same way. She and her horse GV Top Of The Line placed seventh in Jerez. Bunn said, "KER was instrumental in the

At the WEG, experienced staff and the coordinated efforts of Team Members throughout the world combined to provide international competitors with the best service yet.

to shipping to Australia. Van Camp said, "Coordinating the feeds for these athletes was quite an exciting thing for us to do. We worked to produce feeds that were as similar as possible to what would be available in Australia, and then formulated feeds that would help the horses change over from their current diets to the new diets. We feel that our work really helped quite a few horses."

At the WEG, experienced staff and the coordinated efforts of Team Members throughout the world combined to provide international competitors with the best service yet. United States endurance rider Kathy Brunjes said, "KER made sure our horses had their grain, hay, and supplements. It certainly relieved us of the huge task of coordinating all that feed. Every bit of the special feeds arrived in 100% condition, and we riders certainly appreciated having the KER products to use during our stay in Spain. Being a die-hard user of Endura-Max, Myo-Guard, Equi-Jewel, and Neigh-Lox, I, for one, was glad to have KER's support."

John Williams, a member of the United States three-day event team, echoed the sentiment. "Having the feeds already at the training facility and at the venue during the competition was wonderful. It meant that there was one less detail for us to worry about. My wife and I work together to care for our horses. It can be very time-consuming, hard work. This made our jobs easier," he explained.

Another rider who has benefited tremendously from KER's involvement with international competitions has been Olympic and WEG gold medalist David O'Connor, who was a USET rider in Atlanta, Sydney, and Jerez. He and his wife Karen, a member of two medal-winning Olympic teams, have horses that are poster children for KER feeds and supplements. "We first began working with Joe Pagan and Kathleen Crandell in 1995 prior to the Olympic Games in Atlanta, and we have been feeding KER-formulated feeds for even longer. We began using some of the KER supplements like Summer Games Electrolytes in 1996, and we feel they have made a tremendous difference. Team O'Connor could not have achieved all it has without the

success and performance of my horse both at the Rolex Three-Day Event and the World Championships. Emma Roberts, who works in the Melbourne office of KER, designed my horse's diet originally. She then altered it for the different parts of the world we have traveled, trying to keep the diet as consistent as possible the whole time. KER has representatives all over the world, and they have all been so helpful and mindful of the importance of having the correct feed. Prior to travelling to England before the WEG, we altered my horse's feed while still at home to ensure there would not be a problem."

The worldwide network of feed manufacturers assembled by KER provides more than just consistent feeds and supplements. Each Team Member has the ear of KER nutritionists as well. A three-day event horse at the Sydney Games suffered two bouts of tying-up while training in Australia prior to the Games. Pagan devised a feeding program that incorporated local feeds that helped to solve the horse's problem.

That level of involvement and cooperation has been an asset for many professional horsemen such as Imtiaz Anees, a three-day event rider from India. He said, "I cannot praise KER and its Team Members highly enough. Every question I have ever asked them has been answered. I feel that I have access to a tremendous amount of information from them and, of course, my horse benefits greatly. At the WEG my horse had an incredibly easy time adjusting to his new surroundings, thanks largely to the fact that the feed that he normally eats while training in the United States was ready and waiting for him when we arrived. He ate and drank on the very first day. That does not always happen. In fact, at the Asian Championships held in Bangkok in 1998, my horse did not have his normal foods and did not eat or drink well at all. He had to be pulled from the competition, and I had to ride a reserve horse."

KER representatives are already looking forward to participating in the 2004 Olympic Games to be held in Athens, Greece. Edwards explained, "KER has built a reputation for being able to formulate some of the best equine feeds in the world. At Jerez, we proved we could

Splittin' Hairs:

Novel Investigations Into Hair Analysis

Fast forward two years, four years, maybe ten. You've found the perfect horse, the quintessential equine companion—an affable, athletic, and handsome gelding. The prepurchase exam, that requisite though nerve-racking precarious last step prior to closing the deal, is almost complete. Just as you hoped, the gelding has breezed through the battery of usual inconveniences—flexion tests, radiographs, farrier consults. Only the results of one test are standing in the way of you and your dream mount, those of the hair analysis. While the suggestion of hair analysis as a routine prepurchase procedure may be a smidgen far-fetched, in this day and age, where millions of dollars exchange hands for race and show horses alike, nothing is too over-the-top. As advances in hair analysis march forward, could potential buyers one day be able to chronicle certain aspects of a horse's life, including its medication history and perhaps even its nutritional status, by simply having its hair scrutinized? Maybe, maybe not.

The Basics

Hair often does not get its due from horsemen. In fact, some gripe and grumble about the work the natural hair growth of their charges causes them. Much time is spent primping horses for appearances—pulling manes, clipping ears and bridlepats, and polishing coats—but horses have hair for a number of reasons, least of which is sheer vanity. First and foremost, hair helps in the formidable task of body-wide temperature regulation, and one integral aspect of this role is providing a shield against environmental conditions, hence the dense, wooly coats of winter and the slick, short coats of summer. Other functions of hair include protection against predatory insects and a pathway for transport of pheromones and other physiological signals from the body.

Horses possess three primary hair types: temporary, permanent, and tactile. Temporary hair covers the majority of the body, and horses shed this hair seasonally, once in the



Photo by Mark Llewellyn

spring and once in the fall. Permanent hair includes the eyelashes, forelock, mane, tail, and feathers, the long hair that adorns the lower legs of many draft-type horses. The anatomical position of permanent hair also furnishes a degree of defense. When long enough, for example, the mane insulates the major blood-carrying vessels to the brain, and eyelashes guard against eye injuries. Tactile hair includes that which grows on the muzzle and in the ears.

Of these three types, permanent hair, principally mane and tail, is used most often in analysis. Mane is preferred because of its finer texture and manageability, for it is usually shorter than strands of tail. Hair from the mane is also less prone to contamination from urine, feces, and bedding. Perhaps most importantly, results from routine hair testing are more consistent when mane is used.

Assessment of Nutritional Status

Permanent hair is a potentially useful tissue for trace mineral analysis because it is easily harvested and transported, contains a high concentrations of trace elements, and may be representative of nutritional status over an extended period of time. In the past two decades, advances in laboratory methods have made analysis possible for multiple elements, and refinement in analytical procedures has resulted in comparatively inexpensive techniques. Hair analysis is beneficial only if it accurately and consistently reflects nutritional imbalances, however, and this seems to be a stumbling block for some nutritionists who are not wholly convinced of the validity of hair analysis.

Without a doubt, hair analysis has been integral in determining exposure to heavy metals and other environmental toxins. In one instance, horses in central Europe were exposed to cadmium, a toxic metallic element, and traces of the substance were found in tail samples from horses of all ages, genders, and breeds. Interestingly, traces accumulated to a greater extent in the hair of geldings. In a study conducted in the mid-1990s, researchers examined the buildup of toxic heavy metals and elements in horses and other animals exposed to vehicle emissions. Abnormally high levels of lead and cadmium were found in horse hair samples. Lead concentrations were similar in hair and blood, lending credence to hair analysis as an effective measure of toxicity.

Similarly, selenium, an essential micronutrient in the diets of horses, can also be detected in hair. Harold Hintz, Ph.D., a professor of animal nutrition at Cornell University, said, "Hair analysis may be useful in identifying horses being fed high-selenium diets, those in the toxic range." Although Hintz has been investigating the possibility of hair analysis as a means of evaluating nutritional adequacy



Photo by Catherine Bishop



Photo by Mark Llewellyn

Both mane and tail are used in hair analysis, though researchers prefer to use mane because there is less likelihood of contamination.

of trace minerals on and off for over 20 years, he questions the merit of the testing for the majority of minerals. "As a routine procedure, it's not generally accurate."

Veterinarian and nutritionist Sarah Ralston shares the sentiments of Hintz. Ralston, a faculty member at Rutgers University, agrees that hair analysis may be "vaguely useful" for selenium status, but believes values from blood samples are more representative of true levels. In terms of other minerals, Ralston cited one study in which horses were fed escalating amounts of calcium. The calcium content of hair samples, however, did not correspond with increasing blood levels, once again suggesting the questionable merit of the procedure.

Determining Drug Administration History

While hair analysis may be a dubious method to ascertain the nutritional state of a horse, the notion of using it to establish pharmaceutical history is a burgeoning field of scientific study. Mark Dunnett, Ph.D., a research associate with The Royal Veterinary College at the University of London, recently completed research that examined the accumulation of therapeutic and illicit drugs in mane and tail hair. As part of this study, he also evaluated the potential of hair analysis for the

Fun Facts About Horse Hair

- Mane growth is slowest near the withers and fastest near the poll.
- Rate of hair growth may be dependent on breed. In one study, researchers found that native breeds of ponies, hardy individuals well adapted to climatic differences, grew mane and tail faster than Thoroughbreds. The growth of permanent hair in crossbreds fell between the two groups.
- Changes in amount of daylight dictate hair growth. As day length shortens, hair length and density increase.
- Unlike other hair on the legs, feathers are not shed seasonally. Instead, these remain steadfastly in place from season to season, just like the mane and tail.

retrospective detection of drug use and misuse in horses. Results indicated that common antibiotic preparations such as sulphonamides, trimethoprim, and metronidazole could be detected in mane and tail hair for up to two years following systemic administration. Methylxanthine drugs and their metabolites have been routinely identified in mane and tail hair. Caffeine and theobromine are the most well-known methylxanthines. These drugs are usually regarded as prohibited substances in equine competition because of their diuretic properties and central nervous system and cardiac stimulatory effects.

Another drug in the same family, etamiphylline, was the subject of inquiry by Dunnett and co-workers. Etamiphylline is a bronchodilator often used in the treatment of chronic obstructive pulmonary disease. This study was staged to determine if hair could be used to differentiate between acute and sustained etamiphylline dosing. The drug was administered orally to five ponies—three blacks, one chestnut, and one gray—for eight days. Once drug administration ended, researchers collected approximately 30 stands of hair from the midpoint of the mane. Hair was then sliced into minute sections before analysis. Blood samples were also collected at the time of hair harvesting to determine circulating levels of the medication. Interestingly, hair from the black ponies contained traces of etamiphylline as early as 24 hours after administration ended, but no evidence was found in the hair of the chestnut or gray ponies. Why the disparity? Dunnett explained, “The drug binds to melanin, a pigment abundant in dark-colored hair. Chestnut, gray, or white hair contains little or no

melanin, so the drug has nothing to attach to.”

Perhaps the most useful application of hair analysis is the assurance of a level playing field during competitive equine events. Countless performance-enhancing drugs, including stimulants and sedatives, have been misused over the years. Unfortunately, the abuse does not necessarily commence when performance horses begin training. Growth promotants such as the anabolic steroids stanozolol and boldenone, both derivatives of the male hormone testosterone, are abused in horses being prepared for sales, show ring competitions, and racing where above-average musculature is prized. “There is no legitimate reason for sustained use of anabolic drugs in young horses, including two-year-olds in race training,” said Dunnett. In older horses, anabolic steroids are often resorted to in a last-ditch effort to improve down-spiraling performance. In a recent French study, horses were given an intramuscular injection of either stanozolol or boldenone. Hair from these horses was then compared to hair from untreated horses. Both anabolic agents were discovered in the samples obtained from the treated horses.

Other drugs purported to increase performance, such as morphine, diazepam (a sedative), and clenbuterol (a bronchodilator), have been identified in equine hair. Scientists have met with less success in measuring other well-known drugs in hair. In a study conducted three years ago, cocaine was not detected in mane samples following intravenous or oral administration. However, procaine, a drug commonly used as a local anesthetic, was readily detected in hair, according to Dunnett.

Hair analysis may be especially useful in determining whether drug administration was acute or chronic. Racehorses often fail post-race tests for prohibited substances because of chronic feed contamination. Examples of documented feedstuff contaminants include arsenic, atropine, caffeine, morphine, and theobromine, among a host of others. If a trainer maintains that no performance-enhancing agent was given and the results of hair analysis validate the assumption of feed impurity and long-term exposure, horsemen may be able to dodge fines and suspensions or at least lessen the harshness of those imposed.

“Hair analysis may be used as supportive evidence to back up findings of routine blood and urine tests,” said Dunnett, who has been called as an expert witness in the United States, “but it’s not applicable to race-day testing, obviously because of the slow nature of hair growth.”

Advances in horse hair analysis have unveiled an abundance of untouched research possibilities. As science moves forward, the likelihood that hair will reveal further information about the health and well-being of horses is

Kentucky Equine Research Sponsors International Symposium

The 6th International Conference on Equine Exercise Physiology (ICEEP 6), sponsored in part by Kentucky Equine Research, Inc. (KER) and USA Equestrian, was held in Lexington, Kentucky September 22-28. The symposium drew the world's top equine sport medicine scientists, and capped a series of conferences that included the 12th annual KER Nutrition Conference and a lecture series titled Equine Sports Medicine 2002 hosted by the University of Kentucky.

ICEEP was established in Oxford, England in 1982 as an information exchange forum for leading scientists in the field of equine exercise physiology. After the first meeting, it was decided there should be subsequent conferences to allow researchers the opportunity to share results of scientific investigations and to develop collaborative relationships. Since the first gathering, conferences have been held in Sweden, Australia, Japan, and the United States.

KER researchers and staff played a prominent role in ICEEP 6. President Dr. Joe Pagan served as a member of the national organizing committee that was responsible for procuring the conference venue and overseeing local activities. KER was also instrumental in preparing the nearly 600-page hardbound proceedings. Gemma Cowley, a research associate at KER in 2001 and 2002, coordinated the acquisition of papers from authors and the dissemination of those papers to reviewers in the spring and summer of last year. Before acceptance of the papers into the proceedings, they were scrutinized by at least two reviewers. Cowley worked with more than 130 professionals across the globe during the review process. Electronic transfer of manuscripts facilitated prompt communication between authors and reviewers, and the proceedings was produced in advance of the conference for the first time in ICEEP history. A completely searchable CD version of the proceedings, compliments of KER, was distributed with each bound copy.

In addition to his service on the national organizing committee, Pagan presented the results of two studies conducted at the KER research facility in Versailles, Kentucky. One of the studies illustrated the effects of fat adaptation on carbohydrate and fat oxidation in

conditioned horses during low-intensity exercise. A fat-supplemented diet was found to dramatically reduce the production and utilization of glucose, and decrease the respiratory exchange ratio. In addition, whole-body carbohydrate oxidation rate was lowered while an increase was noted in the rate of body-wide lipid oxidation. These metabolic changes, which were apparent after five weeks of fat supplementation, are advantageous during prolonged exercise such as endurance riding, when delayed use of carbohydrates as a source of energy would defer fatigue.

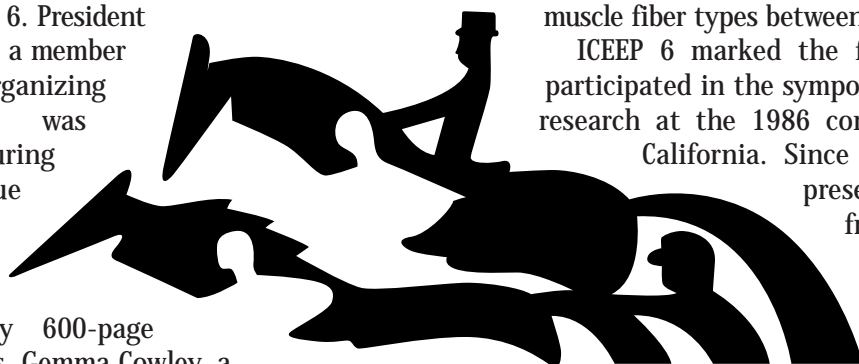
The second study compared the metabolic responses of Thoroughbreds and Arabians during high- and low-intensity exercise. As expected, Thoroughbreds had higher aerobic and anaerobic capacities when compared to Arabians, which were found to be better suited for long-distance riding due to their efficient use of fat to drive exercise. The metabolic variances discovered during the study may reflect the well-documented differences in muscle fiber types between the breeds.

ICEEP 6 marked the fourth time Pagan has participated in the symposium; he first presented research at the 1986 conference in San Diego, California. Since that time, all of his presentations have resulted from research carried out at the KER facilities in central Kentucky.

Lexington was chosen as the site for ICEEP because of its renown as the epicenter of Thoroughbred breeding. KER staff members organized a number of extracurricular activities for the conference participants and their guests including trips to local horse farms, the Kentucky Horse Park, the Red Mile (a harness racing track), and medical facilities such as Hagyard-Davidson-McGee Veterinary Clinic, Kentucky Equine Sports Medicine and Rehabilitation Center, and the KER research facility. Guests were also taken to local historical attractions such as Fort Harrod, Shakertown, and the Labrot and Graham Distillery. University of Kentucky staff provided tours of the Maxwell H. Gluck Equine Research Center on the university campus.

USA Equestrian hosted a dinner for ICEEP attendees at its new facility at the Kentucky Horse Park. Rood and Riddle Equine Hospital entertained conference participants one evening with dinner at its clinic in Lexington.

The next ICEEP is slated for 2006 and will be held in



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5. David Hayes - Champion Thoroughbred trainer in Australia and Hong Kong.
6. Olivia Bunn - Represented Australia at the 2002 World Equestrian Games in three-day eventing.



For more information contact:



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Will It Ever Rain Again?

Vour once-green pasture is starting to resemble an arid desert. Feed and grain prices are climbing and the price of chaff and hay (if you can buy it all) is going through the roof! Your horses need to eat, but what? If you can't get hay and you have no pasture, what on earth are you supposed to do?

Forage

One of the greatest concerns during a drought is lack of forage. If you are well prepared, you may have a modest store of hay to help you through, but in extended periods of drought, there will be a time when you run out.

Luckily, there are a couple of ways that hay can be rationed out to go a little further whilst maintaining healthy gut function.

Horses need at least 1% of their body weight as dry forage each day. That's 5 kg for a 500-kg horse. This is nonnegotiable and falling below this amount has its associated dangers in the form of colic, laminitis, gastric ulcers and loss of condition. During times of drought, the nutritive value of the forage is less important than the physical bulk of it, as poor-quality, low-energy roughage can be supplemented with hard feed to fill in the nutrient gaps.

Care must be taken not to feed mouldy or uncured hay, but other than that, even substandard long-stem grass hay will do when nothing else is available. Unconventional forages such as sorghum stubble, pea straw and good-quality silage can be used when available. Be very careful when using unusual types of forage and be aware of nutrients that will need to be supplemented by these forages. Seek professional advice before using unfamiliar forages.

Energy

To keep horses healthy and in good condition, you will need to provide sufficient dietary energy. Because energy is not available from pasture and hay and may be limited from available forages, most horses in drought conditions will need supplementary feeding in order to maintain condition. When hard feed is provided, it is best to minimise grain intakes, and use energy sources that are considered to be safe, such as fats and digestible fibres. Whether you decide to make your own grain mix or buy a commercial premixed feed, care must be taken to introduce new feeds slowly and in sensible amounts. Feed no more than 2.5 kg of grain or pellets per meal.

Vitamins and Minerals

Vitamin and mineral supplements will likely be required, as dry hay and grains are deficient in some of these important physiological substrates, especially vitamins A and E. A broad-spectrum multivitamin product that contains macrominerals and trace minerals should be used.

Protein

Most classes of horses, except the adult spelling horse, may require a protein supplement during times of drought when poor-quality, low-protein forage is used. Protein is most important for pregnant and lactating mares, young growing horses and old horses. Good-quality protein is vital for healthy development and growth of the foetus and young horse. Signs of a protein deficiency include loss of muscle mass and tone and a potbelly, especially in young horses. Generally, if lucerne hay and good-quality pasture are fed, these requirements will be met, but in times of drought, when this is not possible, there are a number of supplements that should be considered to meet these requirements.

Common Health Risks Associated with Drought Feeding

During drought you may need to make frequent changes to your horse's diet as different ingredients become unavailable, or a new source of an ingredient is found. Constantly changing the diet, sometimes using ingredients that you are not familiar with and feeding more hard feed to make up for the lack of forage, imposes some health risks on your horse. The major risks to be aware of are colic, gastric ulcers and laminitis.

To minimise the risk of colic, try to provide as much roughage as possible, and supply energy in the form of fibre and fat, thus minimising the need for grains. Introduce all new feeds and ingredients, including different hay and chaff types, over a period of 7 to 10 days, gradually phasing out the old whilst increasing the new ingredient.

The lack of forage may cause horses to eat manure and graze rough areas of the paddock to satisfy their need for forage. Maintain a vigilant deworming program during drought to help horses get the most out of their feed, and remove manure from the paddock or yard regularly.

Once the Drought Has Broken

When the rain comes, everyone breathes a collective sigh of relief but the problems do not end with the first patter of the life-giving drops. Paddocks that have become dry and dusty will take a period of time to fully recover, and until then, the dangers of fresh new growth to your horse will also have to be carefully managed.

As with all dietary changes, the introduction of new pasture must be done slowly to avoid the risk of colic or laminitis. If possible, start by allowing just a couple of hours each day on the revitalized pasture.

Beware of "green drought," a condition in which your pasture may appear to remain green, but there is no actual grass to be had. You will need to continue will supplementary forage until there is sufficient pasture for the horse to graze consistently before reducing the amount.

A more detailed version of this article is available from KER Australasia. Please contact KER for nutrition advice at 1800 772 198. A free ration analysis is also available to ensure nutrient requirements are being fulfilled.

Kentucky Equine Research Team Member Directory



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011-41-61-753-9620 Fax

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011-61-03-9357-7874 Fax

Saracen Horse Feeds
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Tottenham Feed Services
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to outshine,
to thrive.**

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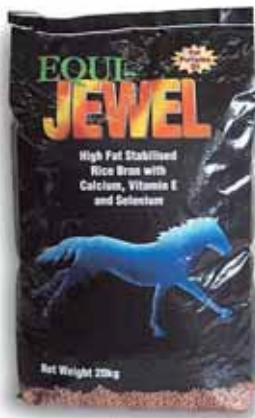
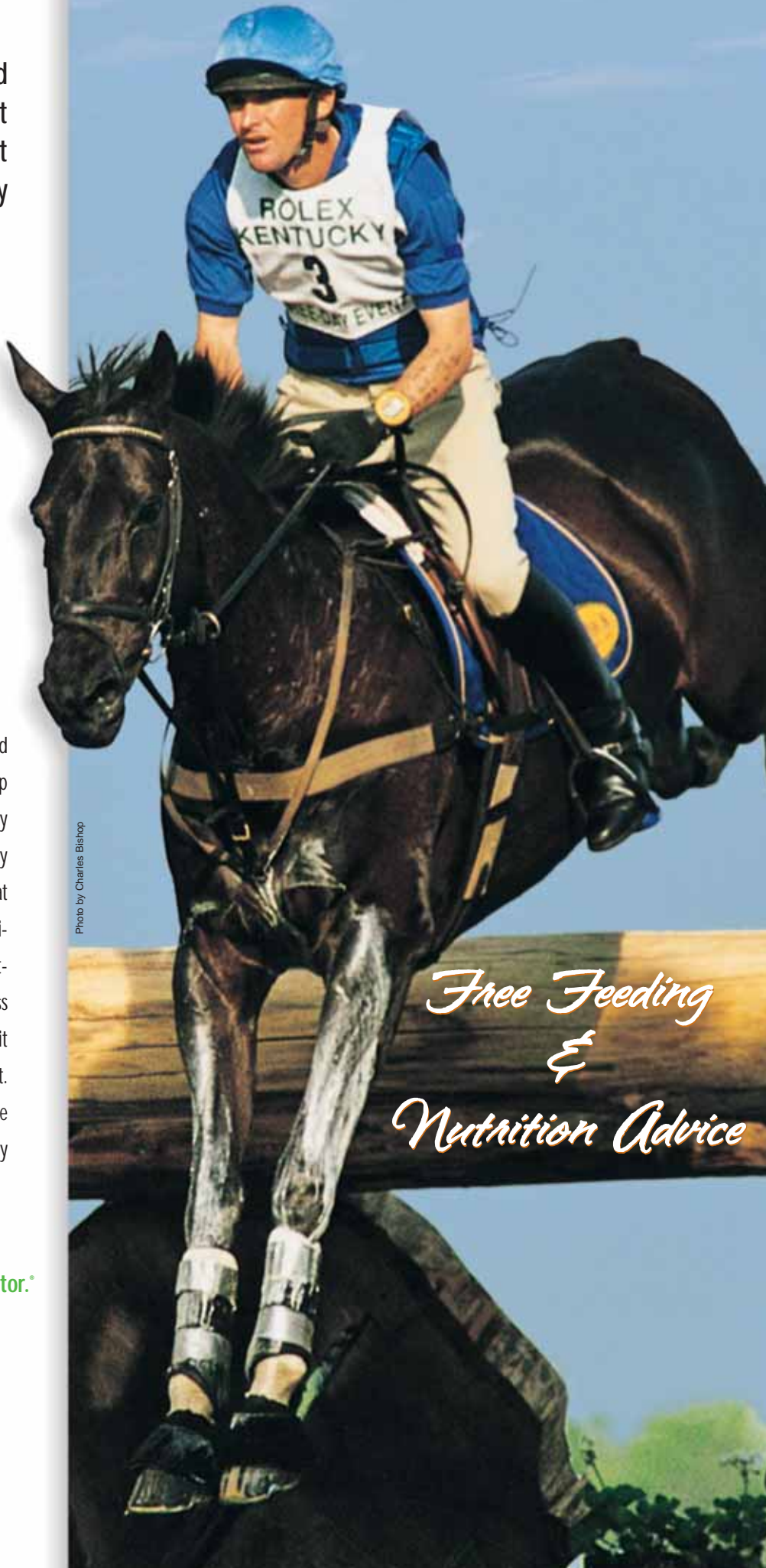


Photo by Charles Bishop



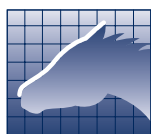
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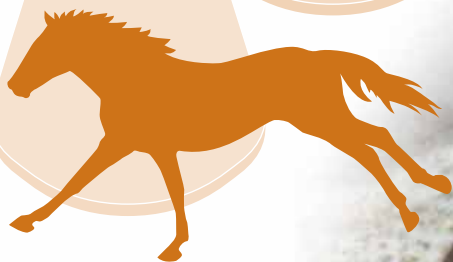
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Conditioner



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