CEH HORSE REPORT

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Platelet-Rich Plasma: Improving Treatment for Tendon and Ligament Injuries

All horses are subject to tendon and ligament injuries, regardless of breed or whether they are performance horses or ridden for the occasional trail ride. Like human athletes, athletic horses are at greater risk by virtue of their occupation. These injuries are notorious for slow, poor-quality healing and a high reinjury rate and can be serious enough to end an athletic career.

Until recently, many different methods were used to treat injured tendons and ligaments, but all of them were palliative, not curative. With recent advances made in the field of regenerative medicine, both stem cell therapy and another component of regenerative medicine known as *platelet-rich plasma* are more widely available than ever before and offer vastly improved healing. The goal of this approach is to create real tendon tissue instead of scar tissue.

Tendons and ligaments are composed of fiber-like connective tissue elements that are carefully aligned in longitudinal bundles that run in the direction of force or pull on the entire structure. These bundles of fibers are grouped together, beginning in small units, then combined with others to form larger and larger parallel fiber bundle groups, much like the structure of a cable on a bridge.

The alignment of fibers in the long axis of this "biological cable" is integral to the tendon or ligament's ability to stretch under load while maintaining its strength and integrity. The parallel alignment of the fibers allows for maximum strength and longitudinal elasticity with minimal total cross-sectional area (size).

The tendon or ligament becomes injured when the load placed on it exceeds the combined strength of the entire fiber bundle groups (i.e., cable strength). The

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UCDAVIS VETERINARY MEDICINE
Center for Equine Health

Director's Message

Dr. Gregory Ferraro

Stem Cells Are Only Part of the Regenerative Medicine Story

Over the course of the last few years, many of you have undoubtedly become aware of the use of regenerative medicine techniques for treating orthopedic injuries in horses. You have probably read about the use of stem cells in the treatment of diseases and injuries in humans and horses. Indeed, we have reported on the use of stem cells in two previous issues of our *Horse Report*. But stem cells represent only a part of the story of regenerative medicine. There are in fact other biological methods used in medical therapies that also would fall under the umbrella of regenerative medicine. We present one of those additional techniques in this issue of *The Horse Report*.

It has been known for some time that cells within blood plasma called *platelets* contain certain growth factors that are involved in and contribute to the body's healing process. More than 10 years ago, a process was developed by oral surgeons to harvest those cells and concentrate them sufficiently for therapeutic use. The product is known as *platelet-rich plasma*, or PRP, and it is easily prepared from a patient's own blood in less than an hour. While the process for its preparation and its possible uses have been described for both humans and horses, researchers are still working to understand how the desired growth factors are released from the platelet concentrate and how their action within the body is controlled.

Among the researchers working in this area at UC Davis is Dr. Fern Tablin. Dr. Tablin is internationally recognized for her knowledge of cell biology and cellular physiology. She has studied various aspects of platelets for the past 25 years and has acquired a vast store of knowledge about their function. Dr. Jamie Textor, an experienced equine surgeon, has been working with Dr. Tablin in her laboratory to better understand the application of PRP in tendon and ligament repair in horses. Dr. Textor's background in equine orthopedics and her experience as an equine surgeon give her a unique perspective on tendon and ligament injuries and their clinical care. We are confident that her laboratory research will result in improved treatments for these injuries in the near future.

In the meantime, horse owners can be pre-emptive in helping their horses avoid injury to these hard-to-heal fibrous tissues. At the first sign of an abnormality—a little swelling, some heat, maybe a slight lameness—stop, look and evaluate. If your horse is not traveling or performing well on a given day, don't just keep going. Take the time to check things out. As a matter of course you should examine your horse's legs every day before and after exercise. Ask your veterinarian to teach you how to properly examine and palpate a horse's tendons and ligaments for abnormalities. Make sure your horse is fit for the activity you are about to undertake, as fatigue is often a contributing factor to tendon and ligament injuries. Horses need also to be warmed up before exercise and properly cooled down following exercise to minimize all types of athletic injury.

Finally, in this issue of our *Horse Report* we are including a story about a paint horse named Rocky to illustrate how the fruits of research benefit horses. Rocky had a form of pneumonia that was treated using a minimally invasive technique that allows accessing the lungs and other structures in the chest cavity without making a large incision. Rocky's illness, his treatment and eventual recovery demonstrate what small technological advancements in medical instrumentation can mean to improving clinical care for animals and humans alike. We hope you find this story as interesting as well.

Rocky

The alignment of fibers in the long axis of this "biological cable" is integral to the tendon or ligament's ability to stretch under load while maintaining its strength and integrity. Illustration by Robin Peterson.

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injury is similar to stretching a piece of elastic too far so that it does not return to its original size and cannot sustain the load it could before being overstretched.

Damage often involves tearing or rupturing individual fibers or fiber bundle groups. The fibers fray, tear, and lose their integrity perpendicular to the long axis (the direction of pulling force) of the tendon or ligament. The illustration below shows these fiber bundles and how the individual fibers fray upon injury. The degree of damage depends on the number of fibers torn.

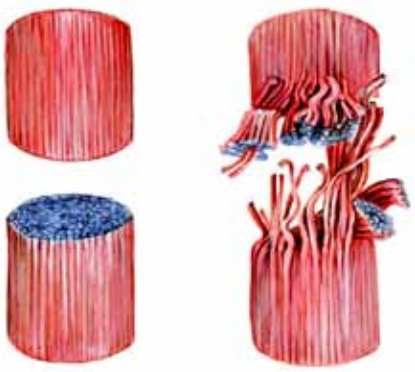

Illustration depicting individual fiber bundles that make up tendons and ligaments. Injury causes the individual fibers to fray.

Clinical signs can be quite varied. Acute injuries are often characterized by heat, swelling and pain on palpation of the affected area. Lameness can range from mild to severe and may be somewhat transient, sometimes lasting only a few days. Chronic injuries often result in persistent thickening of the tendon or ligament and an intermittent or persistent lameness.

The gold standard for diagnosing these injuries in horses is by ultrasound examination. Normal tendons and ligaments show a long, linear fiber pattern and an evenly white appearance when viewed on cross-section. Injuries show a disrupted fiber pattern and a black or gray appearance.

Regenerative Medicine for Tendon and Ligament Repair

Healing of tendons and ligaments is more difficult than healing of tissue in other parts of the body. While the body has the ability to produce new connective tissue for repair, with tendons and ligaments it does not organize the tissue into the original structure of longitudinal bundles of fiber. Therefore, with traditional therapies, the repair rarely recreates a structure that can match its original strength or function.

Over the past several years, mesenchymal stem cells have been used in clinical trials at UC Davis to treat tendon and ligament injuries and the results have been very promising. Recently, stem cells were used to treat a torn superficial digital flexor tendon in a racehorse followed by a long and carefully controlled rehabilitation period. Eighteen months after injury, the horse returned to the racetrack only to win his first race. While these results are very encouraging, research is ongoing and outcomes continue to be evaluated over the long term.

The Functional Molecular Biology Laboratory at UC Davis is developing methods to create engineered ligaments. The ligaments are being

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created from adult stem cells isolated from bone marrow, skin, muscle or ligament and calcium phosphate cements. Together with large animal veterinarians, experiments are being conducted to see how well these ligaments work in the body of a living animal. It is hoped that this collaboration will lead to the development of ligaments that can be used to repair joints in both humans and animals.

Another component of regenerative medicine that has been successfully used to treat tendon and ligament injuries is **platelet-rich plasma (PRP)**, which has been used in horses for about the past eight years, and for a longer time in humans. When injected into an injured site, PRP delivers a concentrated dose of platelets and the growth factors they contain. The goal of PRP treatment is to drive the repair process to improve healing and ultimately to regenerate the tissue at its original strength and resilience to produce a scarless repair.

In a study published in 2008, Standardbred racehorses with severe suspensory ligament injuries were able to return to racing after PRP treatment. Since the degree of injury in these horses was severe enough to be considered career-ending, the results were impressive. It has seen rapid acceptance by equine veterinarians because it is easy to collect and produce and because early reports of treatments of orthopedic injury have been positive.

What is Platelet-Rich Plasma?

Platelet-rich plasma, or PRP, is a concentration of platelets containing protein growth factors that are actively secreted by platelets to initiate all wound healing. These growth factors act to enhance access of healthy inflammatory cells to the area of tissue injury, the formation of new blood vessels and connective tissue, and regeneration of skin. PRP has been used to enhance bone healing, bone-implant security and wound healing.

For over a decade PRP has been used in humans, originally by oral surgeons to help repair large defects in the jawbone and to accelerate soft tissue and bone healing. Since 1998, the effect of PRP on bone regeneration has been investigated extensively. In the field of dentistry, PRP has been used in different clinical procedures such as jaw reconstruction, cleft repair, treatment of periodontal defects and treatment of extraction sockets. It has also been used widely to treat wounds and orthopedic injuries. Human athletes have undergone PRP treatment during their active season of competition.

PRP is always autologous; it is prepared from the patient's own blood. Preparation of PRP is done in the hospital or clinic at the time of the patient's visit and is available for treatment within less than an hour. A sample of the patient's blood is withdrawn and processed in a centrifuge to separate the red blood cells from the plasma. The plasma contains the platelets and some of the white blood cells. The platelets are then further concentrated into a smaller volume of plasma and the end result is PRP.

Shown on the left is PRP in a gel form, which is used to repair tissue surgically. This form of PRP not only releases growth factors but also provides a scaffold for tissue regeneration. Shown on the right is PRP for administering as an injection.

The ultimate concentration of platelets can vary significantly according to preparation method but should be approximately eight times the concentration in the bloodstream in order to truly be considered PRP. Experimental studies have shown that the growth rates of cells from blood vessels, tendon, bone and stem cells all increased as the platelet "dose" in the PRP increased.

Once prepared, the PRP is usually administered by injection into the injured tissue using ultrasound guidance. In horses, the procedure is done on the standing horse under sedation and local nerve block. It can also be used during surgical procedures in a gel or clot form to provide both a source of healing growth factors and as a scaffold for new tissue growth within the wound. PRP is also sometimes mixed with stem cells during surgery to support their growth within damaged tissue.

Many studies in experimental animals, humans, and now horses

have demonstrated improved tendon repair after PRP treatment. In general, PRP is best for acute lesions such as a recent tendon bow and is less effective for chronic tendon lesions.

Not All PRP Is Created Equal

Like almost all biological medical treatment methods, not all PRP products are alike. Depending on the processing method and device used, the number and cell purity of platelets concentrated into the small volume of plasma may vary. Platelets themselves contain inflammatory substances that can cause post-injection "flares" which, though rare, do require responsive therapy.

Additionally, platelets need to be activated to release their growth factors. Unless the platelets are stimulated by such agents as thrombin or calcium before or during their injection, or through a freeze-thawing cycle before use, the desired growth factor release and thus tissue healing promotion may not occur. Thus, reports of poor or adverse results from PRP therapy may be due to improper production or handling of the product.

Like all therapeutic methodologies, biological or otherwise, PRP treatment is not always successful and is highly dependent upon the timely administration of the product, at the proper dose, into an appropriate injury.

Ongoing Research on PRP Therapy at UC Davis

Research at UC Davis is being conducted by Dr. Jamie Textor to examine the many variables involved in PRP preparation and treatment. Her work examines some of these variables individually with the goal of optimizing PRP use to create the best treatment outcome.

"The main question I've investigated is whether PRP should be used in a resting or activated form," says Dr. Textor. "Platelets are very specific about when they release their growth factors, and they don't do so unless they are activated, which occurs during clot formation. This makes sense because, under normal circumstances in the bloodstream, you only want platelets to form clots and release their contents when there is an injury. Otherwise unwanted clots will themselves cause problems. Most often, PRP has been used in horses in a resting form, meaning that nothing has been added to activate the platelets. We know that this works, but the margin of improvement may be much greater if we ensure that the growth factors are fully released from the PRP. It's the growth factor content that we're really after."

A recently published study by Dr. Textor showed that the injection process alone is not enough to activate PRP and that growth factor release is much greater when specific activation is performed. There are a number of ways to achieve that activation and she is currently comparing those methods with the goal of developing a standardized approach to PRP treatment in horses.

Other PRP questions to be investigated are whether multiple treatments are more effective than a single dose, whether certain tissues respond to PRP treatment better than others, and whether PRP can be used to improve bone healing horses. Clinicians also want to know how best to combine PRP with stem cells or if certain injuries respond better to one agent than another. Although there is already a substantial body of PRP research across many species, there are still more questions than answers.

Veterinary and human medical research on PRP will continue to be complementary in nature but also distinctly important. Although many concepts hold true between animals and people, certain features of PRP use are species-specific. For example, although PRP is widely used to treat complicated wounds in people, current research does not support its use for wound healing in horses. On the other hand, because Dr. Textor is studying the basic mechanisms of PRP effects on tissue, her work with equine cells will still be relevant to other animals and humans.

Even as PRP techniques for horses are being refined in the laboratory, it is available as a same-day treatment at UC Davis, as it has been since 2006. At most hospitals, PRP is significantly less expensive than stem cell therapy and requires only a simple blood draw. It is rapidly and easily prepared and administered on site as a fresh product.

PRP is just one of an ever-expanding number of regenerative medical techniques that are being developed and clinically applied by veterinarians and physicians. Each has its particular advantages and disadvantages and its appropriate indications for use. As always, consultation with your veterinarian and careful consideration of the pros and cons should take place before any of these treatments are applied to your horse.

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The Healing Process

Key to the success of returning your horse to work, regardless of the medical therapy employed, is regular ultrasound evaluations to check the progress of healing throughout the rehabilitation. Injured tendons and ligaments should show a progression toward a more normal appearance in size, echogenicity and fiber pattern at each recheck exam.

Consequently, the single most important factor to the recovery of athletic performance following tendon or ligament injury is to minimize the amount of damage to the structure to ensure that the fewest number of fibers within the ligament are torn. To do this, an early diagnosis of the damage is essential.

The second most important factor to recovery is to start effective anti-inflammatory therapy immediately. Injury to a horse's tendons or ligaments is quickly followed by a pronounced inflammatory response characterized by increased blood flow and swelling within the ligament. While this initial response is designed to set the stage for eventual healing, if unchecked it can result in further damage to fiber bundle units adjacent to the damaged area and create an even larger loss of structural integrity.

Finally, the healing of tendons and ligaments occurs very slowly, over a long period of time. These structures have minimal numbers of blood vessels within them by nature of their tight configuration of fiber bundles. Without a large blood flow, the tissues are not able to clean away the debris of damage and institute repair processes rapidly. As such, convalescent periods for horses with substantial tendon or ligament injuries are generally measured in months rather than days or weeks.

Rehabilitation

Initially, stall rest with handwalking is required. Your horse should not have access to unrestricted exercise such as pasture or arena turnout during the first four to six months. The injured tendon or ligament cannot withstand sudden heavy loading during this time and is highly susceptible to injury. Your veterinarian can recommend a controlled exercise program—complementary to the horse's medical treatment—that allows gradual loading of the tendon/ligament in increasing amounts so that it can heal to the best of its ability.

Recheck ultrasound exams are generally performed every 60 days to assess healing and to prevent injury. Ultrasound can detect evidence of tendon or ligament damage before a new injury occurs.

Perhaps the most important factor in a horse's full recovery from a tendon or ligament injury is patient and owner compliance. Some horses tolerate confinement better than others. A rehabilitation program requires patience and commitment. Because it can be difficult to work with a fit horse that is suddenly not able to exercise, consult your veterinarian to develop a recovery plan that works for you and your situation. In the end, this plan will give you the best chance to have your horse return to his pre-injury level of function. ❄

DR. JAMIE TEXTOR

received her veterinary medicine degree from Colorado State University and completed a residency in large animal surgery at Cornell University. She was board-certified by the American College of Veterinary Surgeons in 2003 and has worked as a surgeon in New Zealand and Australia as well as at UC Davis. She is currently pursuing a PhD in comparative pathology at UC Davis, studying the role of platelets in health and disease.

Aidan's Long Road to Recovery

A Case Study from the UC Davis Veterinary Medical Teaching Hospital

by Larry D. Galuppo, DVM, DACVS

AIDAN, A 12-YEAR-OLD Connemara gelding, was evaluated at the UC Davis Veterinary Medical Teaching Hospital (VMTH) for lameness in his right forelimb. The horse had been lame for approximately 10 days prior to admission, and the owners could not identify any specific incident that may have caused the gait abnormality. A shoe with a pad and impression material was placed on the horse's right forelimb to protect the foot and he was treated conservatively with stall rest and hand-walking.

Aidan

During this time, there were no signs of improvement and Aidan continued to be lame when trotted out. He also had a previous history of intermittent locking patella of both hindlimbs, which was being managed with exercise and acupuncture.

Examination of the horse's gait revealed no lameness at the walk but an obvious gait abnormality at the trot. Lounging to the right on hard ground exasperated the lameness. A hoof tester examination was negative. Flexion of the distal extremity for 30 seconds made the horse noticeably more lame when trotted off.

Diagnostic blocks were performed to localize the lameness. A palmar digital nerve block was performed with carbocaine on the outside (lateral) heel, but the lameness persisted. The same block was performed on the nerves giving sensation to the inside (medial) heel and a 60% improvement in the lameness was noted. The same nerve was blocked at the level of the proximal sesamoid bone on the lateral side but no improvement in lameness was observed. Finally, the same block was performed on the medial side and an additional 25% improvement in the lameness was identified. The lameness did not switch to the left front.

For completeness, hindlimb flexion tests were performed to evaluate the historical complaint of intermittent locking patellas. The right hindlimb showed an obvious change in gait (positive flexion test), while the left hindlimb showed a mild response.

Radiographs of the right front distal extremity revealed no abnormalities that could be related to where the lameness was localized on the medial aspect of the foot. An ultrasound exam of the pastern region showed that the deep digital flexor tendon, straight and oblique distal sesamoidean ligaments, medial and lateral branches of the superficial digital flexor tendon, and medial and lateral axial and abaxial palmar ligaments of the pastern were all normal. Ultrasound exam of the collateral ligaments of the coffin joint revealed a moderate medial collateral ligament injury with associated moderate scarring and mineral deposition in the ligament

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and surrounding tissue (Figure 1). The lateral collateral ligament was normal.

Based on the severity of the injury, Aidan was treated with regenerative medicine therapy in the form of platelet rich plasma (PRP). To prepare the PRP, we withdrew 60 cc's of blood from the Aidan's jugular vein and processed it at the VMTH. Aidan was sedated, locally blocked and prepped for a sterile injection procedure. With guidance from ultrasound, a needle was placed from the medial aspect of the coronary band into the injured ligament within the hoof wall capsule (Figure 2).

Once accurate placement was confirmed, 3 ml of PRP was injected into the ligament. Banamine was then administered to limit inflammation associated with the injection procedure. A light bandage was placed over the injection site to protect it. In addition, all shoes were removed during the rest period with a plan to trim the horse's hooves at 6-week intervals.

Figure 2. *Ultrasound is used to guide the needle directly into the injured region of the ligament, which ensures accurate placement of the PRP.*

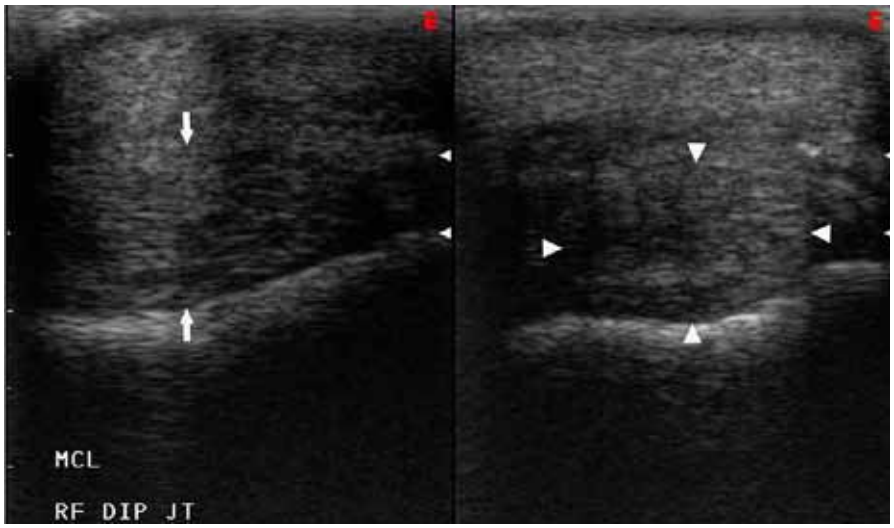

Figure 1. *Longitudinal (left) and transverse (right) ultrasound images showing tearing (black areas represented by arrows and arrowheads) of the medial collateral ligament of the coffin joint.*

Aidan was confined to a stall with a small attached paddock and hand-walked for 10 minutes on a firm level surface, twice a day for 30 days. Although this therapy would be indicated for the collateral ligament injury, it was contraindicated for treatment of the intermittent locking patellas. Thus, we would re-evaluate Aidan at 30 days to determine if he had regained enough soundness to institute an exercise regimen in a water treadmill. This rehabilitation technique would allow continued healing of the collateral ligament (with a low chance for reinjury) while promoting muscle strength of his hind limbs to address locking patellas.

After 30 days of stall rest and hand-walking, the lameness had improved by one grade while trotting straight on hard ground, but Aidan was still very lame when circled to the left. With this degree of lameness noted, stall rest and walking under tack for 15 minutes once a day was recommended. If Aidan remained comfortable at the walk for the first two weeks, then tack-walking would be increased by 5 minutes a week until a recheck evaluation was performed at 30 days.

At the 60-day lameness evaluation, Aidan was sound at the trot in a straight line, but lameness was accentuated when he was circled to the right. A recheck ultrasound exam revealed that the ligament had remained stable in size and had slight improvement in echogenicity and fiber pattern. Even though walking under tack had been increased, the owners reported that in the last ten days the horse showed hind end stiffness. He was reluctant to move forward and had a choppy gait in both hind limbs.

Based on improvement in the front limb lameness and somewhat improved ultrasound findings, Aidan began a rehabilitation program on the water treadmill (Hydrohorse) at Circle

Oak Ranch in Petaluma, CA, to further strengthen the medial collateral ligament and address his hind end stiffness. The initial program began with 5 minutes of Hydrohorse exercise 3 times per week, which was gradually increased by 30 seconds at each session over the following 2 months.

On the days Aidan was not in the water, he was hand-walked or exercised in a Eurociser for 25 minutes twice daily and once daily when exercised in the Hydrohorse. After this time period, the final program consisted of water treadmill exercise of 15 minutes per day, three times per week, and walking in the Eurociser for 30 minutes. When he was not exercised in the Hydrohorse he spent 40 minutes two times per day in the Eurociser.

At the 4-month recheck (after 2 months of specialized rehabilitation), Aidan continued to be sound at the trot but showed improved but mild lameness when circled to the right on hard ground. He was extremely fit (he had lost body fat and gained muscle mass). In addition, there was no evidence of hind limb stiffness. With this level of overall improvement we determined that the rehabilitation program could proceed under the owner's care. Tack-walking on even ground with good firm footing was initiated at 40 minutes per day. Walking could be increased by 5 minutes each week until a total of 60 minutes had been achieved. A progress lameness evaluation was scheduled for 30 days to determine if trotting exercise could be initiated.

During this part of the rehabilitation, Aidan's owner reported that he was showing more signs of lameness in both front limbs. On examination, the horse demonstrated signs of sore front feet. We determined that the extra workload caused excessive foot wear and that Aidan's soles had thinned as a result of being without shoes. Therefore, shoes were placed on Aidan's hooves at this stage and the exercise program was reduced for two weeks to allow the foot soreness to resolve before resuming the 60-minute tack-walking regimen.

At a six-month follow-up exam, Aidan continued to be sound at the trot and showed improved but mild lameness when circled to the right on hard ground. The horse had not lost fitness and there was no evidence of hindlimb stiffness. Ultrasound examination revealed a stable healing ligament (Figure 3). With this level of improvement in the gait and ultrasound evidence of healing, the rehabilitation program could continue with increased amounts of walking under tack on trails with good even ground surface. Trails with modest inclines and declines would be appropriate. Brief amounts of trotting exercise would be incorporated into the hour trail rides if the horse was willing. A recheck exam was scheduled in another 60 days to determine further improvement.

With the severity and chronicity of the injury identified in this case, it is not uncommon to invest a year of rehabilitation time before the horse returns to full soundness and to the previous level of work. Overall the prognosis is good as long as the owners follow the guidelines of a conservative rehabilitation program. Regenerative medicine techniques are not likely to speed the healing process, especially in chronic injuries, but they are likely to improve the healing so there is less of a chance for reinjury when the horse returns to full work.

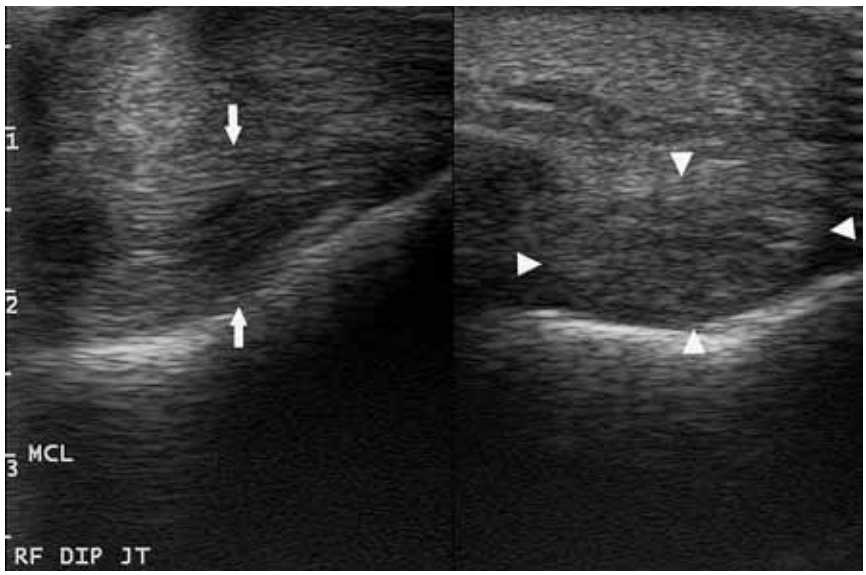

Figure 3. *Longitudinal (left) and transverse (right) ultrasound images of the 6-month recheck showing progressive healing (areas represented by arrows and arrowheads) of the medial collateral ligament of the coffin joint.*

The Horse Report To Be An Online Publication

Starting with our next issue (July 2011), *The Horse Report* will be available only as a Web-based publication in pdf or e-zine formats. **If you would like to be notified of a new online publication, send your e-mail address to *ljchristison@ucdavis.edu*.** For readers who would still like to receive a **print publication**, send your request along with your mailing address to ***ljchristison@ucdavis.edu***.

Dr. K. Gary Magdesian Named to Endowed Chair

DR. K. GARY MAGDESIAN was appointed to the Roberta A. and Carla Henry Endowed Chair in Emergency Medicine and Critical Care. He is the first to hold this honor, which was made possible by a generous gift from the estates of the Henry sisters. The endowment will provide funding to improve the state of veterinary care through research, clinical service, teaching and outreach.

Dr. Gary Magdesian

Dr. Magdesian earned his Doctor of Veterinary Medicine degree at the UC Davis School of Veterinary Medicine, where he also completed a residency in large animal internal medicine. He is board-certified in three specialties: veterinary internal medicine, emergency and critical care and pharmacology.

Dr. Magdesian serves as the Chief of Neonatology and Critical Care at the William R. Pritchard Veterinary Medical Teaching Hospital where he has saved the lives of countless newborn foals and other horses. A faculty member since 1997, he investigates Clostridium difficile, the most common infection of critically ill horses being treated with antibiotics. Dr. Magdesian teaches veterinary students in both the classroom and the clinic and provides advanced training of veterinary specialists. He developed the first residency in the nation to emphasize critical care in large animals.

AAEP Foundation Names Carrie J. Finno Past Presidents' Fellow

Dr. Carrie Finno

DR. CARRIE J. FINNO has received the 2010 American Association of Equine Practitioners (AAEP) Foundation Past Presidents' Research Fellow for her contributions to advancing equine research. Dr. Finno was recognized during the December 6 Frank J. Milne State-of-the-Art Lecture at the AAEP's 56th Annual Convention in Baltimore, MD. The $5,000 research grant is awarded each year to a doctoral or residency student who has excelled in the field of equine research. Dr. Finno's doctoral thesis involves investigating the genetic basis for neuroaxonal dystrophy/equine degenerative myeloencephalopathy (NAD/EDM) in horses. The disease affects multiple breeds of horses and appears with clinical signs similar to cervical vertebral malformation. Through her study, Dr. Finno and her collaborators' objective is to perform a mapping study to determine a candidate region that might contain a genetic mutation causative for NAD/EDM in all breeds of horses. The ultimate goal is to develop a genetic test that will allow horse breeders to make informed decisions and avoid a devastating neurologic disease while aiding equine clinicians in diagnosing NAD/EDM antemortem.

Dr. Finno received her veterinary degree from the University of Minnesota in 2004. She is currently a postdoctoral researcher in genetics at the UC Davis School of Veterinary Medicine and an Associate Veterinarian in equine internal medicine.

Rocky's Story

A Case Study from the UC Davis Veterinary Medical Teaching Hospital

by Jorge Nieto, DVM

A 6-year-old paint horse named Rocky presented to the William F. Pritchard Veterinary Medical Teaching Hospital at UC Davis with possible pneumonia. Rocky had recently been transported for 8 hours from a training facility and the owner noticed when the horse arrived that he was depressed, feverish and had ventral edema. On presentation to the hospital, Rocky appeared lethargic, had a fever and was coughed frequently. A close evaluation of Rocky showed that he was anemic and had severe pleuropneumonia with a large amount of fluid inside his chest. (Pleuropneumonia is an infection of the lungs and pleural space. In most instances, it develops secondary to bacterial pneumonia.)

Rocky

On two separate occasions over three days, fluid was drained from the left side of Rocky's chest using a special needle, but fluid continued to accumulate in Rocky's lungs even though he was also being treated aggressively with medication. Radiographs and ultrasound showed a significant amount of fluid accumulation and the presence of abscesses in his chest. Bacterial culture of the fluid grew several different types of bacteria and allowed us to select the best antibiotic with which to treat him.

After 4 days of medical treatment and no real improvement in his condition, veterinarians elected to place a small camera inside his chest cavity to evaluate the lungs and pleural space. An evaluation of the thoracic cavity with the laparoscope showed severe fluid and fibrin deposition over the lung and the presence of a large abscess at the dorsal border of the lung. The abscess was drained and the fibrin was removed as much as possible. Rocky continued being treated aggressively with antimicrobials and was sent to the Center for Equine Health for layup and continuing medical treatment.

Rocky improved with medical treatment over the new few days, but then the pneumonia worsened and he was returned to the clinic. Due to the amount of fibrin, fluid and pus inside his chest, we decided to perform a thoracotomy, which involves making a-3 inch hole into the chest. This is a new procedure that we have performed in horses with severe complicated pleuropneumonia. The advantages of the procedure are that it can be performed with the horse standing under sedation and local anesthesia, allows good drainage of pus and fibrin and also permits infusion of solutions to clean and lavage the inside of the chest.

In the past, horses with severe pleuropneumonia either were euthanized or the ones that survived may have not returned to their full athletic potential. However, the use of this minimally invasive surgical approach has improved the prognosis of these cases, allowing some animals to return to race training or full racing.

To prevent contamination, the hole in the chest was covered with a sterile sponge. Rocky improved considerably and was again released to the Center for Equine Health for layup 12 days after the surgery, still under antimicrobial treatment and thoracic lavages. By 40 days after the thoracotomy, Rocky was doing very well, the hole in the chest had almost healed, and Rocky was sent home to the owners care.

Rocky continued to improve and we received a picture of him and a letter from the owner 6 months after he went home, saying Rocky was gaining weight and was again a happy horse. The thoracotomy incision has completely healed and only a small depression on the muscle wall is still evident.

One month after the thoracotomy, the wound had almost closed.

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