



EQUINE HEALTH UPDATE

For Horse Owners and Veterinarians
Vol. 20, Issue No. 1 – 2018

Dismiss the Kiss! Understanding Kissing Spines and How You Can Help Your Horse

By Jessica Zeiger, DVM (Class of 2018)
Edited by Stephen B. Adams, DVM, MS, Dipl. ACVS

Overriding Dorsal Spinous Processes (ORDSP), or “Kissing Spines” as it is commonly called, is an occasional cause of back pain in horses. Seen predominantly in sport horses, it has become common practice to ask for vertebral radiographs as part of the pre-purchase examination of horses used for practices such as dressage or jumping. Equine practitioners and owners alike need to understand the diagnosis, treatment options, and preventative measures for this condition in order to best help these horses perform comfortably.

The true underlying cause of kissing spines is not completely understood. Individual vertebrae of the back of horses have an upward projection called a dorsal spinous process (DSP). In horses with kissing spines, two DSPs may touch each other in one or more places along the spine. This causes inflammation, back pain, and spasms of the muscles of the back, drawing these spines even closer together. The most common site of this impingement is at the 15th thoracic vertebrae, which is a vertebra where there is an increased rotational motion compared to other vertebrae. The saddle also sits over this vertebra, potentially contributing to the lesion. While we do not know what causes the DSPs to impinge on each other initially, it is known that weakness of the back and core muscles contribute, as do poor saddle fit and poor equitation.

Some horses function well with kissing spines without showing any clinical signs. If it is discovered incidentally or during a pre-purchase examination in a non-painful horse, it should be considered as a predisposition for possible future back pain, but not necessarily an immediate problem. Preventative measures and exercise regimens can be followed preemptively, but horses should only be treated for kissing spines if they become painful.

Horses with back pain may show a variety of signs which include, but are not limited to, lameness, gait abnormalities, decreased flexibility turning to one side, high head carriage, refusal to take correct leads, saddle or rider avoidance, rearing or bucking, and refusal to take jumps. There are many causes of back pain, and your veterinarian should thoroughly evaluate your horse to elucidate all contributing factors to the pain. Kissing spines can be easily diagnosed by taking radiographs of the dorsal spinous processes and looking for areas of contact or impingement between DSPs. Other imaging modalities found to be useful include nuclear scintigraphy and thermography.

(continued on page 2)

Contents...

Health

Kissing Spines	pg. 1
THO.	pg. 4
Corneal Ulcers	pg. 5

Community Practice

Rain Rot	pg. 6
--------------------	-------

News & Notes

Who's Who?	pg. 3
----------------------	-------

In Depth

Kissing Spines	pg. 1
--------------------------	-------

Visit vet.purdue.edu/ePubs for more information on how to access the newsletter through our PVM ePubs app.

Kissing Spines *(continued from cover)*

Once a diagnosis of kissing spines is made, the treatment options for that horse can be determined. In some horses with only mild pain, saddle fitting can bring significant improvement. However, quite often some form of further treatment will be required. Many horses with kissing spines can be medically managed with injections of corticosteroids into the affected areas of the back. This breaks the cycle of inflammation. This therapy requires a 3 week period following the injection during which time the horse should not be ridden, but should follow a strict exercise regimen to strengthen the muscles of the back and core. Lunge line work with a Pessoa lunging system is one recommendation. Corticosteroid injections in conjunction with physical therapy can show improvement as successfully as the surgical techniques, however, recurrence of clinical signs often occurs, requiring repeated corticosteroid injections.



Another popular non-surgical treatment is SME therapy, which is a multimodal approach combining shockwave therapy, mesotherapy, and exercise. The shockwave decreases the pain associated with the impingement, offering the horse relief, and making them more willing to exercise. The mesotherapy decreases nerve-related pain and also allows for better stretching of the muscles. With the pain decreased and the muscles relaxed, the exercise regimen can work to improve the strength and flexibility of the back muscles, lifting the back and opening the spaces between DSPs. None of these modalities alone will sufficiently treat the signs, but the combination is the key. Like the corticosteroid injections, this technique is often effective, but the clinical signs may recur.

Surgical approaches traditionally have been reserved for those cases which cannot be medically managed. A once popular technique was to use an oscillating saw to remove every other DSP, essentially eliminating the contact points for kissing spines. This procedure is highly invasive, is usually performed under general anesthesia, and requires a 3 month or longer rehabilitation period.

A newer, much less invasive surgery is now available, called the Interspinous Ligament Desmotomy (ISLD), which can be performed in a standing, sedated horse. This approach involves making a small incision and cutting the ligament between two spines, eliminating the pain from the nerve endings where the ligament attaches to the DSP and allowing for a widening of the space between the DSPs. The ISLD is 24 times more likely to result in long term correction than the corticosteroid injections and has a low recurrence rate.

Following ISLD, as with all techniques, a rehabilitating exercise regimen needs to be implemented. Horses who have undergone ISLD can be fully rehabilitated within 6 weeks, compared to 3+ months with spinous processes resection. The faster rehabilitation, lower complications, low cost, non-invasiveness, and high success rates of the ISLD have made this procedure a first-choice treatment for many clients and practitioners. Several recent publications describe another procedure, the subtotal ostectomy of the dorsal spinous process. These surgeries are done standing and may be useful in horses in which the ISLD is not successful, or can be used as a primary treatment for horses not responding to injections.

When faced with a diagnosis of kissing spines, it is important to be informed about the nature of the condition, the treatments available, and what you can do to best help the horse be successful. Remember that not every horse with kissing spines is painful. If the horse requires treatment, there are many options available, but none will be successful without a long-term commitment to physical therapy and rehabilitation. The best way to prevent kissing spines is proper equitation and appropriately building horses' muscles before pushing them into advanced sporting. By implementing management changes, understanding the importance of proper athletic training, and utilizing innovative treatment options when needed, we can help our horses dismiss this kiss!

References:

1. Coomer, Richard P. C., et al. "A Controlled Study Evaluating a Novel Surgical Treatment for Kissing Spines in Standing Sedated Horses." *Veterinary Surgery*, vol. 41, no. 7, 2012, pp. 890-897., doi:10.1111/j.1532-950x.2012.01013.x.
2. Coomer, Richard. "Kissing Spines FAQ." *Kissing Spine Treatment | Cotts Equine*, www.cottsequine.co.uk/services/kissing-spine-treatment/.
3. Jacklin BD et al. *Subtotal ostectomy*. *Equine Vet J*. 2014; May 46(3):339-344.
4. Marcella, Kenneth. "Kissing spines: easy to diagnose, complicated to treat: imaging results, clinical signs and individual circumstances all play a part in addressing this increasingly prevalent condition." *DVM Newsmagazine* Jan. 2015: E1. *Global Reference on the Environment, Energy, and Natural Resources*. Web. 11 Apr. 2018.
5. "Overriding Dorsal Spinous Processes (Kissing Spines)." *Equine Neck and Back Pathology: Diagnosis and Treatment*, by Frances M. D. Henson, Wiley Blackwell, 2018.
6. Tabor, Gillian, and Jane Williams. "Equine Rehabilitation: A Review of Trunk and Hind Limb Muscle Activity and Exercise Selection." *Journal of Equine Veterinary Science*, vol. 60, 2018, doi:10.1016/j.jevs.2017.03.003.
7. Turner T. *Overriding spinous processes ("kissing spines") in horses: diagnosis, treatment and outcome In 212 cases*. *AAEP Proceedings* 2011;57:424-430.

News & Notes

Meet our Staff...



Molly Cripe Birt

I am Molly Cripe Birt, and I have worked as a veterinary technician in the Large Animal Hospital for over ten years. I am a proud graduate of Purdue University's Veterinary Technology Program in 2007, and earned a Veterinary Technician Specialty in Equine Veterinary Nursing in 2015. My predominant interests lie in equine sports medicine and critical care in post-operative patients. Outside of the hospital, I'm an avid endurance cyclist and leisurely hiker with my dog.



Pat Navarre

By way of introduction, I am Pat Navarre, the senior technician in the Large Animal Hospital, working primarily in the surgery section. I have had a very enjoyable career here at the College of Veterinary Medicine as I approach the anniversary of my 42nd year of service. There have been some very dramatic changes in veterinary medicine over this time with new modalities, equipment and techniques for treating our patients. Every day is seen as a new day of mentoring, guiding students, both DVM and veterinary technician, in their development as veterinary medical professionals.

On a personal note, I enjoy spending time in the outdoors through conservation efforts and hunting. Through my memberships in conservation organizations, I get enjoyment introducing folks, young and old to the outdoors.



Lynda Lum

Hi! I'm Lynda Lum. I have worked at the Purdue Veterinary Teaching Hospital for 27 years as a Large Animal Medicine Technologist. I enjoy working here because no two days are the same and I learn new things from every patient. I have 6 cats, 3 dogs, 2 children, a bunny and a husband at home. In my spare time I love to bake, crochet, visit wineries and volunteer with a local cat rescue.



Shannon Wallace

My name is Shannon Wallace, BS-RVT; I am one of the hospital's Large Animal Versa Technicians, but mostly stay on the surgery side of the large animal hospital. I graduated from Purdue University with my degree and have been working here for a little over a year. I enjoy spending my free time with my two dogs (Oscar my Newfoundland and Yeti my Golden Retriever), remodeling my house, traveling and working out.

THO – Oh No!

Temporohyoid Osteoarthropathy in the Horse

By Julie Goodman, DVM (Class of 2018) – Edited by Tim Lescun, BVSc, MS, PhD, Dipl. ACVS

Temporohyoid osteoarthropathy (THO) is a disease of the hyoid apparatus in the horse, first reported in 1983. The hyoid apparatus is made up of four paired bones (the stylohyoid, epihyoid, ceratohyoid, and thyrohyoid) and one unpaired bone (the basihyoid); it is located in the throatlatch region and helps to stabilize the larynx, pharynx, and tongue. The hyoid apparatus is connected to the skull by the temporohyoid joint, an articulation between the stylohyoid bone and the temporal bone of the skull. THO is caused by ankylosis, or fusion, of the temporohyoid joint, which can then progress to fracturing of the stylohyoid or temporal bone.

It is unknown what exactly precipitates the ankylosis of the joint, but there are many theories. Inflammation caused by otitis media or otitis interna (infection of the middle or inner ear) may cause enough local inflammation to induce osteoarthritis and fusion of the joint. It is also possible that infection from a distant site in the body reaches the temporohyoid joint through the blood stream. Trauma from events such as passing nasogastric tubes or rough manipulation of the tongue may set the joint up to develop a nonseptic degenerative process. However, owners of horses with THO usually do not report any trauma or infection. THO may be a primary degenerative joint disease, but no other joints are affected.

Symptoms due to osteoarthropathy of the temporohyoid joint include difficulty eating, pain around the ear base, head shaking, and acting out under saddle. If fractures occur, this can result in edema and hemorrhage leading to compression of the nearby nerves or direct tearing or stretching of the nerves. Vestibulocochlear nerve damage manifests clinically as vestibular signs, ranging from a head tilt and mild ataxia (incoordination) to recumbency. Signs of facial nerve damage include drooping of the ear, drooping of the upper eyelid, and muzzle deviation. Because the facial nerve is responsible for blinking of the eye, keratoconjunctivitis sicca, or dry eye, and corneal ulcers can also result.

Horses suspected to have THO should have a complete neurologic exam performed by their veterinarian. The gold standard for diagnosis is endoscopy of the guttural pouch, which will reveal enlargement of the top of the stylohyoid at the temporo-hyoid joint. Radiographs are less sensitive than endoscopy and may not be conclusive as a diagnostic test. A CT scan can also detect fractures or disease of the middle ear. MRI can reveal additional information, such as fluid accumulation or structural changes of the parts of the inner ear, which help determine prognosis. Administering local anesthesia in the external ear canal can help differentiate whether the condition is unilateral or bilateral. Brainstem auditory-evoked response



Head tilt and corneal ulceration. Courtesy of S. Taylor. Facial nerve paralysis and muzzle deviation. Courtesy of S. Taylor.

testing (BAER) will reveal partial or complete hearing loss. Tympanocentesis, or aspirating fluid from the eardrum, can identify potential bacteria and help determine proper antibiotic usage.

Treatment goals for THO include decreasing inflammation, treating possible otitis or secondary infections, treating secondary eye ulcers and dry eye, performing surgery to remove pressure from the temporohyoid joint, and avoiding further trauma such as ear rubbing, passing a nasogastric tube, and dental floats. Anti-inflammatories (phenylbutazone, flunixin meglumine, dimethyl sulfoxide) should be administered for 1-2 weeks. If the horse has severe vestibular signs, the corticosteroid dexamethasone can be given to further assist in decreasing inflammation. There is no consensus on antibiotic treatment, but antibiotics effective against *Staphylococcus aureus* can be given for 2-4 weeks. Gabapentin can be administered to help with neuropathic pain control. Standard treatment for ulcers is indicated if corneal ulcers are present. In cases of facial nerve dysfunction, temporary tarsorrhaphy (suturing part of the eyelid closed to protect the cornea) may be indicated. Originally, temporohyoid osteoarthropathy was treated surgically with removal of part of the stylohyoid bone, but partial disease recurrence was seen frequently with this method due to bony healing along the gap of resected bone. The surgery of choice to treat THO is a ceratohyoidectomy, in which the ceratohyoid bone and its connection between the basihyoid and stylohyoid bone is removed to relieve pressure and tension on the temporal bone. Decreased pain has been noted in horses 24-48 hours after this procedure and the bone does not tend to heal back.

(continued on page 6)

Equine Corneal Ulcers: Not Something to Look Away From

By Alexandra Fromme, DVM (Class of 2018) – Edited by Jean Stiles, DVM, MS, Dipl. ACVO

The cornea is the outermost layer of the front of the eye and functions as the first line of defense against any foreign material entering the eye. Since the cornea is exposed to the environment, it is very susceptible to irritation, abrasions and foreign bodies. Horses are notorious for hitting their eye on anything they can find such as a broken water bucket clip, loose piece of fencing, broken boards in the stall or nails sticking out in their environment that can lead to a corneal ulcer.

The cornea itself is about 1 millimeter thick, and composed of several layers. Corneal ulcers occur when the outermost layer of the cornea known as the epithelium is disrupted. You should suspect a corneal ulcer in your horse when you see excessive tear production and runny eye, squinting, or a red or swollen eye. If you see any of these symptoms, you should contact your veterinarian immediately to come evaluate the eye. In order to diagnose a corneal ulcer, your veterinarian will need to apply a stain to the eye. If an ulcer is present, this stain will be taken up by the layer of the cornea below the epithelium called the stroma, and will appear as a bright green spot on the eye.

There are multiple types of corneal ulcers that vary in severity and the way they are treated. One of the most important aspects of corneal ulcer care is to never treat them with steroid medications such as ointment that contains dexamethasone, as these suppress the body's immune response and can result in infection or worsening of already present infection. Ulcers can vary in their depth into the cornea, and can be non-infected, infected or "melting". A shallow, non-infected ulcer can usually be treated with topical antibiotic medications, atropine and Banamine at home. Atropine is used in the treatment of corneal ulcers to dilate the eye and prevent painful spasms of

the ciliary body within the eye. Banamine is administered for pain relief. Small, non-infected ulcers often heal within 7-10 days when treated and identified quickly.

An ulcer that penetrates deeper into the cornea or is infected is significantly more difficult to treat and requires hospitalization with advanced medical intervention. These horses often require eye medication administered every hour or two hours for multiple days. To facilitate ease of treatment and ensure medications are reaching the cornea, a subpalpebral lavage system can be placed. A "SPL" (subpalpebral lavage) is a small, long catheter that is placed through your horse's upper or lower eyelid to deliver medication directly onto the eye. The catheter is anchored to your horse's forehead with a few stitches, and weaved through the mane for further security. Small amounts of liquid antibiotics, antifungals and other medications can then be administered through the small catheter port tied in your horse's mane, instead of attempting to place ointment in a moving target twelve or more times a day. A melting corneal ulcer occurs when the bacteria in an infected ulcer release enzymes called collagenases that cause the the cornea to break down and appear gooeey. This is a severe condition, and requires a SPL in addition to treatment with anti-collagenase containing products on top of antibiotics, atropine and Banamine. Melting ulcers may also require surgical intervention to allow for complete healing. The most severe and urgent form of corneal ulcer is one that is so deep there is only a single layer of cells preventing the eye from rupturing. This type of ulcer is termed a descemetocoele, and even small non-infected corneal ulcers can progress to this severity if not correctly identified and treated.

(continued on page 7)



Corneal ulcer. Courtesy of Jean Stiles.



Melting corneal ulcer. Courtesy of Jean Stiles.

Rain Rot? Surely Not!

By Audriana Finney, DVM Student (Class of 2019)
Edited by Stacy H. Tinkler DVM, MPH, Dipl. ACVIM



It's the beginning of spring, flies are starting to reappear after a long winter and the rainfall has been plentiful. The weather is warmer and you have your horse turned out in the pasture with a run-in shed; but he also enjoys standing out in the rain. Today the rain has finally decided to let up and you decide to go for a nice trail ride. You go to get your horse from the pasture and you notice the hair coat on his rump looks kind of bumpy and tufted. Your horse may have a case of rain rot or rain scald.

Rain rot is caused by the bacteria, *Dermatophilus congolensis*. This organism requires two factors to be successful and proliferate: skin damage and moisture. The skin damage can be from a small cut obtained while at pasture or from biting flies while the moisture can be from sweat not properly groomed off after a long ride or chronic rain exposure. Dermatophilosis can be passed on from one horse to the other via the crusts produced from these lesions. As previously stated, these lesions look like tufts of hair and are sometimes referred to as looking like paintbrushes (Figure 1). If these clumps of hairs are plucked off, the underneath skin can have pink areas of irritation, or in more severe cases, a thick creamy pus (Figure 2). When these lesions heal, it may appear as areas of hair loss or scaling of the skin. Rain rot does not just develop on the rump of horses, but can be found in the saddle area, nose and legs (Figure 3). Dermatophilosis is rarely transmitted to people and mainly in tropical areas. If you suspect your horse has rain rot, there are multiple ways a true diagnosis can be obtained. The crusts pro-

duced from this infection can be used to perform a cytology or culture. These diagnostic methods can help differentiate from similar diseases such as those caused by ringworm or mange.

The environment your horse is living in will greatly affect the management of rain rot. For example, horses living in a more humid climate will be more difficult to manage than a horse living in a cooler, drier environment. If horses with rain rot are kept in a dry environment for 4 weeks, then most of these cases will actually regress on their own and no treatment will be needed. More proactive treatment involves removal of the crusts followed by application of topical treatments. In more chronic infections, systemic therapy with antibiotics can be used. Common topical products utilized are 2-5% lime sulfur dip or 4% chlorhexidine solution applied to the affected areas for 3-5 days. These products can come in either entire body shampoos or dips to be applied and left on the skin. Once the lesions are clearing up in a specific area, the topical products can be used weekly until the lesions have completely disappeared. Penicillin and trimethoprim sulfonamides are antibiotics that have been successful in treating chronic infections. Research has been conducted revealing different methods of treating *D. congolensis*. In a study by Valipe et al. (2009), it was found that caprylic acid, a fatty acid, is a potential alternative treatment option for rain rot. This could be an important therapeutic option as it eliminates the use of antibiotics and the concern for the development of antimicrobial resistance.

Take Home Messages

If your horse has been diagnosed with rain rot, don't fret! Keeping your horse clean and dry and preventing contact with other horses until the lesions are cleared will be essential to properly managing this disease. Topical products such as lime sulfur and chlorhexidine solution can be used to treat the lesions produced by *D. congolensis*. Limiting moisture and skin damage will be key to preventing your horse from ever obtaining rain rot. Caprylic acid and its derivatives may be useful treatment options for rain rot in the future.



Figure 1.
Paintbrush lesions seen with
Dermatophilus congolensis.
Photo courtesy of Scott and Miller's
Equine Dermatology



Figure 2.
Pus under paintbrush lesions seen
with *Dermatophilus congolensis*.
Photo courtesy of Scott and Miller's
Equine Dermatology



Figure 3.
Rain rot can be found in places other
than the rump and hair loss can be severe.
Photo courtesy of Scott and Miller's
Equine Dermatology

References:

Rees, C. *Equine Internal Medicine. Chapter 11 – Disorders of the Skin.* Elsevier Health Services. 2004;2: 667-720 <https://www.sciencedirect.com.ezproxy.lib.purdue.edu/science/article/pii/B0721697771500135>
Scott D, Miller W. *Equine Dermatology (Second Edition). Chapter 4 – Bacterial Skin Diseases.* Elsevier Health Services. 2011;2:130-170 <https://www.sciencedirect.com/science/article/pii/B9781437709209000044>
Valipe S, Choi G, Morton M, Nadeau J. *Investigation of the Antimicrobial Mechanism of Caprylic Acid on Dermatophilus Congolensis.* May 2009;29: 404-405 <https://www.sciencedirect.com.ezproxy.lib.purdue.edu/science/article/pii/S0737080609003694>

THO (continued from page 4)

Prognosis is good with early detection; if neurologic signs are already present, prognosis is reduced to fair. With ceratohyoidectomy, recurrence of the disease has not been noted, but facial nerve deficits or vestibular signs may persist. Maximum improvement can take up to two years, but ataxia usually resolves with surgery. In a study of 33 cases of temporohyoid osteoarthropathy, 19 of the 20 surviving horses returned to work after treatment. In another study of 24 cases who were treated with ceratohyoidectomy, 89% had improved within a year; the most significant improvement was made six months after the procedure, but only 50% returned to work.

References:

Divers TJ, Ducharme NG, de Lahunta A, Irby NL, Scrivani PV. *Temporohyoid Osteoarthropathy.* *Clinical Techniques in Equine Practice.* 2006; 1:17-23.
Koch C, Witte T. *Temporohyoid osteoarthropathy in the horse.* *Equine Veterinary Education.* 2014; 3:121-125.
Oliver ST, Hardy J. *Ceratohyoidectomy for treatment of equine temporohyoid osteoarthropathy (15 cases).* *The Canadian Veterinary Journal.* 2015; 4:382-386.

If your horse exhibits any signs associated with temporohyoid osteoarthropathy, contact your veterinarian right away. Many of the earlier signs are often associated with dental issues, but keep in mind this lesser known disease process. Just like most other illnesses, prompt diagnosis and treatment offer the best chance for a full recovery for your horse.

Corneal Ulcers (continued from page 5)

Corneal ulcers are one of the most common conditions of the eye in horses. It is important to remember that although some ulcers can be treated at home, all suspected ulcers need to be evaluated by a veterinarian and many require advanced medical treatment and hospitalization. If you have questions about equine corneal ulcers or other medical conditions, please contact your veterinarian today.

References:

Brooks, D. E., DVM, PhD, Dipl. ACVO. (2016). *Equine Ophthalmology for Horse Owners.* Retrieved November 05, 2017, from <https://aaep.org/horsehealth/equine-ophthalmology-horse-owners>
Brooks, D. E., DVM, PhD, Dipl. ACVO. (2016). *Wait and See Won't Work for Equine Corneal Problems.* Retrieved November 05, 2017, from <https://aaep.org/horsehealth/wait-and-see-wont-work-equine-corneal-problems>
Conley and Koontz Equine Hospital. (n.d.). *Corneal Ulcers: An Eye for An Eye.* Retrieved November 05, 2017, from <http://www.ckequinehospital.com/page/168/Corneal-Ulcers>
Gilger, B. C. (2017). *Equine Ophthalmology, Chapter 5- Diseases and Surgery of the Cornea [Second Edition].* Retrieved from <http://www.sciencedirect.com.ezproxy.lib.purdue.edu/science/book/9781437708462>
Schoster, J. V., DVM, DACVO. (n.d.). *Complicated Corneal Ulcers.* Retrieved from http://cal.vet.upenn.edu/projects/ophthalmology/ophthalmo_files/Tools/ComplicatedUlcers.pdf



EQUINE HEALTH UPDATE

is published by:

Purdue University
College of Veterinary Medicine
Equine Sports Medicine Center
1248 Lynn Hall
West Lafayette, Indiana 47907-1248

ADDRESS SERVICE REQUESTED

Phone: 765-494-8548
Fax: 765-496-2641
www.vet.purdue.edu/esmc/

With generous support of
Purdue University's Veterinary
Teaching Hospital and the College of
Veterinary Medicine Dean's Office.

Please address all correspondence related
to this newsletter to the address above.

Editorial Board:
Drs. Couétil L., Hawkins J. and Tinkler S.

Design & layout by:
Elaine Scott Design

EA/EOU



The **Equine Sports Medicine Center**

Purdue's Equine Sports Medicine Center is dedicated to the education and support of Indiana horsemen and veterinarians through the study of the equine athlete. The Center offers comprehensive evaluations designed to diagnose and treat the causes of poor performance, to provide performance and fitness assessments, and to improve the rehabilitation of athletic horses. Other integral goals of the Center are to pioneer leading-edge research in the area of equine sports medicine, to provide the highest level of training to future equine veterinarians, and to offer quality continuing education to Indiana veterinarians and horsemen. For more information visit our website:

www.vet.purdue.edu/esmc/



Continuum© by Larry Anderson