

# CENTER FOR EQUINE HEALTH HorseReport

SCHOOL OF VETERINARY MEDICINE • UNIVERSITY OF CALIFORNIA, DAVIS

FALL 2017

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Center for Equine Health



# Leading the Way in EPM Testing

Equine protozoal myeloencephalitis (EPM) remains a significant disease for equine veterinarians and researchers to study. Caused by protozoa that are present in the feces of the opossum, EPM is a debilitating neurologic disorder in horses that can ultimately be fatal. Thanks to support from donations to the Center for Equine Health, a group of UC Davis scientists, led by Dr. Nicola Pusterla, are learning more about the disease every year.



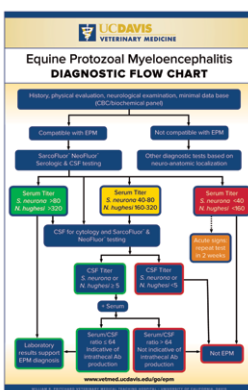
Horses affected by the parasite that causes EPM may appear neurologic.

Due to the difficulty in diagnosing the disease, veterinarians rely on experience in recognizing signs, but ultimately the only definitive diagnosis of EPM comes from tests of the horse's serum or cerebrospinal fluid to determine the presence of antibodies to the protozoa.

Historically, the Western immunoblot test was used to diagnose EPM, but Pusterla's team sought an improved diagnostic tool. To that end, they developed and successfully validated the SarcoFluor™ and NeoFluor™ tests – immunofluorescent antibody tests for both of the known causative agents of EPM (*Sarcocystis neurona* and *Neospora hughesi*). These provide a quantitative indication of EPM infection and provide greater sensitivity and specificity than the Western immunoblot test on serum samples. The new methods also reduce the necessity to obtain cerebrospinal fluid in order to screen for antibodies against the two protozoal agents.

The school offers the only commercial platform that tests for both *S. neurona* and *N. hughesi* antibodies, ensuring more cost effective and complete screening from a single sample.

UC Davis clinicians also created an EPM website with several pages of pertinent information, including a diagnostic flow chart that veterinarians can follow to determine if laboratory testing to confirm EPM is necessary. It can be found at: [www.vetmed.ucdavis.edu/go/epm](http://www.vetmed.ucdavis.edu/go/epm)



UC Davis created this [flow chart](#) to help veterinarians diagnose EPM.

## VGL Testing Options

The school's Veterinary Genetics Laboratory (VGL) provides a variety of tests for horse owners and breeders. The lab offers animal parentage verification, identification, genetic disease screening and diagnostic testing. Particular breeds may be more susceptible to various health conditions.

Equine tests include:

- Cerebellar Abiotrophy Screening Test (CA)
- Connemara Pony Hoof Wall Separation Disease
- Glycogen Branching Enzyme Deficiency (GBED)
- Hereditary Equine Regional Dermal Asthenia (HERDA)
- Horse Embryo Clone Validation
- Horse Embryo Pre-Implantation Genetic Diagnosis
- Hyperkalemic Periodic Paralysis (HYPP)
- Junctional Epidermolysis Bullosa (JEB)
- Lavender Foal Syndrome (LFS)
- Malignant Hyperthermia (MH)
- Naked Foal Syndrome in Akhal Teke
- Occipitoatlantoaxial Malformation (OAAM)
- Ocular Squamous Cell Carcinoma (SCC) in Haflinger Horses
- Severe Combined Immunodeficiency (SCID)
- Skeletal Atavism in Shetland Ponies & American Miniature Horses
- SynchroGait™

For more information about testing services offered through VGL, call 530-752-2211 or visit [www.vgl.ucdavis.edu](http://www.vgl.ucdavis.edu).







# New Hope for ELIMINATING EYE CANCER

Holly Singleton was devastated when one of her Haflinger mares, Charismatic, developed ocular squamous cell carcinoma (SCC), the most common cancer found in equine eyes and the second most common tumor of the horse overall.

“I had never encountered this disease in all the years I’ve worked with various horse breeds,” Singleton said. “It was the first time I became aware that Haflingers were prone to such a devastating cancer.”

Thanks to treatment at UC Davis, Charismatic was given another two and a half years of life before the cancer returned and led to her death. The experience left Singleton determined to help find a way to eliminate SCC from her breeding line, so when Dr. Rebecca Bellone, an equine geneticist at the UC Davis [Veterinary Genetics Laboratory](#) (VGL), asked her to participate in a veterinary clinical trial, Singleton opened her ranch to other Haflinger owners so the researchers would have more horses to test.

As a result of that genetic study funded by the [Center for Equine Health](#) and Morris Animal Foundation, UC Davis scientists recently announced in the *International Journal of Cancer* the discovery of a genetic mutation linked to SCC. The mutation is hypothesized to impact the ability of DDB2, damage specific DNA binding protein 2, to carry out its standard role. Normally, the protein conducts DNA surveillance, looking for UV damage and then calling in other proteins to help repair the harm.

“We believe this is a risk factor because cells can’t repair the damage and then accumulate mutations in the DNA that lead to cancer,” said Bellone, an associate adjunct professor at the school. Work to investigate this hypothesis further, also funded by the CEH, is currently being conducted by Animal Biology masters student Moriel Singer-Berk under the direction of Dr. Bellone.

Several equine breeds, including Haflingers, have a higher occurrence of limbal SCC, the form of the disease that

originates in the junction between the cornea—the clear surface of the eyeball—and the conjunctiva that covers the white of the eye.

“The fact that we see this type of cancer in a relatively small breed with a narrow pedigree makes it a good model to study,” said Dr. Mary Lassaline, associate professor of clinical equine ophthalmology at the school.

Ocular SCC can lead to vision loss and even loss of the eye. In advanced cases, SCC can be locally invasive, spread to the orbit and erode the bone, and eventually the brain—leading to loss of life. These recent study results offer a huge opportunity to identify horses at risk for developing SCC on two fronts.

“One, it’s important for the individual horse with a known risk so we can be more vigilant about exams as well as protecting their eyes from UV exposure,” Lassaline said. “If detected early, we can remove the tumor and save the eye. Secondly, that knowledge is important for making informed breeding decisions.”

Scientists at the VGL were able to develop a genetic test for horses based on the research. Singleton now uses that test to screen her breeding mares to protect the health of her herd of about 50 and the breed as a whole.

“Homozygosity for this particular mutation, or having two copies, explains about 80 percent of affected cases,” Bellone said. “Charismatic’s cancer, however, wasn’t explained by this genetic risk factor. Thus, studying her DNA and that of more horses like her will help further the understanding of genetic risk so we can identify other horses at high risk for developing SCC.”

The CEH has funded a third study, now underway, that aims to identify the other genetic variants responsible for SCC. For horse owners interested in participating in a clinical trial, please contact Dr. Rebecca Bellone, [rbellone@ucdavis.edu](mailto:rbellone@ucdavis.edu) or 530-752-9299. To advance equine research visit: <https://give.ucdavis.edu/VCEH/V007U30>



# Do Horses Need Annual Rabies Vaccination?

It's extremely rare for a horse to contract rabies. Of the nine million horses in the United States, only 25 of them were reported to have contracted the disease in 2014. Perhaps that success rate is due to the strict annual rabies vaccination recommended by the American Association of Equine Practitioners (AAEP).

Most other animals recommended to receive rabies vaccinations get them every two to three years, so is it really necessary for horses to be vaccinated every year? Thanks to a donation to the [Center for Equine Health](#) (CEH), UC Davis researchers are taking a hard look at that question.

How does a horse contract rabies? In California and the Midwest, infection typically occurs when being bit by a rabid skunk. In the East, it's from raccoons, and in parts of Texas and Arizona, it's mostly from foxes. Rabies is zoonotic, meaning the disease can pass from animals to humans. Therefore, protecting horses from rabies also protects the humans who interact with them. While this research is ultimately aimed at finding the best vaccination guidelines for horses, there is a human health benefit as well.

To be fully protected, AAEP recommends that vaccine induced rabies virus neutralizing antibodies (RVNA) titer should be 0.5 IU/mL. UC Davis studied titer levels in 48 horses – 28 younger than 20-years-old, and 20 older or equal to 20 years, since age may be a determinant. Serum samples were collected at eight time points (pre-vaccination, approximately three weeks later, and then every six months for three years).

The study found that most of the horses held the recommended 0.5 IU/mL level for up to three years. The lowest percentage of horses in either group above the threshold, at any point during the three years, was 82% (the younger horses at 12 months). The highest rate (excluding the 100% of younger horses at three weeks) was 91% of the older horses at 30 months.

“There is an increasing body of evidence that protective antibody titers persist for three years for many pathogens



These Center for Equine Health residents participated in a long-term rabies vaccination study funded by the center.

included in vaccines,” said Dr. David Wilson, professor emeritus and former director of the UC Davis veterinary hospital and its Large Animal Clinic.

The researchers' results were published as “Duration of serum antibody response to rabies vaccination in horses,” in the [Journal of the American Veterinary Medical Association](#) and presented at the 62nd Annual AAEP Convention in 2016.

While this study is by no means definitive, and there remains minimal published data on the correlation between RVNA levels and protection of horses against rabies, Wilson feels that arguments could be made for decreasing the time between vaccinations. He also studied a separate group of 11 CEH mares and found that all of them maintained recommended titer levels for more than nine years.

“An administration of a second dose about one year later creates a robust and persistent response in almost all horses,” said Wilson. “Prolonged persistence of antibody above the 0.5 IU/mL protective level suggests that a vaccination of primed horses every three years is probably sufficient.”

Horse owners are encouraged to consult with their veterinarians about the titer levels and best vaccination recommendations of their specific animals.

# PET Scan Solves Horse's Chronic Lameness

**B**ella, a 16-year-old American Quarter Horse mare, has historically suffered from chronic hind limb issues. She was previously diagnosed with bilateral osteoarthritis of the lower tarsal (hock) joints, but intra-articular medication had failed to significantly improve her lameness on the right hind leg. Bella had been ridden by two small children for the past three years and is an integral part of their family. Due to the severity of this lameness, however, she could no longer be ridden. Committed to improving Bella's condition, her family brought her to the UC Davis veterinary hospital.

Upon being presented to the [Equine Surgery and Lameness Service](#), Dr. Larry Galuppo and his team performed an exhaustive lameness exam with diagnostic analgesia and used a computerized lameness locator system to confirm that the area causing her pain and lameness was the right hock. A possible surgical intervention consisting of fusing some of Bella's tarsal joints was considered, but additional information to determine the exact location of the lesion and plan for the surgery was needed.

To determine this, Bella was enrolled in a clinical trial offering advanced imaging techniques unique to the UC Davis veterinary hospital. More than a year ago, UC Davis became the first veterinary hospital in the world to offer positron emission tomography (PET) for its equine patients, made possible by an estate gift from a grateful client. Combined with computed tomography (CT), this state-of-the-art imaging process can pinpoint locations of lameness with more accuracy than CT alone or other forms of imaging.

A team of veterinarians and technicians from the [Anesthesia/Critical Patient Care](#) and the [Diagnostic Imaging services](#) assisted Bella's equine veterinarians to perform a PET/CT scan on her under general anesthesia. The PET/CT revealed that the main cause of pain in Bella's hock was osteoarthritis of the talocalcaneal joint, rather than the degenerative changes in her distal intertarsal and tarsometatarsal joints identified with radiographs and MRI. This joint is rarely affected in horses, and its location and configuration make diagnostic and therapeutic procedures quite challenging. The PET/CT findings explained why the previous treatment had been unsuccessful and suggested that surgical intervention to the distal tarsal joints was not needed.

While Bella was still under general anesthesia, a CT guided therapeutic injection in the talocalcaneal joint was performed. Bella recovered well from the anesthesia following the procedure.

Four weeks after the PET/CT and the CT guided injection, Bella's condition significantly improved, and she could be ridden again. The owners were completely satisfied with the therapeutic and diagnostic procedures performed, and were thrilled to have Bella returned to a healthy state.

"For Bella, PET/CT was an absolute game changer since it allowed precise identification and a targeted treatment towards the affected joint," said radiologist Dr. Mathieu Spriet.

UC Davis veterinarians, led by Spriet and Dr. Pablo Espinosa, with support from the [Center for Equine Health](#), are continuing to see successes in their discoveries of the diagnostic capabilities of PET through this clinical trial and other research focused on advancing the clinical applications of this new modality. If you are interested in supporting advanced imaging such as PET, please contact the [Office of Development](#) at 530-752-7024.

Bella's young rider is happy to have her under saddle again.





# Computers Aid in Mapping **Equine Pain**

Veterinarians may be skilled animal healers, but they aren't Dr. Doolittle and horses can't talk. So, trying to accurately determine whether a horse is in pain can be tricky. Studying a horse's facial expressions can reveal subtle clues though—not just about pain, but also stress, fear, anxiety and boredom.

"Horses evolved over millions of years to get away from predators, but also to be stoic," said Dr. Claudia Sonder, director of outreach for the Center for Equine Health (CEH). "Even around its owner or other familiar people, horses tend to mask their pain responses. But if you look closely,

the involuntary muscles in their face are telling us that there's something wrong."

Sonder collaborated with the UC San Diego machine learning lab and the UC Davis Department of Computer Science to create a system using remote video surveillance with a novel software program, to first map horses' faces and then read their expressions.

Doctoral computer science student Maheen Rashid took a keen interest in the project, and she and her mentor, Young Jae Lee, programmed the computer to recognize the structure of horse faces to map slight changes in expressions. Fifty horses from the CEH herd were studied in collaboration with a Swedish research team, thanks to funding from CEH donors. More work is necessary to validate the equine pain face and program the computer to detect subtle differences. While the technology is not designed to replace careful clinical examination, Sonder sees the ability to observe horses from a distance as an enhanced measure to detect the presence of pain.

"It's exciting to see cutting edge technology merge with the science of veterinary medicine to help us better monitor and research equine pain in a clinical setting," Sonder said.

In addition to many wonderful scientific collaborations and generous donors to the [CEH](#), the McBeth Foundation provided primary programmatic support to make this work possible.



## A Passion for Polo – **Finding Exhilaration**

Michelle Myers has found her true passion in polo—a sport that she has enjoyed for 12 years. While coaching her volleyball team during a tournament at UC Davis, she happened to notice a flyer about polo lessons and immediately contacted the instructor. Myers says from that day forward, the rest is history.

"Playing polo is exhilarating! What I love most about it is the variety of things polo teaches us, including discipline, respect, teamwork and sportsmanship," Myers said. "I feel blessed to have met people from all over the world who share this same passion."

Her love of horses began at the age of five, when she received equine companion, Ginger, from her parents. They instilled the importance of providing good care for animals. When Ginger had an injury, Myers and her parents checked

on her every day and applied medication diligently until she healed.

Myers' devotion to horses grew only deeper over the years, and she was committed to providing the best care possible for them. She first brought one of her horses to the UC Davis veterinary hospital for treatment 35 years ago and continues to appreciate the school's mission and dedication to animals. Especially grateful for the Center for Equine Health's impact on the health and well-being of horses, Myers has made provisions for the center in her estate plans.

"The CEH has given much meaning to my life," Myers said. "Obviously, it feels good to do something for others, but I've also met new people through the center who believe in the same cause as I do, and that we as a group can make a difference. It has given me a way to share with others

# From the Track to the Show Ring

Despite his name, Krazy Flyer never flew around the racetrack fast enough to break any records. In fact, for a Thoroughbred, he's kind of slow and laid back, perfect for his current career as a competitor in the children's hunter division.

Owner Michelle Motyl adopted him a little over a year ago from the [Center for Equine Health](#) where he had been part of Dr. Heather Knych's exercised Thoroughbred research herd. This group of about 15 horses participates in a variety of studies, the most common being a 'drug administration study' where the horses receive a particular drug and then researchers collect samples a number of times post administration.

"This allows us to determine how the drug behaves in a horse's body, how it is metabolized and how long the drug can be detected," said Knych, who focuses on equine pharmacology, particularly in performance horses. "These studies are critical to establish recommendations for medication regulations in horse racing."

The research herd is supported by funds provided by the California Horse Racing Board. Horses like Krazy Flyer typically remain in the herd for three to four years before they age out or take part in the maximum number of studies allowed.

Once they complete their service, there is a wide variety of third career options. Some go on to become embryo recipient mares with the veterinary school's reproduction services. A few may join the teaching herd to help veterinary students learn

the experience of promoting generosity and philanthropy. Additionally, as a teacher I have found it rewarding to see former students graduate from the UC Davis veterinary school."

Through support for technology advances and changes, Myers hopes that her gift will help ensure the center's research well into the future. Appreciative of her thoughtful generosity, the school recognizes Myers as a member of the Heritage Society for Animals, a premier giving society that honors donors who have made planned gifts.

For information about making a gift to the CEH and to learn about the Heritage Society for Animals, please contact the Office of Development at 530-752-7024.

Michelle Myers riding Pepé, a Thoroughbred racehorse trained for polo ▶



Krazy Flyer enjoys his new career.

safe equine handling skills. Others are adopted to private owners and proceed to excel in barrel racing, jumping, three-day eventing or trail riding.

Having contributed to the advancement of equine health, Krazy Flyer is on to his next chapter, recently competing in the hunter division at the San Diego county championships.

"We lucked out with Krazy Flyer," Motyl said. "He's mellow, sweet and silly—we absolutely love him."




[www.vetmed.ucdavis.edu/ceh](http://www.vetmed.ucdavis.edu/ceh)

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## Philanthropy Makes Everything Possible

**Bella, Charismatic** and **Krazy Flyer** and their families were all helped through the power of philanthropy. The new diagnostic tools and treatments highlighted in this issue of the *Horse Report* were made possible by gifts of many sizes. The Center for Equine Health is an integral part of the School of Veterinary Medicine, but like many of its programs, the CEH relies on the generosity of animal lovers like you to build a robust research, service and outreach program. Please consider making a gift today to support the Center for Equine Health—we value your partnership in our efforts. Please call 530-752-7024 or visit <https://www.give.ucdavis.edu/Go/CEH>. Thank you!



## Safer Pain Management

Pain in horses can be difficult to manage. Current use of anti-inflammatory and opioid drugs isn't always effective and can produce undesirable side-effects.

Thanks to a pilot study funded by donors to the Center for Equine Health, researchers are one step closer to providing a new inhaled analgesic for horses that doesn't cause sedation or show evidence of toxicity.

Dr. Robert Brosnan led the study to evaluate behavioral and biochemical effects of escalating doses of this new drug discovered at UC Davis in eight horses. The equine subjects had been diagnosed with spontaneously-occurring orthopedic pain and lameness that was not fully improved by concurrent conventional therapy.

no horse exhibited evidence of ataxia or sedation. A visual analog scale assessment suggested that drug administration produced improvement of pain for up to two hours for most doses studied. A pedometer placed above the fetlock indicated that horses took significantly more steps in the four hours after drug administration than in the four hours prior.

"It is possible that the drug allowed the horses to be more active because it helped alleviate their pain," said Brosnan, a veterinary anesthesiologist. "The volatile nature of this analgesic might also allow veterinarians to measure real-time drug concentrations in the breath of horses to better direct drug therapy and dosing."

Brosnan said now that researchers have identified a dose range that may offer clinically-relevant pain relief, he hopes to conduct a larger, blinded, controlled analgesia study in horses that includes the highest no-observed-adverse-effect level dose of this new drug.

Except at the two highest drug doses administered,



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