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ASK
THE

Infectious Disease Expert

This column, brought to you by Merck Animal Health, features insightful answers from leading minds.

What are a few easy-to-implement steps clients can take to prevent and manage disease spread?

As the equine industry continues to experience outbreaks of highly infectious diseases, such as equine herpesvirus (EHV) and equine influenza virus (EIV), biosecurity has become one of the most important topics in equine health management. And it is one of the most important discussions to have with clients. As riders prepare to attend season-culminating events, many of which will be indoors, now is an ideal time to ensure horses' boosters are up to date and disease-mitigation measures are top of mind.

The topic of biosecurity can be overwhelming for clients, so communicating in an easy-to-understand manner will improve compliance. Start by sharing these key points:

- **Don't wait.** The best offense is a good defense. Establishing a biosecurity plan before an outbreak develops is critical.
- **Vaccinate.** Reinforce that vaccination remains the most practical and economical means of disease prevention.
- **Check for fever.** This is critical at home or on the road. If a horse has a fever, it should not be transported and should be isolated from other horses. Tell clients that animals, unlike people, often do not show definite clinical signs of infectious disease, so body temperature is often the only initial indicator.

With these basics in mind, you can guide clients in creating a simple and effective biosecurity plan. In general, such a plan includes the following steps.

TEMPERATURE CHECKS MADE EASY

Monitoring temperature to identify infectious disease early helps prevent spread, but clients may find that regularly checking horses' temperatures is impractical. Enter a powerful new combo: the EquiTrace® health management app (available via the App Store and Google Play) and Merck Animal Health Bio-Thermo® microchips. Together they provide a secure platform for recording temperature, identity, GPS location and health notes with a quick scan from a standard microchip reader. Digital temperature checks are a low-stress, time-saving way for clients to monitor their horses' temperatures, and EquiTrace charts temperature fluctuations in easy-to-read graphs.

1. IDENTIFY AN ISOLATION AREA

All people and animals have the potential to carry an infectious pathogen, so unrestricted movement can increase the risk of a disease outbreak. No matter the type of facility—barn, event venue or training/boarding facility—establishing an area of isolation allows sick animals to be appropriately separated from healthy animals.

2. CONTROL THE ENVIRONMENT

Counsel clients on the basic steps they can take to help prevent the spread of disease at home and away:

- Prevent close contact with unfamiliar horses.
- Do not use shared water sources.

- Properly dispose of manure and soiled bedding.
- Wash hands before and after working with a horse. (Hand sanitizers work well in the absence of soap and water.)
- Regularly clean and disinfect equipment and tack.
- Consider allocating horse-specific equipment and avoid sharing equipment.
- After travel and upon arrival at the stable/farm/ranch, isolate and monitor horses for fever and other signs of infectious disease.
- Keep horse health records on hand at all times. (Health certificates are required for entry at most events and shows.)

3. AGREE TO SEEK DIAGNOSIS

Encourage clients to contact you at the first sign of an infectious disease so you can work together to prevent or slow the spread, which includes diagnosing the disease. Determining the identity of the infectious pathogen is critical in making timely quarantine and management decisions to help protect other horses and contain an outbreak.

All these elements of biosecurity will help clients manage disease in their horses. While vaccination is highly effective in preventing infectious disease, it is not the only measure to be taken, especially with highly contagious infectious diseases such as EHV, EIV and strangles. Helping clients understand the basic principles of biosecurity and establishing a simple proactive plan will provide broader protection for horses while they're at home or on the road.



ABOUT THE AUTHOR

Fairfield T. Bain, DVM, MBA, DACVIM, DACVP, DACVECC, is Associate Director of Strategic Development and Innovation (Equine) for Merck Animal Health. A graduate of Auburn University, School of Veterinary Medicine, Dr. Bain's distinguished career includes extensive experience in practice, academia and within the industry. He is known especially for his work in perinatology and neonatal intensive care, cardiovascular disorders, pathology and hyperbaric oxygen therapy.

WANT TO ASK A QUESTION? EMAIL THE EDITOR.

For more information on vaccinating for infectious diseases, visit merck-animal-health-usa.com/species/equine/products/prestige-5-wnv

SKIP THE GROCERY STORE When Extending Donkey Semen

With a new extender for donkey semen, veterinarians can skip the last-minute runs to the grocery store, joked **Igor F. Canisso**, DVM, MSc, PhD, DACT, DECAR, senior author of a recent study that looked at a cholesterol-loaded cyclodextrin addition to skim milk-based extenders.

“Anecdotal knowledge has always recommended the addition of fresh egg yolk to the milk-based extender used for donkey semen,” he said. Donkey semen does not do as well with skim milk-based extenders as stallion semen does, because the composition of donkey seminal plasma and sperm plasma membrane are different from that of a stallion. Donkey sperm appears to benefit from the addition of lipids.

However, there can be issues with using fresh eggs, explained Dr. Canisso, associate professor of theriogenology in the Department of Veterinary Clinical Medicine, University of Illinois, Urbana-

Champaign, College of Veterinary Medicine. “The composition of the egg yolk could differ from time to time. It could add bacterial contamination and—most importantly—fresh egg yolk is not readily available in all veterinary practices.”

New semen-cooling extenders with cholesterol-loaded cyclodextrins added to skim milk-based extenders are now available. Dr. Canisso and his team wanted to know whether a commercial extender that contains cholesterol-loaded cyclodextrin (SKM-CLC; BotuSemen Special) would work as well or better than a skim milk-based extender (SKM; BotuSemen).

“The study evaluated the effects of a skim milk-based extender with or without cholesterol on sperm quality and fertility,” said **Lorenzo Segabinazzi**, DVM, MSc, PhD, a former member of Canisso’s lab, now a post-doctoral scholar at Ross University.

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Collecting semen from a stallion.



Photo courtesy of Dr. Igor F. Canisso

Donkey Data

The veterinarians took 35 ejaculates from 7 jacks that ranged in age from 5-to-13 years old. The ejaculates were prepared and then split between the 2 extenders. They were extended at 50 million sperm/mL and stored for 48 hours at 5° C.

Semen was assessed before cooling and again at 24 and 48 hours for total motility, progressive motility and percentage of sperm with rapid motility and were not statistically different ($P>0.05$). Specifically, there was no difference in any parameters between the extenders before cooling and after cooling. There was a slight reduction seen with both extenders. However, the SKM-CLC extender did better among all the parameters.

In a second experiment, which assessed fertility in 2 estrous cycles of 15 mares, the veterinarians cooled and stored 28 ejaculates from a single jack for 24 hours. The mares were randomly inseminated with semen that was extended with either SKM-CLC or SKM extenders. Fifteen days after insemination, pregnancy was assessed. Seven of the 15 cycles resulted in a pregnancy in the mares inseminated with SKM-CLC extender and two of the 15 cycles resulted in a pregnancy in the mares inseminated with the SKM extender (47% vs. 13%; $P<0.05$).

“This study successfully demonstrated that the addition of cholesterol-loaded cyclodextrins to skim milk-based extenders for donkey semen results in superior semen quality and fertility,” Dr. Segabinazzi told the *Modern Equine Vet*.

“This result highlights the importance of cholesterol in stabilizing the plasma membrane of donkey sperm,” she added. “The cholesterol to phospholipid ratio in the plasma membrane is essential to maintain the fluidity and stability of sperm membrane at low temperatures.”

Stallion Studies

They performed similar studies on stallion ejaculate, comparing an extender with a native phosphocaseinate (INRA 96, IMV) and one that contains a sodium caseinate and cholesterol-loaded cyclodextrins (BotuSemen Gold, Botupharma USA). They wanted to assess the semen parameters and embryo recovery rates of the 2 extenders.

They tested 45 ejaculates from 9 mature stallions from 8-to-17 years old. There were 4 Quarter horses, 2 Standardbreds, 1 Paint, 1 Morgan and 1 Arabian. The ejaculates were extended to 50 million sperm/mL and stored in 3 passive cooling containers for 48 hours.

Then, the ejaculates were centrifuged, the seminal plasma was removed, and the pellets were resuspended at 100 million sperm/mL with the same extender used originally.



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¹ Data on file.

² Adequan® i.m. Package Insert, Rev 1/19.

³ Burba DJ, Collier MA, DeBault LE, Hanson-Painton O, Thompson HC, Holder CL: In vivo kinetic study on uptake and distribution of intramuscular tritium-labeled polysulfated glycosaminoglycan in equine body fluid compartments and articular cartilage in an osteochondral defect model. *J Equine Vet Sci* 1993; 13: 696-703.

⁴ Kim DY, Taylor HW, Moore RM, Paulsen DB, Cho DY. Articular chondrocyte apoptosis in equine osteoarthritis. *The Veterinary Journal* 2003; 166: 52-57.

⁵ McIlwraith CW, Frisbie DD, Kawcak CE, van Weeren PR. *Joint Disease in the Horse*. St. Louis, MO: Elsevier, 2016; 33-48.

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Collecting semen from a Jack.

In both instances, they assessed the sperm motility parameters, plasma membrane integrity and high mitochondrial membrane potential at three points: before cooling, and 24 and 48 hours after cooling.

“The study showed that when the semen is not further processed through centrifugation, the addition of cholesterol with the extender improves semen quality,” said **Giorgia Podico**, DVM, MS, a clinical instructor in the Department of Veterinary Clinical Medicine, University of Illinois, Urbana-Champaign, College of Veterinary Medicine. “When the semen is processed and the seminal plasma is removed, the sperm motility, viability and fertility of the semen do not change between the 2 extenders,” said Dr Podico.

The new cholesterol-loaded cyclodextrins extenders have a few advantages for small clinical practices, however, according to Dr. Podico. “They come in a 100-mL plastic vial instead of a glass bottle with a larger volume of more than 200 mL, which is useful to avoid waste and to make sure you work with fresh extender every time,” she said.

IMPORTANCE OF EXTENDERS

Extenders, which contain cryoprotectants like glycerol, or other molecules like cholesterol, stabilize the membrane of the sperm and prevent damage when the temperatures are lowered for shipping or freezing. The addition of sugars provides an energy source for the sperm.

They also contain antibiotics because semen normally contains bacteria. “A heavy bacterial load can reduce the viability of the semen and cause a uterine infection in the mare,” Dr. Igor Canisso said.

“The immediate addition of extenders is very essential in case of contamination of the semen with urine, which can happen during ejaculation in certain stallions, or in the case of seminal plasma toxicity’ when the semen contains proteins that bind and attack sperm damaging them,” he said.

Dr. Giorgia Podico recommended that veterinarians perform a cooling test on breeding stallion semen 30-to-60 days before the breeding season. “The goal is to find the perfect match of extender and cooling device to ensure the viability and fertility of the semen shipped.

“We saw how extenders can interact differently with the sperm plasma membrane and how this heavily affected the ability to endure colling and fertilize the egg once in the mare reproductive tract,” she said. “Doing a cooling test before the breeding season allows you to introduce changes that can improve the semen quality if needed. For example, the diet has quite a significant impact on the sperm membrane composition. Thus, supplements or feed with high amounts of omega-3 and -6 could be introduced to change the lipid composition of the membrane and enhance semen quality.”

“Also, they do not require refrigeration during storage. The box comes with single-use dilutant bottles and packs of powder to be mixed 20 minutes before use. After being mixed they can be stored in the refrigerator for up to 3 days.

She said more studies are needed in larger and more diverse populations, but the new extender represents a viable alternative to traditional extenders. **MeV**

For more information:

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<https://www.sciencedirect.com/science/article/abs/pii/S0737080620301957?via%3Dihub>

PAST Act Introduced in the U.S. House of Representatives

U.S. Representatives **Steve Cohen** (D-TN), **Brian Fitzpatrick** (R-PA), **Jan Schakowsky** (D-IL) and **Vern Buchanan** (R-FL) recently introduced the Prevent All Soring Tactics (PAST) Act.

The legislation (H.R. 5441) would protect Tennessee Walking Horses, Spotted Saddle horses and Rack-ing horses by outlawing the abusive practice of soring, which is the intentional infliction of pain to create the exaggerated gait known as the “big lick” in the show ring. The legislation has the support of 212 additional cosponsors in the U.S. House of Representatives.

In addition, companion legislation (S. 2295) introduced in the U.S. Senate on June 24 by Sen. Mike Crapo (R-ID) currently has 48 cosponsors.

The PAST Act is supported by the American Association of Equine Practitioners, the American Veterinary Medical Association and hundreds of other stakeholder

groups and individuals, including the American Horse Council, Humane Society of the United States, American Society for the Prevention of Cruelty to Animals and many state veterinary medical associations in the United States.

“For many years, the AAEP has championed legislation to end this cruel practice, and the recent reintroduction of this important bill to protect horses is vital,” said **Scott Hay**, DVM, the 2021 AAEP president. “We now will work for passage along with our more than 9,000 equine veterinarian and student members and the industry.”

The AAEP is encouraging U.S. members to contact their congressional representatives and ask them to support the bill in their respective chamber and become a cosponsor. Contact information: house.gov/representatives and senate.gov/senators. **MeV**

Merck Forms Strategic Partnership with EquiTrace

Merck Animal Health formed a strategic U.S. partnership with Irish-based technology company EquiTrace Ltd., creators of the EquiTrace platform.

Through the EquiTrace smartphone app, the entire horse care team can securely update and access each horse’s GPS location and medical record in 1 convenient location. The app also works with Merck Animal Health’s Bio-Thermo microchips, allowing horse care professionals to instantly read, graph and monitor a horse’s temperature.

“This partnership is a natural extension of our commitment to delivering innovative infectious disease management solutions to support improved horse care,” said **Ron McDaniel**, director of U.S. Equine Sales, Merck Animal Health. “By enabling convenient digital temperature monitoring, we’re able to make life easier for busy veterinary and farm teams while providing them with tools to help efficiently identify illness and monitor disease outbreaks.”

EquiTrace, which can be used with individual horses or at large barns, is compatible with any microchip but must be coupled with a Bio-Thermo microchip to access the temperature-sensing functionality. Bio-Thermo microchips measure a horse’s temperature within one-tenth of a degree and provide access to a horse’s identification. Both the EquiTrace app and Bio-Thermo microchips work with the Global Pocket Reader Plus and the HomeAgain UWSR+ microchip readers, and the EquiTrace app is available for iPhones or Androids.

In addition, the Bio-Thermo microchip is compliant with the International Organization for Standardization (ISO) Standards 11784 and 1178 and meets requirements of both the International Federation for Equestrian Sports (FEI) and the United States Equestrian Federation (USEF).

“We are excited to partner with Merck Animal Health to bring EquiTrace to the U.S.; the technology streamlines health recordkeeping, a task that has traditionally been hard to maintain in busy barns,” says EquiTrace founder **Kevin Corley**, BVM&S, PhD, DACVIM, DACVECC, MRCVS.

EquiTrace data are encrypted, and each barn’s data is private. The EquiTrace account owner authorizes others to access data securely through the app. All EquiTrace functions are available with no internet connection for easy access at the barn or on the road. New data are synced when the app is opened with an internet connection. To download EquiTrace, visit the App Store or Google Play. Learn more at www.equitrace.app or contact your Merck Animal Health equine sales representative. **MeV**

For more information:

Langer F, Fietz J. Ways to measure body temperature in the field. *J. Therm. Biol.* 2014 May;42:46-51. DOI: 10.1016/j.jtherbio.2014.03.002.
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Improving the Prognosis for a SURGICAL COLIC

By Marie Rosenthal, MS



A horse with a large colon volvulus. They prefer to stay on their backs to take the weight off the twisted large colon.

An early referral to surgery provides the best opportunity to maximize the successful management of colic and reduce the potential for complications, explained **Anthony Blikslager**, DVM, PhD, a surgeon at the NC State College of Veterinary Medicine, in Raleigh.

The horse will likely suffer less intestinal injury and require a less complicated surgery that can be done faster, and then will have a faster recovery post anesthesia, he explained.

Even a complicated colic, such as a large colon volvulus, should have a better prognosis if the referral is made sooner rather than later, he explained.

A study done by the folks at Rood and Riddle Equine Hospital in Lexington, Ky., found that broodmares with large colon volvulus who were referred were more likely to survive if the time to admission

was fewer than 2 hours. If the duration of the horse's colic was greater than 4 hours before referral, the horse was 11-fold less likely to survive. If the referral was 2 to 4 hours after the colic, the horse was 3-fold less likely to survive, Dr. Blikslager explained. "This is a very severe disease. So, you don't have much time with the horse," he said.

"And those horses—they got into the hospital at less than 2 hours," he reminded. "Now, this is not always possible for all of us because, for example, in North Carolina, many of our trailer rides are 3 to 4 hours in duration but it emphasizes what a difference it can make to refer early in terms of survival."

About 80% of horses are discharged after colic surgery. "Overall prognosis for short-term survival is actually quite good, but complications continue to be

Photo courtesy of Dr. Anthony Blikslager

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¹ Data on file. Merck Animal Health.



Image courtesy of Dr. Anthony Blikslager

A horse with an incisional infection.

problematic,” he said, but “colic is a 24/7 disease.”

Clear Client Communication

To make an informed decision quickly, it's important to be up front with clients and to make sure they understand not only what is at stake in terms of survival, but what they can happen before, during and after surgery.

Clients need to understand what the prognosis is and what complications might occur, when they are trying to decide whether they should consent to a surgical colic, Dr. Blikslager explained.

“I think it's really important to explain the prognosis as accurately as possible to a client, rather than something nonspecific like ‘guarded.’ They are going to want to know what that really means,” Dr. Blikslager said.

“Explain which complications may occur and when. So, with a client that I have, when they come to the hospital, I will talk to them about what their horse is going to go through in the surgery and what might occur in the 24 to 48 hours afterward.”

He will discuss the various places during and after surgery when a complication might occur and what can be done to help prevent that complication. Besides catastrophic injuries, such as a fracture, that any horse could suffer recovering from anesthesia, veterinarians should discuss 3 major complications following colic surgery that could be life-threatening, he suggested:

1. Hypovolemic and endotoxemic shock;
2. Post-operative ileus and the development of adhesions; and
3. Incisional complications, such as wound infections.

Monitoring for hypovolemic or endotoxemic shock tends to be done in the first 24 to 48 hours post-surgery. Management to lessen the chances of shock include administering fluid and electrolytes, and the addition of

colloids or plasma if needed to maintain osmotic pressure. Some veterinarians prescribe polymyxin B, but their efficacy has not been proven, he said.

The appearance of many complications following colic surgery coincides with the inflammatory response, he explained.

“So, can we reduce these complications by reducing inflammation?” He asked, answering that reducing the duration of the colic by early referral would help because a less complicated surgery minimizes surgical manipulation of the bowel. “Surgical manipulation initiates inflammation,” he said.

Medications that can aid healing and pain control, while reducing inflammation are also important.

Pain medications can help improve recovery, but nonselective nonsteroidal anti-inflammatories (NSAIDs) tend not to be the best choice, because they might inhibit intestinal repair and motility, and post-operative ileus is a concern. Cox-2 inhibitors might be the NSAID of choice.

The use of IV lidocaine might improve intestinal repair, with 1 study showing that it reduced the time of post-operative ileus and reflux. However, Dr. Blikslager said studies are needed to confirm these findings.

“One thing that has been looked at in particular is whether or not lidocaine can be used to treat postoperative ileus. In this 1 study, it was shown to be protective. So, an odds ratio of less than 1, but this wasn't significant,” he explained.

“Originally, it was thought that trauma, ischemic distension and endotoxin all contributed to sympathetic overactivity,” slowing gastrointestinal motility.

“But more recently, what has been discovered is that these events trigger inflammation and this syndrome is attributable to inflammation within the intestine.”

The inflammatory response inhibits enteric nerves and reduces contractility, putting the horse at risk for post-operative ileus, he explained.

“So, the key is in reducing inflammation,” he said. “In terms of inflammation, it's also important to recognize that this is happening within the wall of the intestine, but also on its exterior or serosal surface.”

Adhesions, which typically appear within 3 to 5 days of surgery, can cause intermittent pain and sometimes requires an early return to surgery. They are more common in patients with a small intestinal obstruction.

“We will try to manage that pain and see how these horses do, because if they do have adhesions, a second surgery carries a much lower prognosis,” he said.

Carboxymethylcellulose, which can be applied during surgery, can mitigate adhesion formation. His institution compared a period when they did not apply carboxymethylcellulose with a period when they did.

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“You do see a significant difference in survival, meaning reduced survival in those horses not getting carboxymethylcellulose; increased survival in those that do, and we believe that’s because of reduction of adhesions,” Dr. Blikslager said.

Two other post-surgical considerations are wound infections and hernia. Removing skin staples or sutures as soon as possible allows for drainage and lavage, which can help prevent infection. The referring veterinarian might have to continue this management upon discharge, he said.

Horses that suffer hernias are 12 times less likely to return to former work, he said. Hernia belts can reduce tension on the linea alba and prevent the need for a herniorrhaphy. If hernia repair is required, waiting

about 6 months between the colic surgery and hernia surgery will optimize success. Again, this is important to explain the clients: allowing the wound to form thick fibrous tissue is important and that takes time.

Another serious complication is laminitis, which can be devastating. Continuous cryotherapy can help but is “near impossible” to do on the farm and is better used before discharge.

Finally, controlled return to exercise also appears to be beneficial for the horse.

Communication and understanding are key. The veterinarian needs to understand the owner’s expectations for the horse, and the client needs to understand the entire process, not only the surgery and prognosis, but various complications the horse might see. **MeV**

Extended Umbilical Portal Incision Comparable With Parainguinal Incision for Castration

The extended umbilical portal incision offers a comparable and successful alternative to extending the parainguinal incision for removing the testis following laparoscopic castration, according to a recent study.

In addition, the technique may limit trauma to the surrounding musculature or vasculature of parainguinal incisions.

Laparoscopic removal of cryptorchid testes has been routinely reported through enlarged parainguinal incisions in dorsally recumbent horses; however, outcomes following removal through an extended umbilical incision have not been reported previously.

Surgeons reviewed the medical records of 79 horses presenting for a laparoscopic cryptorchidectomy from January 2006 to December 2016. The horses were between 1 and 14 years of age. Of these, 68 horses were unilaterally cryptorchid (38 left, 30 right) and 11 horses were bilaterally cryptorchid.

Cryptorchid testes were castrated by ligating loop application and/or electrosurgery. The umbilical portal incision was extended along the linea alba for testes removal. All descended testes were removed by routine closed castration with the scrotal incision left to heal by second intention.

The researchers recorded all perianesthetic laboratory values, surgical procedure descriptions, surgery and anesthesia times, and in-hospital perioperative complications. Five horses (6%) had intraoperative complications; 3 required an additional hemostatic technique; 1 developed intra-abdominal hemorrhage from the left parainguinal incision that resolved spontaneously, and 1 sustained a perforation of the large colon requiring conversion to a laparotomy.

Thirteen horses (15%) developed post-operative complications: 2 were anorexic and mildly pyrexic; 4 developed colic signs responsive to medical management; 4 horses developed a hemoabdomen, of which 2 resolved without treatment, 1 resolved with medical treatment, and 1 required standing laparoscopic electrocautery of the right spermatic cord; 2 horses developed an umbilical portal incisional infection, of which 1 resolved without treatment and 1 required opening and cleaning of the wound to resolve.

One horse was euthanized due to an inability to stand following anesthesia.

Although the technique appears to be a successful alternative, the researchers cited several limitations. The study was retrospective, lacked a control group, and there was no follow-up after discharge. **MeV**

For more information:

Finley CJ, Fischer AT Jr. Removal of equine cryptorchid testes through an enlarged umbilical portal in dorsally recumbent horses after intra-abdominal laparoscopic castration. *Equine Vet J.* 2021 June 10. 10 June 2021 <https://doi.org/10.1111/evj.13483>
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INDICATION BetaVet® (betamethasone sodium phosphate and betamethasone acetate injectable suspension) is indicated for the control of pain and inflammation associated with osteoarthritis in horses.

IMPORTANT SAFETY INFORMATION For **Intra-articular** (I.A.) use in Horses. **CONTRAINDICATIONS** BetaVet® is contraindicated in horses with hypersensitivity to betamethasone. Intra-articular injection of corticosteroids for local effect is contraindicated in the presence of septic arthritis.

WARNINGS: Do not use in horses intended for human consumption. Clinical and experimental data have demonstrated that corticosteroids administered orally or parenterally to animals may induce the first stage of parturition when administered during the last trimester of pregnancy and may precipitate premature parturition followed by dystocia, fetal death, retained placenta, and metritis. Additionally, corticosteroids administered to dogs, rabbits and rodents during pregnancy have resulted in congenital anomalies. Before use of corticosteroids in pregnant animals, the possible benefits should be weighed against potential hazards. **Human Warnings:** Not for use in humans. Keep this and all medications out of the reach of children. **PRECAUTIONS:** Corticosteroids, including BetaVet®, administered intra-articularly are systemically absorbed. Do not use in horses with acute infections. Acute moderate to severe exacerbation of pain, further loss of joint motion, fever, or malaise within several days following intra-articular injection may indicate a septic process. Because of the anti-inflammatory action of corticosteroids, signs of infection in the treated joint may be masked. Due to the potential for exacerbation of clinical signs of laminitis, glucocorticoids should be used with caution in horses with a history of laminitis, or horses

otherwise at a higher risk for laminitis. Use with caution in horses with chronic nephritis, equine pituitary pars intermedia dysfunction (PPID), and congestive heart failure. Concurrent use of other anti-inflammatory drugs, should be approached with caution. Consider appropriate wash out times prior to administering additional NSAIDs or corticosteroids. **ADVERSE REACTIONS:** Adverse reactions reported during a field study of 239 horses of various breeds which had been administered either BetaVet® (n=119) or a saline control (n=120) at five percent (5%) and above were: acute joint effusion and/or local injection site swelling (within 2 days of injection), 15% BetaVet® and 13% saline control; increased lameness (within the first 5 days), 6.7% BetaVet® and 8.3% saline control; loose stool, 5.9% BetaVet® and 8.3% saline control; increased heat in joint, 2.5% BetaVet® and 5% saline control; and depression, 5.9% BetaVet® and 1.6% saline control. **SHAKE WELL IMMEDIATELY BEFORE USE.** For additional safety information, please see full prescribing information. **CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.**

References: 1. Trotter GW. Intra-articular corticosteroids. In: McIlwraith CW, Trotter GW, eds. Joint Disease in the Horse. Philadelphia: W.B. Saunders; 1996; 237-256.

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(Betamethasone Sodium Phosphate and Betamethasone Acetate Injectable Suspension) 6 mg betamethasone per mL
For Intra-Articular (I.A.) Use in Horses

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

INDICATION: BetaVet® is indicated for the control of pain and inflammation associated with osteoarthritis in horses.

DOSAGE AND ADMINISTRATION: Shake well immediately before use.

CONTRAINDICATIONS: BetaVet® is contraindicated in horses with hypersensitivity to betamethasone. Intra-articular injection of corticosteroids for local effect is contraindicated in the presence of septic arthritis.

WARNINGS: Do not use in horses intended for human consumption.

Clinical and experimental data have demonstrated that corticosteroids administered orally or parenterally to animals may induce the first stage of parturition when administered during the last trimester of pregnancy and may precipitate premature parturition followed by dystocia, fetal death, retained placenta, and metritis. Additionally, corticosteroids administered to dogs, rabbits and rodents during pregnancy have resulted in cleft palate in offspring. Corticosteroids administered to dogs during pregnancy have also resulted in other congenital anomalies including deformed forelegs, phocomelia and anasarca. Therefore, before use of corticosteroids in pregnant animals, the possible benefits to the pregnant animal should be weighed against potential hazards to its developing embryo or fetus. **Human Warnings:** Not for use in humans. For use in animals only. Keep this and all medications out of the reach of children. Consult a physician in the case of accidental human exposure.

PRECAUTIONS: Corticosteroids, including BetaVet®, administered intra-articularly are systemically absorbed. Do not use in horses with acute infections. Acute moderate to severe exacerbation of pain, further loss of joint motion, fever, or malaise within several days following intra-articular injection may indicate a septic process. Because of the anti-inflammatory action of corticosteroids, signs of infection in the treated joint may be masked. Appropriate examination of joint fluid is necessary to exclude a septic process. If a bacterial infection is present, appropriate antibacterial therapy should be instituted immediately. Additional doses of corticosteroids should not be administered until joint sepsis has been definitively ruled out. Due to the potential for exacerbation of clinical signs of laminitis, glucocorticoids should be used with caution in horses with a history of laminitis, or horses otherwise at a higher risk for laminitis. Use with caution in horses with chronic nephritis, equine pituitary pars intermedia dysfunction (PPID), and congestive heart failure. Concurrent use of other anti-inflammatory drugs, such as NSAIDs or other corticosteroids, should be approached with caution. Due to the potential for systemic exposure, concomitant use of NSAIDs and corticosteroids may increase the risk of gastrointestinal, renal, and other toxicity. Consider appropriate wash out times prior to administering additional NSAIDs or corticosteroids.

ADVERSE REACTIONS: Adverse reactions reported during a field study of 239 horses of various breeds which had been administered either BetaVet® (n=119) or a saline control (n=120) were: acute joint effusion and/or local injection site swelling (within 2 days of injection), 15% BetaVet® and 13% saline control; increased lameness (within the first 5 days), 6.7% BetaVet® and 8.3% saline control; loose stool, 5.9% BetaVet® and 8.3% saline control; increased heat in joint, 2.5% BetaVet® and 5% saline control; depression, 5.9% BetaVet® and 1.6% saline control; agitation/anxiety, 4.2% BetaVet® and 2.5% saline control; delayed swelling of treated joint (5 or more days after injection), 2.5% BetaVet® and 3.3% saline control; inappetence, 3.4% BetaVet® and 2.5% saline control; dry stool, 1.7% BetaVet® and 0% saline control; excessive sweating, 0.8% BetaVet® and 0% saline control; acute non-weight bearing lameness, 0.8% BetaVet® and 0% saline control; and laminitis, 0.8% BetaVet® and 0% saline control.

CLINICAL PHARMACOLOGY: Betamethasone is a potent glucocorticoid steroid with anti-inflammatory and immunosuppressive properties. Depending upon their physico-chemical properties, drugs administered intra-articularly may enter the general circulation because the synovial joint cavity is in direct equilibrium with the surrounding blood supply. After the intra-articular administration of 9 mg BetaVet® in horses, there were quantifiable concentrations of betamethasone (above 1.0 ng/mL) in the plasma.

EFFECTIVENESS: A negative control, randomized, masked field study provided data to evaluate the effectiveness of BetaVet® administered at 1.5 mL (9 mg betamethasone) once intra-articularly for the control of pain and inflammation associated with osteoarthritis in horses. Clinical success was defined as improvement in one lameness grade according to the AAEP lameness scoring system on Day 5 following treatment. The success rate for horses in the BetaVet® group was statistically significantly different (p=0.0061) than that in the saline group, with success rates of 75.73% and 52.52%, respectively (back-transformed from the logistic regression).

ANIMAL SAFETY: A 3-week target animal safety (TAS) study was conducted to evaluate the safety of BetaVet® in mature, healthy horses. Treatment groups included a control (isotonic saline at a volume equivalent to the 4x group); 1X (0.0225 mg betamethasone per pound bodyweight; BetaVet®); 2X (0.045 mg betamethasone per pound bodyweight; BetaVet®) and 4X (0.09 mg betamethasone per pound bodyweight; BetaVet®). Treatments were administered by intra-articular injection into the left middle carpal joint once every 5-days for 3 treatments. Injection site reactions were the most common observations in all treatment groups. Injection site reactions were observed within 1 hour of dosing and included swelling at the injection site, lameness/stiffness of the left front limb, and flexing the left front knee at rest. The injection site reactions ranged from slight swelling (in many horses on multiple days in all treatment groups) to excessive fluid with swelling, pain, and lameness (4x group only). Injection site reactions were observed most commonly on treatment days, and generally decreased in number and severity over subsequent days. The incidence of injection site reactions increased after the second and third injection (number of abnormalities noted on day 10 > day 5 > day 0). In the BetaVet® treated groups the number and severity of the injection site reactions were dose dependent. The 4X BetaVet® group had the highest overall incidence of and severity of injection site reactions, which included heat, swelling, pain, bleeding, and holding the limb up at rest. The control group and 4X group (which received similar injection volumes) had a similar incidence of injection site reactions; however, the severity of reactions was greater in the 4X group. Absolute neutrophils were statistically significantly higher in the BetaVet® treated groups as compared to the control group. Trends toward a decrease in lymphocytes and eosinophils, and an increase in monocytes were identified in the BetaVet® treated groups after the initial dose of BetaVet®. Individual animal values for white blood cells generally remained within the reference range. BetaVet® treated horses also had a trend toward increased blood glucose after the initial dose. Some individual animals showed mild increases in blood glucose above the reference range.

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Could Soluble CD14 Aid in the Diagnosis of EPM?

By Paul Basilio

The discovery of a biomarker to aid in the diagnosis of equine protozoal myeloencephalitis (EPM) could be an invaluable diagnostic tool, because the diagnosis can be frustrating and inexact.

To that end, **Alayna N. Hay**, PhD, of the Virginia-Maryland College of Veterinary Medicine, Blacksburg, Va., and her colleagues set their attention on soluble CD14 (sCD14)—a protein that is part of the innate immune system—to investigate whether it could be a reliable way to differentiate EPM-affected horses and neurologically normal horses.

“Further defining inflammatory proteins associated with EPM, could help us characterize the inflammatory response associated with EPM and potentially improve diagnostics,” Dr. Hay said at the ACVIM Forum 2021.

The Study

Study horses were recruited at the Virginia-Maryland College of Veterinary Medicine. Neurologic signs were assessed, and blood and cerebrospinal fluid (CSF) specimens were collected and then analyzed for sCD14 at Cornell University.

Horses were considered to have EPM based on veterinarian-assessed clinical neurologic signs consistent with the disease, as well as SAG 2/4/3 titers. If a horse had a serum:CSF ratio ≤ 100 , it was indicative of EPM.

EPM-affected horses received no corticosteroid treatments prior to enrollment.

Horses were considered healthy controls if their neurologic examination was within normal limits, their titer levels were >100 , and their spinal cord appeared histologically normal on postmortem examination.

A total of 13 horses (7 with EPM and 6 healthy control horses) were included. The average age was 13.4 years for the EPM horses and 16 years for controls.

Results

“In EPM-affected horses, there was an increase in serum and CSF concentrations of sCD14,” Dr. Hay said.

The increase did not quite reach significance for serum sCD14. The mean concentration was 502 ng/mL in controls vs 673 ng/mL in EPM-affected horses.

“However, the CSF concentrations for the EPM group were significantly increased when compared with the control group,” she added. “The mean sCD14 CSF concentration for the EPM group was 29 ng/mL, and the mean sCD14 concentration for the control group was 18 ng/mL.”

The group then went a step further to investigate

the correlations between CSF and serum sCD14 concentrations. Results showed no correlation between the 2 concentrations for the control horses, but there was a significant positive correlation between serum and CSF sCD14 concentrations.

“This could suggest a relationship between peripheral and intrathecal sCD14 levels in horses with EPM, but further investigation is required,” she explained.

In answer to the question of whether it’s possible to use this information to characterize the inflammatory response in horses with EPM, Dr. Hay said, “It’s a step in the right direction but further investigation is needed to fully determine the role of sCD14 in EPM pathogenesis and diagnosis.”

“sCD14 is a myeloid-derived inflammatory marker that is correlated with monocyte and macrophage activation, these results give us insight on the inflammation that occurs in the spinal cord of an EPM-affected horse,” she said. “However, this was a small pilot study. Future studies with larger sample populations will need to be conducted to see if these trends hold true.”

Dr. Hay also pointed out that this trend may be present in other conditions as well.

This work has been accepted for publication by *Veterinary Immunology and Immunopathology*. **MeV**

Aservo EquiHaler Wins Innovation Award

The Aservo EquiHaler (Boehringer Ingelheim) received a 2021 Pharmacapack Health Product Award in the newly established Animal Health category.

The award recognizes innovations that have improved drug efficacy, user safety or reduced the environmental impact.

“What makes our Aservo EquiHaler stand out is the ergonomic handle and dosing lever for ease-of-use handling and the nostril adaptor that fits gently inside the horse’s nostril, allowing for easy inhalation of the medicated mist,” explained **Martin Folger**, principal fellow Expert & Risk Management, Global Innovation, Boehringer Ingelheim. “We submitted this product because it is an industry first in equine medicine. Until now, there was no approved inhalant therapy licensed for use in horses with severe equine asthma.” **MeV**



After Ophthalmic Surgery, Champion Racehorse Returns to Winner's Circle

By Rob Warren

Thanks to UC Davis equine specialists in surgery and ophthalmology, Camino Del Paraiso is back to his winning ways after what could have been a career-ending injury.

Camino Del Paraiso, an 8-year-old Thoroughbred gelding, has never been one to enjoy visits to the farrier. The champion racehorse was spooked when being led to the farrier shop at his Golden Gate Fields stable. He smashed his head into a barn wall and took a severe fall. His handlers could see damage to his left eye and called for the onsite veterinarian, who informed them that if they wanted to save the eye, they needed to get him to the University of California Davis veterinary hospital immediately.

Specialists from the Equine Surgical Emergency and Equine Ophthalmology services at UC Davis' Large Animal Clinic observed an anxious horse with abrasions to the left side of his head, with swelling and involuntary muscle spasms surrounding the eye orbit. His third eyelid was prolapsed, and the globe of the left eye could not be located within the orbit. A brief ultra-

sound was performed which showed a displaced, but intact globe with normal lens position.

The Diagnostic Imaging Service was brought in to get a better diagnosis of the situation. Radiographs highlighted the extent of the damage—a complete orbital fracture, but further evaluation would be needed to fully characterize the fracture and the integrity of the eye prior to surgery. So, a computed tomography scan was ordered to get the best details of the injury. There were multiple fracture fragments associated with the orbit causing the globe itself to be pushed inward.

"In many instances like this injury, the eye is removed, and the socket sewn closed," said **Bridget Nottle, DVM**, an equine surgery resident, commenting on the severity of the injury. "Camino Del Paraiso is fortunate to have an owner who would go to such lengths to save the eye."

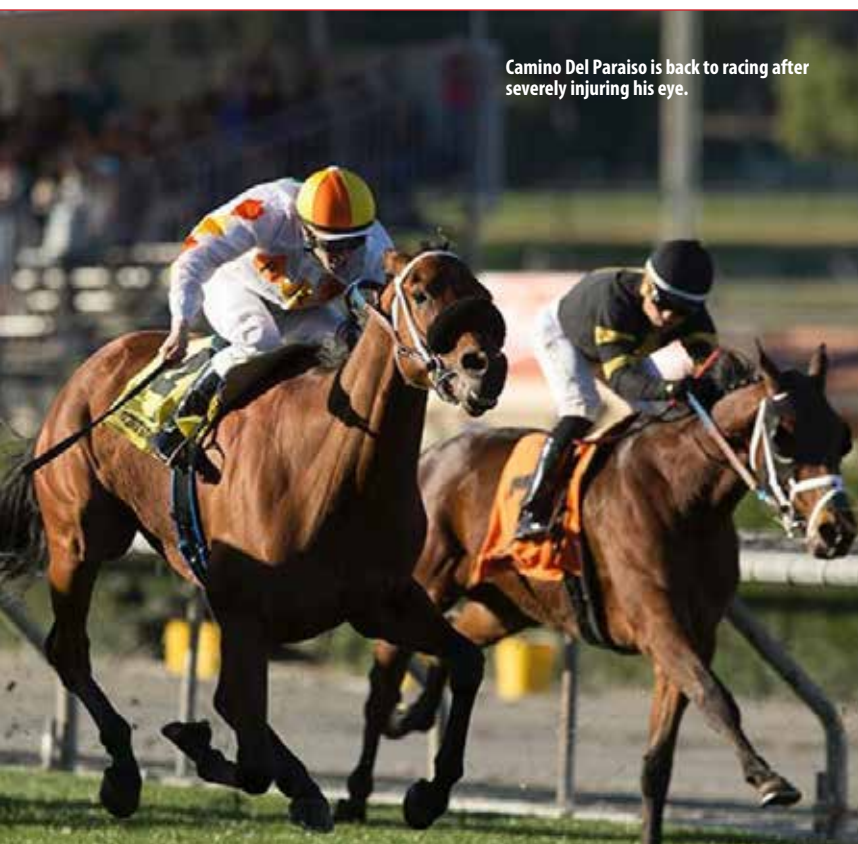
Based on the location of the fracture and the degree of fragmentation, the surgeons wanted to try to manipulate the fragments back to a normal orientation to allow the globe to return to a more normal position in the orbit under general anesthesia. Working with the ophthalmology team, equine surgeons repaired the fracture and repositioned the eye and muscles surrounding the orbital socket. Following surgery, the globe was noted to be within a more normal position, however, there was residual swelling surrounding the eye as a result of the initial trauma.

Camino Del Paraiso responded well to surgery and improved every day. By the third day of recovery, ophthalmologists were finally able to examine the eye fully. Camino Del Paraiso could follow motion with the repaired eye, clearly showing the eye to still be visible. A recheck ophthalmology examination was performed 2 days later which revealed continued improvement in the swelling around the eye and the third eyelid.

In total, Camino Del Paraiso was hospitalized at UC Davis for 1 week. After discharge, he remained on stall rest for 6 weeks with only brief hand walks daily. Additional rehabilitation at a layup facility was necessary to recover from the severe body soreness from the fall, but Camino Del Paraiso was back to training in 5 months.

On Sept. 6, almost exactly 8 months after the accident, Camino Del Paraiso won the Rolling Green Stakes at Golden Gate Fields in his first race back.

Bought in 2014 as a yearling for only \$5,000, Camino Del Paraiso has earned more than \$519,000 in 42 starts, with 8 firsts, 12 seconds and 4 thirds. **MeV**



Camino Del Paraiso is back to racing after severely injuring his eye.

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[1] Brendemuehl JP, Kopp K, Altman J. Uterine Inflammatory Response to Frozen Semen is attenuated by Oral Supplementation of a Blend of Omega-3 Fatty Acids (Algal DHA and Flax Seed) in Susceptible and Resistant Mares. Submitted to Theriogenology. [2] Brendemuehl JP, Altman J, Kopp K. Influence of dietary algal N-3 fatty acids on breeding induced inflammation and endometrial cytokine expression in mares bred with frozen semen. J Equine Vet Sci. 2014; 34(1): 123-124. [3] A.M. Adkin, A.V. Muniz, C.J. Mortensen, L.K. Warren. Maternal fatty acid supplementation influences memory and learning ability in yearling and 2-year-old horses. J Equine Vet Sci. 2015; 35: 418-436. [4] A.M. Adkin, L.K. Warren, C.J. Mortensen, J. Kivipelto. Maternal supplementation of docosahexaenoic acid and its effect on fatty acid transfer to the foal (longitudinal study). Equine Vet Sci. 2013; 33: 321-329. [5] A.M. Adkin, L.K. Warren, and C.A. McCall. Effect of maternal docosahexaenoic acid supplementation on behavior and cognitive development in nursing foals. J Equine Vet Sci. 2013; 33: 321-399.



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Lidocaine Appears Safe for Ophthalmic Anesthesia, but Did Cause a Transient Increase in IOP

Retrobulbar injection using 10 mL lidocaine appears safe in normal eyes of adult horses, but causes a transient increase in intraocular pressure (IOP), according to a recent study.

The researchers wanted to characterize the safety and efficacy of 1 injection technique for retrobulbar anesthesia.

Unilateral retrobulbar injection with 10 mL lidocaine (2%) was performed in 8 sedated adult mares. Contralateral eyes served as untreated controls. They measure neurophthalmic parameters, in IOP, and corneal and periocular sensation while the horses were awake, post-sedation and at periodic times for 24 hours following injection. Adverse effects were documented.

Injection of 10 mL lidocaine significantly increased IOP for up to 2 hours, maximally at 30 min (mean [95% CI]: 6.0 [2.7, 9.2] mm Hg).

Six of the 8 treated eyes developed mild-to-moderate reversible chemosis for 2 to 24 hours. One eye developed

severe chemosis and superficial corneal ulceration at 24 and 48 hours following injection, respectively. Corneal sensitivity significantly decreased for 6 hours, maximally at 10 min (-44.4 [-34.6 , -54.1] mm).

Periocular sensitivity (measured as increase in applied force) significantly decreased dorsally and medially for up to 2 hours (maximal at 2 hours [367.1 [238.5, 495.7], and at 30 min: 345.8 [202.6, 488.9] respectively). Ventral and lateral sensitivity were not effectively decreased beyond 30 min. Optic nerve function was not consistently reduced following injection.

Reversible chemosis commonly develops 2 to 4 hours following injection and may be severe in some horses with risk for corneal ulceration, the researchers said.

Corneal anesthesia is rapid and prolonged, but all periocular regions are not anaesthetized consistently. Therefore, it should be combined with other local anesthetic injections for eyelid surgeries or enucleations, they added.

MeV

For more information:

Yang VY, Eaton JE, Harmelink K, et al. Retrobulbar lidocaine injection via the supraorbital fossa is safe in adult horses but produces regionally variable periocular anaesthesia. *Equine Vet J*. 2021 Aug. 16.

<https://beva.onlinelibrary.wiley.com/doi/10.1111/evj.13496>

Foundation for the Horse Awards Nearly \$640,000 to Benefit Horse Welfare



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—Alexa Riddle, DVM
Owner, Ocotillo Ranch & Riddle Equine Hospital

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The Foundation for the Horse approved \$638,922 in grants for 31 programs and projects committed to the foundation's mission of improving the welfare of horses.

The disbursement includes support for 5 working equid welfare projects administered by equine veterinarians and others throughout Central America, the Caribbean, Africa and the United States. Scholarship support to help students and recent graduates offset the financial strain of veterinary school includes the inaugural Bill Rood Leadership Scholarship—an endowed scholarship established by friends, colleagues and clients of the retired Rood & Riddle Equine Hospital cofounder.

Allocated funds are also earmarked for disaster preparedness programs in Kentucky and West Africa and continued support of veterinary first responders in areas prone to floods and wildfires.

Other projects receiving funds include essential skills workshops and convention programming for students as well as 7 equine research projects spearheaded by graduate students and/or residents.

"In a year where we've seen a greater need than ever before, we are so grateful to our donors that have joined in supporting our mission," said **Richard Mitchell**, DVM, MRCVS, DACVSMR, chair of The Foundation for the Horse Advisory Council. "The Foundation's investment in equine veterinary education, research and support for horses at risk will truly improve the welfare for many horses and working equids."

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