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You Might Not Need to Taper Omeprazole

To Shoe or Not to Shoe?

Controlling the Mud

Reducing Burnout Among Interns

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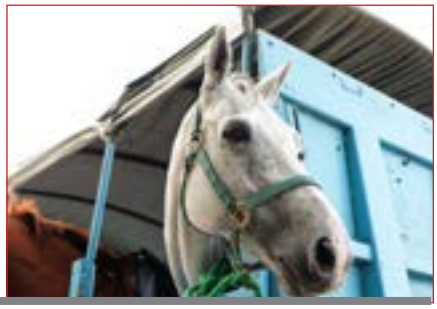

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The Modern Equine Vet

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Movement Sensors Show Promise in Identifying Racehorses at Risk for Injury

By Devin Rokyta

A small 3-ounce sensor capable of recording 2,400 movement data points in 1 second could reduce the number of injuries to racehorses, according to a recent study.

The research team, lead by **Warwick Bayly**, PhD, MS, BVSc(Hons), DACVIM, a professor in equine medicine at the College of Veterinary Medicine, Washington State University, used the biometric sensors, developed by StrideSAFE, to track Thoroughbreds as they trained and raced at some of the top racetracks in the United States. The researchers identified miniscule stride changes associated with increased risk for injury, allowing them to intervene before a catastrophic breakdown.

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"These racehorses get extensive examinations before races, but catastrophic injuries still happen, and not because they stepped in a hole or took a bad step. A large percentage have a pre-existing pathology not readily apparent on clinical examination," said **Denise Mc Sweeney**, DVM, MS, an equine surgery resident at WSU who was the first author on the study. "From our sensor data, we know most catastrophic injuries have a distinct stride pattern. Now we can see when there's something wrong with their strides and step before a major injury occurs."

The sensors measure changes in the rate and direction in which a horse moves its legs and body, and generates graphs of its stride pattern. The data are processed by an algorithm and compared against an "ideal stride" derived from high-performing, sound racehorses. Using data from more than 6,500 starts, the algorithm also identifies similarities with strides produced by horses that suffered catastrophic injuries.

Based on how far a stride deviates from ideal and how similar it is to a stride associated with an injury, the horse is assigned an injury risk factor ranging from 1 to 5. Horses with a 5 are 950 times more likely to suffer a catastrophic injury than those with a 1, which is close to the ideal stride.

Of the horses tracked, 70% have fallen into category 1, with 3.5% in category 5.

To test and refine the algorithm, a sensor was placed on horses starting at Churchill Downs and Ellis Park in Kentucky from April 29 to July 2, 2023. Dr. Mc Sweeney was responsible for collecting clinical data on the high-risk horses.

In their case study published in the *Journal of the American Veterinary Association*, the team focused on a pair of 3-year-old colts and a 4-year-old stallion flagged as category 5. The sensors alerted veterinarians and trainers to potential injury risks, prompting diagnostic imaging that confirmed an increased risk for catastrophic musculoskeletal injuries. Each horse avoided catastrophic injury after being given time to recover before returning to the track.

"These are prime examples of how this technology can prevent horses from breaking," Dr. Mc Sweeney said, adding she is hopeful the sensors will become standard for all Thoroughbred racing and training.

"I believe this is going to make a huge impact," she said. "The sensors can save the lives of horses and jockeys—they already have."

WSU has been working with StrideSAFE since 2020 when the sensors were tested at the campus' Hitchcock Research Racetrack. WSU is the only U.S. university with a dedicated research racetrack. **MeV**

For more information:

Mc Sweeny D, Holmström M, Donohue KD, et al. Using accelerometers to identify a high risk of catastrophic musculoskeletal injury in three racing Thoroughbreds. *JAVMA*. 2024 Jun 21. doi: 10.2460/javma.24.02.0114

https://avmajournals.avma.org/view/journals/javma/aop/javma.24.02.0114/javma.24.02.0114.xml

The project was supported by a grant from the Kentucky Equine Drug Research Council. Researchers included employees and shareholders of StrideSafe. The WSU researchers have no vested interest in the StrideSafe company.

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Mackay's now down to 2 quarts of Sentinel Senior twice a day and maintaining his weight. Geick said extruded feeds can have multiple benefits for senior horses, like Mackay, that don't have as robust of a gut and immune system.

"Extruded nuggets contain more fat and fiber compared to pelleted feeds, and the cooking process helps break down starches and sugars much easier," Geick said.

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Working for New England Equine Medical & Surgical Center (NEEMSC) in New Hampshire, Geick says extruded feed plays a critical role in reintroducing horses to feed after colic surgeries. Because extruded nuggets are lighter and airier than pellets, they absorb water faster to create an easily digested mash.

"That goes back to producing saliva to buffer the stomach, and it's also easier on their teeth, so it's helpful for long term dental health, as well," she said.

FINDING SOLUTIONS IN QUALITY NUTRITION

Geick says she first heard about extruded feed when she rode competitively and again during her clinical work. Looking at diet as the main cause of concern for choke or weight loss and comparing different types of feed, extruded "kept popping up" as a potential solution.

"Extruded feed helps support the hindgut for postoperative colic and colitis cases by improving nutrient absorption in the small intestine," Geick said.

EXPERT ADVICE ON EQUINE NUTRITION

Despite the awareness, Geick said the amount of information and products online makes it difficult for horse owners and veterinarians to know what feeds are backed by sound science. That's an area where Geick says the Sentinel nutrition team fills an important role, as they're able to recommend feeds, help educate owners and provide other valuable resources.

"Sometimes major management changes need to be made to prevent choke episodes, fecal water syndrome or to make sure certain horses are getting adequate nutrients as they age," she said.

ABOUT THE AUTHOR

Growing up in Connecticut, **Kristyn Sturken** and her family rode horses competitively across the United States for more than 25 years. She earned her bachelor's degree in animal science from the University of Connecticut and joined Kent Nutrition Group in 1995, where she currently serves as Equine Product Manager.

No Taper Needed

AFTER MEDIUM-TERM USE OF OMEPRAZOLE

By Marie Rosenthal, MS

There may not be a need to taper omeprazole when discontinuing the drug if used for a short or medium duration, according to **Amy Lovett**, BVSc (Hons), DACVIM, FHEA, who provided insights about a study she and her colleagues performed on 14 Thoroughbreds.

Short-term use of proton pump inhibitors (PPIs) like omeprazole are well tolerated in both humans and horses, but there is some concern about the recurrence of gastric disease when PPIs are stopped after long-term use. Some human patients have seen rebound gastric hyperacidity after stopping PPIs, and there are similar concerns in equids, particularly horses that have equine squamous gastric disease, according to Dr. Lovett, who discussed her findings at the 69th Annual AAEP Convention.

"When that PPI treatment is discontinued, rebound gastric hyperacidity has resulted in rapid recurrence of gastric acid related symptoms in 47% to 58% of [human] patients following the discontinuation of PPI treatments across various studies," she said, and a couple of equine studies suggested a similar result.

Dr. Lovett and her colleagues wanted to know the response after using omeprazole for a medium term of 57 days. They tested 14 retired racing Thoroughbreds, who were used to train jockeys. The horses received 4.4 to 5.3 mg/kg of omeprazole every 24 hours over 61 days and then stopping abruptly rather than tapering to see what it would do to serum gastrin and serum chromogranin A (CGA) in the horses. Gastrin is used by the body to control stomach acid.

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"We hypothesized that omeprazole treatment for this period and its abrupt discontinuation would result in the development of hypergastrinemia and increased ECL [enterochromaffin-like] cell density in horses," she said.

Enrolled horses received a clinical and lameness examination, and the trainer considered them to be suitable for a conditioning program over a 10-week period. Any horse that had received omeprazole or another acid suppressant within the 2 months prior to enrollment were excluded.

All the horses received a similar exercise training program under the same trainer with the same stable feeding conditions throughout the study. This program was like those used by racehorses in training.

All horses received a feeding and exercise program that was similar to the program a racehorse would receive.

From day 1 to 61 except for withholding periods, horses received 2.28 g of oral omeprazole at 4 AM each morning. The omeprazole was administered 30 minutes before morning feeding on an empty stomach.

The horses received their last dose of omeprazole on either day 59 or 61, but to simulate withholding periods that would be provided to horses that were racing, they also had 2 clear days at the end of week 4 and week 8.

They found a 2.5-fold increase in CGA within 7 days of initiating omeprazole treatment compared with the baseline measurements, and gastrin concentrations remained elevated throughout that entire treatment period until day 56 but did not continue to increase, according to Dr. Lovett, from the Massey University School of Veterinary Medicine, in Manawatu, New Zealand.

"Once elevated serum gastrin concentrations did not change during the omeprazole treatment," she said.

Following the last dose of omeprazole the SGAs returned to baseline by day 63, she said. "So that's a return to baseline concentration being observed within 2 to 4 days of administration of the last dose of omeprazole—median serum gastrin concentrations more than halved from days 7 and 56."

The chance of equine squamous gastric disease (ESGD) recurrence was limited to within just several days of that last dose.

When compared with days 63 to 91 after the discontinuation of omeprazole, the median serum gastrin returned to below baseline from days 70 to 84, she explained.

"And serum gastrin concentrations during the period of omeprazole treatment in the present study did not continue to increase beyond that initial rise seen by day 7," she said.

"Our CGA results did not demonstrate a significant change in serum CGA concentrations in response to omeprazole treatment, nor any significant change with omeprazole discontinuation," Dr. Lovett explained.

"The findings do not support the use of tapering protocols, at least after medium-duration omeprazole treatment in the horse," she said.

Since there might be rebound after using for more than 8 weeks, a veterinarian might choose to taper in that case. However, she said, a short taper of several days would probably be enough.

"From our study, serum gastrin concentrations increased in response to omeprazole treatment within 7 days, but was not progressive, and hypergastrinemia was very short-lived once omeprazole was discontinued, rapidly returning to baseline within several days after that last dose of omeprazole," Dr. Lovett said.

"We propose that the findings of the current study don't support the use of tapering periods following medium-duration omeprazole therapy in the horse, which is any treatment course less than or equal to 8 weeks."

Because there is a slight risk for ESGD, she said horses should be managed right after the last dose of omeprazole by providing strict rest. Horses should not be exercised or transported and roughage should be maintained by allowing the horse free choice hay.

"And once this immediate period lapses following the last omeprazole dose, normal gastrin protective mechanisms will be restored, and therefore, normal management and workload can be resumed," she explained. **MeV**

For more information:

Clark B, Steel C, Vokes J, et al. Evaluation of the effects of medium-term (57 day) omeprazole administration and omeprazole discontinuation on serum gastrin and serum chromogranin A concentrations in the horse. *J Vet Intern Med.* 2023;37:(94):1537-1543.

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Thermal imaging also demonstrated a significant impact on temperature readings both at the time of the trial as well as after exercise and application of Performance Ultra. Near the end of 30 days, horses in the treatment group had a lower average back temperature.

**Reference:

Walter, K.W., Altman, J. & Haussler, K. (2023) Reducing chronic back pain and inflammation in horses using a commercial herbal liniment. Equine Veterinary Education, 35, e499-e506.

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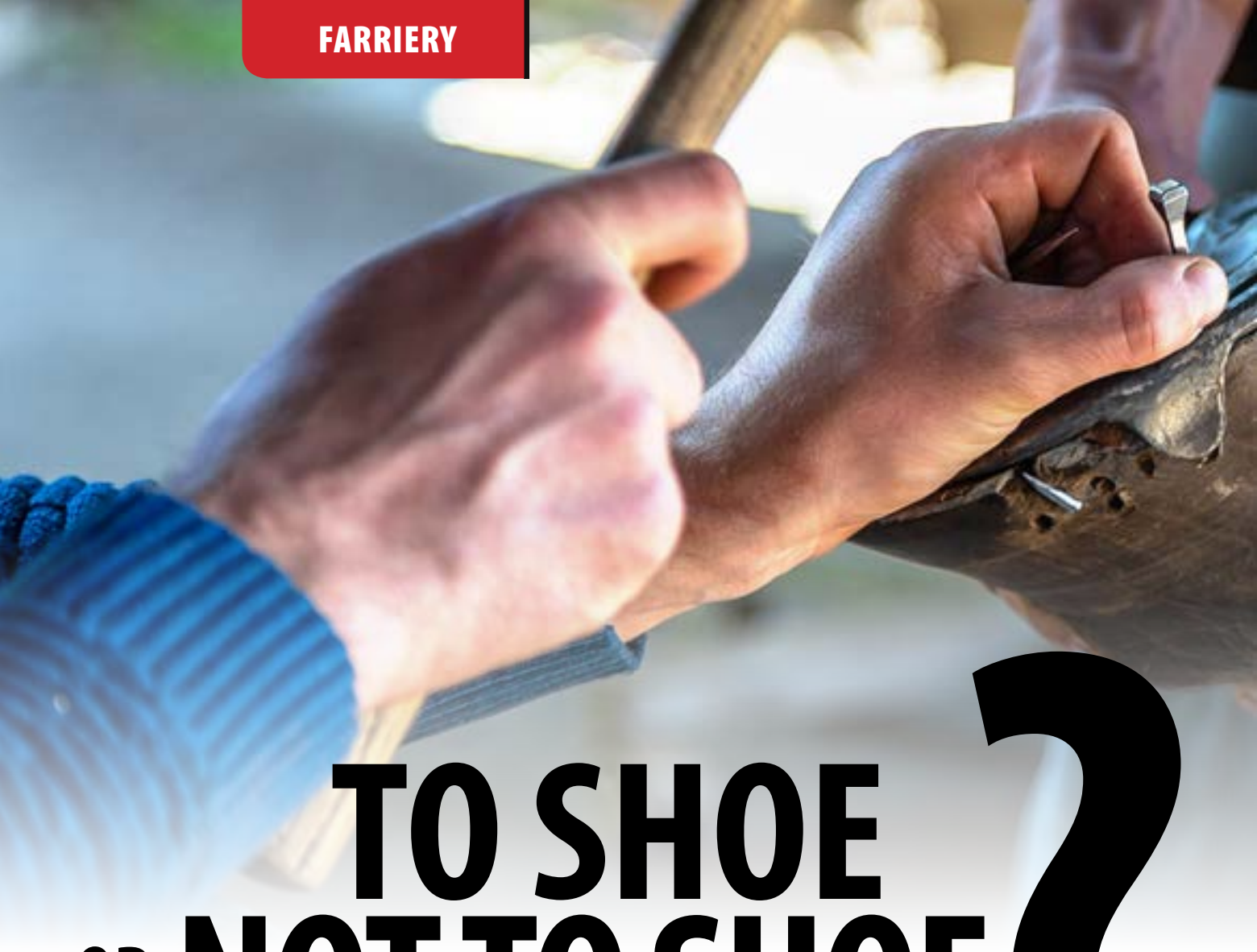

TO SHOE OR NOT TO SHOE?

Transitioning to Barefoot

By Joy Curzio

Although there is debate regarding the necessity of shoes for working horses, it is more universally accepted that there are circumstances when it is necessary for a horse to be barefoot, such as during rehabilitation for hoof capsule distortions. Whether there are special considerations or just hesitation over the benefit of repeated shoeing cycles, the transition from shod to barefoot takes time and attention to technique.

"Let me be very clear, this is a farriery option," said **Stephen E. O'Grady**, DVM, during his presentation at the 69th AAEP Annual Convention. "As I certainly believe, having been a farrier for 50 years, horses can be trimmed and shod in a proper physiological manner with minimal damage to the hoof capsule."

An inductee of the International Equine Veterinarians Hall of Fame and a recipient of the AAEP President's Award for his work in farrier education, Dr. O'Grady said that there are several situations in which it is beneficial or even necessary for a horse to transition to barefoot temporarily, including:

- during injury rehabilitation for out-of-work horses; and
- during rehabilitation for hoof capsule distortions, such as soft tissue structures in the palmar foot, sheared heels, and prolapsed or recessed frogs.

Horses with an abnormal gait that can be associated with interfering or forging and those with chronic foot lameness associated with farriery or unexplained

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foot lameness are excellent barefoot candidates. In addition, poor hind foot conformation is a problem in farriery today, according to Dr. O'Grady, and removing the hind shoes improves foot conformation and appears to alleviate back pain almost immediately.

"The bullnose low-heeled foot in the hind limb has almost become an epidemic in farriery," Dr. O'Grady said, referencing recent literature showing a clear-cut correlation to this low-heeled bullnosed appearance and problems in the musculoskeletal system further up the hindlimb.

Benefits of Barefoot

Shoes provide traction when working or performing, and they provide protection when there is wear on the solar surface of the foot that exceeds growth at the coronet. Shoes also are used in therapeutic farriery for injuries such as foot lameness, laminitis, white line disease and quarter cracks. Although shoes have demonstrated benefits, they also invariably have consequences on foot function.

"The horseshoe, as we often hear, is not an extension of the horse's foot," Dr. O'Grady explained during his presentation. "Placing a horseshoe with different properties other than the hoof capsule between the hoof and the ground creates 2 interfaces, which obviously changes how the structures of the horse's foot interact with the ground" (Figure 1). According to Dr. O'Grady, when the shoes are removed, these structures have the inherent ability to strengthen, improve and change shape through the process of adaptation, which is very important to the overall health and well-being of the horse.

FIG. 1

Left: Barefoot 1 interface. Right: Shod 2 interfaces

Images courtesy of Dr. Stephen O'Grady

Horseshoes promote peripheral loading, which transfers all the horse's weight to the hoof wall, and this changes the physiological function of the foot. Horseshoes may decrease energy absorption and influence movement. In 1999, Willemen et al. showed that applying a standard horseshoe increases the stress on the navicular bone by the deep flexor tendon by as much as 14%.

"In my opinion, that's huge. The higher the frog is off

A transitioning period of 30 to 60 days allows the hoof and limb structures to adjust to load bearing. This includes 2 to 3 weeks of walking under saddle and turnout in a small area.

the ground, when you put the horse's weight on top of it, that frog is going to descend and start looking for the ground and wherever it does that [increased load/stress is applied to the] deep flexor tendon," Dr. O'Grady noted.

Shaping vs. Trimming

Dr. O'Grady said that he uses a transitioning period of 30 to 60 days, which allows the hoof and limb structures to adjust to load bearing. This period includes 2 to 3 weeks of walking the horse on firm footing under saddle and allowing turnout in a small area. During this time, the feet are shaped at 2- to 4-week intervals.

FIG. 2

Left: Shape angle/bevel. Right: Trim horizontal/flat

FIG. 3

3 months post transitioning to barefoot

Shaping the feet may be a tough adjustment for some farriers, as it requires a different technique than trimming. Farriers are used to using there rasp in a horizontal plane rather than a vertical plane (Figure 2).

"[Shaping] is a tough thing for farriers to get used to because they are used to doing things horizontally. When we shape the foot, [however,] we keep the same rules used for trimming the foot for shoes," Dr. O'Grady said.

After removing the shoes at the end of the shoeing cycle, the hoof should be cleaned with a wire brush. Dr. O'Grady counseled the audience to replace the hoof knife with a wire brush.

"Put your hoof knife in your pocket, and leave it there. If it doesn't come out with a wire brush, leave it there. It doesn't need to come out," he said.

When shaping the foot, the heels should be trimmed to the same plane as the frog, and the border of the hoof wall should be trimmed with nippers (if necessary) or a rasp used on an 45° angle, this will maintain bulk and depth. The rasp is then used in a rounding motion to remove the sharp edge and create a thick bevel.

"A cup will form in the sole when the horse is barefoot, which promotes a nice border around the perimeter of the horse's foot wall. This is what you want to preserve. Think about if you trim this horizontally, you're going to remove that bevel," Dr. O'Grady explained.

Observations based on approximately 60 upper-level horses competing barefoot, Dr. O'Grady has seen minimal lameness issues on horses that were transitioned to barefoot using this time frame and technique. Hoof walls became harder/thicker, natural sole calluses formed at the toes of the horses transitioned, and all horses displayed stronger hoof wall-bar junctions, good cup to the sole, broader frogs, and more depth to the foot (Figure 3). **MeV**

For more information:

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Pezzanite L, Bass L, Kawcak C, et al. The relationship between sagittal hoof conformation and hindlimb lameness in the horse. *Equine Vet J*. 2019;51(4):464-469.

Willemen MA, Jacobs MW, Schamhardt HC. In virtro transmission and attenuation of impact vibrations in the distal forelimb. *Equine Vet J Suppl*.1999;(30):245-248.

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Should Muddy Paddocks Concern Horse Owners?

By Landon Gray

Veterinarians should inform horse owners of the serious health problems associated with muddy footing as well as provide measures for the prevention of mud and to keep owners' equine facilities clean and safe, according to a presentation given as part of the Cornell Equine Seminar Series.

"Studies have shown horses housed in muddy environments are at a significantly higher risk for developing problems [such as thrush, dermatitis and cellulitis]," said presenter **Ken Estes Jr.**, an agriculture program leader for Cornell Cooperative Extension in Livingston County, New York. "These health issues can cause pain discomfort in horses and none of us want that. Moreover, muddy conditions can lead to pollution and increase insect populations, further endangering the well-being of horses and their caretakers."

These issues are of particular concern if horses are constantly in mud that covers their coronary bands. In addition to the issues listed above, they are at risk for penetration injuries and coronary band dysplasia, presenter **Steve Kraus,** BS, CJF, told *Modern Equine Vet*.

Especially in regions and areas with usual heavy rainfalls and mild winters, like New York, mud is an annual issue for all livestock producers. Mud can be dangerous to move equipment in through the winter; hay feeding and lack of maintenance can negatively affect horses. According to Mr. Estes, mud will deplete food storage in horses and livestock, making it harder for horses to maintain weight. High traffic areas where animals congregate, such as feed and water locations, tend to be the worst. These are the areas that most commonly cause issues related to mud.

"We have poor draining soil and horses pretty much wreck the environments that they're in, unless you do things to prevent that," said Mr. Kraus, who is the head of Farrier Services at the Cornell University Hospital for Animals, in New York. "Constant moisture just degrades the hoof itself so that even if you could nail the shoe on, the nails won't hold, making it more likely to have hoof infections. And the proof of that is in this mild winter that we've had where we've had more mud than usual, and I have

Images courtesy of Steven E. Kraus

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had to work on more horses with coffin bone infections than usual."

The only way to prevent muddy paddocks is to install gutters and leaders to move the roof rainwater outside the paddock. Plus removing the native soil and replace that with crusher run fill, topped off with stone dust.

Mr. Estes said owners can test their soil to see how prone it is to become muddy by using the mason jar test. Fill a mason or other glass jar with a cover, halfway with soil, and the other half with water, leaving about a one inch air gap at the surface. The jar then needs to be vigorously shaken, creating a muddy mixture.

Once shaken for approximately 3 minutes, ensure everything is broken down and there's no visible clumping in the soil. Set the jar aside for 24 hours, during which the fine particles will float to the top, the heavier particles like the sands will float to the bottom. At the end of the 24 hours, owners should be left with a breakdown of how much sand, silt and clay make up their soil. Higher percentages of clays in soil lead to more muddy areas, whereas more sandy areas can filter out water and moisture.

"Mud management is a critical aspect of our equine facility disease. Prevention is key, and a primary prevention is worth its weight in gold."

—Mr. Ken Estes Jr.

"Mud management is a critical aspect of our equine facility design," Mr. Estes said. "Prevention is key, and a primary prevention is worth its weight in gold."

Both presenters recommended regular maintenance and adequate drainage systems to prevent and alleviate muddy paddock conditions.

According to Mr. Kraus, it's always better to minimize the amount of manure in pastures. For example, compost and organic matter are used in a garden to increase the water holding capacity. In this scenario, owners need to minimize the soil's water holding capacity to a point where it's balanced.

"Regular maintenance is key to managing our paddocks and in soil areas to prevent the mud from getting worse," Mr. Estes said. "Drainage is something that we're going to have to do. If we can minimize the amount of water that's entering our paddock areas and our pastures, we're going to have less of a concern for mud." **MeV**

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The Use of Systemic Doxorubicin in the Treatment of Epithelioid Hemangiosarcoma

By Lisa Jolley, LVT

Improved imaging and diagnostic capabilities have increased our ability to locate and diagnose neoplasms in horses. As a result, treating cancers will be of increasing interest to the veterinary profession and to horse owners looking to improve the outcomes for their patients with malignant tumors. Although the use of intralesional and intertumoral chemotherapy with antineoplastic drugs such as 5-fluorouracil and cisplatin have become more common, the use of these treatments is limited by whether they can reach the tumor with limited effect on the surrounding healthy tissues and organs.

Images courtesy of Lisa Jolley

CT of Scout's head

Radiation therapy has also been used to treat neoplasms in horses, but their use is limited by the size of the horse and the need for more frequent anesthetic episodes. The use of systemic chemotherapy in horses is rare, but with more commonly used therapies could offer a promise of remission for horses with more widespread malignancies or in areas of the body that cannot be safely or easily treated externally.

Doxorubicin, an anthracycline antitumor medication, is considered a hazardous drug and must be handled appropriately for the safety of the animal, veterinary staff and owners. This chemotherapeutic is used frequently in small animal medicine, and its use and complications in canine and feline patients have been studied more extensively than in equids. However, the choice to use this hazardous medication with more common antineoplastic therapies can produce successful outcomes.

A 15-year-old Percheron and Quarter horse cross gelding, used for mounted police patrol, presented to Texas A&M University Large Animal Teaching Hospital in November 2021 for ocular discharge and a suspected ocular mass on the medial canthus of the left eye. This was confirmed by computed tomography (CT) imaging during an appointment, on which the mass displayed mild contrast enhancement, and the adjacent bone was smoothly marginated. An incisional biopsy of the mass was performed while the patient was anesthetized for the CT scan, and histopathology of the excised mass, while originally inconclusive, was consistent with a carcinoma.

Later immunohistochemistry identified the mass as an epithelioid hemangiosarcoma.

In January 2022, the medial canthus mass was removed after which abnormal tissue deep to the mass was also palpated and then removed. Photodynamic therapy (PDT) was applied in 3 sites, with each site receiving 5 cycles of 550mW for 30 seconds for a total of 8,936 J for all 3 sites. The patient returned in March 2022 for a follow-up appointment with the ophthalmology service at Texas A&M University Large Animal Teaching Hospital, at which time it was noted that there was increased irritation and dis-

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Above, Scout's eye, Right and below, getting ready to give Scout his chemotherapy.

charge from the left eye.

A flush of the nasolacrimal ducts raised a suspicion that the left nasolacrimal duct was connected to the sinus rather than the eye itself. This led to the recommendation that the patient return for a repeat CT. In August of the same year, the mass was noted to have increased and a second mass on the temporomandibular joint (TMJ) was palpated. The CT showed the periorbital component of the mass had indeed increased since the imaging performed in November 2021 and the increased size of the periocular component was now causing a mild left exophthalmos.

Punch biopsies of both the mass on the medial canthus and the TMJ were consistent with epithelioid hemangiosarcoma.

The recommendation to pursue radiotherapy followed by enucleation and finally chemotherapy with doxorubicin was agreed to by the owner. Unfortunately, due to equipment failure, TomoTherapy was not available at Texas A&M University Large Animal Veterinary Teaching Hospital, and the owners elected to take the patient to another referral hospital for a planned 5 fractions of TomoTherapy.

Scout returned to Texas A&M University in October 2022, 2 weeks after the completion of radiation therapy, and a repeat CT showed the mass size had reduced and the left-sided exophthalmos had resolved. No bone lysis nor proliferation was seen. A CBC revealed a mildly elevated fibrinogen and a red blood cell count slightly below the reference interval, but otherwise was unremarkable.

Scout was placed under general anesthesia for the enucleation of the globe and periocular tissues of the left eye. The procedure and recovery were uneventful. Pathology reported that the samples submitted from the enucleation were consistent with an incompletely excised hemangiosarcoma and the samples taken from the periocular tissues demonstrated mild inflammation, possibly from previous biopsies or radiation. The patient was discharged with the plan to return for the first doxorubicin injection in 3 weeks.

A protocol for systemic chemotherapy using doxorubicin was implemented, with the first dose given on Nov. 17, 2022, with 4 subsequent doses to be given 3 weeks apart. For each treatment, the patient was brought to Texas A&M University Large

Animal Teaching Hospital 1 to 2 nights before the scheduled chemotherapy date. His weight was noted, and a CBC was sent to the clinical pathology laboratory. The venous samples were obtained for a CBC via either the saphenous vein or the transverse facial sinus to avoid damage to either jugular vein.

He was housed in an isolation stall to reduce the biohazard risk posed by urine and feces contaminated with doxorubicin post-treatment. Thirty minutes before chemotherapy started, the patient was given diphenhydramine, and topical lidocaine was placed on the future catheter sites. Immediately prior to administration of the chemotherapeutic, a 14 ga Mila long-term catheter was placed with great care shown to ensure a clean venipuncture to reduce the risk for necrosis of the tissues surrounding the jugular vein due to extravasation of doxorubicin. The catheter and its extension set were secured with tissue glue.

After chemotherapy, the horse was housed in an isolation stall to reduce the biohazard risk.

A second catheter was placed in the opposite jugular vein to administer emergency drugs during the treatment and for medicating post-treatment. Flunixin meglumine was given before treatment began via the emergency catheter on the non-chemotherapy side, and xylazine was given for sedation as needed. A 3-L bag of NaCl 0.9% was connected to the chemotherapy catheter and run at a rate of approximately 2 L over 1 hour. The first dose of doxorubicin was given over the course of 45 minutes via an Equashield closed chemotherapy system attached to the saline IV line. The patient was given a second dose of diphenhydramine 6 hours post procedure and a second dose of flunixin meglumine 12 hours after the initial dose. The patient remained in isolation for 48 hours post-chemotherapy administration to minimize caretaker contact with chemotherapy contaminated feces or urine. He was then discharged to his normal home stabling with instructions to monitor the patient for diarrhea or colic symptoms and to receive a follow-up CBC 1 week post-chemotherapy.

The first post chemotherapy CBC revealed a mild leukopenia with a white blood cell count only slightly lower than the reference intervals and was otherwise unremarkable. The next pre-chemotherapy CBC on Dec. 12, 2023 showed that the leukopenia had been rectified, but mild anemia and thrombocytopenia had developed. The decision was made to recheck the CBC and delay the scheduled chemotherapy for 24 hours. The CBC on Dec. 13, was within normal range, and the patient received doxorubicin in the left jugular using the same protocol as the chemotherapy treatment on Nov. 17. Scout's vitals remained stable throughout the procedure; however, he exhibited tachycardia (heart rate of 92) at his 4:00 PM vitals check. A dose of diphenhydramine and flunixin meglumine was due at this time and his vital signs (heart rate was 40) were normal at 12:00 AM There were no more incidents of tachycardia, and the patient returned to his normal housing after he stopped excreting doxorubicin in his urine 48 hours post chemotherapy.

The patient returned to Texas A&M University Large Animal Teaching Hospital on Jan. 5, 2023 for another dose of chemotherapy. On arrival it was noted that his coat condition had deteriorated, and he had lost a considerable amount of mane and tail, presumably due to the side effects of doxorubicin. His handlers had also noted that he was more subdued in his interactions at home. His pre-chemotherapy CBC showed moderate leukopenia. Most notably, he exhibited moderate non regenerative anemia and thrombocytopenia, most probably due to bone marrow suppression caused by doxorubicin.

The decision was made to postpone treatment for a week with the hope that the anemia and thrombocytopenia would resolve, and the patient was discharged.

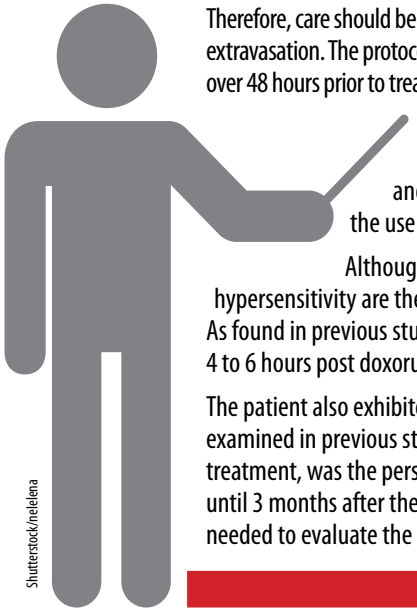
On Jan. 11, 2023, the referring veterinarian submitted a CBC to ensure that the anemia had improved before returning to the hospital. While there was still moderate leukopenia and anemia, his platelet count had returned to a normal level and the decision was made to proceed with the scheduled chemotherapy.

The patient was admitted on Jan. 12, 2023, and his platelet count, while still mildly depressed, was deemed to be at an appropriate level to continue with treatment. His third course of doxorubicin was administered in the right jugular vein over the course of 45 minutes on Jan. 13, 2023 using the same pre- and post-medication protocol as the previous 2 treatments. Scout received a lower dose to reduce the non-regenerative anemia caused by doxorubicin. The

Teaching Points

Due to the dangers posed by doxorubicin, as well as the size and nature of equine patients, special precautions were taken to ensure the patient's safety. Extravasation of doxorubicin during IV administration can have extreme consequences, with sloughing and necrosis of the injection site leading to amputation reported in canine and feline patients. As jugular venous access is the most common site of administration for IV medications in equids, extravasation of doxorubicin has the potential to be catastrophic.

Therefore, care should be taken in the preparation of and the placement of the jugular catheter to minimize the risk for extravasation. The protocol developed for this patient included ensuring that neither jugular vein was used for venous access for over 48 hours prior to treatment, use of lidocaine cream instead of a subcutaneous infiltrative nerve block with mepivacaine to block the catheter site, as well as insisting on a clean "single stick" for the IV catheter placement.



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The common side effects of doxorubicin reported in canine and feline patients include vomiting and diarrhea, neutropenia and anemia, and, occasionally, alopecia, while the major complication in the use of doxorubicin in humans is cardiotoxicity.

Although there are few comprehensive studies on the use of doxorubicin in equids, myelosuppression and hypersensitivity are the 2 commonly reported dose-limiting factors. Both contraindications were seen with this patient. As found in previous studies, hypersensitivity (symptoms to include increased heart rate and respiratory rate) was seen 4 to 6 hours post doxorubicin administration during the second treatment.

The patient also exhibited the mild reversible neutropenia discussed in previous studies, however, what was not examined in previous studies, and proved to be both dose limiting, and ultimately the deciding factor to discontinue treatment, was the persistent thrombocytopenia that began after the second dose of doxorubicin and did not resolve until 3 months after the final dose. This is a reported but rare side effect of doxorubicin in canine patients; further study is needed to evaluate the prevalence of this adverse effect of doxorubicin in equids.

patient was discharged on Jan. 16, 2023 after his urine no longer contained elevated levels of doxorubicin contamination.

In preparation for his fourth doxorubicin administration, the referring veterinarian submitted a CBC on Jan. 28, 2023. Once again, a mild leukopenia and thrombocytopenia were found as well as anemia. However, the platelet count was found to be acceptable to continue treatment, and the patient was admitted to Texas A&M University Large Animal Teaching Hospital on Jan. 30, 2023 for chest radiographs, a recheck CT scan of the head and the fourth doxorubicin administration. The CBC on admission revealed a more severe anemia than found on the CBC submitted by the referring veterinarian and a severely depressed platelet count. Radiographs of the thorax found only evidence of chronic lower airway disease but no evidence of metastatic pulmonary neoplasia.

The recommendation was to pursue radiotherapy followed by enucleation and chemotherapy.

A CT of the head with contrast was performed on Jan. 31, 2023. There was no evidence of gross neoplastic reoccurrence, although mild periosteal proliferation on the wall of the left orbit, as well as new discontinuities of its osseous components, could have indicated infiltrative neoplastic disease. However, it was more likely to be due to periostitis resulting from surgical insults from the enucleation and biopsies performed in January and November 2022. Another platelet count was performed on Jan. 31 and again on Feb. 2, still showing a thrombocytopenia too severe to continue with the administration of chemotherapeutics at that time.

The patient was discharged with instructions for

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the referring veterinarian to submit and repeat the CBC in 1 week with the hope that the platelet counts would return to a normal level. The patient was found to have an inadequate platelet count on the subsequent 2 CBCs performed on Feb. 7 and Feb. 14, 2023, and the decision was made to discontinue chemotherapy indefinitely. With the results of the CT scan showing evidence of the neoplasm in remission, the concern for the patient's overall health outweighed the possible benefits to continuing with the last scheduled rounds of doxorubicin administration.

Doxorubicin offers a promising option for the veterinary community in the treatment of equid neoplasia.

The patient's CBC and condition continues to be monitored for signs of metastasis or reoccurrence of the neoplasm at the original site. On March 4, 2023, the CBC sent by the referring veterinarian showed a low-normal platelet count and very mild anemia, but the prior leukopenia had resolved. The patient returned to normal work, being cleared for his first patrol on March 13, 2023. His physical exams have been unremarkable as of Oct. 1, 2023.

While more research is needed on the long-term effects and efficacy of this treatment, doxorubicin offers a promising option for the veterinary community in the treatment of equid neoplasia. With careful management of the patient immediately pre- and post- doxorubicin injection, as well as monitoring for persistent myelosuppression, the obstacles that equine patients present due to their size, temperament, and physiology can be overcome to successfully return the equine patient to full work. **MeV**

For more information:

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ABOUT THE AUTHOR

Lisa has worked in various roles in equine veterinary medicine for more than 20 years, from aesthesia at a busy multisurgeon sports medicine practice in Weatherford, Texas, to her current role as the lead Theriogenology technician at Texas A&M University's Large Animal Teaching Hospital.

Lisa grew up competing in Dressage but transitioned to showing in reining and reined cow horses while she was attending Texas A&M University. When not working with horses, Lisa is found playing with her son and their dogs on their small farm.

VET Stats

Pets and COVID-19

Americans acquired quite a few pets during COVID-19. Here is a rundown of dog and cat ownership during COVID-19 from the American Veterinary Medical Association.

CHAIN OR INDEPENDENT STORES ACCOUNTED FOR MOST OF THE ADOPTIONS.

% of Pet Owners using stores, shelters or rescues

Chain or independent store:	41%
Shelter or rescue:	35%
Both:	24%

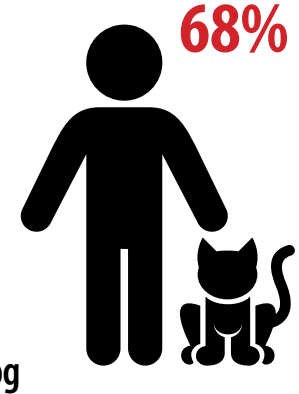
Did you adopt a new pet during COVID-19?

YES! **22%**

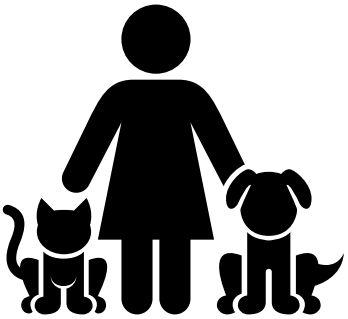
NO! **78%**

DOGS VS. CATS

Households acquired a dog **82%**



Acquired a cat **68%**



Acquired both dogs and cats **47%**

Do you own or have you considered owning a pet?

62% have pets

26% considered owning

12% have not considered owning

Based on a survey of 2,011 respondents conducted online in early 2021, reflecting 2020 data. From 2022 AVMA Pet Ownership and Demographic Sourcebook. **https://ebusiness.avma.org/ProductCatalog/product.aspx?ID=2050**

Reducing Burnout Might Increase Retention Among Equine Veterinary Interns

By Landon Gray

Images courtesy of Dr. Jonathan A. Yardley

Equine medicine is tough, but if the profession wants to attract new talent, it needs to address burnout among veterinarian interns.

Equine medicine is tough, and to attract new talent, it is important to address burnout among equine veterinary interns. **Jonathan A. Yardley**, DVM, NBC-HWC, an associate clinical professor at The Ohio State University College of Veterinary Medicine, said workplace burnout is affecting equine care, because it can increase the risk for medical errors and staff shortages.

"We know young veterinarians overall have more serious psychological distress," said Dr. Yardley, who is also a health and wellness coach, citing a 2022 wellbeing study by Merck Animal Health. "And the more burnout we have, the more medical errors."

He cited another study of nurses who care for human patients that were burned out. Patients receiving urinary catheters were more likely to get a urinary tract infection from a nurse experiencing burnout than one who was not. "This is very translatable to what we do every day," he explained.

He alluded to the elephant in the room—only 5.8% of all graduating veterinary students go into equine practices. Twenty-two percent of fourth year veterinary students go directly into private practice; 78% pursue an equine internship. However, 50% of these recent graduates will leave equine practice.

"We have 70% of [new graduates] going into an internship. How can we keep them in equine practice and really stimulate their wanting to be here with us?" Dr. Yardley asked rhetorically. "Burnout is huge. [Occupational Safety and Health Administration] is now studying burnout like a workplace issue, and burnout is defined by having a workplace issue—so it's not the individual."

The Ohio State University, the College of Veterinary Medicine, which has had a rotating internship program since the 1970s, includes areas such as equine field service, equine surgery, equine medicine, equine overnight emergency and critical care, according to Dr. Yardley. Each intern serves for 2 weeks on each service and are responsible for patient care, on-call duties and client communication.

"The interns seek an internship after graduation from vet school to gain more experience and confidence," he told *Modern Equine Vet.*

The goal of any veterinary internship program is to transition recent graduates into competent clinical veterinarians—and to not burn them out, Dr. Yardley emphasized.

To assure that does not happen, they have placed an emphasis on wellness, he explained. Yardley explained that by incorporating the 9 dimensions of wellness, as defined by the university, burnout can be addressed and mitigated.

After completing the program, interns were given exit interviews to help improve the process. Based on these interviews, Dr. Yardley reported that 100% of the interns continued in veterinary medicine, with 82% continuing in equine practice. Twelve percent of interns took a position with small animal general practice, and 6% took a mixed animal medicine general practice job.

Dr. Yardley noted that the cohort was too small to do an in-depth burnout analysis.

"We just must change the culture. We think that by focusing on the most vulnerable population, our trainees, we're optimistic that we can change the culture overall," Dr. Yardley concluded. "If the culture does not change, [a] strategic plan will be eaten for lunch—you must change the culture. So therefore, we must lead by example." **MeV**

CHECK OUT

The 2022 wellbeing study by Merck Animal Health

Mare and Foal Survive Rare Uterine Torsion

By Aimee Levitt

As Lynnette, a 7-year-old Percheron mare weighing approximately 2,000 lbs, moved into the final weeks of her second pregnancy in March 2023, her owner, **Bonnie Marr**, MD, noticed that she seemed unusually uncomfortable.

"She didn't look distressed," Dr. Marr said. "It was more of a subtle thing. I thought she might be having a bit of colic."

But when the symptoms went on for close to a week, Marr, a physician, began to worry that it might be early labor, and she took Lynnette to her equine veterinarian at the Leatherstocking Equine Center in New Berlin, N.Y., where they also suspected colic and did an examination. This revealed that the colic wasn't related to Lynnette's intestines or colon, but rather involved her uterus.

The uterus was twisted. Called a uterine torsion, the condition is rare in horses. No one knows for sure what causes them, but they can be fatal. The most obvious problem is that the foal can't be delivered from the uterus when the time comes because of the blockage, and the twisted blood vessels also become engorged and can rupture, killing both the mare and the foal.

At Cornell College of Veterinary Medicine Dr. Marr turned Lynnette over to the care of a team of veterinarians: from the surgery service, then-resident **Brenna Pugliese** and veterinary surgeon **Erica Secor**, DVM, and from the reproductive medicine service, resident **Bradley Back**, DVM, and associate professor **Soon Hon Cheong**, DVM. The team stabilized Lynnette as they evaluated her condition and decided on a treatment plan. The foal, they determined, was alive, but surgery would be necessary as soon as possible.

Initially, they considered doing an emergency c-section, but the reproductive medicine team decided that Lynnette was still too far from her due date and the foal wasn't ready. Surgery was considered the best option, and since Lynette is so big—Percherons average 16 to 17 hands high—the safest way to do surgery was a standing approach. Improved standing surgical procedures, along with advances in anesthesia and pain management, avoid laying the big draft horses like Lynette down with general anesthesia, which is important for preventing complications. The anesthesiologists perform a local nerve and/or tissue block at the site of the incision, monitor the intravenous constant drip of anesthetic medications and the vital parameters of the horse, while the surgeon focuses on flipping the uterus back to the correct position.

"We made an incision on either side of the abdomen in the flank region," Dr. Secor said, "and then we tried to rotate the baby and the uterus into the correct position."

All easier said than done. The foal alone weighed approximately 120 lbs, not counting the placenta, and, as surgery got underway, the veterinarians discovered the foal was very active. "She was kicking like nobody's business," she added. "She seemed very upset that we woke her."

It took several hours of lifting and the deployment of every strategy the team members could think of, plus emergency calls to colleagues. In the end, they filled Lynnette's abdomen with 25 L of sterile fluid, which made the uterus float. That, and an extra set of arms, finally did the trick. "There were cries of joy when we finally got it back around," Dr. Secor said.

Images courtesy of Bonnie Marr and Cornell University

Lynnette with her filly, Lili Marlene.

Lynnette, meanwhile, remained calm. "I don't think she ever moved a foot," Dr. Secor said. "Not many horses would have tolerated that. She's worth her weight in gold."

Dr. Marr and the surgical team agreed it would be best for Lynnette to remain at Cornell until she foaled. A filly, Lili Marlene, was born 2½ weeks later. It was fortunate Lynnette stayed at Cornell, as Lili had a complicated delivery. She was not in the correct orientation and needed veterinary assistance. Both mare and foal were healthy and able to go home within a couple days.

Now, over a year later, Lynnette is ready to return to the show circuit. Lili Marlene suffered from an issue in her airway and unfortunately passed away in May 2024 due to a colonic torsion. Neither condition was related to the uterine torsion.

Dr. Marr is debating whether to breed Lynnette again. It's unlikely Lynnette will have to suffer through another uterine torsion, but Dr. Secor recommends that owners keep a close eye on their pregnant mares for anything out of the ordinary and to reach out to their veterinarian with any questions or concerns. **MeV**

This story was originally published on the Cornell Univeresity website. It has been edited for length and style. ***https://www.vet.cornell.edu/about-us/news/mare-survives-dire-upside-down-pregnancy***

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