

Optimizing the Care and Management of Your Equine Athlete

When the Great Scorer comes to mark against your name, He writes not that you won or lost, but how you played the game.

National Sportsmanship Day is March 1, and whether the athletes we most admire happen to be human or equine, they have uplifted and inspired us through the love of competition. Horses were part of the Ancient Olympic Games in 680 BC and have been competing with and alongside their human counterparts through the ages. The equestrian disciplines of jumping, dressage and eventing have been part of the Olympics for more than 100 years!

The Olympic Games are based on a philosophy that advocates using sport not just as a physical activity but also as a means of educating people. According to this philosophy, the good



INSIDE THIS ISSUE...

- Optimizing the Care & Management of Your Equine Athlete..... 1
- Director’s Message2
- Equine Anti-Doping Regulations 3
- Maximizing Health..... 4
- Nutrition..... 4
- Conditioning and Fitness..... 9
- Environmental Factors 12
- Podiatry 14
- Complementary Medicine/
Early Screening for Injury 15
- Kenneth L. Maddy Equine
Analytical Chemistry
Laboratory 18
- For the Love of Sundance 19

sportsmanship, sense of fair play and respect for fellow athletes developed through participation in sports teaches men and women of all races, religions and nationalities to work peacefully together in competition toward common goals.

The FEI (Fédération Equestre Internationale) functions in a similar role as the International Olympic Committee, serving as the international governing body for equestrian sports. The USEF (United States Equestrian Federation) is our national regulatory organization, regulating competitions and promoting the safety and welfare of horses and riders while encouraging excellence at

every competitive level. They provide a body of rules, an effective means of enforcing them, and a judicial process that is fair to competitors while providing for optimum integrity within the sport.

The FEI and the USEF work to ensure that the welfare of the horse is paramount in all equestrian sports and that athletes—human and equine—compete on a level playing field. Anti-doping regulations exist to prevent any attempt to alter a horse’s performance or to mask an underlying health problem. When

—Continued on page 3

DIRECTOR'S MESSAGE



Dr. Claudia Sonder

We need to strive for what is optimal, not what is maximal. –Temple Grandin

I was one of those little girls who declared at a young age that I would ride in the Olympics. I believed that if I trained hard enough and rode well enough, that the rest would fall into place. The truth is, getting a horse and rider team to the pinnacle of their sport is a daunting task. Many stars must align early in the game. First and foremost, the horse has to have the body type, conformation and competitive nature to set it up for success in a particular sport. Its diet, temperament, environment, training history, and comfort level all play a role in its desire and ability to work as a team with its rider. For most of us, the Olympic dream fades, but the joy of competing successfully with a horse that we have brought along remains.

Horses and riders require a certain amount of mental maturity to navigate a large course or complete a complex test that requires focus and technical mastery. Younger horses often have the raw physical

ability but lack the mental maturity and solid behavior to complete the task. They often require years of graduated training in capable hands before they make a suitable mount for a less experienced rider. In most cases, by the time the horse is capable of such work in the English equestrian competitions, they are past their physical prime and dealing with some low-grade degenerative joint disease or other symptom of all their years of practice. For this reason, medications do have their place in equestrian competition. It is important that riders and veterinarians alike have the option to provide comfort to those horses that love their work but pay a physical price. The same is true for human athletes. After heavy work, it is not unusual for us to take an anti-inflammatory, and when used judiciously this serves us well.

The health of our sport and industry will rest on the decisions we make now to strive for what is optimal and to create an environment of compassion and integrity for those who will one day take our place.

The problem occurs when medications are used to enhance performance or alter behavior. Society is no longer willing to put up with medicated athletes, human or equine. A current sentiment is that concern for animal welfare is at an all-time high, while general familiarity with horses seems to be at an all-time low. Recent, highly publicized reports of drug abuse in the racehorse and English hunter worlds has called the equestrian regulatory bodies to the plate, and the result has been the development of some new rules affecting performance horses in competition. These new rules are important to maintain a level playing

field and to protect the welfare of the horse. The technology to detect drugs in the horse's system is advancing as new drugs are developed. The Kenneth L. Maddy Analytical Chemistry Laboratory at UC Davis uses state-of-the-art technology and methodologies to study medications within a horse's system and investigates new classes of drugs with the potential for abuse.

So in this new, strong and enforceable era of anti-doping sentiment, we must remember that we have the tools to support our horses in such a way that minimizes the need for behavior- and performance-enhancing medications. There are steps we can take all along the way to preserve athleticism and prolong the bond we share with our horses. This *Horse Report* will discuss some of the rule changes that

have gone into effect this past year within the FEI, USEF and the State of California and describe our current understanding of optimizing wellness for the athlete. The health of our sport and industry will rest on the decisions we make now to strive for what is optimal and to create an environment of compassion and integrity for those who will one day take our place. ✨

Equine Athletes — From page 1

competing under FEI rules, riders in equestrian events are subject as well to drug testing. Individual states also have their own rules governing equine medications. Athletes accept these rules as a condition of participation in athletic competitions.

In this *Horse Report*, we call your attention to some changes to drug and medication rules made by the USEF, FEI and the California Medication Monitoring Program. Our primary focus, however, in keeping with the Center for Equine Health's mission, is to highlight a number of evidence-based areas in which equine athletes can best be supported, possibly pre-empting or minimizing the need for medications and supplements. While these management techniques are not remedies for all conditions or all horses, they have proven effective in maintaining physical condition, alleviating pain or discomfort, and preventing injury.

Equine Anti-Doping Regulations

There has been much publicity in the last few years about the prevalence of drugs in horseracing and too many stories about fatal breakdowns involving the abuse of medications. In December 2012, the sport horse world got a taste of the same medicine when the *New York Times* ran a story about a hunter pony that collapsed and died after having received 15 separate drug treatments in the three days preceding his death. The substances included anti-inflammatories, corticosteroids and muscle relaxants, according to his medication chart.

Since 2010, random drug tests at equestrian events, including the Olympic trials, have uncovered dozens

of violations for substances including cocaine, antipsychotics, tranquilizers and pain medication. Show-horse trainers have been implicated in abusing some of the same drugs that have caused widely publicized problems in racing. In response to these events, the USEF and FEI have recently instituted changes to their medication and equine welfare-related rules; these are highlighted below. For the complete rules and details concerning these changes, please visit their respective websites.

USEF Rule Changes Effective December 1, 2013 (www.usef.org/rulebook):

- No horses or ponies may be injected within 12 hours of competing.
- There are only three exceptions to this rule: therapeutic fluids, antibiotics, and dexamethasone for the treatment of hives.
- All excepted substances must be administered by a licensed veterinarian and cannot be administered to a horse or pony within 6 hours of competing.

USEF New Rule, GR 843 Mandatory Reporting & Cooperation of Horse/Pony Collapse, Effective August 1, 2013

- A collapse is defined as "a fall to the ground with no apparent cause."
- The trainer, owner, or rider of a horse must report a collapse no later than 3 hours after it has occurred.
- Any horse or pony that collapses is subject to drug and medication testing and inspection by a USEF appointed veterinarian.
- Cooperation with the federation as to an investigation concerning

a horse/pony collapse or death is mandated.

FEI Rule Changes Effective January 1, 2014 (www.fei.org):

Three substances have been added to the controlled medication list for:

- Metformin—a potent but legitimate oral anti-diabetic drug with a potential welfare risk.
- Levothyroxine—an exogenous thyroid hormone replacement that could enhance performance.
- Adrenocorticotrophic hormone (ACTH)—this is currently classified as a banned substance and will be moved to the controlled medication section of the 2014 list due to its therapeutic value in equine medicine.

Three previously unlisted substances will be added to the banned substances section of the 2014 list:

- Injectable ammonium chloride—an injectable nerve-blocking solution that can be used to mask lameness.
- Gamma-butyrolactone (GBL)—a pro-drug (biologically inactive) that is converted into GHB in the body.
- Gamma-hydroxybutyrate (GHB)—a naturally occurring substance that can elevate growth hormone levels and is associated with performance enhancement.

California Equine Medication Rule Changes Effective January 1, 2014 (www.cdfa.ca.gov/ahfss/animal_health/EMMP)

In California, the equine industry has had legislation in place since 1971 to prevent misuse of drugs and medications in equines in public

— Continued on page 4

Equine Athletes

— From page 3

shows and sales. The resulting law is known as the California Equine Medication Rule and is enforced by the California Department of Food and Agriculture through its Equine Medication Monitoring Program. Exhibitors and consignors must comply with *both* the California Equine Medication Rule and any event-sponsoring organization's (e.g., USEF) drug and medication rule for the event, with the more stringent medication rule being applied.

Here is a very brief summary of changes to the California Equine Medication Rule:

- ▶ Modification to the definition of an event to clarify exempted events not originally intended to be covered under the Equine Medication Monitoring Program.
- ▶ Limit of one nonsteroidal anti-inflammatory drug (NSAID) in the system.
- ▶ Elimination of drug declaration form for NSAIDs.
- ▶ Additions to the restricted permissible medications list.
- ▶ An allowance for emergency use of flunixin (Banamine®).
- ▶ No administration of injectable substances within 12 hours of competition.

For the complete rules and details about the changes, please visit the California Equine Medication Monitoring Program website.

In addition to specific medications, herbal and natural products have the potential to contain prohibited substances. FDA approval is not

necessary for manufacturers to produce commercial herbal products; therefore, herbal products are not scientifically tested or regulated as modern medications.

When administering a product with an herbal or natural label to an equine, be aware that specific ingredients and quantitative analyses are not known for these products. Contrary to a manufacturer's claim, detection of a prohibited substance (positive drug test) may occur after use of herbal products such as valerian root, kava, chamomile, capsaicin, and devils claw, to name a few. A complete list of herbal offenders is available on both the USEF and FEI banned substances list.

Maximizing Health

Health is a state of complete physical, mental and social well-being — not merely the absence of disease. It reflects an environment of optimal conditions for normal function, one that encourages natural healing and minimizes the need for invasive treatment. Described below are some areas of health that will contribute to maintaining your athletic horse in its best condition.

As with human athletes, physical activity, athletic performance and recovery from exercise in horses are enhanced by nutrition that meets the body's particular needs along with an appropriate conditioning program that supports injury prevention. Since horses work on surfaces that may actually increase the risk for injury to tendons and ligaments, we will share some recent research that has been conducted in this area. Research for sport horses is still in the early stages, but enough initial work has been done to provide some interesting results.

Some injuries occur long before there are any outward signs of

lameness, and early screening for injury can help prevent further damage and prolonged healing times. Daily palpation of limbs for swelling or heat is a crucial part of any successful program. Acupuncture and chiropractic have been effective as treatments for conditions ranging from musculoskeletal problems to gastrointestinal disorders, and acupuncture has been shown to be an effective early screening tool for lameness. Finally, a major contributor to keeping athletic horses sound is attention to the foot, which supports all other anatomical structures at risk of injury. The following sections will address each of these areas.

Nutrition

Dr. Clair Thunes, PhD, teaches equine nutrition and equine exercise physiology in the UC Davis Department of Animal Science and has competed in a number of sport disciplines including eventing, show jumping and dressage. She is also an independent equine nutritionist and owner of Summit Equine Nutrition LLC. She offers the following perspective on optimizing nutrition for equine athletes.

Today's performance horses lead lives that are very different from their wild ancestors. Yet physiologically, they are not so different: modern horses still have a digestive tract where more than 50% of its volume is given over to the fermentation of forages and that still secretes acid and bile 24 hours a day because it expects almost continuous grazing rather than infrequent meals.

Horses evolved eating grasses that for the most part were high in complex carbohydrates, requiring fermentation by hindgut bacteria. The relationship between these bacteria and the horse

— Continued on page 6



Equestrianism is the only sport that involves two athletes, equine and human, and it is the relationship of trust and respect that is built up between this partnership that makes the sport so exceptional.

Equine Athletes

— From page 5

is mutually beneficial because the horse absorbs the byproducts of the fermentation processes as an energy source. Therefore, maintaining the health of the microbial population is a vital component of nutritional management. The bacterial population requires that adequate amounts of complex carbohydrates be provided in the diet and that the diet stay relatively static with only gradual changes.

An appropriate feeding program for any horse takes into consideration the horse's digestive anatomy and physiology. Ideally, the primary diet should have a foundation in forage, regardless of whether the horse is a retired pasture ornament or an Olympic-level show jumper. Performance horses may need more calories in their diet than can be met from forage alone; as a result, the temptation is to feed increasingly high levels of calorie-dense feeds. The focus of the ration can easily become these supplemental energy sources, with less and less attention paid to the ration's forage components.

Because many supplemental feeds fed to performance horses are fortified, this can create a perception that the forage is nothing but filler. However, the majority of horses should be consuming a minimum of 1.5% of their body weight per day as forage, or approximately 18 pounds a day for a horse weighing 1,250 pounds. Thus, in most cases the forage portion of the diet provides the majority of the calories, protein, and minerals such as calcium and phosphorous, making it far more than just filler.

Careful selection of forages can mitigate a number of problems observed in equine athletes. For most performance horses, this forage



will be hay. Undesirable hay bellies, which are caused by consuming large amounts of indigestible, poor-quality forage, are best fixed not by reducing the amount of hay fed but rather by switching to a hay that is more easily digestible. Conversely, feeding a lower-quality hay to horses that typically need calorie intakes restricted will allow a greater amount of hay to be consumed without the risk of weight gain. With careful hay selection, the amount of hay fed can be maximized for each horse, thus

honoring the digestive physiology and reducing the risk of conditions such as equine gastric ulcer syndrome and stable vices like wood chewing.

The purpose of concentrate feeds and supplements should be to provide what is missing in the forage portion of the ration. For nearly all forages, this means a source of trace minerals, certain vitamins and fatty acids. For many horses competing at the entry levels of their disciplines, feeding a nutrient-dense low-calorie ration

balancer with a small serving size in combination with hay will provide nearly all of the necessary additional nutrients.

For horses unable to maintain condition on forage and a ration balancer, a more calorie-dense feed should be added to the ration. There is a tendency within certain disciplines for horses to be maintained with too much condition, which results from overfeeding. There are two major consequences of these practices: (1) extra condition adds unnecessary wear and tear on joints and soft tissues and can result in soundness issues, and (2) extra condition may produce negative behaviors.

Horses that are overfed calories can become exuberant, and when this is not given an appropriate outlet such as turnout, undesirable behaviors under saddle can result. This is particularly troublesome in the show arena and can lead to the pursuit of calming supplements and other measures to create a more tractable mount. **In most cases, the simplest and most appropriate solution would be to feed a more appropriate diet.**

For those struggling to keep weight off their easy keepers or who feed commercial feeds in quantities less than the manufacturer-recommended amounts, a suboptimal diet can result. Horses may appear to be in good condition when, in fact, they are suffering from a level of malnourishment. For example, manganese is needed for the creation of chondroitin sulfate and copper for the formation of collagen, the foundation of tendons and ligaments. Without careful attention to the diet, these deficiencies can potentially go unnoticed. The long-term impact of suboptimal diets is not well documented in horses. However, the harder a horse works and the greater

demands made on metabolism and physiology, the more likely nutrient deficiencies will negatively impact both health and performance.

Fat sources have become a common ingredient in many performance horse feeds. Because fats are very energy-dense (2.25 times more calories than an equal weight of carbohydrate), they are an effective way of adding large amounts of supplemental energy to a ration. Fat also does not raise blood glucose and insulin the way high-starch intakes do, which is an important consideration when dealing with horses that are sensitive to nonstructural carbohydrates, such as those with PSSM or insulin resistance.

Fat is susceptible to rancidity, and when a high-fat diet is fed to a horse, the horse is at a higher risk of developing cellular oxidative damage. If vitamin E, a natural antioxidant, is supplemented in the ration (usually at 1,000-2,000 IU per 1/2 cup of oil), it can help offset that oxidative damage. Interestingly, high-fat feeds that have been stored in hot environments, or that are not fresh, could have higher levels of rancidity, so ensuring that the feeds purchased are fresh is important.

There is also much anecdotal evidence that horses fed fat instead of grains are less excitable. Research has shown that there may in fact be merit to these claims, with dressage horses fed high-fat diets being less easy to startle and having lower resting cortisol (a measure of stress) than when fed a diet higher in starch. Other research has confirmed that foals fed high fat and fiber diets cantered less often and for less time than those fed calories from starch and sugar. More is not always better though. When fed in excess, fat has the potential to disrupt hindgut fermentation and absorption of some minerals and vitamins. As always, the key is in finding the correct balance.

Performance horse managers are constantly on the lookout for inflammation, especially of the joints, but they also have to battle other inflammatory conditions such as hives and even laminitis. As all of these conditions can keep a horse out of the competitive arena, there is a lot of interest in nutritional aids in the form of nutrients with potentially anti-inflammatory properties such as various joint supplements, omega-3 fatty acids and, most recently, resveratrol and turmeric. However, potentially anti-inflammatory supplements may violate anti-doping regulations.

Unlike plants, horses and other mammals are unable to create omega-3 and omega-6 fatty acids, so these nutrients must be provided in the diet. Good-quality fresh pasture provides approximately three times more omega-3 fatty acid than omega-6. The amount of omega fatty acids is lower in hay as they are not heat stable. Flax provides a good source of omega-3 fatty acids at approximately four times more omega-3 than omega-6. It may be fed whole or is available for purchase in ground, stabilized forms. Unless stabilized, the fatty acids will oxidize once ground. Grains and oils tend to provide larger amounts of omega-6 than omega-3. Corn oil, for example, provides approximately 45 times more omega-6 than omega-3 fatty acid.

The relative amount of omega-3 to omega-6 in the diet may have important implications for inflammation within the body. The ratio in good quality grass pasture is about 3:1 omega-3 to omega-6. High-grain diets will throw the ratio the other way, and this has the potential to be pro-inflammatory versus anti-inflammatory. Research conducted at UC Davis revealed a 60%

— *Continued on page 8*

Equine Athletes — From page 7

drop in biomarkers of inflammation after supplementation with a product containing an omega-3 to omega-6 ratio of 4:1. Competition exists between omega-6 and -3 fatty acids at the cellular level; therefore, the dietary fatty acid composition has the potential to impact a number of important cellular level functions relevant to performance.

Approximately 15 to 25 g per day of supplemental omega-3 fatty acid is often recommended for a 1,100-pound horse; a cup of ground flax provides about 22.5 g. The National Research Council (NRC) requirement for omega-6 is 0.5% of dry matter intake, or about 5.5 g per day for a 1,200-pound horse eating 2% of body weight in feed.

Vitamin E is a powerful antioxidant that protects sensitive cell membrane components from oxidative damage. Currently, the NRC recommends a minimum daily intake of 1.6 to 2 IU/kg body weight per day for working horses, or about 1,000 IU per day for a 1,200-pound horse. There is research showing that levels above this may improve performance in some horses, especially those doing rigorous speed or endurance work or suffering from neuromuscular disorders. Horses who fail to develop an adequate topline despite normal development and soundness may also benefit from additional vitamin E supplementation.

Common over-the-counter supplements will often contain selenium. The margin of safety for selenium is far below that of vitamin E, so it is important that vitamin E is supplemented alone unless a selenium deficiency is detected. Consult with your veterinarian before initiating a combination supplement.

A diet of good-quality fresh pasture provides significantly more vitamin E than the above recommendation. However, due to oxidation processes, naturally occurring vitamin E in pasture declines dramatically during curing for hay as well as in other feed ingredients that undergo processing. Losses in hay can be so great that stored forage should not be relied upon as an adequate source for performance horses. While better-quality commercial feeds provide a source of vitamin E, in some instances separate vitamin E supplementation may be justified, especially for horses in intense work and those showing signs of muscle soreness or prone to recurrent tying-up.

For maximum absorption, vitamin E should be supplemented in the natural α -tocopherol form. Water-soluble versions exist, which are the most absorbable and are recommended for horses with neuromuscular conditions.

Vitamin E appears to play a role in a number of neuromuscular diseases including equine degenerative myeloencephalopathy (EDM), equine motor neuron disease (EMND), as well as muscle atrophy conditions. Further work is needed to better understand its role in these conditions.

So where does all of the above information leave us as far as making sound nutritional decisions for our horses? A good initial rule of thumb is to always remember how the horse's digestive anatomy and physiology work and to design a feeding program that honors this. This means starting with forage and selecting the right forage for the individual horse. All hay must be clean and free of weeds, molds and dust. Select the hay that allows you to feed the greatest amount possible while still maintaining a desirable body condition. Keep in mind that access to fresh green pasture is not ideal for all

horses. Consult with your veterinarian regarding individual restrictions.

Whenever possible hay should be tested, especially when several months of hay are purchased at one time. Compared with the cost of hay, testing is a very modest investment starting at around \$30 for information about the calorie, protein, carbohydrate fractions, macro and trace mineral content. Make sure that the lab chosen to run the analysis provides equine-based information. When an analysis is not viable, a thorough visual assessment can give some nutritional information. Hay with a greater proportion of leaves relative to stems is higher quality and will have a higher calorie and protein content versus a stemmy hay with lower leaf content.

Alfalfa is a higher-calorie hay than grass hay, making it less desirable for easy keepers but a good choice for harder keepers. It can be included up to about 30% of the total forage. Above that amount, protein and calcium intakes become excessive.

Once the hay is selected, nutrients not present in hay in adequate amounts need to be provided by some additional means. If the horse is able to maintain condition solely on hay, then a broad-spectrum supplement providing approximately 50 mg of copper and 200 mg of zinc (this is half of the NRC requirement for a 1,100-pound horse at rest) or a ration-balancing feed (look for feeds with a 1- to 2-pound serving size per 1,000 pounds of body weight) should be added to provide necessary trace minerals. The benefit of the ration-balancing feed is that it will also provide a source of quality protein that may be lacking in some grass hays. For some very easy keepers, even the limited calories provided by a ration balancer may be too many, making a supplement a better option.

For horses needing additional calories to maintain condition, a performance or senior feed will be a better option. It is very important to pay attention to the feeding directions and select a feed that you can feed at the recommended amount. This is particularly important for senior feeds that may be “complete” feeds, meaning that they provide all of the necessary forage as well and therefore have very large serving sizes, upwards of 15 pounds per day in some cases. Read the labels to determine the serving size for your horse’s needs and purchase accordingly. Also look at the label to determine whether the feed is providing calories from fat (% crude fat) or starch. Feeds with a low percentage of crude fiber tend to have a higher starch content. Look at the ingredient list to see whether the feed includes beet pulp, soy or almond hulls—desirable sources of fermentable fiber—and do not shy away from wheat middlings and wheat mill run, which provide the same calorie content as many grains but with half the starch.

Beyond this, be sure to provide a source of salt and consider adding supplemental sources of omega-3 and vitamin E. Many horses do not consume enough salt from a block to meet their minimum sodium requirement, which is equivalent to a 2-pound block of salt a month for an 1,100-pound horse living in cool weather and doing no work. Therefore, it is advisable to add 2 tablespoons (1 ounce) of white salt to the daily feed in addition to having access to a block. An additional electrolyte may be needed during hard work and/or hot weather.

Elite human athletes have come to realize that, while they may think they know how to eat properly for their chosen sport, there are real benefits to working with a nutrition professional

with the expertise to fine-tune their diet for maximum performance ability. This is where working with an independent equine nutritionist can really make a difference. They can create a diet based on the forage and help with correct product selection, thus ensuring that your horse is getting everything needed while at the same time honoring digestive anatomy and physiology.

Given the large amount of money spent on feeds and supplements every month, consulting with an independent equine nutrition professional is a sound investment, with most offering a range of services priced from about \$100 for an hour-long phone consultation, to \$200-\$300 for an in-depth ration analysis.

A good independent equine nutritionist will be basing their recommendations on the available science, not the need to sell certain products. There is still much work to be done when it comes to research in sport horse nutrition:

- Studying the effectiveness of potentially anti-inflammatory nutrients in horses such as quercetin, resveratrol, and turmeric.
- Quantifying whether mimicking natural eating habits in stabled horses lowers stress.
- Making a commitment to support general sport horse nutrition research.

Advancing our knowledge in these areas will help provide nutritionists and veterinarians with the tools they need to make sound feeding recommendations and to improve both the welfare and performance of sport horses.

For a summary of nutrition recommendations, see page 10. Dr. Thunes

is available for personal consultations. For more information, please visit www.summit-equine.com.

Conditioning and Fitness

Numerous scientific studies support fitness as a preventative for musculoskeletal injury. Fitness is a measure of the horse’s ability to deliver oxygen to working tissues under extremes of exercise. Some of this energy is delivered through aerobic or well-oxygenated conditions. When that energy is consumed, the horse must be able to create energy without oxygen, or under anaerobic conditions. The mechanisms are different and truly fit horses are able to perform well because they can deliver energy to their tissues efficiently under both circumstances. Fitness is also the adaptation of bones and soft tissues to loads they must carry during competition. A horse is not truly fit until these adaptive changes are complete.

Cardiopulmonary and muscular fitness precede tendon, ligament and bone fitness in early training. Across disciplines, horses in the first few weeks of intensive exercise are more likely to be injured than those that have been in training for 60 days or more. In order for bones, tendons and ligaments to adjust to strain and load, they must be pushed gradually to endure the level of exercise expected in competition. In the past, horses were “spared” from heavy work and used lightly until show time. That thinking has changed as we have learned how the musculoskeletal system adapts to work. The trick is to achieve fitness without adding to repetitive-use injury. Once a horse has achieved fitness, it takes less work to maintain than what is intuitive and there is a great need to establish

— Continued on page 11

Summary of Nutrition Recommendations

- ▶ The primary diet should have a foundation in forage, regardless of whether the horse is a retired pasture ornament or an Olympic-level show jumper.
- ▶ Careful selection of forages can mitigate a number of problems observed in equine athletes.
- ▶ The purpose of concentrate feeds and supplements should be to provide what is missing in the forage portion of the ration. For nearly all forages, this means a source of trace minerals, certain vitamins and fatty acids.
- ▶ For horses that cannot maintain condition on forage and a ration balancer, a more calorie-dense feed should be added to the ration.
- ▶ Horses that are overfed calories can become exuberant, and when this is not given an appropriate outlet such as turnout, undesirable behaviors under saddle can result.
- ▶ For those struggling to keep weight off their easy keepers or who feed commercial feeds in quantities less than the manufacturer-recommended amounts, a suboptimal diet can result. Horses may appear to be in good condition when, in fact, they are suffering from a level of malnourishment.
- ▶ Fat sources are an effective way of adding large amounts of supplemental energy to a ration. However, when fed in excess, fat has the potential to disrupt hindgut fermentation and absorption of some minerals. As always, the key is in finding the correct balance. Canola oil has a healthy ratio of omega 3 to omega 6 and should not be fed in excess of 2 cups/day for a 1,000-pound horse. Rice bran is higher in Omega 6 and should not be fed in excess of 2 pounds/day. Note that any additions to the diet should be made gradually over 7 to 10 days. Exceptions to these quantities can occur under veterinary supervision.
- ▶ Fatty acids such as omega-3 and omega-6 can be found in good-quality fresh pasture and flax. Grains and oils provide larger amounts of omega-6. Approximately 15 to 25 g/day of supplemental omega-3 is often recommended for a 1,100-pound horse; a cup of ground flax provides about 22.5 g. Approximately 5.5 g/day of omega-6 is recommended for a 1,200-pound horse (0.5% of dry matter intake). Exercise caution with herbal anti-inflammatory supplements as they may violate anti-doping regulations.
- ▶ Vitamin E is an important antioxidant that protects cell membranes from oxidative damage. It can be found in good-quality fresh pasture and quality commercial feeds. Vitamin E should be supplemented in the natural α -tocopherol form, which is water-soluble. A dosage of 4,000 IU/day is recommended for horses with neuromuscular disease.
- ▶ Whenever possible, hay should be tested especially when several months of hay are purchased at one time. Make sure that the lab chosen provides equine-based information.
- ▶ Provide a source of salt to ensure that the daily minimum sodium requirement is met.

Equine Athletes — From page 9

evidence-based best practices for fitness training within each equestrian discipline.

Exercise induces mild inflammation, which creates increased blood flow and stimulates musculoskeletal adaptation. This process often happens in the recovery or rest phase after work, as does the repletion of glycogen (sugar reserves) within muscle. Unfit horses tend to injure soft tissue structures that fatigue when workload exceeds the horse's capacity to deliver oxygen and sugar to the vital muscular structures supporting the limb, or if their bones and ligaments are not sufficiently adapted to carry the added load. For example, a jumper landing on the far side of a fence transmits load to the structures that support the fetlock joint: the superficial digital flexor tendon, the deep digital flexor tendon and the suspensory ligament. The amount of fetlock drop that occurs in the landing determines the amount of strain to those structures and thus risk

for injury. When horses are fit, they are more likely to endure movements without their joints exceeding their normal ranges of motion. However, fit horses can injure bones and joints when they are pushed outside of the normal physiologic range and are less likely to suffer soft-tissue injury.

Footing plays a large role in preventing lameness and achieving fitness, and current thinking suggests that working the horse on multiple surfaces improves adaptability of the musculoskeletal system. Many horses train on one surface and then go to a show with different footing and ground surface characteristics, which affect deceleration of the foot and dispersion of load. Interestingly, the warm-up ring footing is often different than the show-ring footing, which adds another variable. Imagine training for a marathon on the road and then competing in sand. Research is currently underway to identify qualities of footing that are ideal for the different equestrian disciplines. The shoe-footing interface is also an important area of future research.

Several parameters can help guide training programs in both human and equine athletes. Heart rate during and after work is one of the most sensitive indicators of fitness. Horses differ from human athletes in several regards when it comes to fitness and delivery of oxygen to muscles. Being flight animals, they are highly adapted for speed to escape predators. Horses are able to contract their spleens at the onset of intense exercise and literally double their oxygen delivery to cells via increased red cell volume. Horses have a greater muscle mass per kilogram of body weight and have two times the oxygen delivery system per kilogram of body weight. Lastly, the pulmonary function of the horse is compromised in the upper gaits because respiration is synchronized with stride at the canter and the gallop. This affects ability to gather oxygen and increases the horse's reliance on internal mechanisms for enhanced delivery.

In humans, a lower resting heart rate and respiratory rate are associated

— *Continued on page 12*



Equine Athletes

— *From page 11*

with fitness; this is not necessarily the case in horses. As horses become more fit through base cardiovascular training, they are able to move at higher speeds with lower heart rates, and their heart rate will come back to normal more quickly after exercise. This is known as cardiac recovery. This index is used in endurance riding and eventing to ensure that the horses are fit to proceed and that they are not overloading their capacity. Dehydration, elevated temperature, lameness, and excitement are all factors that can influence heart rate and should be considered if the horse's heart rate is unusually elevated during or after work in a relatively fit horse. Heart rate variability, which is the variation of time between heart beats, can be a more sensitive means of separating excitement from heart rate elevations associated with decompensation and requires the use of continuous electrical monitoring of the heart via EKG.

Many riders carry heart rate monitors that attach to the tack and provide feedback to the rider's watch. This is a similar idea as Fitbit, with biofeedback being used to modify activity levels with an ideal goal in mind. Although methods of training vary dramatically and no one method is correlated with success, a common thought is that horses will benefit from initial core training, followed by interval training that is gradually escalated to the full work necessary to be successful in the show ring. Base training will often elevate the horse into the 120-150 beats per minute rate. Maximal heart rate for a racehorse in full gallop is 240 beats per minute. Racehorses are commonly timed at the gallop, whereas hunters, jumpers and dressage horses are not.

Future research in the area of baseline heart rates of the different disciplines

under different gaits may prove useful to fine-tune conditioning plans. In this day and age of smart phones and applications, it seems that establishing such a database would be a reasonable undertaking. The outside factors such as environmental conditions and the presence or absence of lameness would skew this data, so inclusion criteria would have to be set.

For horses suffering from injuries that must be rested, auxiliary forms of exercise such as swimming or underwater treadmill are very appealing because they offer maintenance of cardiovascular fitness, with decreased loading of the limbs. These horses will still require a ramping up of load on bones, tendons, ligaments and muscle once healing has occurred but will not need the additional time to re-establish cardiovascular fitness.

There is much interest in human and veterinary fields regarding the use of biomarkers to screen training. Stall-side labs to assess excessive bone remodeling or cartilage repair or tendon or ligament strain are not far on the horizon. The enzyme lactate is used in laboratory situations to assess fitness and anaerobic metabolism. MRI tendon mapping, which is currently being investigated at UC Davis, has shown us that changes start to occur in the extracellular matrix of soft tissues before any detectable lesion is visible on MRI. If we could find changes at this level, there would be far less wastage of horses in the equine industry.

Ideally, a panel test to monitor athletes during the ramping-up phase of work would be a great tool. Extensive research is currently underway to identify targets to be measured. These tools could also be used to develop best practices for the recovery phase of work, which is the essential rest period that the body

needs to repair any damage induced by exercise. The rest period is vital, and horses that are worked without such breaks will eventually succumb to overtraining.

Environmental Factors

Dr. Susan Stover is the director of the J. D. Wheat Veterinary Orthopedic Research Laboratory in the UC Davis School of Veterinary Medicine. She is an internationally recognized expert in the field of racehorse injuries and has spent a number of years studying the reasons for death and injuries among racehorses in order to develop prevention strategies.

Significant progress has been made in discovering the causes of catastrophic injury in racehorses and we now have a better understanding of the events leading to bone fracture along with better techniques to detect stress fractures in live horses. Dr. Stover and her team have identified race surface and exercise factors that place horses at increased risk for catastrophic injury and have provided horseshoe recommendations to prevent suspensory apparatus injury.

Performance horses incur a wide variety of athletic injuries that are unique to their particular athletic pursuit. Dr. Stover and her research team are working hard to discover risk factors, preventive measures, and effective treatments for these athletes.

Injuries to structures that support the fetlock and digit (suspensory ligament, superficial and deep digital flexor tendons) are the primary causes of performance limitations in show jumpers, dressage horses, and eventing horses. The likelihood of injury to these structures increases with increasing limb loads, as might occur with harder surfaces or higher or more difficult jumps. High limb loads induce extremes of carpal (knee), fetlock,

and coffin joint hyperextension and can cause damage to the supporting tendons and ligaments.

While several factors affect limb loads and limb biomechanics, a key factor that can be managed for injury prevention is the arena surface that horses are performing on. There is some evidence to support the association of surface with injury and the role of surface in limb biomechanics. Unfavorable ground conditions (soft or heavy ground) were associated with failure to complete the Grand National event. In a study of hoof landing in elite jumping horses, differences were observed between sand and turf surfaces. Differences were also found in hindlimb fetlock motion and hoof slide of racehorses between a dirt and a synthetic track surface, and forelimb dynamics in horses between turf and synthetic surfaces.

Surface characteristics affect maximum limb loads, loading rates, and hoof accelerations. Forces associated with these loads and accelerations spread up the limb, with higher loads and forces causing greater joint extensions and higher tendon and ligament strains. Superficial digital flexor tendon strains differed in horses traveling on asphalt, sand and synthetic surfaces. Epidemiological evidence for racehorses on flat surfaces indicates that racetracks and race surfaces appear to affect risk for racehorse injury. Although the results of different studies are somewhat inconsistent relative to which types of surfaces have the greatest risk for injury, two larger scale studies found that injury risk in racehorses was higher for dirt surfaces than for synthetic surfaces.

In a recent study with elite dressage horses, fetlock joint and hoof motion were compared between a dirt and a synthetic dressage arena surface. We



A research study with elite dressage horses demonstrated that the arena surface material has an effect on the amount the fetlock hyperextends during stance.

found that fetlock hyperextension was greater on the synthetic surface than the dirt surface (note the opposite result to that found in racehorses). In addition, the synthetic surface had a higher load rate than the dirt surface (note the opposite result to that found in some racehorse surfaces). We found that the hoof of dressage horses at an extended trot interacts with surfaces very differently than galloping racehorses.

Not all dirt and synthetic surfaces would produce the same result, however, because surfaces vary markedly in their physical characteristics. The research study also measured the physical characteristics of the surfaces because this information is most useful in

designing new surfaces for injury prevention. Thus, there is a need to customize surfaces for individual horse occupations.

Given the high relevance and broad interest in arena surfaces and the large financial investment associated with ring installation, the equine community would greatly benefit from footing recommendations based on science, with the long-term goal of establishing mixtures and management ideal for each discipline. This work could significantly impact wastage in the industry and reduce the need for medications to alleviate pain and inflammation in the performance horse.

— **Continued on page 14**

Equine Athletes — From page 13

Podiatry

Scott Morrison, DVM, has been a veterinarian specializing in equine podiatry at Rood and Riddle Equine Hospital in Lexington, KY, since 1999, bringing with him years of experience as a farrier. As the podiatry caseload increased, Rood and Riddle built a podiatry center that is staffed by veterinarians, technicians and farriers. Currently, Dr. Morrison's caseload is 100% podiatry. He has graciously provided the following information on the care and maintenance of the equine foot.

The foot as a distinct structure is designed for support, with limbs extremely dependent on the health of the entire foot for support.

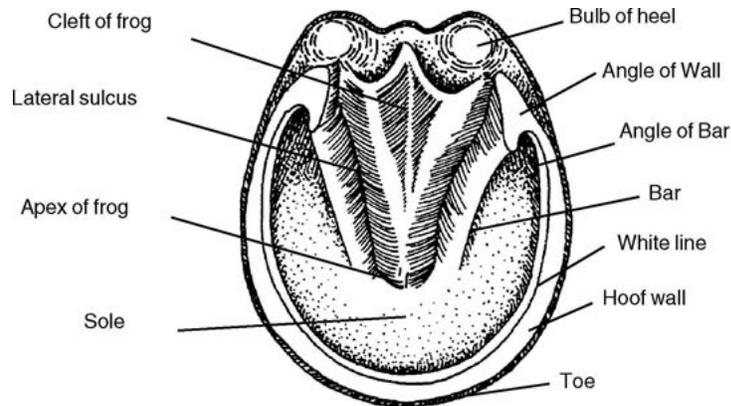
Structural collapse can occur due to disease (laminitis, white line), trauma, conformation, regional overloading (one area of the foot receives more than its share of the load), ratio of body weight to foot size, poor shoeing and foot care, and/or environmental conditions (overly wet).

For a foot to remain healthy and accommodate its basic functions, it needs to have proper form and structure. Balance is the term most widely used when describing the foot's form and structure. A balanced foot is believed to be functionally efficient and capable of providing support to the limb. A balanced foot is not necessarily perfectly symmetrical, but it does possess a degree of symmetry and is free of hoof capsule distortions such as flares, dishes, bull-nosed dorsal wall, crushed/collapsed wall, contracted heel, etc., which are all signs of imbalance.

For a foot to remain healthy and accommodate basic functions, it

needs to be structurally strong and balanced. Characteristics of strong and healthy foot structures are:

- Strong, thick sole
- Strong, robust wall that is free of distortions (flares, dishes, underrun/collapsed heels, contracted heels)
- Well-developed bars
- Even wall growth



The heel of the equine foot functions primarily as shock absorption and houses such structures as the frog, digital cushion, collateral cartilage and an elaborate vascular system. The heel also contains various sensory receptors that allow the horse to feel and negotiate the ground surface and foot/limb position. The toe is basically designed to cut into the ground and stabilize the limb for traction. If one region of the foot is compromised or structurally unstable, it affects the foot's ability to support the weight of the horse.

Distortions, or shape changes, are a sign of over- or under-loading a particular region of the foot. These distortions are seen as collapsing or structural failure of an area of the hoof wall. These hooves do not respond well to normal loading forces and are more susceptible to trauma and injury. The point of ground contact affects the manner in which the foot and all the structures above it are loaded. This is the essential concept underlying the importance

of dynamic balance and the ability of the horse's foot to provide support, shock absorption, traction, and proprioception (the perception of position and posture).

A preventative hoof care program can help ensure that foot structures are balanced and remain healthy. Keeping your horse on a short regular shoeing

interval is one of the key management factors in keeping most athletes sound. As feet grow long, they become more out of balance, and when a foot is out of balance it puts all other anatomical structures at risk of injury (foot, limb, back, neck, etc).

Proper conditioning for the physical demands of specific athletic disciplines is important and goes hand-in-hand with attention to the foot.

Footing and shoe type should complement each other. When deciding what type of shoe your horse should wear, consider the type of footing your horse is on. This will dictate what kind of web width or traction devices might be appropriate. Also consider any pre-existing conditions such as conformational abnormalities, old injuries, degenerative joint disease or chronic heel pain. There are some shoeing modifications that can help alleviate stress on these various conditions and prolong your horse's career.

Foot problems or developing pain are usually indicated by performance-related issues such as jump-refusing, shortened gait, altered head carriage, tripping, forging and overt lameness.

Signs that the hoof wall is unhealthy include cracks, shelly walls, and shoes that come loose frequently or fall off. To improve wall quality, first we evaluate the horse's nutrition to ensure that the diet is well balanced, because over- or under-supplementation can cause wall problems. Keeping the hooves painted with a pinetar-based product can help decrease the wet to dry cycles that often deteriorate the walls.

A podiatry exam and foot evaluation should be part of a routine examination of equine athletes. Intermittently, foot radiographs should be taken and reviewed for balance by your veterinarian and farrier. If needed, a plan can be devised to decrease wear and tear on the feet.

Equine podiatry has been practiced by a few veterinarians over the past three or four decades and is a rapidly growing field. Many veterinarians have worked as farriers prior to going to veterinary school, and many of them have combined the two professions to advance foot care.

As we have learned more about equine podiatry, we have identified some areas of research needed in this field:

(1) Hoof wall quality studies. We need better diagnostics to determine why some walls are weak. Is it nutrition, mechanical, infection, management or genetics?

(2) More kinematic studies on how shoe modifications affect disease and what effect shoe modifications

have on horses with different conformational deviations.

(3) What might be the role of stem cells in healing different foot diseases like laminitis, navicular apparatus disease, and soft tissue injuries in the hoof?

(4) Many conditions of the foot still are not completely understood such as canker and some forms of coronitis (irritated, crusty, swollen coronary bands). Although many treatments may help alleviate these conditions, more research is needed to understand the cause of these conditions.

To contact Dr. Morrison, visit the Rood and Riddle website at www.roodandriddle.com.

Complementary Medicine/Early Screening for Injury

Acupuncture is becoming more prevalent as an adjunct treatment and diagnostic modality for various conditions in horses. Many sport horses have acupuncture performed on a routine basis to maintain and potentially enhance their athletic performance. An estimated 80% of elite show jumpers and dressage horses are treated with a combination of traditional Chinese medicine (acupuncture and chiropractic) and western medicine.

The use of complementary medicine in animals has closely paralleled its development in human medicine and is becoming more and more mainstream. The two most widely used are veterinary acupuncture and chiropractic. The American Academy of Veterinary Acupuncture, the International Veterinary Acupuncture Society, the American Veterinary Chiropractic Association, the Chi Institute, and the International Veterinary Chiropractic Association

all work to promote excellence in the practice of complementary therapies through establishment of standards, educational programs, and accreditation exams.

Dr. Sarah le Jeune, a board-certified equine surgeon and board-certified specialist in equine sports medicine and rehabilitation at UC Davis, is also certified in both veterinary acupuncture and chiropractic. Dr. le Jeune focuses on the treatment of various performance-related musculoskeletal injuries and lameness by an integrative approach including acupuncture and chiropractic. She received her acupuncture training from the Colorado State University and the Chi Institute in Florida and obtained certification in veterinary chiropractic by the International Veterinary Chiropractic Association. Because of her personal involvement with performance horses, particularly jumpers and dressage horses, Dr. le Jeune was motivated to pursue all possible treatment and management modalities to maintain and preserve soundness in athletes.

Acupuncture therapy may be effective as an adjunctive treatment in the following conditions:

Musculoskeletal problems—muscle soreness, back pain, osteoarthritis, degenerative joint disease, obscure lameness, tendon/ligament problems, laminitis

Neurological disorders—seizure, laryngeal hemiplegia, facial and radial nerve paresis

Gastrointestinal disorders—diarrhea, impaction, chronic colic, gastric ulceration, ileus

Other chronic conditions—heaves (chronic obstructive

— *Continued on page 16*

Equine Athletes — From page 15

pulmonary disease, recurrent airway obstructions, asthma), anhydrosis, uveitis, behavioral problems, Cushing's disease, hypothyroidism, hyperthyroidism, infertility, renal failure, geriatric weakness, skin problems

Performance enhancement and prevention of disease—horses experiencing performance issues associated with musculoskeletal pain, who must comply with prohibited substance policies mandated by show associations, can benefit show-side from acupuncture and/or chiropractic treatments. This occurred at the 2008 Olympics, the 2010 World Equestrian Games, and the 2012 London Games in compliance with the FEI.

The physiological effects potentially induced by acupuncture include:

- Pain relief
- Promotion of microcirculation
- Anti-inflammatory effects
- Regulation of gastrointestinal motility
- Immunoregulation
- Endocrine and reproductive regulation
- Antipyretic effects

When performed by a trained and qualified veterinarian, acupuncture is a very safe medical procedure. Very few negative side effects have been reported in clinical cases and most horses tolerate the treatments well with minimal restraint and no need for sedation. Acupuncture is not usually recommended during pregnancy as it can cause uterine contractions. It is also not recommended as the sole treatment modality in cases involving fractures, open wounds or infectious conditions. However, it can easily be combined with other traditional therapies.

Veterinary acupuncturists and chiropractors can add valuable information to the physical examination of the horse and findings can be used to localize and treat sources of discomfort. In a recent study, Dr. le Jeune and colleague Dr. Jim Jones of the UC Davis School of Veterinary Medicine sought to obtain scientific evidence for the use of acupuncture (AP) scanning in predicting lameness in horses in a routine clinical setting. It was hypothesized that horses exhibiting a painful response during palpation of superficial AP points along the neck, back and rump (AP scan) would also show signs of lameness as determined by a conventional lameness exam.

The study was conducted in 102 client-owned horses that were presented for routine AP, reduced performance or lameness. Each horse first underwent a brief (less than 2 minutes) screening scan of AP points and was classified as positive or negative for acupoint sensitivity. Then each horse was evaluated in the conventional manner for lameness and categorized as lame or sound. In this study, AP scanning had a high sensitivity, specificity and accuracy (all around 80%) to detect lameness. The conclusion of the study was that an AP scan could be a useful, quick screening tool during the physical exam to identify horses that should undergo a full lameness exam and other diagnostic testing.

Chiropractic care focuses on the health and proper function of the spinal column, although the pelvis, limbs and head are also considered. When a chiropractor examines a patient, he/she is looking for joints with a reduced range of motion. The common principle in all chiropractic theory is that joint dysfunction affects the normal neurological balance found in healthy individuals.

A chiropractic adjustment involves a high velocity, low-amplitude thrust that induces segmental spinal motion. This motion usually exceeds that created by normal locomotion. The adjustment activates muscle spindle cells and other local proprioceptive receptors, which provide stimulation to override the neurologically induced restrictions in that area and inhibit the perception of the painful stimulus.

The goal of any adjustment is to restore the optimal range of motion to that joint, which will subsequently alleviate inflammation in and pressure on surrounding nerves and soft tissue. The inflammation makes it difficult for nerves to transmit their messages accurately, similar to static on a telephone line. Considering that nerves coupled with the brain and spinal cord (the central nervous system) control everything in the body, improving their ability to communicate well enhances overall health. This is particularly important in the spine. Note that chiropractic is not recommended in cases involving fractures or infectious conditions.

To become fully accepted in the veterinary and scientific community, there is a need to perform scientifically sound clinical trials for horses undergoing acupuncture and chiropractic treatments for a variety of conditions, such as described for acupuncture scanning as a diagnostic modality earlier in this section. Other types of studies that would be very useful for performance horses include the following:

Can acupuncture and chiropractic cause a horse to bear weight more evenly and to use its body in a biomechanically more efficient manner? Objective and noninvasive methods of assessing foot-fall patterns and lameness in horses can be performed with force plate

analysis, which would be an excellent tool to quantify the response of different treatment modalities in clinical patients over time. UC Davis recently acquired a force plate to enhance lameness evaluation and research by providing objective information regarding limb loading and multifactorial lameness.

To what extent do acupuncture and chiropractic promote gastrointestinal motility? Colic is a very common problem in horses and is frequently related to changes in gastrointestinal motility. Acupuncture and chiropractic are currently being used as adjunctive therapies to promote GI motility. An objective assessment of motility in clinical patients could be performed with noninvasive monitoring devices such as the Smartpill. This could have significant implications for postoperative ileus, a common complication following colic surgery.

For more information on complementary medicine or on current or future clinical trials, please contact Dr. Sarah le Jeune by email at sslejeune@ucdavis.edu. *



Electroacupuncture on a horse with back pain. Back pain is commonly seen in horses and can be successfully treated with acupuncture and chiropractic. Typically, at least three consecutive treatments are required to obtain resolution of clinical signs.



Motion palpation of the lumbar spine. Restrictions in the lumbar spine are commonly identified in horses and can result in back pain, girthiness and loss of performance.

Kenneth L. Maddy Equine Analytical Chemistry Laboratory at UC Davis

In an ideal world, every horse would be tested for prohibited substances at a facility on the race track before each event, with definitive results available in a few minutes so that, if necessary, stewards could prevent the horse from running. In the absence of such capabilities, racing authorities send samples to their official laboratory, such as the Kenneth L. Maddy Equine Analytical Chemistry Laboratory at UC Davis.

The Maddy Laboratory has become a national center of excellence, recognized as an outstanding anti-doping laboratory and for its equine pharmacology research. The lab is accredited by the International Standards Organization (ISO-17025) and they were the first lab accredited by the Racing Medication and Testing Consortium.

The late Senator Kenneth L. Maddy was a driving force of all the major racing legislation authored in the state of California. He was largely responsible not only for establishing equine research funding for the UC Davis School of Veterinary Medicine but for ensuring this support remains in place for decades to come. He championed the concept of drug testing to prevent misuse of drugs in equine athletes and believed that for horse racing to remain a viable and healthy industry, the integrity of the sport must be guaranteed. His goal was realized in 2000 with the establishment of the Kenneth L. Maddy Equine Analytical Chemistry Laboratory, a research and anti-doping laboratory specifically dedicated to resolving equine industry concerns.

The Maddy Laboratory has the distinct advantage of proximity and access to the UC Davis School of Veterinary Medicine. The primary functions of this lab are to:

- Provide routine anti-doping services for racehorses and performance horses to ensure the integrity of sporting events.
- Conduct research to develop testing protocols for new drugs and investigate new classes of drugs susceptible to abuse.
- Develop new technologies to research the pharmacology of therapeutic medications.
- Provide information, continuing education, and recommendations on drug testing and equine pharmacology related issues to practitioners and horsemen.

- Partner with the veterinary pharmaceutical industry to investigate new equine drugs.

California has five major racetracks and a greater number of fair tracks. For every horserace, a minimum of two to three horses are randomly selected for drug testing. The Maddy Laboratory analyzes over 50,000 post-race urine and blood samples annually, screening for the presence of more than 2,200 different drugs, including narcotics, analgesics, stimulants, tranquilizers, opiates, local anesthetics and small peptides (i.e., demorphin, etc.).

Medications that are used for therapeutic purposes have varying degrees of clearance (time needed for withdrawal of treatment before racing), but by California Horse Race Board rules and regulations

— *Continued next page*



The Maddy Laboratory has become a national center of excellence, recognized as an outstanding anti-doping laboratory and for its equine pharmacology research.

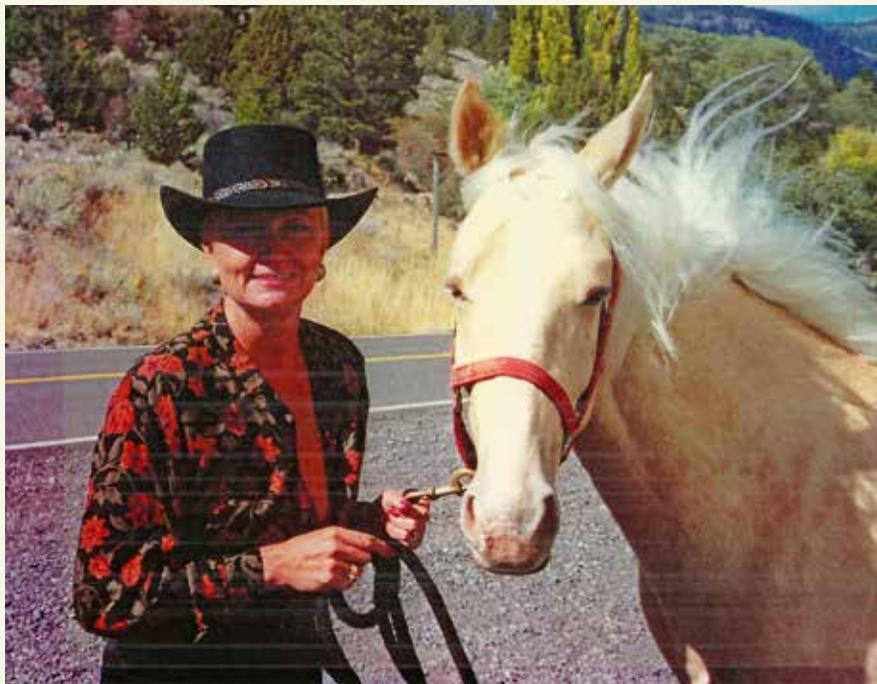
For the Love of Sundance

Inspiration for enduring commitment to the well-being of horses

Carol Green had a lifelong love of horses and great passion for horseback riding. She owned a number of horses throughout her life, but she especially adored Sundance—a palomino horse and namesake for her equestrian center, the Sundance Ranch.

Sundance suffered from bouts of laminitis for several years, prompting Ms. Green to find out more about this condition. When she learned about the Center for Equine Health and its excellent reputation for advancing equine welfare and research, Ms. Green decided to make the center a beneficiary of her estate.

Sadly, Ms. Green passed away in September 2010, but her commitment to the well-being of horses lives on as part of her legacy. The estate gift is nearly \$4 million, with an additional amount expected over the next year. The gift established the Sundance Ranch Endowment, which supports important biological research to help find a cure for



Carol Green had a lifelong passion for palomino horses and is pictured here with her favorite horse, Sundance.

systemic diseases of the horse such as laminitis.

“We are very thankful to Ms. Green for her generosity and for the significant impact her gift has on equine health,” said Dr. Claudia Sonder, center director. “It gives me a great deal

of satisfaction to know that her wishes are honored.”

For more information about estate planning and planned gifts, please contact the Development Office at (530) 752-7024.

Maddy Lab — Concluded

therapeutics cannot be administered within 48 hours of a race.

The Maddy Laboratory uses state-of-the-art gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry. Employing validated methods, confirmation analyses, and strict quality control ensure the accuracy of every test result.

The laboratory currently has 19 different mass spectrometers employed for various investigations and sample analyses. This state-of-the-art technology permits the detection of very small amounts of drugs and/or medications. In some cases, these low-level detections are made after the cessation of the medication’s pharmacological effect. In the late 1960s and early 1970s, some equine therapeutic medications

were only detected for 1 or 2 days after administration. Today, the same substances may be detectable for weeks after the last treatment. This illustrates one of the primary goals of the Maddy Laboratory, striving to provide information, continuing education, and recommendations on pharmacology-related issues. ✱

CEH HORSEREPORT

Mail ID#1415
Center for Equine Health
School of Veterinary Medicine
University of California
One Shields Avenue
Davis, CA 95616-8589

Presorted
First Class Mail
US Postage
PAID
Davis, CA
Permit #3

RETURN SERVICE REQUESTED



View the videos in our award-winning online Horse Report!

The Horse Report is now brought to you in an online format that allows us to include videos. If you can access *The Horse Report* from our website, you can read it sooner and save us the postage. Send your e-mail address to ljchristison@ucdavis.edu and receive an e-mail notice whenever a new publication is posted!

www.vetmed.ucdavis.edu/ceh

CEH HORSEREPORT

©The Regents of the
University of California
Spring 2014

Center for Equine Health
(530) 752-6433
www.vetmed.ucdavis.edu/ceh
www.facebook.com/ucdavis.ceh

Director: Dr. Claudia Sonder
csonder@ucdavis.edu

Director Emeritus: Dr. Gregory Ferraro
gferraro@ucdavis.edu

Senior Editor: Barbara Meierhenry
cehwriter@ucdavis.edu

Management Services Officer: Kim Ney
klney@ucdavis.edu

Dean, School of Veterinary Medicine:
Dr. Michael D. Lairmore

The Center for Equine Health is supported with funds provided by the State of California Pari-Mutuel Fund and contributions by private donors.

The University of California does not discriminate in any of its policies, procedures or practices.

The University is an affirmative action/equal opportunity employer. The information you provide will be used for University business and will not be released unless required by law. To review your record, contact Advancement Services, 1460 Drew Avenue, Ste. 100, Davis, CA 95616. A portion of all gifts is used to defray the costs of administering the funds. All gifts are tax-deductible as prescribed by law.